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Mapping Teacher's Readiness to Improve the Government Policy in Implementing Higher-Order Thinking Skills-Based Learning

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ABSTRACT: Recently, there have been many trainings aimed at investigating pedagogical practices among teachers related to HOTS-based teaching in the context of Indonesian education. This research aims to test the teachers' readiness to implement high-order thinking skills-based learning in Indonesia. This research used a mixed-method approach with a cross-sectional design. Furthermore, a cross-sectional design was used because three variables (teacher readiness, government policy, and higher order thinking skills-based learning) were involved with qualitative and quantitative testing. A total of 260 teachers and 2,645 students were selected by random cluster sampling. Data were collected using documentation, observation, and questionnaire techniques. The results showed that 96% of teachers were aware of high-order thinking skills-based learning, but only 71% applied the skill, and the lesson was correctly designed by 48.75%. The teachers are ready for the factual and conceptual knowledge, but not the procedural and metacognitive aspects. Besides, in preparing the high-order thinking skills-based learning design, some teachers choose the action verb of Bloom's taxonomy inaccurately, so the learning objectives and evaluation are also inappropriate. In addition, teachers have provided learning subjects to direct students in critical thinking; creativity; collaboration; and communication, but the intensity is necessarily increased. The research results conclude that teachers are unprepared to implement high-order thinking skills-based learning programs due to their lack of knowledge and experience. Therefore, teachers need intense assistance to support the success of learning.

Keywords: critical-creative, factual-metacognitive, high-order thinking skills.

I. INTRODUCTION

Building a sustainable future is closely linked to education. The primary role of education is to empower individuals and future generations as decision-makers to face the complex and important challenges in the 21st century, including enabling change and building a sustainable future collectively [1]. Higher education has a special role in educating and creating agents of change. The UN Sustainable Development Goals (SDGs) (establishing the 2030 agenda for Sustainable Development), the link between higher education and sustainability is more crucial [2]. The Conference on Sustainable Development with the Higher Education Sustainability Initiative (HESI) for the first time in the context of the UN initiative [3]. Higher Education Institutes recognize the responsibility that they bear in pursuing a sustainable future and agree to act collectively and share their practices in a large voluntary contribution [4]. Integrating in higher education sustainability refers to a broad scope of initiatives including pedagogy and learning, academic research, campus management, practice, and impact as an organization. Pedagogical ability is one of the keys to successful educating [5]. Teachers must develop professionally on an ongoing basis so that their competence is always up-to-date. Teachers are the implementers of various programs and policies in an effort to increase students' abilities to improve the quality of learning. High-order thinking skills (HOTS) based learning was

implemented to improve critical and creative thinking skills in 2016. The demands faced by students in the industrial era 4.0 are to become students who have critical thinking, communication, collaboration, and creative skills to solve real-world problems effectively in the era of global competition [6, 7, 8]. Therefore, education in Indonesia has an important role in teaching quality learning processes and achievements.

The Indonesian Ministry of Education and Culture includes these skills in the context of classroom learning through the implementation of the latest curriculum, namely the Merdeka curriculum. In the Merdeka curriculum, there are six dimensions of character that students must have. These dimensions include faith in God Almighty and noble morals, independence, cooperation, diversity, critical thinking, and creativity. The six profiles are known as the Pancasila student profile [9]. The Pancasila student profile is a character that is implemented in everyday life. According to [10], with the Pancasila student profile, students not only study theoretical knowledge but also implement this knowledge. Students must observe, study, and solve problems or obstacles that occur around them. Proper learning can encourage students to analyze and evaluate what they learn so that they gain meaningful learning experiences. Basically, high-level thinking skills are skills that train students to become accustomed to dealing with real-world problems [11]. Based on the research results it also showed students' average scores to be below standard because they have difficulty doing well on the National Examination. Although teachers have been trained to implement student-centered approaches, they failed to do it appropriately [12]. The educational experts criticized the teacher-centered learning approach because it does not stimulate students to think critically and creatively [13]. The results of the evaluation also show teachers' wrong understanding of HOTS-based learning. Most teachers are confused about the process. According to Rinorvian et al. [14], HOTS-based learning equips students to adapt to the work environment. The research of González-pérez and Ramírez-montoya [15] stated that competencies and skills needed in the 21st century include the ability to think critically, creatively, and adaptively. Fisher and Seroussi [16] indicate that the hallmark of HOTS-based learning is capable of directing students to be skilled in critical and creative thinking. These help students to be more innovative and have good creativity, ideas, and imagination [17]. Critical and creative thinking skills include communication, collaboration, critical thinking, and problem-solving, as well as creativity and innovation [18].

The urgent need experienced by teachers and the lack of knowledge and experience have led to many obstacles in every lesson. Teachers are not able to design learning oriented towards higher-order thinking skills which are learning competencies that teachers must have as an effort of continuous professional development [19]. In addition, teachers lack understanding in designing questions with the HOTS category. This is a concern for the government with the support of universities to think of initiatives to solve this problem by organizing micro but gradual and sustainable trainings to facilitate today's teachers. The efforts of the Ministry of Education, Culture, Research and Technology in improving the quality of learning have yielded results in the form of improving the quality of students by implementing the Learning Competency Improvement program initiated through the Directorate General of Teachers and Education Personnel (Ditjen GTk). One of the materials that is the focus of development in this program is Higher Order Thinking Skills-based learning, the main objective of which is to provide teachers with provisions to implement HOTS-based learning in their respective institutions so that students are accustomed to this form of learning that produces results. In reality, the government has not tested teachers' readiness for HOTS-based learning. Teachers' readiness is tested through their beliefs and the development of teaching practice [20]. Problems arise when teachers are asked to change the way they teach in the classroom because they have been trained to adapt to the problem-solving system. According to some studies, certain teachers still face problems in ensuring that HOTS is included in the lessons. According to Momanyi [21] stated that most teachers do not show sufficient readiness to teach thinking skills. According to [22] also stated that the professional training process does not facilitate the promotion of curiosity and analytical skills because teachers often teach memorization of facts and figures [23]. Thus, this causes students to rely on memorization without proper stimulation of analysis and synthesis of meaning [24]. The above-mentioned issues highlight the implementation gap that can be seen between government policies and their implementation. In this context, teacher's beliefs and world wise views on HOTS-based learning are necessary. The knowledge about HOTS-based learning and innovation is a key component of teachers' readiness. Therefore, correct knowledge and good learning innovation improve HOTS [25]. Teachers are the most important aspect of implementing a

quality school [26]. According to Louws et al [27], innovations significantly affect the effectiveness and students learning outcomes. The difference between this study and previous studies is the latest intervention design in the form of an independent curriculum and the competencies it develops. Most previous studies used interventions in the form of teaching methods and only focused on high-level thinking skills. This is different from this study which uses an independent curriculum that not only focuses on high-level thinking skills but also teacher readiness and government policies.

The literature above shows that knowledge, instructional design, teaching practices, and student responses are key components of teacher readiness in teaching. It is very important to investigate teacher readiness in transforming towards the learning paradigm in the current era, due to the lack of empirical studies examining teacher practices in HOTS-based learning. This study aims to investigate pedagogical practices among teachers related to HOTS-based teaching in the context of Indonesian education.

II. RELATED WORK

1. TEACHING AND LEARNING

A teaching and learning process can be defined as a transformation process of knowledge from teachers to students [28]. It refers to the combination of various elements within the process where an educator identifies and establishes the learning objectives, develops teaching resources, and implements teaching and learning strategies [29]. A teaching and learning process is an educational setting environment of instructors who provide content, objectives, and goals; learners receive knowledge and produce performance and outcomes [30]. The quality of teaching and learning is often compromised due to a lack of constant up-gradation in knowledge on certain subjects or issues. Innovation and continuous learning are the primary ways to ensure success in teaching [31].

2. HIGH-ORDER THINKING SKILLS (HOTS)

According to Özgelen [32], students operating on high cognitive domains help to produce a significant uniqueness in communication, different ideas, and the application of critical and creative knowledge. The high cognitive domains as inferring, drawing conclusions, synthesis ideas, generating hypotheses, comparing and differentiating, and analyzing and evaluating alternatives. Furthermore, it is stated that thinking skills are a knowledge discipline learned and practiced until it forms a norm or experience.

Students' thinking process needs to go beyond simply learning facts and content to confront the real world. Students with a deep conceptual understanding of an idea are capable of solving new problems because knowledge obtained through high-order thinking skills is easily transferable [33]. Furthermore, thinking ability is divided into two parts: Low Order Thinking Skills (LOTS) and HOTS [34]. In simple terms, the differentiation between HOTS and LOTS can be seen in Table 1 below.

Table 1. Comparison of HOTS and LOTS in learning.

		Cognitive process	Definition
C1	L	Observing	Taking relevant knowledge from memory
C2	O T	Comprehending	Constructing meaning from the learning process, including oral, written, and pictorial communication
C3	S	Applying	Performing or using procedures in unusual situations
C4	H	Analyzing	Breaking matter down into its parts and determining how the parts relate to the structure or overall purpose
C5	O T	Assessing / Evaluating	Making considerations based on criteria or standards
C6	S	Creating	Putting elements together to form a coherent or functional whole; rearranging the elements into a new pattern or structure.

HOTS aims to improve students' thinking skills at a higher level [35]. Mastering this skill is necessary to win the competition in a global era, solve problems at the workplace, and build cooperation [36].

Furthermore, it is developed to improve the quality of learning and graduates [37]. The specific high-order thinking skills include reasoning, analyzing, problem-solving, and critical and creative thinking [38]. 21st-century learning needs to maintain the application of creativity, critical thinking, collaboration, and communication skills [39]. Critical thinking skills also draw on other skills such as communication and information skills and the ability to examine, analyse, interpret and evaluate evidence. The above skills are regarded as the 4C and are often referred to as HOTS. According to Selznick and Mayhew [40], there is a need for communication and collaboration to work with other people. HOTS-based learning helps students create and apply ideas to compete in the modern, ecological, and democratic era [41].

3. 21ST CENTURY EDUCATION (P21)

In the 21st century, thinking skills, especially creativity, are important in supporting economic prosperity. Therefore, human creativity has become a major economic resource [42]. The activities of the 21st century depend on creativity and innovation as an important key to success [43].

The idea is categorized as HOTS-based learning that requires high-level creative thinking and action because it is regarded as all stages of abstract thinking [44]. Therefore, complex thinking skills such as problem-solving, creating, analyzing, and evaluating are needed to process the collected information for generating an idea [45]. Furthermore, the HOTS challenges people to interpret, analyze, or manipulate information [46]. High-level thinking also makes people use and manipulate information to obtain a reasonable response to new situations [47]. Consequently, in the application of knowledge learned in daily life, creative ideas are generated through HOTS instead of LOTS.

There is a creation of a new lifestyle because the advancement of 21st-century technology has changed lifestyles and ways of interaction [48]. The readiness to face 21st-century challenges is effectively pursued through classroom learning [49]. Therefore, teachers need digital technology to support teaching and create a culture of sharing in the classroom to make students active.

4. COGNITIVE ASPECT

HOTS are closely related to cognitive, affective, and psychomotor domains which are an integral part of the learning and teaching process. The cognitive domains include students' ability to repeat or restate the concepts and principles that have been learned. Vukić, Martinčić-Ipšić, and Meštrović [50] revised the taxonomy by adding factual, conceptual, procedural, and metacognitive knowledge. Factual knowledge is essential facts, terminology, and details students need to know to understand a discipline or solve a problem. Conceptual knowledge is the classifications, principles, generalizations, theories, models, or structures pertinent to a particular disciplinary area. Procedural knowledge helps students do something specific to a discipline, subject, or area of study. Also, it is the methods of inquiry, finite skills, algorithms, techniques, and particular methodologies. Metacognitive knowledge is a strategy on how to solve problems and cognitive tasks and includes contextual, conditional, and self-knowledge.

Based on the concept above, it can be seen that teachers' ability to make variations of innovation in the classroom is the main factor that must be considered when teaching. Teaching based on comprehensive knowledge helps teachers discover appropriate teaching strategies and improve student learning outcomes. By understanding the knowledge dimension, HOTS-based learning can be implemented more easily.

III. MATERIAL AND METHOD

This research used a mixed-method approach with a cross-sectional design. The quantitative approach was used to generalize teachers' readiness, while the qualitative helps provide an interpretation of the data gained [51]. Furthermore, a cross-sectional design was chosen because it involves three variables with two testing methods. These variables include knowledge (Anderson), cognitive process (Bloom), and 4C-P21. FIGURE 1 shows the relationship between the 3 variables.

The factual, conceptual, procedural, and metacognitive aspects were used in the measurement of knowledge. Meanwhile, the cognitive process was reviewed in LOTS and HOTS, while 4C consists of creative, critical thinking, collaboration, and communication. The test method was in the form of written tests of knowledge and performance on the procedural aspects. Performance testing was carried out in the form of design demonstrations and classroom learning practices. The written test was used to find teachers' knowledge while performance was used to measure the ability to design and practice teaching with a HOTS-based approach.

FIGURE 1. Conceptual research design.

A conceptual research design is needed to conduct testing with cognitive process indicators at the HOTS-based level in Bloom's concept. Therefore, teachers' knowledge needs to be tested with Anderson's concept to show whether they have implemented the HOTS-based learning process. A total of 260 teachers and 2,645 students were selected from 21 provinces in Indonesia using random cluster sampling. This method was chosen because the population is quite large. Cluster random sampling is a regional sampling technique used to determine samples when the object to be studied is very large, for example, the population of a country, province, or district [52]. The formula for determining cluster random sampling is by using the following formula:

$$Ni = fi \times n \quad (1)$$

Fi Cluster fraction sample, *NI* number of individuals in the cluster, *N* total population size, *n* number of members included in the sample.

This regional sampling technique is often used in two stages. The first stage in determining regional samples is carried out by grouping respondents according to their regional zones in Indonesia, namely east, central, and west with a total of 34 provinces. The second stage is to determine the objects/individuals in the area, for example after being selected based on the zone, 21 provinces were determined as the respondents' residences.

Data collection was carried out using observation and questionnaire techniques. Observation techniques are able to provide an objective picture of the facts that occur in the field [53]. Data collection was carried out by distributing questionnaires to teachers and students in 21 provinces online using Google Form. This questionnaire is used to identify the level of application of high-level thinking skills.

The testing method is in the form of a written test of knowledge and performance on the procedural aspect. Performance testing is carried out in the form of a demonstration of design and learning practices in the classroom. The written test is used to determine teacher knowledge while performance is used to measure the ability to design and practice teaching with a HOTS-based approach.

Validation of questions and statements through expert evaluation and construction of validity testing using the SPSS application. Revisions are made based on input from experts and the results of construct validity tests. Next, instrument testing by conducting sample trials and collecting experimental data. Experimental data are analyzed (validity and reliability tests) by revising and deleting invalid and unreliable questions and statements. The instrument is also tested with content and construct validity. Content validity involves expert judgment to assess whether the items in the instrument cover all relevant aspects of the construct being measured. Meanwhile, construct validity refers to the extent to which the instrument accurately measures the intended theoretical construct.

The entire data of this study is in the form of qualitative and quantitative data. Qualitative data is processed using non-statistics and vice versa quantitative data using statistical analysis [54]. The first data analysis, data is collected using instruments that have been tested for validity and reliability, so that it can be ensured that the data obtained is valid and reliable. Second, the collected data is tested for homogeneity and normality using SPSS for windows 22. The results of the homogeneity test of statements and written test questions are greater than 0.05 which indicates normal and homogeneous data. Non-statistical analysis, related to observation results is used to give meaning to the description of data related to the content, logic, inference, and dynamics of the entire research process stages [55].

IV.RESEARCH RESULTS

1. HOW IS TEACHERS' KNOWLEDGE CONCERNING HOTS-BASED LEARNING?

Investigating teachers' knowledge in HOTS-based learning aims to test their understanding. The aspects of knowledge tested include factual, conceptual, procedural, and meta-cognitive aspects. However, it is measured by yes or no questions with a total of three questions, and the results are shown in FIGURE 2 below.

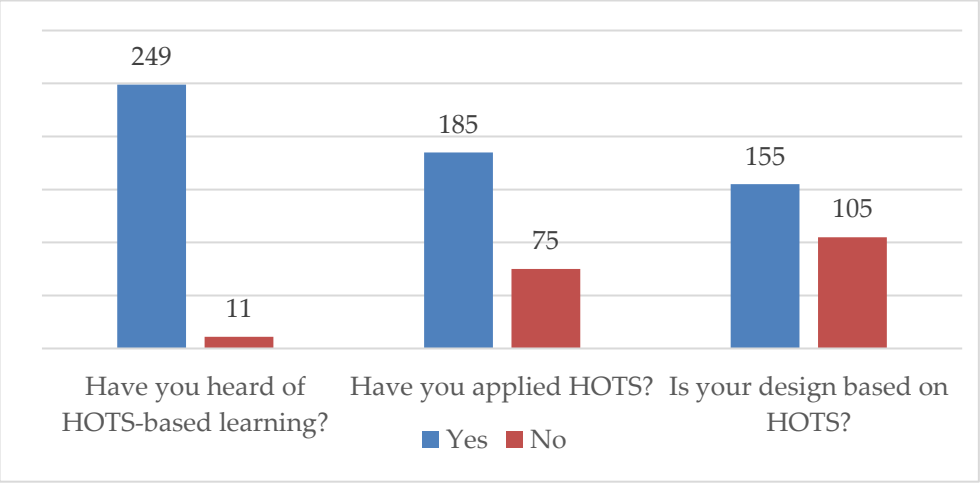

FIGURE 2. Factual knowledge histogram of high-order thinking skills-based learning.

From the results of Figure 2, data was found that factual knowledge of high-level thinking skills-based learning is divided into three things, namely teacher insight into HOTS-based learning, experience in implementing HOTS-based learning, and experience in designing HOTS-based learning. The results obtained indicate that teacher knowledge in the factual aspect is very good, especially in the first question (left bar). However, there was a decrease in knowledge in the second (middle bar) and third (right bar) questions. On the other hand, the third question shows that there are still few teachers who design HOTS-based learning. Teachers' factual knowledge is actually still limited to listening statements and lacking in the application and design of learning.

The conceptual knowledge aspect was measured by providing short answers to four questions. The results are shown in can be seen that in general the conceptual aspect is good. In the first question, the results were informed that only a minimal percentage (2%) was obtained regarding the understanding of HOTS-based learning. In addition, it can be seen that in the second question, there were 30% of teachers who did not understand Bloom's taxonomy action verbs including HOTS. This shows a lack of information regarding the ability to write Bloom's taxonomy sentences with HOTS levels. The third question resulted in 13% of teachers who had not been able to write examples of HOTS-based learning models. However, it is still lacking in the aspect of question number four. This question defines operational verbs (Bloom's taxonomy action

verbs) which are the core of conceptual understanding. The results obtained in the fourth question have reached 90% of teachers who can write examples of HOTS questions.

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Table 1. Teacher knowledge in terms of conceptual aspects.

No.	Items	Correct answers	Incorrect answers
1	Describe the meaning of HOTS-based learning briefly.	98%	2%
2	Write down two of Bloom's taxonomy action verbs including HOTS.	70%	30%
3	Write down two examples of learning models including HOTS.	87%	13%
4	Write two examples of HOTS-based questions.	90%	10%

The procedural aspect is measured by developing a set of HOTS-based learning designs. The compilation is focused on 2 main indicators, namely format and substance. The format contains components of the learning design, while the substance contains a complete description of each component. The results showed that 86% of teachers were able to compile the format and 14% were wrong. Meanwhile, the ability of substance showed 50% correct and 50% incorrect. This shows that in general the aspect of teachers' procedural knowledge is still lacking. Teachers' metacognitive knowledge was measured by two questions, and the results are shown in Table 2.

Table 2. Teacher knowledge in terms of metacognitive aspects.

Question	Correct answers	Incorrect answers
What are teachers going to do if students are passive in learning?	90%	10
What will be the impact if teachers do not apply HOTS-based learning?	100%	0

The above data showed diversity in teachers' knowledge about HOTS learning. Teachers' knowledge of the factual and metacognitive aspects is good, but their knowledge of conceptual and procedural aspects is poor. In addition, it is still found that some teachers have not been able to carry out interesting learning alternatives when students are passive in learning. Some teachers are sometimes confused in choosing learning strategies that trigger students' high-level thinking skills. This finding is in line with the results of observations. The observation of learning activities conducted by teachers revealed that the learning process was undefined clearly. The result showed the difficulty of teaching high-order thinking skills because the teachers lack the training to develop their learning tools.

2. HOW IS TEACHERS' LEARNING DESIGN IN PLANNING HOTS LEARNING?

The answer to this question is to determine whether teachers utilized the HOTS-based approach to design the learning. This also answers people's doubts that teachers know about the skill but they had difficulty implementing its real form. Therefore, teachers' learning designs that were assessed depending on HOTS-based learning indicators are measured by performance tests. The results are shown in Table 3.

Table 3. Results of HOTS-based learning design performance.

Aspects	Performance		Analysis
	Suitable	Unsuitable	
Format	78%	22%	In general, the format is correct.
Study plan formulation	35%	65%	most lesson plans do not refer to HOTS-level thinking processes
HOTS learning activities	45%	55%	HOTS-level learning activities are slightly more than LOTS
HOTS level evaluation	37%	63%	The evaluation represents the HOTS level

Table 4 shows that the results of HOTS-based learning design performance are seen in four characteristics, namely the format created, the formulation of the learning plan, HOTS-based learning activities, and HOTS level evaluation. In general, teachers have compiled the HOTS learning design format correctly. This is because the learning format has been provided by the government in the form of a teaching module format. However, there are still teachers who are not yet skilled in compiling HOTS learning formats. In addition, most of the lesson plans made by teachers do not refer to the HOTS level thinking process. Teachers have difficulty identifying HOTS-based learning indicators. They tend to compile simple lesson plans. When examined in Bloom's taxonomy, teachers make mistakes in determining operational verbs according to Bloom's taxonomy. The selection of operational verbs used in lesson plans is still in the cognitive realm of the knowledge and understanding level. Finally, they do not choose verbs at a higher level because of their minimal knowledge.

Furthermore, the results of observations show that teachers have procedural knowledge but fail to apply it in learning. However, teachers have difficulty linking HOTS-based objectives, activities, and evaluations together. These three things are the main points in classroom teaching plans. This is also emphasized as a component of learning by the government. Most teachers have not carried out HOTS-based learning activities optimally. Teachers prefer ordinary and uninteresting learning activities. They consider that high-level thinking is not needed so they choose LOTS-based learning or low-level thinking skills. Learning is made simple without any interesting triggers for students. Learning is carried out using the lecture method, doing assignments on worksheets, simple discussions, and questions and answers. As for learning evaluation, teachers have not made it at the HOTS level. On the other hand, the results of the study show that teachers already know the procedure for compiling learning designs but do not yet have the skills to make them. This condition is caused by the lack of intensive training, guidance, and assistance from other parties.

3. HOW IS THE PRACTICE OF TEACHERS' TEACHING EXPERIENCE IN HOTS LEARNING?

The teachers' practical teaching experience was measured to compare the design and implementation of learning. Data were collected using questionnaires and observation methods. The P21 criteria including critical, creative, communicative, and collaborative thinking were used for the measurement. The statistical analysis is described in Table 4.

Table 4. Descriptive analysis of the learning implementation.

Descriptive statistics					
Criteria	**N**	**Minimum**	**Maximum**	**Mean**	**Std. Deviation**
Learning Implementation	260	1.77	4.00	3.1882	0.39775
Critical thinking	260	1.00	4.00	3.1821	0.50922
Collaboration	260	1.00	4.00	3.2885	0.56904
Creativity	260	1.75	4.00	3.1375	0.45934
Communication	260	1.33	4.00	3.1449	0.45184
Valid N (listwise)	260				

Table 5 shows that the learning process carried out by teachers meets five criteria, namely learning implementation, critical thinking, collaboration, creativity, and communication. Of the five criteria, critical thinking skills are the criteria with the lowest minimum score. This means that there are still some teachers who ignore critical thinking skills as their learning objectives. In other words, teachers implement learning without always considering the aspect of students' thinking skills after learning. On the other hand, the average value of learning implementation shows a range of values that can be considered quite good (in the range of values 3). The results of the learning implementation questionnaire analysis show are described in Table 5.

Table 5. The results of the learning implementation questionnaire analysis

No	Criteria	Achievement level interval	Category
1	Learning Implementation	3.1882	Good
2	Critical thinking	3.1821	Good
3	Collaboration	3.2885	Very good
4	Creativity	3.1375	Good
5	Communication	3.1449	Good

From table 6, it is known that the implementation of learning with five criteria is dominated by collaborative learning. This means that teachers more often conduct discussions in groups. This is in line with the results of observations that show the conditions when teachers divide students into several groups. Group formation is often used by teachers because teachers want to provide freedom of differences during group work. However, they do not consider the effectiveness of the group process. When in groups, smart students are more dominant in mastering the group process. Teachers need to pay attention to special aspects in dividing groups. Groups must contain heterogeneous students.

On the other hand, the creativity criteria are still lower than other criteria. This indicates that teachers have not inserted the creative side into the learning process. Creativity is considered quite difficult to develop because its characteristics are difficult to find in the learning process. Student creativity requires precise tools or media during learning. In fact, teachers rarely use media in learning. These limitations trigger low achievement scores for creativity criteria. In addition to the explanation of learning implementation, this finding also discusses the criteria for teachers' critical thinking skills. The complete results are in Figure 3.

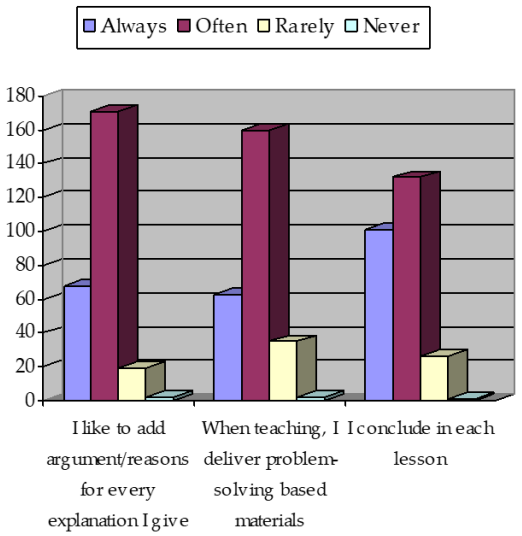

FIGURE 3. Criteria for teachers' critical thinking skills.

Figure 3 shows that the teachers have provided learning subjects to direct students to think critically. From Figure 3, it is shown that teachers often ask questions or ask for opinions from students during the process of explaining the material. Then, teachers also often send or provide problems according to the material while teaching. This activity is carried out to strengthen the ability to identify problems in students. In addition, teachers have also been accustomed to making conclusions for each lesson. This activity is carried out so that students remember the material that has been studied. This shows that teachers have various readiness. This data is highly expected by the government and becomes a stimulant for quality learning.

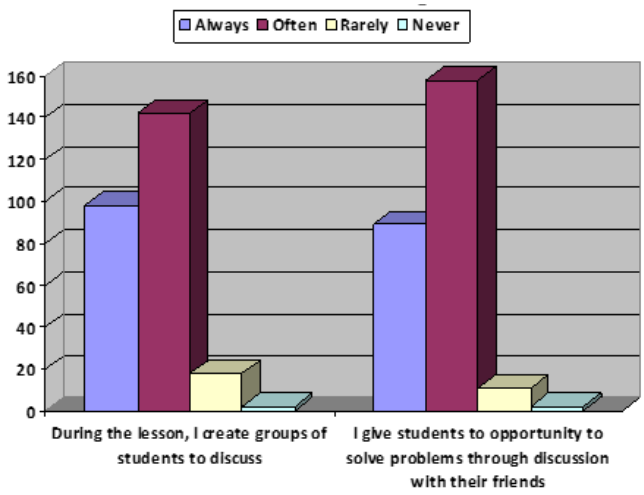

FIGURE 4. The histogram of teacher collaborative skills.

Figure 4 shows information about teachers' collaborative skills. This finding shows that teachers are good at developing collaborative skills in learning. The data shows that teachers create class groups for discussion during learning. As many as 57.7% of teachers have formed group discussions to solve their problems. Some other teachers have not implemented this routinely. In line with that, teachers also provide opportunities for students to solve problems together with their friends. Although the discussion method has been applied, it seems that the intensity needs to be increased. The discussion method is a learning innovation that has a high effectiveness in improving collaboration skills, as explained in the background. In addition to discussing students' collaboration skills, this study also discusses teachers' creativity. The complete results are presented in Figure 5.

Figure 5 contains the results of teacher creativity. There are four things that are emphasized in teacher creativity. The first is related to asking students about the subject matter during learning. The second is related to providing a variety of questions so that students can develop the subject matter. The third is related to creating opportunities for students to ask questions. The fourth is related to provoking ideas to students who cannot answer questions independently.

Of the four indicators, the ability to provoke ideas from students to students who cannot answer questions themselves is the most dominant. The answers obtained by the majority often do that. On the same side, teachers asking students during learning also achieve quite satisfactory results. Many teachers always and often apply this. However, the questions asked are not always varied. The opportunity to create or make questions is also not always superior. There are many reasons that underlie these results, such as there has been no habituation of question variations or opportunities to ask students.

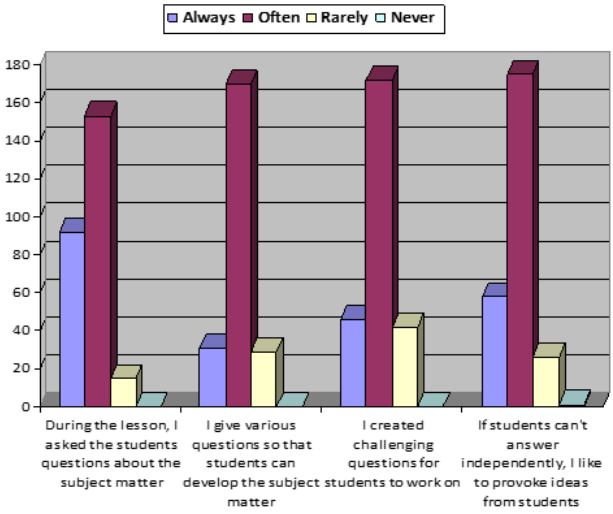

FIGURE 5. The histogram of teacher creativity.

All four indicators are in normal learning conditions. Therefore, teachers are required to increase learning creativity. This is indicated by the large percentage of teachers that rarely do creative learning. Therefore, teachers rarely give challenging questions to students because this data is consistent with observations during the implementation of classroom teaching. This data is certainly not comfortable to see. Creativity is needed for today's people and it is important to practice it since they are in schools.

Figure 6 shows a chart of teacher communication skills. There are three important things that are emphasized, namely the ability to explain feedback on student answers, provide explanations of the importance of the material being studied, and involve students in group assignments. The findings of this study provide less than satisfactory data. The teachers had not found a clear formula for developing communication skills. Meanwhile, observations made the teachers create interactive learning, but feedback, appreciation, and reward find difficulty generating higher curiosity. In case this condition is not resolved, it then leads to the application of a teacher-centered learning atmosphere and this is counterproductive to stakeholder expectations.

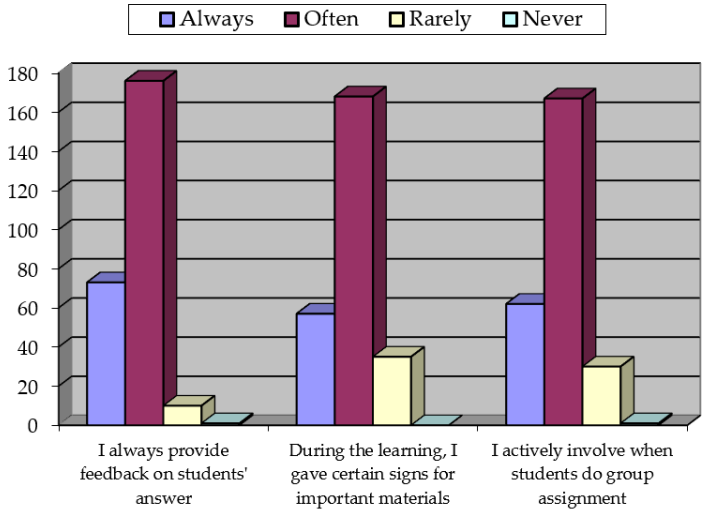

FIGURE 6. The histogram of teacher communication skills.

Observational data helped the teachers to implement and develop HOTS-based learning experiences. This is indicated by their ability to manage the class in an interactive, creative, and collaborative manner. However, learning experiences were not guided by a systematic design syntax. Students often repeated learning experiences at the LOTS level because it resulted in inconsistent evaluations and unmeasured HOTS indicators. Therefore, observation supported the questionnaire data that the teachers were good at HOTS-based learning in the factual and metacognitive aspects but were poor in the conceptual and procedural aspects.

V. DISCUSSION

In general, all dimensions of knowledge can be observed, but each dimension shows different data (Figure 2, Tables 2, and 3). The difference in data due to the knowledge dimension is based on the competence of each teacher. In this study, the difference in data is precisely the keyword. Therefore, it can be seen which dimensions are important to improve. it specifically presented in the following section. The research data indicated the diversity of teachers' knowledge about HOTS-based learning in Indonesia. Furthermore, factual and metacognitive aspects meet superior categories while conceptual and procedural aspects are poor. A teacher's factual and metacognitive knowledge reflects his/her compassion, care, and proficiency in understanding learning to be a teacher, sense of organization, democratic classroom, and clinical role for effectiveness [56]. The causes of teachers' poor procedural aspects are that teaching discourages manipulative skills, the teachers rarely apply integrated IT skills in learning, and teachers' practice of visual pedagogy is limited. Here, it is important to emphasize that teachers need to improve their procedural aspects. They are advised to learn more about manipulative skills, such as using interesting models, media, and learning methods. The analysis of learning implementation shows that the teacher-centered learning approach dominated continuously. Student-centered learning often has a negative impact on the learning process in the classroom. Teachers need to provide opportunities for students to be active in learning. Teachers should position themselves as facilitators rather than as directors and organizers of learning. In addition, the varied abilities of students were the challenges for the teachers in implementing HOTS-based learning. There was a weakness in students' learning independence since most of the students did the problems based on the examples, but they refused the complicated problems. Students did not understand how to solve a problem properly and correctly [57]. This happened due to the limited time and characteristics of each student. On the other hand, some students found it difficult to work on complex problems but they easily provide answers to easy problems. Thus, teachers need to get used to giving students questions that have a higher weight/complexity. This habit will foster higher abilities in students. Students will be more consistent in positive habits and solving problems with a high level of complexity.

The results of the knowledge test show that the factual and metacognitive aspects are very strong. This provides an opportunity for teachers in Indonesia to have the potential to advance. Factual knowledge increases teacher's beliefs while metacognitive enhances world wise to teach with future insights. The two aspects are needed for effective learning because teachers' beliefs help guide instructional decisions, influence classroom management, and serve as a lens for understanding classroom events [20]. Teachers' confidence in decision-making affects the learning process in the classroom. Teachers become wiser in dealing with conditions that occur in the classroom. The instructions given are also more logical and easier for students to understand. That way, students will be carried away with the potential to advance. Teachers need to maximize their metacognitive abilities well. Philosophically, worldviews present a framework where new ideas are examined and developed. It is found that the conceptual and procedural aspects are still weak when the teachers compile the learning design. The learning design that was prepared did not reflect high-level thinking conditions. A good understanding of HOTS-based learning is a challenge for teachers to redesign teaching materials including lesson plans and materials supporting learning [58]. In preparing HOTS-based learning designs, most of the teachers failed to choose Bloom's taxonomy action verbs. It means that the teachers choose levels C1 to C3, not C4 to C6. This level is considered an easy level to apply. In reality, most of the teachers do not understand how to implement the concept of Bloom's Taxonomy [59]. Teachers preferred to determine the provided assessment instrument measurement tools rather than develop

their own measurement tools. For them, the development of measuring instruments only shortens their time in completing class administration. As we know, there are a lot of class administrations that teachers must complete. Completing the administration takes a lot of time. They prefer to complete the administration rather than thinking about the learning process and outcomes produced/obtained by students after learning. In fact, now there are many examples of complete learning designs. Sometimes, teachers do not think about the content. They think about the practicality so they choose to adopt the existing learning design. Thus, teachers practically were clueless about how, when, and where Operational Verbs (OV) and Bloom's Taxonomy were appropriately applied [60]. In addition, there were also errors in the preparation of questions or quizzes since those presented questions did not refer to the chosen verbs so the learning objectives and evaluation were not appropriate. In line with the other opinion [61] stating that the average mistake in making HOTS questions by students was in determining the operational verbs. Operational verbs support question makers to formulate questions based on the level of ability in Bloom's taxonomy that they want to test. In addition, there was a weakness in the ability to integrate technology into learning designs to increase teacher creativity in implementing learning [62]. In fact, the integration of technology in learning has a great impact on student learning activities. As previous research states that the integration of technology in learning affects students' creativity and activeness. The ability of teachers to design and implement teaching is discussed in this section. In general, the ability of teachers to design HOTS-based learning is not good enough (Table 4). This corroborates the research findings in the first question. Knowledge plays a major role in the quality of teachers in teaching. Teaching experience data shows that the teacher's enthusiasm for teaching is very good and this fosters confidence in learning success. The teachers also use their time effectively but learning was not innovative because the subject taught is limited and there is no cooperation in the expert's effort. Students' learning experiences tend to be effective if there is cooperation, support by specialist expertise, focused on aspirations for learners, and sustained over time [63]. Additionally, professional learning positions teachers as agentic and also direct their learning to achieve a goal [64]. Teachers' professional learning has long been recognized as an important factor in enhancing educational quality [65]. Specifically, teachers' quality is a primary driver of variation in student learning outcomes [66].

The students are only interested in a specific indication and have the potential to think critically and creatively because their responses to HOTS-based learning show activeness. This is shown by their speed in answering the questions given and actively discussing with their friends. The fact that students only answer factual questions whose answers are easily found in books is one of the limitations of this program. Also, the students are less skilled in carrying out the scientific process on questions that require higher answers. They are used to getting simple questions that do not require complex answers. Furthermore, learning in the current era emphasizes more on results than on the process. Results in the form of numbers are a priority that many teachers pursue so that they are considered successful in teaching and explaining the material to students. The appreciation given by parents to teachers is also a reference so that teachers pay less attention to how students gain quality experiences in learning. Therefore, creativity and scientific process skills have a significant relationship [67]. The lack of learning experience in the form of discussion and problem-solving is another limitation. In most cases, teachers are stuck with the Teacher-Centered Learning (TCL) approach. The TCL makes students inactive and waits for the teachers' subject to learn. Emphasized that teacher-centered applications bring about more negative effects than student-centered education [68]. The TCL method cannot be applied absolutely in all situations. There are certain materials that require a different approach. More teacher effort is spent in learning. In addition, not all students get the same attention from the teacher. There are many risks of lack of student involvement in learning if not directed properly. The most important thing is that there is no balance between student learning freedom and teacher control. The next discussion was the students' unexposed reasoning and critical power. In a case where low-criteria verbs such as mentioning were used in a question, the students easily provided their answers. Meanwhile, when the questions used operational verbs with high criteria such as concluding, they had great difficulty in answering. This showed that the students were not used to answering complex questions. when students were given problems that were different from the examples, students found it difficult to work on them. It indicated that students were not accustomed to working on problems requiring a higher level [69]. Therefore, teachers provide learning experiences to stimulate students' critical and creative thinking. Leading students

to have high-level thinking skills is not as easy as pie, it needs a process and teachers' diligence in guiding it. The burden to improve students' critical thinking seems to be more mandated to teachers. Skills mostly grow and develop in schools [70]. Therefore, teachers' understanding of HOTS-based learning is crucial and urgent since it determines what and how the learning process is conducted. Teachers' understanding of HOTS can affect the way they teach HOTS in the classroom [71, 72]. A lack of knowledge about HOTS can make it difficult for teachers to design appropriate learning materials and learning activities.

Teachers are the key to enhancing critical thinking, creative, collaborative, and communication skills. Teachers have provided learning subjects to direct students in critical thinking. Observation results revealed that teachers incorporated critical thinking skills into their teaching. In addition, students were encouraged to find and solve their own answers through tasks taught in class with teacher guidance. This takes place through the habituation of group discussions in learning. This process is very impactful. The students can eventually acquire higher-order thinking ability. It is said that knowledge acquired through higher-order thinking processes is more transferable, so it is more likely that students with deep theoretical understanding connect the acquired knowledge to solve new problems. Meanwhile, students with deep theoretical knowledge provide better access to information to use it in new perspectives [73]. Teachers are also required to increase creativity in learning. The main key to enhancing creativity and innovation skills in students is an excellent learning environment by providing opportunities for students to solve real-world and authentic problems [38]. In addition, the development of student creativity is achieved by encouraging the students to utilize critical thinking skills in generating brilliant ideas and conducting things that have never been done by others [74]. Bright ideas challenging the students are solved by increasing the intensity of discussion methods in collaboration. Collaboration improves students' social skills. Teamwork in a group provides the students with a new perspective on the significance of working together and exchanging opinions with others in solving a problem actively. Collaboration allows for a variety of ideas and perspectives often stimulating creativity and innovation. The student groups practice communication and interaction between students. It trains students' communication skills in delivering their ideas and opinions. To create interaction between students and teachers, there is a harmonious communication process. Teachers ask questions and reveal the situation of students and vice versa. The students raise problems and obstacles that they face. Teachers' challenge in creating communicative learning aims to train students to get used to forming concepts, reasoning, and making decisions. Training students to have good communication skills is conducted by implementing a learning strategy with question and answer. The strategy is determined by providing interesting themes with learning materials. An interesting theme can provide a stimulus for the students to learn to respond well. The stimulus and response train the students to communicate during the learning process [75]. This stimulation process requires special and continuous assistance from teachers. Teachers need to combine complete learning tools. Occasionally, teachers need to invite students to learn outside the classroom so that they are interested and motivated to follow the learning with enthusiasm. Learning outside the classroom has many advantages, such as making the mind clearer, learning more enjoyable, objects being studied are clearly visible, and students' creativity is honed. However, teachers must master students more deeply because of the many wild objects that can attract students' focus more than the objects in the classroom.

Communication activities run well if both parties respond in the learning process. Communication skills are also indicated by the ability to convey information, ideas, emotions, and expertise through the use of symbols such as words, pictures, and other numbers accompanied by feedback. Communication activities come with various stimuli in learning, such as using unique and interesting learning styles and media. This indicates that teachers need to learn more about learning media that suit the characteristics of students. Media is a way for communication to occur in learning between teachers and students. Another assumption is that media is a stimulus for teachers to enliven learning in class. Communication becomes two-way. After the stimulus, there is a response or an argument, from the students. Therefore, there is a need for initiatives to conduct deeper and continuous assessments because the changes in HOTS-based learning have complex and complicated aspect aspects. The government is to create an intense mentoring program for teachers in designing HOTS-based learning. Also, the activities of partnership or collaboration help in providing many advantages and overcome incomplete understanding of learning. Incomplete understanding means limiting

the teacher's understanding (world wise) about the learning needed [20]. This research suggests the innovations of teachers in learning design and reform classroom management. Furthermore, innovations enhance effective learning experiences. Therefore, learning design and planning innovations provide a different learning experience in the classroom [28]. Class management reform help in developing high-order thinking skills, for both teachers and students. These reforms explicitly asked teachers to change their teaching strategies from traditional textbook-based and rote learning to exploration and inquiry-based learning situated in real-world phenomena.

Moreover, there is a recommendation of policymakers to improve educational strategies in the future [76]. The response is to strengthen teachers' knowledge about HOTS-based learning, especially the conceptual and procedural aspects. Meanwhile, the training held needs to be reformatted by adding conceptual proportions and guided exercises. This reinforcement helps in creating a new or adopting a model from another country.

VI. CONCLUSION

The results of the study indicate that teachers are not ready to implement HOTS-based learning programs which are characterized by several characteristics. First, most teachers have understood HOTS-based learning, but only a small number of them apply skills in learning and design learning correctly. In terms of teachers' conceptual knowledge, most teachers have difficulty in identifying learning indicators, organizing learning frameworks and substances. Teachers' metacognitive knowledge is good even though they have difficulty designing this aspect. In general, teachers are ready in the factual and metacognitive parts, but poor in the conceptual and procedural aspects. Second, most teachers fail in selecting Action verbs from Bloom's taxonomy in designing HOTS-based learning which is characterized by many errors in formulating questions. Third, teachers have provided learning materials that direct students to think critically, creatively, collaborate, and communicate, but the intensity still needs to be increased. Therefore, teachers need intensive guidance so that their conceptual and procedural understanding remains intact.

These findings have implications for Policies that can be taken or made by Policy makers to emphasize more on HOTS-based learning by paying attention to teachers' readiness to implement it. This policy must be socialized and required by the education office so that teachers implement it. Policy makers also need to help strengthen innovation in learning design and reform classroom management. In addition, in the teacher working group forum, teachers need to set discussion topics about HOTS learning. Teachers can share their opinions about their readiness in their respective schools to implement the learning scheme. In addition, teachers need to innovate learning design and practices because 21st century students have high abilities.

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Author Contributions

All authors made an equal contribution to the development and planning of the study. all authors have read and agreed to the published version of the manuscript.

Conflicts of Interest

The authors declare no conflict of interest.

Data Availability Statement

Data are available from the authors upon request.

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