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CRITICAL THINKING ANALYSIS OF SENIOR HIGH SCHOOL STUDENTS

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Abstract

Critical thinking skills are crucial in 21st-century education, which is filled with various challenges. This research uses a combination of quantitative and descriptive approaches. Its aim is to examine and compare students' analytical thinking capabilities at the secondary school level specializing in Social Sciences with those studying Mathematics and Science Data is gathered through observations and surveys that cover several. The research results revealed that students in Social Sciences major have much better critical thinking skills compared to students in the Mathematics and Science majors. Students in the Social Sciences major were also better at evaluating and making critical decisions, but students in the Mathematics and Science majors were worse at analytical thinking. These findings indicate that the curriculum and teaching methods in Compared to the Mathematics and Natural Sciences majors, The Social Sciences major promotes Strengthening critical thinking skills is very important. It is recommended that the MIPA study program update its teaching approach with more emphasis on developing evaluation and critical thinking skills.

Keywords: Critical Thinking Skills; Social Sciences; Comparison; High School Education

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INTRODUCTION

There are various definitions of critical thinking that are widely used in scientific research (Paul & Elder, 2019). Critical thinking is the capacity to assess and scrutinize information in order to judge its validity and trustworthiness.It is an essential skill for students, enabling them to approach information thoughtfully and make well-informed judgments (Putri et al., 2018). Peter emphasizes It is emphasized that critical thinking is essential, with the assertion Students who possess good critical thinking skills will make someone better prepared to face various challenges. challenges effectively are better equipped to address the challenges they face. In essence, critical thinking involves making decisions supported by well-founded arguments and reasoning (Lestari et al., 2020). Education has a goal, one of which is to Enhance critical thinking abilities (Kazempour et al., 2020). The 4C model integrates cognitive, social and emotional dimensions to develop effective learning skills) (Atmojo & Nugroho, 2020). As mentioned by Nugroho et al. (2020). These skills help individuals to solve problems effectively, adapt and face increasingly complex challenges in everyday life need to be developed as a very important skill.

In order to overcome different challenges and complex demands in the era of society 5.0, critical thinking skills must be mastered (Kompasiana.com, 2024). Critical thinking is an ability possessed by all individuals, which can be measured, trained, and developed (Kurniawati & Ekayanti, 2020). The primary strength in critical thinking for

students is their ability to think critically in a logical and structured manner in order to make precise and well-informed decisions (Azizah et al., 2022).

Several challenges in the field of education include: (1) a learning process that overly emphasizes theoretical mastery and rote memorization, which hampers the development of students' reasoning abilities; (2) curriculum requirements that lead to less contextualized learning in relation to the surrounding environment; (3) insufficient supervision of education quality; and (4) issues related to teacher professionalism (Sutisna et al., 2019).The purpose of education It is a vital component of education as this educational objective provides the direction to be achieved or that education wants to go (Hidayat & Abdillah, 2019).

Indicators of critical thinking skills as suggested by Facione (2015) Self-control Critical thinking abilities can be measured through the processes Including interpretation, analysis, evaluation, inference, and reasoning. In this research, critical thinking skills were assessed with these elements. The ability to present an argument and support it logically with information and facts obtained is known . The understanding a problem is part of interpretation. Meanwhile, the process of examining or recognizing relationships between statements and information facts, and ideas to draw conclusions. Evaluation involves assessing the truthfulness of statements or representations and understanding the relationships between claims, information, facts, ideas, or other formats. Inference is the ability to identify and retrieve ideas and components to draw conclusions. Self-regulation is used to describe the capacity to observe one's own thoughts. process while solving problems by evaluating and analyzing the results of previous reasoning. The following are sub-indicators of critical thinking skills (Alifteria et al., 2023).

Students in Indonesia continue to have limited critical thinking skills (Khasanah & Ayu, 2018). Critical thinking abilities are essential to pupils' cognitive growth (Rachmantika & Wardono, 2019). Critical thinking skills can provide great benefits for students, because they help them analyze information in more depth, make various arguments, and make more precise and rational decisions. With these skills, students can be more effective in solving problems, develop more logical thinking, and face academic and life challenges with more confidence to adapt In response to fast-paced progress of this era (Kurniawan, 2023). It involves the ability to consider multiple perspectives, identify assumptions, and filter information to make more informed and rational decisions. These skills are essential in dealing with complex problems and making decisions based on strong evidence (Kompas.com, 2021). PISA concluded that Indonesian students' thinking skills were severely lacking since they could only respond to questions at levels 1 and 2 out of a total of six possible levels. Data from in (OECD) through the 2018 PISA report indicates this is proven Indonesian students had an average reading score of 371 out of 487. In mathematics, their average score was 379, while their average science score matched the OECD average of 487.

The 2018 PISA results place Indonesia in the quadrant of high equity and low performance. As a result, Indonesia still has the opportunity to improve its critical thinking skills, given the untapped potential and capacity it holds. According to Azizah et al. (2018), Critical thinking is like solving puzzles, requiring careful analysis is a concern can have an impact major concern that demands urgent action. One contributing factor to this issue is the use of ineffective teaching methods, which have impeded the development of students' critical thinking capabilities (Ahmad, 2020). One of steps that can be taken in this learning model is to provide problems in learning that can be applied in students' daily lives. With the problems provided, students can hone their analytical skills and ability to solve problems by processing information that has been learned. Then students will also be asked to evaluate the effectiveness of the problem solving strategy

that has been made. Through this process, students will undergo development. Therefore, According to the 2018 PISA data, it can be concluded that Indonesian students still have the potential to enhance their critical thinking abilities.

Nizam's analysis of TIMSS 2015 data reveals interesting patterns about Indonesian students scored 397, ranking 44th out of 49 countries.(Suyanti & Umurul Hadi, 2019). According to the data, Indonesia is at the low level of TIMSS, with scores divided divided classified into four categories: low (400), moderate (475), high (550), and advanced (625).(Martyanti & Suhartini, 2018) It appears that poor exam results indicate that strong cognitive abilities, including critical thinking, are to answer research questions. Given this, it is imperative that Indonesia stress the value of critical thinking abilities to both teachers and students in order to meet learning goals and enhance performance globally. In addition, other research shows that critical thinking skills among Indonesian students are generally low, with many studies reporting only moderate levels of proficiency (azkiyah et al., 2023). A systematic review of mathematics critical thinking skills shows that students struggle (Syahnur, 2023). Mainly with providing arguments and drawing conclusions (Elmawati & Juandi, 2022).

Critical skills of middle school students studying social studies were compared and analyzed in this study mathematics, and natural sciences. The survey focuses on grade XI students from these three programs. The research seeks to identify factors that influence Students' critical thinking abilities were analyzed to find out whether The analysis processes for the two groups differed significantly evaluated and solved problems.The findings of this study can be used to improve teaching strategies. Furthermore, it is expected that teachers and other stakeholders will utilize this research as a resource to Assist students in enhancing their critical thinking abilities and foster a positive influence on the learning experience.

METHODS

This study was conducted in July 2024 at a senior high school during the 2023–2024 academic year, employing a quantitative descriptive research methodology. The study sample included 34 students from class XI specializing in mathematics and natural sciences, along with 34 students from the social sciences track. Data was collected through questionnaires and observation. The observation method involved monitoring the learning activities of students from both Questionnaires are used to measure students' critical thinking abilities in three important areas: social, mathematics and science aire is used with four different scales, as shown below.

Table 1.
Critical Thinking Scale Points

No	Scale Point	Value
1	SA	4
2	A	3
3	D	2
4	SD	1

Source: Sugiyono (2016)

Before distributing questionnaires to respondents, data quality tests were carried out. The data quality test obtained from the results of the research questionnaire can be measured from the validity test and reliability test. The validity was evaluated using IBM

SPSS Statistics 23 and reliability survey students' critical thinking abilities majoring in social sciences and mathematics as well as natural sciences. After considering all valid items, the reliability coefficients for the logical thinking is required to complete tasks that require a high level of skill. questionnaire were as follows: 0.838 for the explanation indicator, 0.924 for the evaluation indicator, 0.973 for the inference indicator, 0.821 for the interpretation indicator, 0.981 for the analysis indicator, and 0.899 for the self-regulation indicator. These values indicate a high level of reliability in the critical thinking survey given to students enrolled in social science, natural science, and mathematics streams.

The data analysis technique obtained from respondents uses Without examining whether one variable depends on to determine how closely two variables are related, the correlation test is applied to measure Strength of Braid between related variables.

To assess the relationship between variables, Pearson Product Moment correlation is used. variables using the correlation coefficient (r). Test (r) was used. There may be both positive and negative correlations between variable X (students majoring in mathematics and natural sciences) and variable Y (students majoring in sciences). The criteria for decision-making are as follows: a correlation a braid is considered significant For α=0.05, compare Pearson's r with the r-table value.

Table 2.
Degree of Relationship Guidelines

No.	Relationship Interval Coefficient Level	Relationship Interval Coefficient Level
1	0,00-0,199	Very Weak
2	0,20-0,399	Weak
3	0,40-0,599	Medium
4	0,60-0,799	Strong
5	0,80-1,000	Very Strong

Source: Sugiyono (2016)

RESULTS & DISCUSSION

Results

An analysis was conducted on high school students' ability to think analytically majoring in mathematics, natural sciences, and socIal sciences. To assess the analytical cognitive abilities of middle school student, a scale for evaluating analytical thinking was created by Ocak & Park (2020). To get better academic achievement, critical thinking skills are very important (Susanto et al., 2023). Studies have also shown that critical thinking skills are crucial for success, both in professional settings and in everyday life (Demir, 2022), and the difference between problem solving and analytical thinking (Tasgin & Dilek, 2023).

Fifteen statements with indicators such as explanation, interpretation, by using metrics such as analysis, self-regulation, evaluation, and so on, students' critical thinking test results in mathematics, the study evaluated students' critical thinking abilities using questionnaire responses.

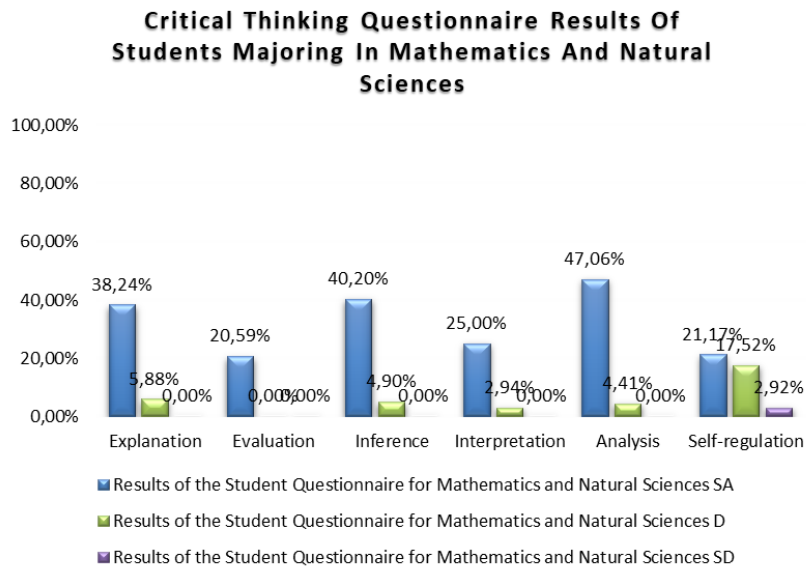

Figure 1.
Results from questionnaire
Source: Results of questionnaire analysis of research respondents

In figure 1 above, the highest results in the analysis indicator with students majoring in mathematics and natural sciences answered the statement Strongly Agree (SA) as much as 47.06%. While the lowest result in the evaluation indicator was 20.59% who answered the Strongly Agree (SA) .

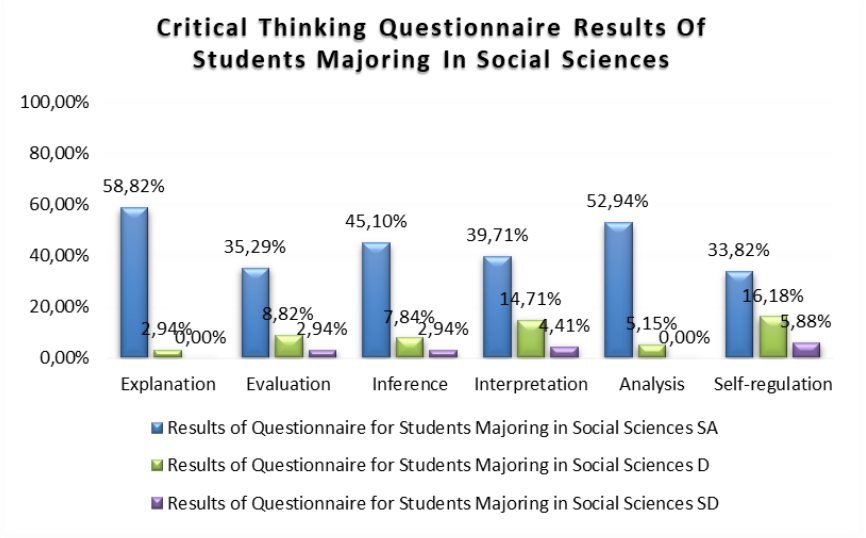

Figure 2.
Results from questionnaire
Source: Results of questionnaire analysis of research respondents

In figure 2 above, the highest results in the explanation indicator with students majoring in social science answering the statement Strongly Agree (SA) as much as 58.82%. While the lowest result on the self-regulation indicator was 33.82% who

answered the Strongly Agree (SA) statement. To check the collected data, Pearson Product Moment Correlation Test was used. Table 3 shows the results of this analysis; Please paraphrase and clean up the plagiarism, because the turnitin is a little lost

Table 3.
Examining Critical Thinking Indicators using Pearson Correlation Students majoring in social sciences and mathematics as well as those majoring in natural science

Correlations			
Model		**Math and natural science explanations**	**Social science explanations**
Math and natural science explanations	Pearson Correlation	1	.838
	Sig. (2-tailed)		.162
	N	4	4
Social science explanations	Pearson Correlation	.838	1
	Sig. (2-tailed)	.162	
	N	4	4

Source: Correlation test results of research respondents

In Table 3 above, the significance value for the Explanation indicator of the critical thinking variable among students specializing in social sciences and mathematics and natural sciences is 0.162. Since the value exceeds 0.05, there is no correlation or relationship between these variables. According to the table, the Pearson Correlation for critical thinking between students in the correlation value between mathematics, natural sciences and , a negative correlation of -0.838 indicates a moderate relationship between critical thinking skills in Science/Mathematics and Social Sciences.

Table 4.
When comparing the assessment indicators of students majoring in mathematics and the natural sciences to those majoring in the social sciences, the correlation test results reveal.

Correlations			
Model		**Math and natural science evaluation**	**Social science evaluation**
Math and natural science evaluation	Pearson Correlation	1	.924
	Sig. (2-tailed)		.076
	N	4	4
Social science evaluation	Pearson Correlation	. 924	1
	Sig. (2-tailed)	.076	
	N	4	4

Source: Correlation test results of research respondents

As presented in Table 4 above, the significance value for the evaluation indicators of the critical thinking variable in science, mathematics, and social studies is 0.076, indicating that there is no correlation or relationship between these variables.

Table 5.
Correlation test results from inference indicators of students majoring in mathematics and natural sciences and students majoring in social sciences

Correlations			
Model		**Math and natural science inference**	**Social science inference**
Math and natural science inference	Pearson Correlation	1	.973
	Sig. (2-tailed)		.027
	N	4	4
Social science inference	Pearson Correlation	. 973	1
	Sig. (2-tailed)	.027	
	N	4	4

Source: Correlation test results of research respondents

As shown in Table 5 above, there is a correlation between the critical thinking variables of students specializing in The inference indicator shows a correlation between students majoring in students who majored in mathematics, natural sciences, and social sciences.

Table 6.
Correlation test results of interpretation indicators of students majoring in mathematics and natural sciences and students majoring in social sciences

Correlations			
Model		**Math and natural science interpretation**	**Social science interpretation**
Math and natural science interpretation	Pearson Correlation	1	.821
	Sig. (2-tailed)		.179
	N	4	4
Social science interpretation	Pearson Correlation	. 821	1
	Sig. (2-tailed)	.179	
	N	4	4

Source: Correlation test results of research respondents

As shown in Table 6 above, the critical thinking variable for students majoring in there are interpretive indicators, the significance value in Social Sciences, Mathematics and Science is 0.179, which is above 0.05. This shows where there is no relationship or correlation between students' critical thinking variables in these two disciplines concerning the Interpretation indicator.

Table 7.
The findings of a correlation test that analyzes indicators between students majoring in social studies with mathematics and science

Correlations			
Model		**Math and natural science analysis**	**Social science analysis**
Math and natural science analysis	Pearson Correlation	1	.981
	Sig. (2-tailed)		.019
	N	4	4

Social science analysis	Pearson Correlation	. 981	1
	Sig. (2-tailed)	.019	
	N	4	4

Source: Correlation test results of research respondents

As indicated in Table 7 above, critical thinking variable for The significance value of 0.019 for the performance metrics, which is below 0.05, suggests that a relationship or correlation exists between the critical thinking variables of students majoring in mathematics and natural sciences and those majoring in social science sof students in these two fields with respect to the analysis indicator.

Table 8.
Correlation test results of self-regulation indicators of students majoring in mathematics and natural sciences and students majoring in social sciences

Correlations			
Model		**Math and natural science self-regulation**	**Social science self-regulation**
Math and natural science self-regulation	Pearson Correlation	1	.899
	Sig. (2-tailed)		.101
	N	4	4
Social science self-regulation	Pearson Correlation	. 899	1
	Sig. (2-tailed)	.101	
	N	4	4

Source: Correlation test results of research respondents

As shown in Table 8 above, the critical thinking variable for students majoring in The significance value of 0.101 for the self-regulation indicator, which exceeds 0.05 This implies that there is no relationship or association between the variables assessing critical thinking.in mathematical knowledge, science knowledge, and IPS knowledge. Similarly, no correlation exists between the variables representing critical thinking within these fields.

Discussion

Compared to students majoring in mathematics and the natural sciences, social science majors demonstrated noticeably better correlation test results for critical thinking, particularly on the analytical indicator, where the value was 0.019, indicating a relationship (since it is less than 0.05). As seen by the 0.981 correlation for the analysis indicator for both social science and math/natural science students, there is a substantial correlation and positive connection between these two variables. This implies that the analysis score for social science majors tends to rise while the analysis score for math Students majoring in the field of natural sciences, there is a visible decline. In general, there is a relationship between indicators of student analysis in these two fields and critical thinking variables. However, for students majoring in social studies, mathematics and science, interpretation indicators show the weakest correlation with critical thinking abilities with a significance value of 0.179, which is higher than 0.05.

The Pearson correlation of 0.821 between the interpretation indicators for social science and mathematics/natural science majors indicates a weak negative relationship

between these two factors. This implies that as the interpretation score for social science, the score for mathematics and natural sciences majors tends to decrease.

Students majoring sciences generally exhibit stronger analytical skills than those in math, due range of analytical activities that demand critical thinking and reflection. However, pupils studying mathematics and the scientific sciences often concentrate more on memorization and structured methodologies which may limit their broader analytical development (Putri et al., 2020). The development of analytical skills is related to the educational methods used. Social science majors often use problem-based learning and research, encouraging higher-order thinking (Toleva-Stoimenova & Rasheva-Yordanova, 2023). Research shows that students majoring in social sciences generally achieve better learning outcomes and scientific process skills compared to their counterparts in math and natural science majors, suggesting a difference in the development of analytical skills (Hadi, 2015).

On the explanation indicator, students in social studies assess their peers in mathematics and physics based on their learning. In social studies, a stressful learning approach to debate activities can be improved. These findings align with previous research conducted by Arung & Jumardin, (2016) It claims that teaching debate enhances pupils' speaking abilities. Only 47.06% of students in the natural sciences and mathematics chose "Strongly Agree," compared to 52.94% of students in the social sciences, who scored higher on the analysis indicator. This illustrates how people process arguments and then present their analytical conclusions in order to assess data on a certain subject (Matsuba et al., 2021). Only 40.20% of students in mathematics and the natural sciences selected "Strongly Agree," compared to 45.10% of students in the social sciences, who scored higher on the inference indicator. In this sense, Critical thinking Refers to the way a person analyzes and considers something aptitude and propensity to make evidence-based decisions (Eggen & Kauchak, 2012).

Students majoring in on the interpretation indicator, the social sciences did the best, with 34.71% selecting "Strongly Agree." Only 25.00% of students majoring in mathematics and the natural sciences, however, chose "Strongly Agree" on the same measure. sealed that problem-based learning improves students' ability to think critically. With 35.29% of social science students choosing "Strongly Agree," social science majors did better on the evaluation indicator than math and science majors compared to only 20.59% of students in mathematics and natural sciences. A key trait of critical thinkers to think openly, factually, an effective way". Furthermore, it demonstrates a person's capacity to analyze, combine, and assess information (Roksa & Kinsley, 2019).

In the self-regulation indicator, students majoring in social sciences are still superior with the results of 33.82% of students answering Strongly Agree, while students majoring in mathematics and natural sciences only 21.17% of students answered Strongly Agree on the self-regulation indicator. Istarani & Ridwan (2015) the debate model of learning involves presenting material from both sides, weighing the advantages and disadvantages in order to determine the reality of a particular circumstance. When students are forced to voice beliefs that are different from their own, debate may be a powerful teaching technique for encouraging critical thinking and introspection.

At the high school education level.,students majoring in the social sciences excel in critical thinking compared to their counterparts in mathematics and sciences. Observations at the school suggest that this advantage This is attributed to innformation Systems Learning , especially debate-based teaching, which focuses on improving the critical thinking abilities of pupils (Dilekli, 2017). Implement learning methods that can attract students' interest and improve their ability to think critically (Elim et al., 2024), that the Argument-Driven Inquiry (ADI) model with a Contextual Approach proved

feasible and effective for improving critical thinking skills. Continuous critical thinking test practice needs to be done so that they are easier to answer critical thinking questions (Shwartz-Asher et al., 2022). These students rarely participate in debates or discussions in class (Bathgate et al., 2015), It is stated that high school students' ability to construct arguments in science influences their learning, including their critical thinking skills (Narmaditya & Omar, 2019). Debate method as a critical learning strategy hampers differences in learning orientation between departments determine a valid and neutral measuring tool for each department in this research.

CONCLUSION

The research shows that social science majors have better critical thinking skills than math and natural science majors, especially in the aspects of reasoning, problem solving, and analysis of facts and data. This is due to the characteristics of the social science curriculum which emphasizes logical thinking and argumentation skills. In addition to the primary subjects, factors such as teaching methods and students' active involvement in learning activities were also found to influence critical thinking skills. Consequently, innovative and interactive teaching approaches are strongly recommended to enhance students' critical thinking abilities in both fields. One challenge in this study is the differing focus of the two majors, which made it difficult to establish a valid and impartial assessment tool for both. The study revealed notable disparities between math and natural science majors and social science majors in terms of critical thinking abilities. Students in each group exhibited distinct abilities that made one major more adept than the other in problem identification, information analysis, and decision-making.

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