Analysis Exploratory of Sociological Learning Process Based on Higher Order Thinking Skills for Sustainability Education

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Abstract: This research aimed to identify and analyze the factors influencing the Sociology learning process based on higher-order thinking Skills (HOTS) and to determine the dominant factor among them. This study is quantitative research with a survey method carried out in Yogyakarta, with the research sample being students of SMA Negeri 1 Yogyakarta and SMA Negeri 11 Yogyakarta who were selected purposively to reflect the diversity of student's academic and social backgrounds. Data was collected using a questionnaire distributed to 196 students. Data analysis employed the Exploratory Factor Analysis (EFA) technique to explore the underlying factors shaping the learning process. The study identified six key factors influencing the HOTS-based Sociology learning process: (1) discussing cases, (2) asking questions and providing arguments, (3) reflecting on knowledge, (4) generalizing ideas, (5) analyzing cases, and (6) using sources of discussion material. Among these, the most dominant factor was discussing cases, highlighting its role in enhancing critical thinking skills and student engagement in Sociology learning, while the least influential factor was using sources of discussion material. These findings offer valuable insights for effectively integrating HOTS into the Sociology curriculum, supporting educational sustainability, and developing students' critical thinking skills.

1 INTRODUCTION

Higher-order thinking skills (HOTS) are complex cognitive processes that every individual must possess in facing 21st-century challenges. (Wita & Mursal, 2023). These skills go beyond basic memorization and understanding, requiring learners to analyze, evaluate, and create new knowledge. The ideal education process is to help learners develop these thinking skills. The goal is for learners to face the challenges in everyday life, especially in the increasingly complex 21st century (G. et al. et al., 2015). In the education process, learners must master both low-order and higher-order thinking skills (Istiyono & Mardapi, 2014).

Theoretically, HOTS is defined differently, and others have mentioned that HOTS is a critical thinking skill, problem-solving, and metacognitive (Ennis, 1989). Skills for understanding, reasoning, and problem-solving with thinking strategies using logic and analogy to find the solutions and to solve the problems (Grossen, 1991). Skills include acknowledging and expanding information to achieve a goal or finding possible answers in confusing

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situations (Lewis & Smith, 1993). The use of thought to face new challenges involves information analysis to determine a problem, evaluate problems, and create new solutions that can be applied to solve a problem (Chinedu et al., 2015). Furthermore, based on Bloom's Anderson's taxonomic rankings, HOTS is a thinking skill at analyzing, evaluating, and creating (Miri et al., 2007a). The difference in the HOTS concept by these experts shows that there is no consistent definition of HOTS, yet from some opinions, it can be taken as a similarity that essentially, HOTS is a thinking skill that can help the individual find a solution to the problems.

Empirically, the HOTS skills possessed by the learner still experience problems because, in general, the HOTS level is still at the lower level, especially in the stage of synthesis and evaluation skills to increase the creativity of learners in science (G. M. Saido et al., 2015). Several other studies have also revealed problems in implementing HOTS in learning. Among them are the first; teaching HOTS in the form of critical thinking skills is still problematic and has not succeeded in teaching social studies (Karabulut, 2012); the second, developing HOTS learners has been considered one of the essential goals in education, but in practice HOTS still cannot be trained to learners in school well, and the thirdly; students' thinking ability at high school level is still relatively low (Ramadhan, 2024).

The benefits of HOTS vary greatly. Others mentioned that HOTS is very important in helping learners participate and contribute to a modern democratic society, helping learners achieve success in a global society, helping learners analyze complex situations, and generating good arguments (Noma et al., 2016). Learners can succeed if HOTS is taught continuously (Miri et al., 2007b). It furthermore affirms that everyone requires HOTS to be able to participate as responsible and empowered citizens in a democratic society, contribute as productive workers in a technological society, and have a satisfying personal life, including managing personal affairs, continuing to learn and earn benefits of culture (Barak & Dori, 2009).

Indonesia's national education system has been replacing the curriculum to improve national education in the face of the 21st century. Developing higher-order thinking Skills (HOTS) has become one of the priorities in learning. HOTS becomes an important aspect that must be designed thoughtfully for each learner. The reason is to realize the significant missions of the national education curriculum, prioritizing the development of HOTS literacy, character, and competence. HOTS literacy, character, and competence skills are developed to prepare human resources for global challenges in the 21st century (Miri et al., 2007b). However, based on the results of PISA 2015, an international assessment of student performance, it was identified that Indonesian students' thinking skills were still low, as Indonesia ranked at the bottom 9 with an average score of 403 science skills, 397 literacy, and 386 mathematical skills (Newmann, 1990). This highlights the urgent need to improve the development and application of HOTS in the Indonesian education system.

One of the subjects in the curriculum that requires learners to develop HOTS is a subject of Sociology (OECD, 2016). Students in high school sociology are expected to develop themselves in thinking, from lower-order thinking skills (LOTS) to higher-order thinking skills (HOTS). Therefore, learners should be familiar with problem-based learning and contextual learning materials that require HOTS.

Based on the above explanation, it is understood that HOTS is a skill that students need to master, as it can help them succeed in learning and navigating community life. Sociology is highly relevant to the development of HOTS because it involves understanding social issues, analyzing real and contextual cases, and solving problems within the dynamic context of social life. However, HOTS' application in sociology learning still faces various challenges. Furthermore, studies on the factors that influence the success of HOTS-based Sociology learning still need to be completed, especially within Indonesia's education context. This study addresses this gap by identifying the factors affecting the HOTS-based Sociology learning process at the high school level. Through this research, effective strategies are expected to be developed to integrate HOTS into school sociology learning, equipping educators with practical tools to enhance their teaching methods. The findings of this study are hoped not only to promote the development of HOTS in Sociology learning but also to provide guidance for educators in designing learning that supports sustainable education and the development of students' thinking skills.

2 RESEARCH METHOD

This type of research is survey research. This research was conducted in Yogyakarta. In this study, SMA Negeri 1 Yogyakarta students and SMA Negeri 11 Yogyakarta were selected as samples for exploratory analysis of the sociological learning process based on

higher-order thinking skills. The selection of the sample was carried out purposively to ensure the diversity of academic and cultural backgrounds of the school. SMAN 1 Yogyakarta represented a group of excellent schools that provided students with access to high-quality education. At the same time, SMAN 11 Yogyakarta was a non-flagship school, reflecting the diversity of students' backgrounds. The combination of students in these two schools allows for a comprehensive comparison between the elite school and the non-flagship school to understand the HOTS-based sociology learning process implemented in the school. Thus, the research that has been conducted can provide a comprehensive picture of HOTS in Sociology learning in high school, and the results of this research can be used to explain the same case in different places and times.

The data collection technique uses a closed questionnaire with a Likert scale, choosing always, often, sometimes, rarely, and never. *Alpha Cronbach* was analyzed to determine the instrument's reliability level using SPSS-22. Furthermore, research data analysis uses *the Exploratory Factor Analysis* (EFA) technique. This technique was chosen because this study aims to assess the instrument's validity by identifying the relationship patterns between the questionnaire items, selecting the number of factors underlying the latent variables, and understanding the structure of factors relevant to the HOTS-based sociology learning process. Thus, EFA allows in-depth exploration of new dimensions underlying the HOT-based learning process. In addition, this technique supports the formation of conceptual models based on empirical data, significantly contributing to understanding the key factors that play a role in sociology learning in schools.

3 RESULTS AND DISCUSSION

3.1 Result

The results of this study indicated that the instrument used reliably with Cronbach's alpha (0.811), valid with KMO 0.777 and Ballett's test of sphericity approx chi-square (935,723) with df/sig (153 / 0.000) and statistically fit (absolute value more than 0.05 is 47.0%). This study also indicated that the factors influencing Sociology learning process based on Higher Order Thinking Skills (HOTS) consist of six factors: (1) discussing cases (4.610/25.613%), (2) asking questions and giving arguments (1.736/9.646%), (3) reflecting knowledge (1.538/8.546%) (4) generalizing ideas (1,412/7,847%), (5) analyzing cases (1.130/6.276%), and (6) using the source of discussion material (1.031/5.730%). However, of the six factors formed, discussing cases was the dominant factor influencing the learning process of Sociology. For more details, the results of this study can be seen in the following table.

Table 1: Factor Loading Matrix and Descriptive of Learning Process-Based Higher Order Thinking Skills.

Description variable	Factors						Description	
	F1	F2	F3	F4	F5	F6	**Means**	**Item-total correlation**
SK2 (The teacher explains well the relationship between concepts of sociology and real life).	.860						3.36	.329
SK4 (Teachers help students to be able to apply concepts).	.688						4.00	.485
DK2 (Sociology learning activities are conducted as an open discussion between teachers and students).	.626						3.80	.534
DK3 (Students discuss the latest scientific issues related to sociology learning).	.567						3.42	.294
AB1 (Teachers provide questions that challenge students to think critically).		.866					3.73	.525
AB2 (The teacher gives a question that moves a deeper understanding of the topic).		.718					3.35	.596
MP1 (Students must express ideas or opinions on current scientific issues).		.604					3.53	.185
AB5 (Teachers challenge students to ask questions in each learning process).		.428					3.43	.225

AB3 (Students are given enough time to answer questions and complete assigned tasks).			.728				3.70	.419
DK6 (The teacher discusses the student's work after the student has finished working on it).			.653				4.14	.260
AM1 (Students fill out worksheets provided by teachers).			.651				2.03	.272
MP2 (Students can express their opinions on the subject matter discussed).			.567				2.23	.309
AM3 (Students are required to make a mind mapping of a learning topic)				.835			3.44	.307
AM2 (Students are asked to write opinions/essays/scientific articles on current issues).				.794			3.59	.568
SK5 (Students are asked to find and explain the meaning and value of a case).					.807		3.93	.377
SK1 (Students learn and analyze current cases related to sociology learning topics).					.732		3.49	.429
DK4 (Students discuss material sourced from textbooks).						.751	3.45	.531
DK5 (Students discuss material sourced from the internet).						.599	3.82	.491
Eigenvalues	4.610	1.736	1.538	1.412	1.130	1.031	Cronbach's Alpha = 0.811	
% of variance	25.613	9.646	8.546	7.847	6.276	5.730		
Cum %of the variance	25.613	35.258	43.804	51.651	57.927	63.657		
Kaiser-Meyer-Olkin Measure of Sampling Adequacy.							0.777	
Bartlett's Test of Sphericity Approx. Chi-Square							935.723	
Df							153	
Sig.							0.000	
Model Fit = an absolute value greater than 0.05 is 73 (47.0%)								

F= faktor, F1= SK2, SK4, DK2, dan DK4, F2= AB1, AB2, MP1, AB5, F3= AB3, DK6, AM1, MP2, F4= AM3, AM2, F5= SK5 dan SK1, F6= DK4, DK5.

3.2 Discussion

Exploratory factor analysis (EFA) was used in the data analysis process to achieve research objectives. Based on the study, it was identified that the instrument used was reliable with Cronbach's alpha value (0.811), valid with KMO 0.777 and Ballett's test of sphericity approx chi-square (935,723) with df/sig (153 / 0.000) and statistically (an absolute value greater than 0.05 is 47.0%). Thus, the developed instrument can be used in subsequent research. Furthermore, there were six factors influencing the HOTS-based Sociology learning process. All the incoming variables on each factor produced have a positive correlation. Thus, it was concluded that the greater the variable factor load concerned, the greater the tendency of its influence on the Sociology-based learning process HOTS.

The first is discussing cases. The factor of discussing cases more dominant influenced the HOTS-based Sociology learning process. The value of eigenvalue 4.610 evidenced this with a 25.613% variant of 63,657 total variants. These results indicated that discussing cases was the factor that had the most significant impact on the HOTS-based Sociology learning process. Through discussion activities, small and large group discussions can develop students' thinking skills because discussions are based on social interaction, understanding a topic in detail, and learning to collaborate and collaborate well (Karabulut, 2012). If the discussion is going well, it will be able to increase the HOTS of each participating individual because, in the debate, there is a process of asking questions, giving critical views, and providing arguments for supporters of other people's views (Barak & Dori, 2009). In the context of sociology learning, sociology learning often uses theories that need to be connected to real situations so that students easily understand them. By discussing cases, students are invited to understand how sociology concepts are applied in real-life situations and practice critical thinking skills.

The second is asking questions and giving arguments. The second factor influencing the HOTS-based Sociology learning process was asking questions and giving arguments. This factor has an eigenvalue value of 1.736 with a 9.646% variance. A related study identified that learning by using questioning and answering questions positively affects learner's learning outcomes. In addition, the learning model, by applying the activity of asking and expressing opinions in the classroom, can provide

opportunities for learners to express the thoughts of their friends and discuss the concepts or topics that have not been understood (Yunus & Ilham, 2013). Asking questions is a form of student curiosity and participation in the sociology learning process. Meanwhile, giving arguments can train students to think logically and formulate their opinions based on relevant data and theories, which is the core of sociological analysis.

The third reflects knowledge. This factor has an eigenvalue value of 1.538 with a variant value of 8.546%. Reflecting knowledge is a process done so that learners can use their thinking skills to analyze and assess something that has happened (G. A. Saido et al., 2015). The teacher's action in reflecting on knowledge is to guide learners to be aware of their thinking process and that they can control and manage it (Yeung, 2015). This study is the process of learners using the ability to think and knowledge held in the training given by the teacher in the classroom, activities discussing the work done between teachers and learners, and the process of expressing opinions by learners about the topic discussed. In the context of sociology learning, reflection on knowledge can help students understand the implications of the theories or concepts they learn. It also allows students to evaluate theories relevant to a particular social context.

The fourth is generalizing ideas. This factor has an eigenvalue value of 1.412 and a 7.847% variance. Through writing activities, a person will develop a business process to distinguish important information from unimportant ones, train themselves to create an assumption (Karabulut, 2012), and make mind maps. Both are activities that can encourage someone to think more deeply. In sociology learning, this ability is the first step in developing sociological theories to understand social phenomena broadly.

The fifth is analyzing cases. This factor has an eigenvalue value of 1.130 with a 6.276% variant. Analyzing a case is a great way to introduce issues related to learning topics to learners in the classroom. In the learning process, learners can analyze cases with classmates who can provide diverse views (Floyd & Bodur, 2006). In sociology learning, case analysis can train students to solve problems, integrate theories and data, and understand the social reality around them with a sociological perspective so that students' sociological imagination develops.

The sixth is using the source of discussion material. The sixth factor influencing the HOTS-based Sociology learning process is the discussion material factor, with an eigenvalue of 1,031 and a 5,730% variance value. Using various sources as discussion material in sociology learning can enrich students' insights and strengthen students' arguments. In addition, using multiple sources provides diverse perspectives related to a social issue being discussed to help develop a deep understanding of what students are learning.

Depending on the overall analysis, discussing cases was the most dominant factor influencing the HOTS-based Sociology learning process because the highest eigenvalue and variance are 4,610 and 25,613%. Thus, discussing cases is a very effective method to improve students' HOTS in learning Sociology. This is because, with this method, students are directly involved in critical thinking and carry out in-depth social analysis through guidance by teachers. Through case discussions, teachers help students to understand how sociological theories can be applied in real life. For example, the theory of social differentiation becomes more real for students when students discuss social differences that occur in society. In addition, in case discussions, students are guided to think logically and systematically because they are taught to organize ideas, express opinions logically, and present relevant evidence related to their arguments. Not only that, case discussions also train students to think more openly and consider different points of view so that students get a deep understanding of the problems they are studying.

Besides that, the factor of using the source of discussion material that least influences HOTS learners on Sociology Learning is because the discussion material source factor has the lowest eigenvalue and variance of 1,031 and 3,574%. Several aspects can cause the background factor of using discussion source material to be the least dominant factor, including (1) the quality of the discussion material presented by the educator. Discussion materials that are less relevant and less interesting cannot encourage students to think critically and creatively. Therefore, teachers should provide material sources that are contextual and relevant to the needs of students. (2) The method of presenting the discussion material is not appropriate. Teachers should apply active discussion methods such as debate, think-pair-share, or simulation that encourage active participation of students in formulating their ideas. (3) The teacher does not give the right direction to explore the students' HOTS. Ideally, teachers should be able to provide open-ended triggering questions and guide students to explore the idea in depth. (4) Not utilizing technology to stimulate students' motivation and HOTS. Teachers should use digital media such as interactive learning applications and relevant educational videos that challenge students' critical

thinking, and (5) there is no straightforward measurement instrument regarding the extent to which discussion activities can support HOTS. Therefore, teachers should develop a review rubric that measures students' HOTS during discussion activities.

In this regard, several previous studies have identified that learning activities using case studies either discuss cases, analyze cases, or write a case in the learning process based on experiments conducted. In a teacher education program, identifying case studies and case writing can increase engagement in decision-making (Floyd & Bodur, 2006). On the other hand, it is mentioned that case-based learning activities have a positive impact on the ability of HOTS learners because using case studies in learning activities can help learners gain a complex theoretical understanding of the topics they are learning as well as improving the cognitive skills of learners (Floyd & Bodur, 2006). Furthermore, authentic problem-based learning can also improve problem-solving skills, learning achievements, and learners' learning outcomes (Syafii & Yasin, 2013), helping learners connect learning topics covered with their real-life and help learners develop themselves in high-level learning approaches (Mathews et al., 2017). Implementing learning with case studies, either through case discussions or writing, can allow students to try to find the truth of an answer and teach it to appreciate better the differences in the educational process (Syafii & Yasin, 2013). In line with this, it is also emphasized that learning activities by presenting real problems, encouraging learners to have open discussions, and experimenting with inquiry-based skills can improve the HOTS skills of learners, especially critical thinking skills (Miri et al., 2007a). Thus, it can be emphasized that learning activities with case discussions, questioning and conveying opinions, reflecting on knowledge, analyzing problems, conducting social research, and using various media, both internet and textbook learning, can be used in the process of learning Sociology in schools in the hope of encouraging HOTS skills learners.

Applying a 21st-century learning approach is a practical strategy for teachers to increase the use of these six factors in the classroom. (Wita G & Mursal, 2021). This 21st-century learning approach uses a student-centered and differentiated approach that suits students' needs. (Susilo et al., 2024). In this case, the teacher acts as a catalyst and facilitator who can present meaningful learning to students. Project-based learning is one learning model that can be used. (Rehman et al., 2024), discovery learning, cooperative learning, and problem-based learning (Rehman et al., 2024).

Sustainability education is relevant in this context because education with a sustainable approach is an important strategy to encourage social development in the long term (Nousheen et al., 2020). Continuing education plays a crucial role in raising social awareness, empowering individuals to make informed decisions and take proactive action, promoting critical thinking and problem-solving skills, enabling individuals to engage in discussions, advocate for policy change, and implement sustainable practices in their communities (Wang et al., 2024)**.**

Education with this approach focuses on experiential learning, the development of critical thinking skills, and problem-solving abilities (Wang et al., 2024). In the context of higher-order thinking skills (HOTS), sustainability education can be implemented through case-based learning that emphasizes the exploration of new ideas and contextualized cases to students, the application of analytical skills in real-world contexts, and reflective attitudes that help students stay relevant in keeping up with current developments. In this regard, Tang (2018) identified that the learning experience provided is significant in shaping students' attitudes and beliefs toward lifelong learning. Students are more likely to value learning when it benefits their future and contributes to the well-being of society. Therefore, integrating HOTS-based learning into Sociology with the principles of continuing education will support the achievement of educational goals.

Several treatments of HOTS for sustainability education are, first, analytics and problem-solving skills. Sustainability education needs entirely environmental, social, and economic problems. Students analyze data, evaluate information, and find innovative solutions to problems. *Second*, HOT could be the critical thinking students for environmental and social consequences. Students can consider the assumption and evaluate the long-term effect of environmental decisions effect. It stimulated the student to think deeply about their daily consumption, production, and behavior. *Third*, it can boost creativity and innovation for students seeking sustainability solutions. They could implement many aspects, beginning with product design and public policy. In sustainability education, students with creativity could improve in finding new treatments to minimize ecological ways and solutions for ecologically friendly. HOTS collaboration and communications skills critics also effectively collaborate in group discussions or project basic

groups. Sustainability education usually collaborates with stakeholders and students to improve the comprehensive solution.

4 CONCLUSIONS

The dominant factor influencing the learning process of Sociology was discussing cases. Case discussions can effectively develop scholarly thinking skills, student involvement, and deep theoretical understanding. Thus, implementing activities such as discussing cases, asking questions and giving arguments, reflecting knowledge, generalizing ideas, analyzing cases, and using the source of discussion material in the learning process can increase the HOTS of students in sociology learning. Meanwhile, the use of discussion sources is the factor that has the lowest influence, but it is still important as a discussion material to improve students' skills. Finally, the HOTS of learners can increase to be better than before, and the learning process becomes more meaningful. For further researchers interested in researching the HOTS-based Sociology learning process and the ability to influence HOTS, it is recommended to increase the number of research samples or to use different sample selection techniques and to use the following factor analysis methods, for example, confirmatory factor analysis or other statistical analysis.

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