

# Higher Order Thinking Skills in Evaluation of IV Grade Thematic Materials in Elementary Schools

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## ABSTRAK

Guru masih mengalami kesulitan dan belum maksimal dalam menyusun soal berbasis HOTS, sehingga kemampuan berpikir kritis siswa menjadi kurang optimal. Penelitian ini bertujuan untuk mengembangkan keterampilan berpikir tingkat tinggi atau Higher Order Thinking Skills yang dikenal dengan HOTS. Jenis penelitian yang digunakan adalah R&D dengan pendekatan kualitatif dan kuantitatif. Model pengembangan menggunakan model Martin Tessmer terdiri dari Tahap Pendahuluan, Tahap Evaluasi Diri, dan Tahap Prototyping. Metode yang digunakan dalam mengumpulkan data yaitu kuesioner. Instrumen yang digunakan dalam mengumpulkan data yaitu angket. Soal dan dilakukan uji validasi terhadap 2 dosen dan 2 guru. Uji coba terbatas pada 10 siswa dan tes luas untuk seluruh siswa kelas IV. Teknik analisis data menggunakan analisis deskriptif kualitatif dan kuantitatif. Hasil penelitian membuktikan bahwa soal yang dikembangkan layak digunakan dalam pembelajaran. Oleh karena itu dapat disimpulkan bahwa penelitian pengembangan Higher Order Thinking Skills atau HOTS pada soal tematik layak digunakan dalam pembelajaran di kelas IV sekolah dasar. Thinking Skills atau HOTS pada soal tematik layak digunakan dalam pembelajaran di kelas IV sekolah dasar.

## ABSTRACT

Teachers still experience difficulties and are not optimal in compiling HOTS-based questions, so students' critical thinking skills become less than optimal. This study aims to develop higher-order thinking skills or Higher Order Thinking Skills known as HOTS. The type of research used is R&D with qualitative and quantitative approaches. The development model using Martin Tessmer's model consists of the Preliminary, Self-Evaluation, and Prototyping Stage. The method used in collecting data is a questionnaire. The instrument used in collecting data is a questionnaire. Questions and validation tests were carried out on 2 lecturers and 2 teachers. The trial is limited to 10 students, and the test is broad for all fourth-grade students. Data analysis techniques using qualitative and quantitative descriptive analysis. The study results prove that the questions developed are suitable for learning. Therefore, it can be concluded that research on the development of Higher Order Thinking Skills or HOTS on thematic questions is appropriate for use in learning in grade IV of elementary schools. Thinking Skills or HOTS on thematic questions are appropriate for learning in grade IV of elementary school.

## 1. INTRODUCTION

The current development of science and technology requires students to have various abilities to face the future including 21st century skills consisting of critical thinking, creative, innovation, communication and collaboration (Detterbeck & Sciangula, 2017; Mahalingam & Fasella, 2017; Novita & Novianty, 2020). The 2013 curriculum is structured to improve 21st century skills requiring teachers to play an important role in training students to develop higher-order thinking skills (Hosnan, 2014; Karar & Yenice, 2012; Suknaisith et al., 2014). Students are expected not only to know and understand a knowledge but also to be able to analyze, evaluate and even create something from the utilization of the knowledge they have (Khiyarusoleh, 2016; Komara, 2018). Students need to be supported and given learning that can make them ready to live their lives in the future. Learning with the concepts of higher order thinking, problem solving, creative, innovative, being able to collaborate, and being able to

communicate well is an important indicator needed in the 21st century (Mardiana, 2020; Redhana, 2019). Therefore teachers need to design learning with the concept of higher order thinking skills, facilitating students in dealing with skills 21st century. One of the efforts to deal with 21st century skills is to develop an evaluation tool in the form of questions using HOTS.

In the 2013 curriculum or now the new paradigm curriculum, learning between one subject and another is made in a thematic form, except for mathematics and PJOK subjects. Thematic learning can equip students with the ability to think logically, analytically, systematically, critically, and creatively, as well as the ability to work together. These competencies are needed so that students can have the ability to acquire, understand, process, and utilize information to survive in conditions that are always changing, uncertain and competitive (Benmarrakchi et al., 2017; Obradović et al., 2015). Efforts so that students can have these abilities are carried out by applying questions that contain high-order thinking skills or known as Higher Order Thinking Skills or HOTS (Lusiana & S, 2022; Yulinawati & Wahyuningsih, 2022).

The observation results show that learning outcomes in theme 3 are still low in non-fiction text material. One of the reasons is that the test instruments given by the teacher to their students are only tests of knowledge, understanding which is included in the category of low-order thinking skills tests (Low Order Thinking Skill). Teachers rarely develop test instruments in the form of HOTS tests and there are no tests specifically designed to train HOTS so that students are not trained enough to work on questions that measure higher order thinking skills. This condition is caused because the teacher does not fully understand how to make questions that contain HOTS. In making questions containing HOTS, the teacher must first understand the Competency Achievement Indicators or GPA and learning objectives. But in reality, teachers are still confused in determining Competency Achievement Indicators (GPA) and learning objectives. In determining the GPA the teacher must know Bloom's taxonomy, but the teacher only knows and applies aspects of cognitive 1 or C1, cognitive 2 or C2, and sometimes uses cognitive 3 or C3. Therefore, efforts or steps are needed to encourage teachers to understand and apply the cognitive levels of the revised edition of Bloom's taxonomy as a way to create HOTS questions.

Referring to the problems above, it is necessary to create and develop questions for the subject matter of the Indonesian Language subject with HOTS content. This study aims to create and develop HOTS-laden Indonesian subject questions. This research is important so that teachers have skills in making HOTS-charged questions, in order to provide students with critical thinking skills in accordance with 21st-century learning. at level 4 (C4) namely analysis, level 5 (C5) namely synthesizing, and level 6 (C6), namely creating. Through an evaluation tool in the form of HOTS-filled questions, it is hoped that students will have 4C skills, namely Critical thinking and problem solving, Creativity and innovative, Collaborative, and Communicative, or said to be 21st century skills (Nofrion & Wijayanto, 2018; Pachler et al., 2019).

Higher-order thinking skills are defined in a variety of different perspectives according to experts. Higher Order Thinking Skills (HOTs) are defined as methods for critical thinking, knowledge transfer and problem solving (Fuadi et al., 2017; Mahalingam & Fasella, 2017). HOTS or high-level thinking skills are processes of deep thinking about information processing in dealing with and solving complex problems and involving the skills of analyzing, evaluating and creating. To measure high-level thinking skills, which are abilities that are not just remembering or referring without doing analysis, the instrument can be used in the form of HOTS-based questions. From this explanation it can be seen that students' thinking skills can be developed through the provision of challenging HOTS concepts.

Several experts explained about the characteristics of HOTS including Conklin who stated that the characteristics of HOTS were: "characteristics of higher-order thinking skills: higher-order thinking skills encompass both critical thinking and creative thinking" (Fanani, A., & Kusmaharti, 2018). The statement states that the characteristics of higher order thinking skills include critical thinking and creative thinking. The ability to think is a basic ability that can encourage someone to see a problem from various perspectives and look for different alternative solutions in order to produce new products that provide benefits for their survival.

The characteristics of HOTS-based questions are (1) being able to measure higher-order thinking skills, (2) using interesting problems or problems in everyday life, and (3) using types of questions in various forms (Adzobu, N, 2014; Morrar et al., 2017). This is described in the following description. (a) Measuring higher order thinking skills. These abilities include problem solving skills, critical thinking, creative thinking, decision making skills, and reasoning abilities. In line with this thought, the characteristic of HOTS is the ability to solve problems that have many possible solutions where the theory has not been taught beforehand (Budsankom et al., 2015; Suarti & Ramadhani, 2022). (b) Using problems in everyday life (contextual). HOTS-based assessments are assessments that involve situations in everyday life and students are expected to be able to apply the basic knowledge or concepts they have acquired to solve these problems. This definition concerns the skills of students in correlating, applying

and integrating science concepts to solve problems related to everyday life problems. This treatment is seen as very important so that teachers can carry out evaluations in accordance with the principles of objective assessment and can measure the actual abilities of students. The purpose of this study is to determine the development of Higher Order Thinking Skills on thematic questions and the feasibility of Higher Order Thinking Skills on thematic questions.

## 2. METHOD

The type of research used is R&D with qualitative and quantitative approaches. The development model using Martin Tessmer's model consists of the Preliminary Stage, Self Evaluation Stage, and Prototyping Stage (Validation, Evaluation, and Revision) (Wulandari et al., 2020). In this study, the product produced was in the form of thematic HOTS questions in class IV which were valid and practical. The research was conducted at Kampung Rambutan State Elementary School, Bogor City. In summary, the stages or research procedures can be seen in Figure 1.

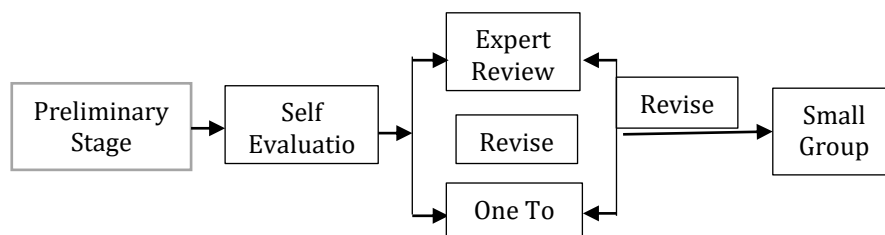


Figure 1. Formative Evaluation Design Flowchart

The research and development steps that will be carried out are (1) Preliminary Stage; assessment of several reference sources related to research. After some theory and information has been collected, activities will be carried out to determine places and test subjects by contacting school principals and teachers at schools that will be used as research locations and making other preparations, such as arranging research schedules and collaboration procedures with teachers. (2) Self-Evaluation Stage; self-assessment of the HOTS instrument design that the researcher will make. Stage is divided into 2 namely analysis and design. The flow of developing HOTS questions is show in Figure 2.

The activity begins with designing a question grid, HOTS questions and answer keys. Product design as a prototype. Each prototype focuses on three characteristics, namely content, construct, and language. The description of the three characteristics can be seen in Table 1.

Prototyping Stage (Validation, Evaluation, and Revision). The data analysis technique was carried out by testing the feasibility of HOTS questions and the practicality of HOTS questions. The due diligence was given to 3 validators, 2 lecturers and 1 teacher. Grid instrument for experts is show in Table 2.

The eligibility of the HOTS test questions uses the criteria in Table 3. The practicality of the HOTS test questions uses the criteria in Table 4.

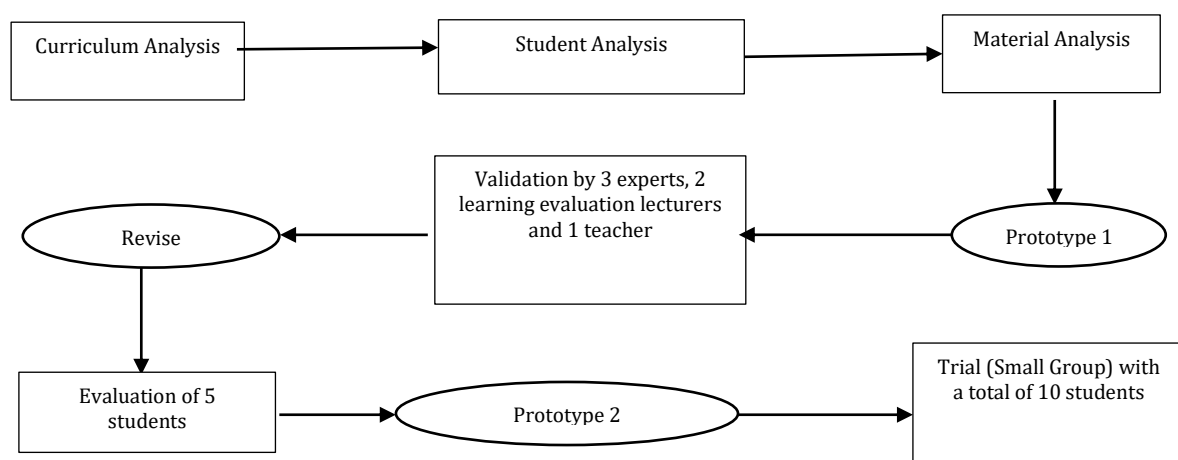


Figure 2. The HOTS Question Development Flow

**Table 1. Characteristics That are the Focus of the Prototype**

Content	a. Correspondence to the theme material 2 always saves energi
	b. Clarity of meaning
Construct	a. Questions according to supporting theory and indicators.
	b. With the type of finding relationships between various representations of concepts, the application of theme 2 always saves energy in other fields, and its application in everyday life.
	c. Have more than one solution or settlement strategy.
	d. In accordance with the level of fourth grade elementary school students.
Language	a. EYD compatible
	b. The questions do not contain multiple interpretations
	c. Sentences are commutative questions, using simple language, and easily understood by students.

**Table 2. Grid of Instruments for Experts/Experts**

No.	Indicator	Component assessment	No. Items
1.	Theory	Conformity of the items with SK, KD, and Indicator.	1
		Conformity of the items with level education.	2
		The suitability of the items with the material	3
2.	Construction	Question sentences are formulated with interrogative sentences or clear orders.	4
		The instructions are clear.	5
		Scoring guideline compliance	6
		Pictures, graphs, tables, diagrams, cases, or the like works clearly.	7
		Items do not depend on the answer to the question previously.	8
3.	Language Use	Sentences about communicative.	9
		Sentences using good language and right.	10
		Sentences do not cause interpretation double.	11
		The questions do not contain the words can offend students.	12
4.	HOTS	The questions have a standard Criterion C4	13-17
		The questions have a standard Criterion C5	18-22
		The questions have a standard Criterion C6	23-27

**Table 3. Eligibility Criteria for HOTS Test Questions**

Eligibility Value (%)	Criteria
$R > 3,20$	Very Valid
$2,40 < R \leq 3,20$	Valid
$1,60 < R \leq 2,40$	Valid Enough
$0,80 < R \leq 1,60$	Less Valid
$R \leq 0,80$	Invalid

**Table 4. Practicality Criteria**

Practical Value (%)	Criteria
$85 \leq P \leq 100$	Very Practical
$75 \leq P < 85$	Practical
$60 \leq P < 75$	Enough Practical
$55 \leq P < 60$	Less Practical
$0 \leq P < 55$	Impractical

### 3. RESULT AND DISCUSSION

#### Result

This research was conducted by examining several reference sources with the aim of obtaining information related to learning aspects. Determine the research location, namely SD Negeri Kampung Rambutan Bogor City and class IV with the theme of learning material 3 as research subjects. Coordination was carried out with school principals, teachers and students in preparation for development, then compiling a research schedule. After the design of the research implementation schedule is approved, the next step is to carry out the self-assessment of the HOTS instrument design that will be made. The stages are divided into 2 namely analysis and design. Next, design a question grid, HOTS questions and answer keys. Product design as a prototype and each prototype focuses on three characteristics, namely content, construct, and language.

The development of HOTS questions begins with compiling grids, compiling rubrics, and compiling questions. After the questions were designed, an initial expert validation test was carried out and revisions were made based on expert advice. After that, a limited trial was carried out at SD Negeri Kampung Rambutan Bogor in thematic learning followed by fourth grade students with a total of 20 students. Implementation of trial I used learning tools including learning designs (RPP), Student Worksheets (LKPD), teaching materials, learning media, attitude assessment and performance assessment, the learning model used was the Problem Based Learning model.

From the results of the analysis of multiple choice questions, it shows that there are 5 valid questions, namely numbers 3, 4, 5, 8, and 9. And 5 invalid questions, namely numbers 1, 2, 6, 7, and 10. Furthermore, for the essay it shows that there is 8 valid questions, namely numbers 5, 6, 8-13 and 5 invalid questions, namely numbers 1-4, and 7. From the data for calculating the reliability of the multiple choice test using the SPSS program, it shows a reliability coefficient value of 0.602. A test is said to be reliable if the alpha value is greater than the R-table. R-table of 0.444. then multiple choice questions can be said to be reliable. For the essay alpha value based on the table, it shows an alpha value of 0.741. greater than the R-table of 0.444. then the question can be said to be reliable.

The questions underwent revision II based on considerations of validity, reliability, discriminating power, level of difficulty, and deception. After revision II, trial II was carried out. Trial II was conducted at SDN Kampung Rambutan with 20 students. After that the device was again analyzed using the SPSS program, Microsoft Excel, and manually using the product moment correlation formula. To find out the validity of the questions after trial II.

Data validation of multiple choice questions and essays shows that all questions are valid. Because the validity score exceeds the R-table price. Multiple choice reliability value data has a value of 0.848 indicating that the question is reliable. And the essay questions have an alpha value of 0.885 indicating that the questions are reliable because both exceed the R-table value of 0.444. In the next stage, the HOTS item product was successfully developed with several revisions, both by experts and according to the results of the analysis of validity and reliability. Table 5 show grid of HOTS questions and rubrics. The next stage of preparing the rubric for essay questions is show in Table 6.

**Table 5. Question Grid**

Lesson	Indicator	No. Items	Aspect cognitive
Sains (IPA)	1. Explain the meaning of energy	1 (essay)	C5

**Table 6. Arrangement of Rubric**

Question	Answer key	Score	Criteria
Anita explained the meaning of energy. According to Anita, energy is something that is produced by an energy source. Is Anita's answer correct? If not, what answer should Anita answer?	Less correct,	3	Students answer tepat and use clear sentences.
	the correct answer is energy is the ability to do work	2	Students answer correctly, but there are 1-2 words that are not clear.
		1	Student answered wrong
		0	No answer

The next stage is the process of practically testing and improving the solution. At this stage improvements are made to produce HOTS-based test questions that are feasible to use. Then the validation stage was carried out on the design of HOTS-based test questions. Validation was carried out to determine the quality of the validity of the questions based on expert judgment. Because a good question


is a matter that measures what you want to measure. As has been described in the previous chapter. The author performs expert validation with the help of two experts. In order to find out how the quality of the questions before try out 1.

There are no questions that have changed, but the change is only in the writing of questions because it makes it easier for students to answer questions. Changes also occurred in the scoring rubric because essay questions had to be assessed more objectively with the help of a good rubric. The example of improving the rubric of question number 7 is show in [Table 7](#).

In the next stage, the HOTS item product was successfully developed with several revisions, both by experts and according to the results of the analysis of validity and reliability. The following is the Grid, HOTS questions and rubrics as show in [Table 8](#).

Based on [Table 8](#) show the results of the recapitulation of the validator's assessment, a mean score of 3.5 was obtained with very good criteria.

**Table 7. Examples of Problem Corrections**

Question	Indicator	Score	Criteria
Make interesting words from the picture below at least 8 words! 	Students make at least 8 words	4	Students make words by fulfilling 3 indicator
	The words are made according to the pictures	3	Students make words by fulfilling 2 suitable indicator.
		2	Students make words by fulfilling 1 indicator.
		1	Students make up words by not fulfilling 3 indicators.
		0	No answer

**Table 8. List of Validator Ratings**

No.	Validators	Result	
		Score	Category
1	Class V elementary school Teacher	3.63	Very Good
2	Class V elementary school Teacher	3.37	Very Good
3	Learning Evaluation Lecturer	3.52	Very Good
4	Learning Evaluation Lecturer	3.48	Very Good
<b>Average</b>	<b>3.5 (Very Good)</b>		

**Discussion**

The questions created by this researcher were developed from the teacher's need for questions that required higher order thinking skills (HOTS). The development of HOTS questions is needed because the teacher has difficulty making questions that are able to hone students' thinking skills, especially students who are already familiar with the questions given by the teacher. This reason was found by researchers during interviews with teachers at SD Negeri Kampung Rambutan in Bogor. Researchers developed HOTS questions according to the criteria of Revised Bloom's Taxonomy on higher order thinking skills (HOTS) from these criteria, indicators were developed to create HOTS learning outcomes test questions on the material on theme 3 saving energy for fourth grade elementary school students. The test questions developed consisted of 15 descriptive questions, in each question there were questions with different levels of thinking. Questions with analysis level (C4) are at numbers 2, 5, 6, 9, and 10, while questions with numbers 1, 4, 11, 13, and 15 are questions with evaluation level (C5), and the last question with evaluation level (C5). numbers 3, 7, 8, 12, and 14 are questions with a creative level (C6).

After validation, the researchers conducted trials on 20 grade IV students. In this trial using class IV students because students' thinking abilities were very heterogeneous. There are students who have high abilities, there are students who have low abilities, and there are also those who have low abilities. In the validity test, all questions meet the validity standard and are very significant, meaning they are very valid and can be used as questions in this theme 3 material. But there is one problem that needs to be corrected in terms of the sentence, even so this question can still be used as a measure of student ability. The reliability results in this wide trial also have a very high interpretation, namely 0.95, which means that this question can be said to be consistent or steady. The results of the analysis of the difficulty level of this trial got good results, none of the questions were in the easy category. There are 2 questions that fall into the difficult category, namely 14 and 15, and 13 questions that fall into the moderate category. In accordance with the results obtained, the test questions developed are in accordance with the criteria for

higher order thinking skills (HOTS). The results of the analysis of differentiating power are 4 items that have adequate interpretations and 12 items including good interpretations. This happens because there are some students who can really answer but are not thorough so that the results obtained are different from the answer keys and there are, some students can answer but it takes quite a long time.

Based on the results of data analysis in the form of validity, reliability, discriminating power, and the level of difficulty of the test, there were no questions (HOTS) that were revised because they already had validity, reliability, and a high level of difficulty. The results of this study are consistent with the findings of previous study who developed HOTS-based thematic question banks in elementary schools showed good results related to the questions they developed (Fadilah et al., 2021). Likewise with the research findings who found that the development of HOTS questions in thematic material had an influence on students' thinking power (Desyandri et al., 2021; Dewi, 2021; Suarti & Ramadhani, 2022). In this case students are able to think critically and creatively in solving a question. The findings of the research results have similarities with research findings that have been carried out by previous researchers, namely the HOTS content of the questions being developed. What distinguishes between the findings of this research and the findings of previous studies is the location of the research and the subjects studied. However, it can be concluded that HOTS questions are needed in learning so that students have the skills needed in the 21st Century, namely 4C skills, which consist of Critical Thinking and Problem Solving, Creativity and Innovative, Collaborative, and Communicative (Anagün Assoc & Osmangazi Üniversitesi, 2018; Hosnan, 2014; Soleh & Arifin, 2021).

In addition to fulfilling the characteristics of good item items as described above, these items also meet the criteria for high thinking level items because based on the analysis of the item difficulty level data, none of the questions fall into the easy category. Then it is reinforced by the validation results that have been given by the validator for each higher order thinking indicator. This shows that the HOTS questions are in accordance with the indicators for each level of higher order thinking. So that from the results of this study produced HOTS thematic material questions for fourth grade elementary school students based on the revised Bloom's Taxonomy consisting of 15 essay questions. The HOTS questions are ready to be distributed to measure the higher order thinking skills (HOTS) of fourth grade students on energy-saving materials. This is in line with research which states that HOTS-based questions are used to measure students' abilities in their pedagogical aspects (Haataja et al., 2023). Meanwhile the research findings explain the importance of questions with higher order thinking skill content to make students more prepared to face the 21st century (Bilbao et al., 2021; Kwangmuang et al., 2021; Polat & Aydın, 2020).

The research findings are supported by other research findings including researchs who developed HOTS questions for categorizing junior high school students' problem-solving abilities (Widhiyani et al., 2019; Yuliandini et al., 2019). This study developed questions that could be used to measure students' ability to work on HOTS questions. Then another research was carried out by previous studies who developed HOTS questions on number material with the result that the questions developed had very practical criteria for use in learning (Puspitasari et al., 2021). The results of the HOTS analysis in the thematic evaluation were carried out who found that there was conformity in the evaluation questions with basic competencies and HOTS content (Mar'atul Uswah & Wardani, 2021). Likewise with the analysis conducted by with the finding that the questions the teacher made were at cognitive levels 4, 5, and 6, which means they were at the HOTS level. The findings from the results of previous studies with the research conducted are that there are similarities in the development of HOTS-filled questions, but different from the problems, research subjects, and conditions in the field. However, it can be concluded that the development of HOTS-based questions is needed in 21st Century learning, which is related to 4C skills (Critical Thinking and Problem Solving, Creativity and Innovative, Collaborative, and Communicative). Through HOTS questions, students are expected to have skills according to their characteristics, talents and interests.

This research by developing HOTS-based questions has had a good impact on teachers, students, and schools. The implications for students are that students are able to develop their ability to solve problems, be creative in composing sentences, be able to work together or collaborate with other friends, and be able to communicate the results of group discussions in front of the class. This means that students are more confident and motivated by their group or class mates. Meanwhile, teachers are motivated to innovate and create or develop questions with other themes in the teacher's and student's books. Teachers are also used to applying cognitive levels and sharing with other teacher teams. Meanwhile, school institutions can produce graduates who have quality in accordance with educational goals.

#### 4. CONCLUSION

Based on the results of the research and discussion, it can be concluded that the development of Higher Order Thinking Skill thematic questions in grade IV Elementary Schools is appropriate for use in learning. The results of the study showed that HOTS questions on thematic material for grade IV elementary school students showed criteria that met the HOTS category questions, namely having a good level of difficulty. Based on the results of the data test analysis, it can be seen that the questions developed have good quality. Thus the development of HOTS-based questions can be used in learning. The development of HOTS-filled questions is not only needed in class IV, but in other classes with different material. Through the development of HOTS-based questions, teachers are required to continue to innovate and be creative in learning, especially those related to continuous learning or continuing education. The development of HOTS-based questions can have an impact on students, especially on 21st century skills that require individuals to be creative, innovative, communicative and collaborate, as well as being competitive with the global community.

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