

Development of higher order thinking skill assessment instruments in social studies learning

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ABSTRACT

Higher order thinking skill (HOTS) in social studies learning are still often ignored by teachers despite the need for students to acquire these skills. The purpose of this study is to develop her HOTS assessment in a social studies classroom to help teachers improve their students' thinking skills. This kind of research is research and development with 4D models. Validation was performed by two social studies learning assessment specialists and three social studies teachers. The HOTS test was administered to 112 students in class VIII (second grade) of Yogyakarta junior high school. Data analysis consisted of validity, reliability, difficulty, selectivity, and distractor index. Explanatory factor analysis (EFA) pathway analysis was used for data analysis of small trials and confirmatory factor analysis (CFA) pathway analysis was used for large trials. The multiple-choice HOTS assessment tool consisted of 30 items, and the effectiveness results of this HOTS questions on material, structure, and language aspects by two social studies learning assessment experts where it was valid and suitable for our application. Effective results for three social studies teachers indicated that the assessment tool was valid and applicable. HOTS in social studies learning helps improve quality and learning outcomes, enabling students to examine information critically, develop creativity, and improve problem-solving skills.

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1. INTRODUCTION

The currently implemented education curriculum in Indonesia encourages teachers to raise the latest issues regarding higher order thinking skills (HOTS). Higher-order thinking skills are needed to achieve a deeper and more abstract understanding of a topic or problem, as well as to develop metacognitive (self-reflective) and problem-solving skills. HOTS is an important skill in education and everyday life, especially in today's information and technology era which demands critical and innovative thinking to solve complex problems [1]–[3]. Teachers are required to ask HOTS questions to assess learning outcomes. In creating international standard questions based on the regulations of the Republic Indonesia Ministry of Education, Culture, Sports, Science and Technology, HOTS questions are characterized by stimuli that can measure critical and creative abilities [4]–[7]. Questions that have HOTS criteria have at least met these three requirements. The National Education Standards Agency (BSNP) adapts to the needs at the international

level, by improving education outcomes in Indonesia by enabling students to be able to think at higher levels HOTS in dealing with their lives [8]–[10]. HOTS is the ability to think quality conceptually based on the level of thinking in Bloom's Taxonomy, students need the ability to think critically and rationally thinking in overcoming increasingly complex problems [11], [12]. Learning in the 21st century emphasizes the ability to think critically and solve problems, and it is imperative that students master these [13], [14]. A student's potential continues to grow, at least because they are accustomed to being trained to tackle interesting their HOTS questions to solve [15], [16].

Assessment is very important in the learning process which is used as an integral part of the education system so that it can monitor or evaluate the quality of learning and learning outcomes [17], [18]. Assessment in social studies learning can be analyzed through its characteristics of effort to develop competency as a good citizen. Good citizens mean those who can maintain harmonious relations among the people so that unity and integrity of the nation are established [19]. Social science is an educational program aimed at developing students' understanding of how people live together as individuals and groups and interact physically and socially with their environment [20]. Social science learning assessment is the process of collecting and processing information to measure student achievement of social science learning outcomes [21]. Assessment is holistic, encompassing attitudes, knowledge, and skill competencies both during the learning process (assessment process) and after completion of learning (assessment of learning outcomes) [22], [23]. However, in practice, many teachers who issue test questions do not follow the test grid and use book questions available in the market [24], [25]. This is one of the reasons why students are not trained in higher-order thinking [26], [27]. In Indonesia, advanced thinking ability, especially among middle school students, is still very low, which can be seen in students' ability to investigate, understand theory, analyze, and solve problems [28], [29].

The use of the HOTS assessment tool for social science subjects in the revised 2013 curriculum is 4 hours per week, making it difficult to meet planned learning goals [30], [31]. Furthermore, the learning objectives should correspond to a good learning base and good tools. Learning assessments in the revised 2013 curriculum include i) knowledge through written exams; ii) job and project skills; and iii) attitudes through observation, self-assessment, and diaries [32]. Various aspects of assessment require social studies teachers to devise lesson plans to achieve these competencies [33], [34].

Questions as an assessment of learning outcomes must be under the demands of the revised 2013 curriculum, namely high-level thinking skills involving analysis and synthesis (C4), evaluating (C5), and creating or creativity (C6) [18], [35]. Meanwhile, the question of assessing social studies learning outcomes made by teachers at state junior high schools (SMP) in Yogyakarta is still classified as low-level thinking ability, which involves memory (C1) and understanding (C2) [36], [37]. The researcher has conducted interviews with social studies teachers at state junior high schools in Yogyakarta, but he has not been able to make HOTS-based learning outcomes assessment questions. Therefore, researchers innovate in the aspect of assessment of learning outcomes in the form of developing assessment instruments that can train high-level skills, especially in the basic competencies 4.3 material analyzing chronology, change, and spatial continuity (geographic, political, economic, educational, social, and cultural) from the colonial period to the growth of the national spirit. The material has a wide range of arguments and requires critical and creative thinking, including advanced thinking activities [38].

Studies on higher-order reasoning skills have been conducted by several researchers so far: learning mathematics [39], [40], learning physics [41], and language by descriptive questions. The focus was only on the learning of [42], [43]. Based on previous research studies on HOTS, there is a need to develop a multiple-choice HOTS assessment tool for social studies learning. Researchers are therefore interested in developing tools to assess HOTS in SMP social studies learning.

The significance of this study lies in the fact that the HOTS question tool is one measure of students' critical thinking skills. This research requires the development of questioning tools that enhance students' critical thinking skills and improve their learning outcomes. HOTS in Social Studies is a major subject developed as HOTS prepares students to improve critical thinking and problem solving in social and national contexts. Specifically, the purpose of this study is to i) create a HOTS evaluation tool for social studies learning; ii) determine the validity of the HOTS evaluation tool for social studies learning; and iii) was to determine the characteristics of the HOTS problem in social science learning.

2. RESEARCH METHOD

2.1. Type of research

This research uses research and development (R&D) methods with a 4D development model. Four stages are the focus of this research. The first stage is a definition, which involves a needs analysis to identify challenges in social studies learning. This stage serves as a starting point. The second stage is design, where

the conceptual framework of the social studies learning model and supporting tools in the form of HOTS-based questions are carefully designed. Next, the third stage is development, which includes testing the effectiveness and feasibility of the models and tools that have been designed. Finally, the fourth stage is dissemination, which is the implementation of HOTS questions in social studies learning for students [44], [45]. The 4D model was chosen because it can produce valid and effective HOTS questions, allowing students to develop high-level thinking skills in social studies learning.

2.2. Research design

To assess the feasibility of his HOTS assessment tool product in the social studies domain, consult the material for Core Competency 4.3. An analysis of the chronology, changes, and continuity of the space (geographical, political, economic, educational, social, and cultural) from the colonial period to the growth of the national spirit is first evaluated with instrumental experts done by experts in a revision stage has taken place. The revised product was validated by three social studies teachers and then revised to the second level. The revised product of the second phase was tested in three classes of state junior high school in Yogyakarta.

2.3. Research subject

The population that was used as the research subject was class VIII (second grade) social studies at state junior high school in Yogyakarta, with a sample of 112 students. The sampling technique used is random sampling so that each member of the population has the same probability of being selected. This study uses a material in basic competencies 4.3 because each student must be able to critically and in-depth analyze the conditions of their nation in the past so that students can have problem-solving abilities in dealing with contemporary problems of the nation.

2.4. Data collection techniques and instruments

Data collection techniques using questionnaires and tests. Questionnaires were used to identify responses from experts in the form of her HOTS questions in social studies learning materials on basic skills from the colonial era to the rise of nationalism. The data collection tools consisted of: i) test equipment, the test was tested in a multiple-choice format with his five possible answers to a total of 30 questions; and ii) validation forms, performed by equipment experts (test equipment validation) and valuation experts (HOTS validation validation). In addition, three social studies teachers were validated to determine their practicality and responsiveness as teachers in school settings.

2.5. Data analysis technique

This ponders employments subjective and quantitative information examination. Subjective information examination of HOTS test questions was gotten from the comes about of the approval sheet based on perspectives of the fabric, development, and dialect. Substantial test things are based on the appraisals of two master speakers and three social thinks about instructors. The rules utilized: the esteem of one is "invalid", the esteem of two is "less substantial", the esteem of three is "reasonably substantial", the esteem of four is "substantial", and the esteem of five is "exceptionally substantial".

Quantitative information investigation was gotten from understudy reactions which were analyzed utilizing Microsoft Exceed expectations. Information investigation incorporates: i) Test the validity of the test, using the biserial point formula with the calculation results compared with r_{table} at a significant level of 5%. If r_{count} is greater than or equal to r_{table} then the item is valid, but if r_{count} is smaller than r_{table} then the item is invalid [46]; ii) The test reliability test, using the SMART-PLS 3.0, because the questions are in the form of a dichotomy (0 and 1), the reliability criterion is if the coefficient interval value is 0.7 [47]; iii) The level of difficulty using the calculation $P=NP/N$ (0.00-0.30=too difficult, 0.31-0.70=medium, and 0.71-1.00=too easy); iv) Distinguishing power, using the formula $DP=BA/JA-BB/JB$ (0.00-0.20=bad, 0.21-0.40=enough, 0.41-0.70=good, and 0.71-1.00=very good) [48]; v) Detractor index, using the formula $IP=P \times 100 / (N-B) / (n-1)$ (76%-124%=very good, 51%-75% or 126%-150% is good, 26%-50% or 151%-175% is poor, 0%-25% or 176%-200% is poor, and >200% is misleading). The content validity analysis technique with quantitative analysis using the Aiken's V formula. The construct validity test uses path analysis explanatory factor analysis (EFA) on a small-scale test.

3. RESULTS

3.1. Product trial results data

3.1.1. Expert validation

This validation process involves two important stages, namely assessment from instrument experts and evaluator experts. These two stages involve the use of the Aiken-V formula and the calculation of content validation coefficients to evaluate the quality of the tools used. The results of the analysis that has

been carried out show that validation by experts of the tool consisting of 20 questionnaire items, as well as expert evaluation of all 20 questionnaire items, has reached the expected operational level. Complete details regarding the results of this validation analysis can be found in the recapitulation listed in Tables 1 and 2. This table contains information detailing the evaluation results from both validation stages, providing a clear picture of the validity of the tools used in this research.

Table 1. Results of instrument expert validation analysis

Question number	Aiken's V coefficient	Criteria	Question number	Aiken's V coefficient	Criteria
1	0.75	Eligible to use	11	0.50	Eligible to use
2	1.00	Eligible to use	12	0.75	Eligible to use
3	0.75	Eligible to use	13	1.00	Eligible to use
4	0.75	Eligible to use	14	1.00	Eligible to use
5	0.75	Eligible to use	15	0.75	Eligible to use
6	0.75	Eligible to use	16	0.50	Eligible to use
7	1.00	Eligible to use	17	0.75	Eligible to use
8	0.75	Eligible to use	18	1.00	Eligible to use
9	1.00	Eligible to use	19	1.00	Eligible to use
10	1.00	Eligible to use	20	1.00	Eligible to use

Table 2. Result of validation of expert evaluations

Question number	Aiken's V coefficient	Criteria	Question number	Aiken's V coefficient	Criteria
1	1.00	Eligible to use	11	1.00	Eligible to use
2	1.00	Eligible to use	12	1.00	Eligible to use
3	1.00	Eligible to use	13	0.75	Eligible to use
4	0.75	Eligible to use	14	1.00	Eligible to use
5	0.75	Eligible to use	15	0.75	Eligible to use
6	1.00	Eligible to use	16	1.00	Eligible to use
7	0.75	Eligible to use	17	1.00	Eligible to use
8	1.00	Eligible to use	18	0.75	Eligible to use
9	0.75	Eligible to use	19	1.00	Eligible to use
10	0.75	Eligible to use	20	0.75	Eligible to use

3.1.2. Validation by social studies teacher

Three social studies teachers carried out validation to check the content and effectiveness of the original product developed. Analysis of HOTS test items using the Aiken's-V formula shows that all 30 multiple-choice questions are in the valid category with a validity index varying between 0.58 to 1.00 [46]. The validity criteria are below 0.6 indicating a good level of validity, between 0.6 and 0.8 is an adequate level of validity, and above 0.8 is a very high level of validity. The results of the recapitulation of the question item analysis can be seen in Table 3.

3.2. Limited trial results data

A limited test was conducted with 112 students from class VIII (second grade) social studies (IPS) of Yogyakarta state junior high school. HOTS test question quality is based on question characteristics such as validity, reliability, difficulty, power, and distraction index. The interpretation results of the item analysis are presented in sub-section.

3.2.1. Item validity, reliability, and difficulty

The validity of the test items was calculated using Microsoft Excel and interpreted using the r_{table} value at a significance level of 5% with a sample size of $N=112$. The r_{table} value used was 0.339. From the calculation results, 28 questions were declared valid. Thus, the results of the validation process show that of the total questions evaluated, 28 questions have validity that meets the criteria at a significance level of 5%. Detailed recapitulation results can be seen in Table 4.

Table 4 presents the results of the analysis of HOTS questions in social studies learning, showing the use of core skills in material 4.3. The analysis highlights the success in measuring spatial change and continuity from the colonial period to the national spirit with excellent valid factors, with more than 50% of HOTS questions meeting the measurement objectives. Table 5 reveals the results of the analysis of the effectiveness of developing HOTS questions with a significant score above 0.5 using SMART-PLS 3.0. Table 6 notes that the reliability of HOTS questions in social studies learning received a construct reliability

(CR) value exceeding 0.7, indicating the reliability of the measuring instrument in measuring the desired abilities [47], [48]. The detailed results can be seen in Tables 5 and 6.

Table 3. Results of validation analysis of social studies teacher

Question	Rater 1	Rater 1	Rater 1	Aiken's V coefficient	Criteria
1	4	4	4	0.75	Eligible to use
2	5	5	5	1.00	Eligible to use
3	4	4	4	0.75	Eligible to use
4	4	4	4	0.75	Eligible to use
5	5	4	4	0.83	Eligible to use
6	5	4	4	0.83	Eligible to use
7	5	4	4	0.83	Eligible to use
8	5	3	5	0.91	Eligible to use
9	5	4	3	0.75	Eligible to use
10	3	4	3	0.58	Eligible to use
11	3	4	3	0.58	Eligible to use
12	5	4	5	0.91	Eligible to use
13	5	4	4	0.83	Eligible to use
14	5	4	3	0.75	Eligible to use
15	4	4	4	0.75	Eligible to use
16	4	4	4	0.75	Eligible to use
17	5	4	5	0.91	Eligible to use
18	4	4	4	0.75	Eligible to use
19	5	4	4	0.83	Eligible to use
20	4	4	4	0.75	Eligible to use
21	5	4	4	0.83	Eligible to use
22	5	4	5	0.91	Eligible to use
23	5	4	4	0.83	Eligible to use
24	5	4	3	0.75	Eligible to use
25	5	4	4	0.83	Eligible to use
26	4	4	4	0.75	Eligible to use
27	5	4	5	0.91	Eligible to use
28	4	4	4	0.75	Eligible to use
29	5	4	4	0.83	Eligible to use
30	5	4	4	0.83	Eligible to use

Table 4. Validity test results

Question	Validity index	Question item	Total	Percentage
1	>0.339 (Valid)	1, 2, 3, 4, 5, 6, 7, 8, 9, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21, 22, 23, 24, 25, 26, 27, 28, 29, 30	28	93%
2	≤0.339 (Invalid)	10, 11	2	7%

Table 5. Rotated component matrix

Construct	Component			
	X1	X2	Y1	Y2
X1.1	0.91			
X1.2	0.90			
X1.3	0.88			
X1.4	0.85			
X2.1		0.82		
X2.2		0.85		
X2.3		0.87		
X2.4		0.79		
Y3.1			0.87	
Y3.2			0.87	
Y3.3			0.82	
Y3.4			0.64	
Y4.1				0.78
Y4.2				0.62
Y4.3				0.82
Y4.4				0.73

Table 6. Criteria for calculating construct reliability

Items	Factor loading	Construct reliability	Decision
X1.1<-X1	0.91	0.91	Reliable
X1.2<-X1	0.90	0.89	Reliable
X1.3<-X1	0.88	0.87	Reliable
X1.4<-X1	0.85	0.85	Reliable
X2.1<-X2	0.82	0.82	Reliable
X2.2<-X2	0.85	0.85	Reliable
X2.3<-X2	0.87	0.87	Reliable
X2.4<-X2	0.79	0.78	Reliable
Y3.1<-Y1	0.87	0.85	Reliable
Y3.2<-Y1	0.87	0.85	Reliable
Y3.3<-Y1	0.82	0.80	Reliable
Y3.4<-Y1	0.64	0.62	Reliable
Y4.1<-Y2	0.78	0.78	Reliable
Y4.2<-Y2	0.62	0.61	Reliable
Y4.3<-Y2	0.82	0.81	Reliable
Y4.4<-Y2	0.73	0.72	Reliable

Based on the results of the analysis in Tables 5 and 6, it can be concluded that the HOTS questions in social studies learning have met the validity and reliability criteria well. This shows that the measuring instrument can be relied on in measuring the desired abilities in social studies learning, as well as ensuring that the measurements carried out are by the stated measurement objectives. For further details, the analysis results of path coefficients can be seen in Figure 1.

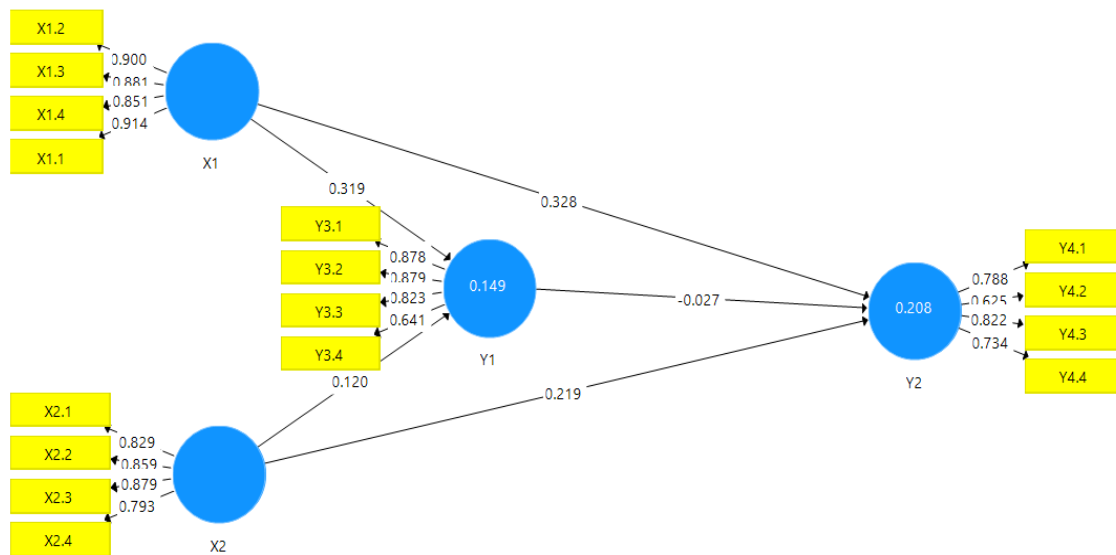


Figure 1. Structural model path coefficients

The difficulty level of HOTS questions is calculated using the formula $P=NP/N$ via Microsoft Excel. The calculation results show that six questions can be categorized as difficult, 22 questions are in the medium category, and two questions are considered too easy. These results provide an idea of the variation in difficulty levels in the HOTS question set, which can help in customizing and compiling tests that suit students' level of understanding and skills in social studies learning. Table 7 presents the results of item difficulty.

Table 7. Results of item difficulty

Question	Difficulty index	Item	Total	Percentage
1	0.00-0.30	4, 5, 10, 12, 15, 17	6	20%
2	0.31-0.70	1, 2, 3, 6, 7, 8, 9, 11, 13, 14, 16, 18, 19, 20, 21, 22, 23, 26, 27, 28, 29, 30	22	73%
3	0.70-10.00	24, 25	2	7%

3.2.2. Distinguishing power of items and distracting item index

Discriminant analysis and distractor index for HOTS questions were calculated using Microsoft Excel. The purpose of this analysis is to differentiate the level of difficulty between questions and to evaluate the ability of distractor choices to attract students' attention so that they are interested in choosing answers in the context of social studies learning. Detailed recapitulation results can be found in Tables 8 and 9. This analysis shows that the results of the discriminating index and distracting index questions are in a good category, which indicates that these HOTS questions are effective in measuring students' abilities and present appropriate challenges in the process. social studies learning.

Table 8. Distinguishing power results

Question	Distinguishing power	Item number	Total	Percentage
1	0.00-0.20	-	-	0%
2	0.21-0.40	1,4,7,8,15,22	6	20%
3	0.41-0.70	2,3,5,6,9,10,12,16,19,21,24,26,27,28,29,30	16	53%
4	0.71-1.00	11,13,14,17,18,20,23,25	8	27%

Table 9. Results of the deception index

Question	Answer option	Number of options selected	Percentage	Criteria
3	A, B, C*, D, E	A=3, B=2, C=18, D=4, E=3	A=62.5%, B=76%, C=60%, D=83%, E=62.5%	Good
9	A, B, C, D, E*	A=2, B=4, C=3, D=4, E=17	A=57%, B=70%, C=57%, 82%, D=70%, E=57%	Good
24	A*, B, C, D, E	A=15, B=4, C=3, D=5, E=3	A=52%, B=66%, C=50%, D=83%, E=50%	Good

4. DISCUSSION

4.1. HOTS assessment instrument in social studies learning

This study creates a HOTS assessment tool that can be used in middle school social studies learning. The development of this HOTS assessment tool focuses on his one of the Grade VIII social studies materials, namely the core skills 4.3 material. An analysis of the chronology, changes, and continuity of space (geographical, political, economic, educational, social, and cultural) from colonial times to the growth of the national spirit. The HOTS questions he developed consisted of 30 multiple-choice, 5 choice questions covering levels C4 (analysis and synthesis), C5 (evaluation), and C6 (creation or creativity). rice field. The HOTS questions developed relate to the overarching conceptual framework of the revised Bloom taxonomy.

4.2. The validity of the HOTS assessment instrument in social studies learning

Validation of her HOTS assessment tool using logical validation includes material, structural, and linguistic aspects analyzed according to the verifier's assessment using the Aiken-V formula for calculating content validity coefficients. included. The results of his two expert assessments for the assessment of social science learning show that the HOTS assessment instrument is valid and can be used. Validation results from three social studies teachers also indicated that the HOTS assessment tool is valid and can be used.

4.3. Characteristics of HOTS questions in social studies learning

Characteristics of multiple-choice items were calculated with a Microsoft Excel program obtained from 30 items, 2 of which were invalid. This indicates a good relevance quality as the valid items are over 50%. This means that HOTS questions can measure what they should measure. The item has a confidence level of 0.87, so this question can be placed in the "very strong" category. An average item difficulty of 0.73 is in the good category. The mean difference test of 0.53 is in the good category and the mean distractor index is 0.44 in the good category.

Based on the discussion, this assessment tool can be used to measure secondary school students' high-level skills in social studies learning, especially in the core skills 4.3 material. An analysis of the chronology, changes, and spatial continuity (geographical, political, economic, educational, social, and cultural) from colonialism to the growth of nationalism. Containing HOTS questions, this test encourages students to think critically about the material. The development of her HOTS-based assessment tool in social studies learning is one of his ways of targeting learning and assessment [49]. If the learning methods used are compatible with the materials and school conditions, the learning that is carried out can develop good thinking abilities in students [50], [51]. Adaptation to assessment tools that focus on measuring higher-order thinking skills makes students more developed and actively sharpens their potential [52]. HOTS-based assessment is a critical and creative thinking skill, so students already possess these skills that allow them to analyze the context of problems and social materials [53].

The HOTS assessment tool is a tool for measuring student learning outcomes and achievement of higher order reasoning skills [54], [55]. When solving problems, students directly apply the concepts of learning and relate them to the contextual problems they have experienced themselves. This is consistent with previous finding [56], [57] that higher-order reasoning skills are a form of intelligence in problem-solving and decision-making, critically and creatively providing solutions can [58].

Since the development of his HOTS-based assessment tool in social studies learning has not been widely developed by academics and practitioners, this study focuses on that concept, namely multiple-choice with very important and creative answer options. The research provide the development of HOTS rating by problem [59], [60]. Students are therefore highly motivated to maximize their competence and ability to answer the questions developed [61]. Social studies learning through HOTS is expected not only to memorize, but also to understand social science theories and concepts through presented problems, and to be able to solve problems by incorporating higher-order reasoning abilities will be HOTS questions train students to solve problems and make decisions.

5. CONCLUSION

An analysis of the chronology, change, and continuity of space (geographical, political, economic, educational, social, and cultural) from colonial times to the growth of the national spirit. It consists of 30 multiple choice questions and 5 answers. Higher order thinking skill and multiple-choice questions were characterized by two out of 30 questions with confidence of 0.87 (strong category), average difficulty of 0.73 (good category), average discrimination test of 0.53 (good category), and average the distractor index is 0.44 (categorical good). Products from the HOTS multiple-choice scorer met the item selection criteria for relevance, reliability, difficulty, power, and distractor index. In short, these HOTS questions serve as practice material for students to practice higher-order reasoning skills and as an alternative assessment tool to help social studies teachers frame and implement HOTS-based questions in the students.

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