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# Analysis of Critical Thinking Ability in Artificial Intelligence-Assisted Guided Inquiry Model Based on Mathematical Disposition

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Abstract

This research aims to analyze the quality of implementing the Guided Inquiry learning model assisted by Artificial Intelligence on students' critical thinking abilities and to describe students' critical thinking abilities based on their mathematical disposition after being given the Guided Inquiry learning model assisted by Artificial Intelligence. This study employed a mixed-methods approach used a sequential explanatory design. The quantitative research involved a population of 10th-grade students at MA Annidlomiyah. The selected samples were class X B as the experimental group and class X A as the control group. Research instrument in the form of a test of mathematical critical thinking abilities, mathematical disposition questionnaires, an interview, and student worksheets with data analysis was used with IBM SPSS 16. The qualitative research described critical thinking abilities based on high, medium, and low mathematical dispositions. The research results show that 1) The quality of implementing the Guided Inquiry model assisted by Artificial Intelligence met valid criteria at the planning stage, achieved a very good category at the implementation stage, and fulfilled learning effectiveness at the evaluation stage of results. 2) The description of students' critical thinking abilities is as follows: (a) Students with a high mathematical disposition demonstrated very good critical thinking abilities and were able to meet all four indicators of critical thinking ability. (b) Students with a medium mathematical disposition had critical thinking abilities that were not as good as those with a high mathematical disposition. Most students only met two to three indicators of critical thinking ability. (c) For students with a low mathematical disposition, there were two differences in critical thinking ability observed in this study. Some met three indicators, while others only met one indicator.



## 1. Introduction

Mathematics is a fundamental discipline present at every educational level, from kindergarten through university. Providing mathematics education is crucial for equipping students with the ability to think logically, analytically, systematically, critically, and creatively, as well as the capacity for teamwork. These skills enable students to acquire, manage, and utilize information to thrive in an ever-changing, uncertain, and competitive world. According to the National Council of Teaching Mathematics (NCTM), mathematics instruction encompasses five key competency standards: problem-solving, reasoning and proof, communication, connection, and representation (Mukarromah & Junaedi, 2023).

Critical thinking is an incredibly vital skill, preparing students to face numerous challenges in life, careers, and their personal obligations and responsibilities. Simbolon (in Arif et al., 2020), defines critical thinking as the process of searching, analyzing, synthesizing, and conceptualizing information to develop one's thoughts, foster creativity, and take risks. Fauziah (in Hidayat et al., 2019) offers a similar definition, stating that critical thinking involves deep thought using reasoning to acquire relevant and responsible

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knowledge. Critical thinking is also one of the four essential competencies for 21st-century learning, alongside collaboration (the ability to work well with others) and communication. These 21st-century skills are crucial for navigating globalization, changes in the global market, international competition, environmental migration, and technological advancements (Wahyunita & Subroto, 2021).

Mathematics education and critical thinking are deeply interconnected. Mathematical concepts can be understood through critical thinking skills, and critical thinking can be honed through learning mathematics (Samosir, 2019). Critical thinking offers numerous benefits to students, including enhancing and developing conceptual understanding and fostering thinking abilities, which makes it easier for them to solve more complex problems. When mathematics learning incorporates critical thinking, several positive impacts emerge: (1) It trains problem-solving skills. (2) It fosters innovative questions and the design of appropriate solutions. (3) It encourages active argument construction by presenting accurate and logical evidence (Ratnawati et al., 2020). Furthermore, critical thinking enables students to consider any problem in a structured way, approach diverse issues systematically, formulate innovative questions, and develop actionable solutions (Irfiani et al., 2023)

Undeniably, critical thinking is an essential skill to possess. However, in reality, students' critical thinking abilities still need improvement. Observations and interviews with a mathematics teacher at MA Annidlomiyah Kaliwungu Kendal revealed that students' critical thinking levels are still low. Many students struggle to solve problems requiring critical thinking, often only being able to complete example problems previously discussed by the teacher. When given problems that demand critical thinking, many students cannot answer correctly. Additionally, the low critical thinking ability is evident in student exam results, which show difficulty in finding relevant evidence to reach solutions. This indicates that certain indicators of students' critical thinking skills remain unfulfilled.

Karim & Normaya (in Afifah & Kusuma, 2021) stated that students' critical thinking abilities can be assessed using four indicators: Interpretation, Analysis, Evaluation, and Inference. The Interpretation indicator relates to an individual's ability to understand a problem, demonstrated by formulating the core issues. The Analysis indicator concerns the ability to connect questions and concepts and uncover facts within a given problem. The Evaluation indicator relates to the ability to plan and execute strategies to accurately complete assigned tasks. The Inference indicator pertains to the ability to draw conclusions from the problems being worked on

To enhance students' critical thinking skills, a learning model that actively engages students in mathematics is needed. Student engagement in learning makes them more enthusiastic and better able to understand material, as they don't just passively receive information but actively participate in acquiring learning material and solving problems. One such effective model is the Guided Inquiry learning model. The Guided Inquiry learning model emphasizes critical and analytical thinking processes to independently search for and discover answers to a problem (Rizky & Sritresna, 2021) Research on the Guided Inquiry model by Rizky and Sritresna (2021) showed that students' mathematical critical thinking skills improved by 0.77 when using this model (Rizky & Sritresna, 2021).

Currently, there are many innovations in education, including the use of Artificial Intelligence (AI). AI tools like ChatGPT and PhotoMath can be particularly beneficial. ChatGPT (Generative Pre-training Transformer), an AI conversational format, allows users to ask questions and quickly receive answers (Suharmawan, 2023). PhotoMath, on the other hand, acts as a virtual tutor in mathematics education, with its AI capabilities providing step-by-step solutions to math problems.

Critical thinking ability is also influenced by affective aspects, with mathematical disposition being a key factor. Critical thinking skills develop well when students possess a good mathematical disposition (Kurniati et al., 2017). (Islamiati et al., 2021) also emphasize that mathematical disposition, as an affective domain, plays a crucial role in mathematics learning.

According to NCTM (1991) (in Kurniati et al., 2017), mathematical disposition relates to how students perceive and solve problems: whether they are confident, persistent, interested, and flexible in exploring various solution alternatives. The National Council of Teachers of Mathematics (NCTM, 1989) outlines several components of mathematical disposition: (1) Confidence, (2) Flexible thinking, (3) Persistence in mathematical tasks, (4) Interest, (5) Monitoring and reflecting on thoughts and performance, (6) Valuing the application of mathematics in other disciplines or daily life, (7) Appreciating the role of mathematics as a tool and a language.

The Guided Inquiry learning model assisted by Artificial Intelligence is believed to have the potential to enhance critical thinking abilities. This is because the Guided Inquiry model encourages students to be active in exploring and discovering knowledge independently, albeit under teacher supervision. The use of Artificial Intelligence applications, meanwhile, will help students independently find learning materials and problem-solving references. Based on these explanations, the researcher is interested in conducting this study.

## 2. Methods

This research was a mixed method. According to Creswell (2018) mix methods research design was a research approach that combines or associates qualitative research and quantitative research. The design used in this study was sequential explanatory (order of proof). Sequential explanatory combining quantitative and qualitative methods, with quantitative techniques as the underlying stages, while the next stage used qualitative methods Sugiono (in Faroh, 2023) Qualitative data was used to help explain or decipher the results of quantitative data. The quantitative method in this study was used to determine the average critical thinking ability of students in the model Guided Inquiry Assisted Artificial Intelligence achieve the actual completion limit, knowing the proportion of completeness of students who use the model Guided Inquiry Assisted Artificial Intelligence more than 75%, knowing the average critical thinking ability of students on the model Guided Inquiry Assisted Artificial Intelligence more than the expository learning model, knowing the proportion of students who use type Guided Inquiry Assisted Artificial Intelligence more than students who use the expository model. While the qualitative method is used to describe Critical thinking abilities students were reviewed from the learning style in type Guided Inquiry Assisted Artificial Intelligence.

The research was conducted from March 11, 2025 to March 20, 2025. The population in this study was class X students of MA Annidlomiyah Kaliwungu Kendal. Sampling was done using the Random Sampling Technique, so that class X B was chosen as the experimental class and X A as the control class. The subjects of this study were selected by all students in the experimental class who had high, medium, and low disposition levels. The quantitative method used a pretest-postest controll group design. In summary, the applied research design is presented in Table 1 below

**Table 1**. Pretest-Posttest Controll Group Design

| | | | |
|---|---|---|---|
| Randomly selected class as an Experimental Class | Pretest | Provision of Guided Inquiry model learning assisted by Artificial Intelligence | Posttest |
| Randomly selected class as the Control Class | Pretest | Expository model learning | Posttest |

Table 1 shows that the experimental class and the control class will be given a pretest at the beginning of the meeting and a post-test at the end of the meeting. The learning process in both classes will be differentiated, the experimental class will apply Guided Inquiry assisted by Artificial Intelligence, while the control class will apply the expository learning model. Giving a Pretest to see how the student's initial condition is. Meanwhile, the Posttest is given to determine students' critical thinking abilities in experimental and control classes after getting two different learning models.

Furthermore, data analysis for learning quality is divided into three stages, namely (1) the planning stage related to content validation and construct validation of the learning tools used along with research instruments by experts, (2) the implementation stage, the results of observation assessments of learning activities and student responses to learning activities with a minimum of good categories, (3) the evaluation stage, prerequisite tests are carried out, Average completeness test, proportion completeness test, average difference test, and difference proportion test. Qualitative research data analysis was carried out on subjects in the experimental class. The results of qualitative data are descriptions of students' critical thinking abilities based on their mathematical disposition.

## 3. Results and Discussion

### *3.1 Quality of Artificial Intelligence-Assisted Guided Inquiry Model*

- *Planning Stage*

The researcher carried out planning and preparation by designing learning tools and research instruments. The tools prepared are Teaching Modules (MA), Test Questions, Disposition Questionnaires, Interview Guidelines, and Student Worksheets. The teaching module instrument scored 4.73, with a very good category. The instrument for pre test and post test questions got a score of 4.67 in the Very Good category. The Mathematical Disposition Questionnaire Instrument scored 4.83 with the category of Excellent. The interview guideline instrument received a score of 4.83 in the category of Excellent. Student Worksheet Instrument scored 4.65 in the category of Excellent. Based on the results of the critical thinking ability test questions, it was concluded that question items 1 to 5 had a reliability value of 0.967.

- Implementation Stage

This research was conducted from March 11, 2025 to March 20, 2025 at MA Annidlomiyah Kaliwungu, Kendal. Samples were taken using Random Sampling Techniques. Selected class X B as the Experiment class and class X A as the Control class. In the Experiment class, learning was carried out in 4 meetings with the implementation of the *Guided Inquiry* learning model assisted *by Artificial Intelligence.* The subject matter taught is Statistics.

Assessments on the implementation of *Guided Inquiry* learning assisted *by Artificial Intelligence* were obtained through observations conducted at each meeting. The results of observations on the implementation of learning by teachers can be seen below

**Table 2.** Learning implementation score

| Meeting | Average Score | Information |
|---|---|---|
| 1 | 3.60 | Good |
| 2 | 3.80 | Good |
| 3 | 3.85 | Good |
| 4 | 4.40 | Excellent |

- Evaluation Stage

The test was carried out in the experimental class and the control class with a time allocation of 80 minutes. The test questions given are critical thinking ability tests that have passed validity, reliability, difficulty tests, and differentiation at the time of the test. A summary of the test data is presented in the following table

Before conducting the experiment, the researcher conducted a normality and homogeneity test as well as an average similarity test. The normality test aims to find out whether the two sample groups, namely the experimental class and the control group, are normally distributed or not. Based on the results of the normality test with SPSS, obtained before conducting the experiment through the pre-test, it was found that the significance value of the experimental class was 0.124 and for the control class was 0.104. The significant value of both classes indicates (> 0.05) so $H_0$ is accepted which means that the two sample groups are normally distributed.

Then followed by a homogeneity test which aims to find out if there is a difference in variance between the two samples. Based on the homogeneity test, the results of the significance value of 0.983 > 0.05 were obtained so that the value of $H_0$ was accepted, which means that the critical thinking ability of the experimental class and the control class were from the same variant. After the Normality Test and the Homogeneity Test were also carried out to test the average similarity of mathematical crisis thinking abilities for the two classes, for the average similarity test used a t-test to find out the similarity of mathematical critical thinking abilities of the two groups. Based on the results of the t-test conducted with SPSS, a value = 0.378 > 0.05 was obtained, so that $H_0$ was accepted and $H_1$ was rejected, meaning that there was no difference in the average ability of the two groups. Then, quantitative and qualitative data are analyzed.

Quantitative data analysis was carried out to determine the achievement of the Guided Inquiry model on mathematical critical thinking abilities. The Guided Inquiry model assisted by Artificial Intelligence is said to be carried out if critical thinking abilities meet 4 criteria: (1) the average critical thinking of students exceeds the Actual Completion Limit 52; (2) Critical thinking abilities achieve a minimum of 75% completeness; (3) the average abilities of students taught with the Artificial Intelligence-assisted Guided Inquiry model are better than those taught by the expository model; (4) the proportion of critical thinking abilities taught by the Guided Inquiry model is better than the proportion of critical thinking abilities of students taught by expository.

Before conducting quantitative data analysis to test the 4 achievement criteria of the Guided Inquiry model assisted by Artificial Intelligence. Quantitative data on the post-test value of critical thinking abilities was carried out by normality test and homogeneity test. In the normality test, a significant value was obtained for the experimental class of 0.108 and the control class of 0.060. The significant value of both classes shows (> 0.05) so $H_0$ is accepted which means that the two sample groups are normally distributed. Then followed by a homogeneity test which aims to find out if there is a difference in variance between the two samples. Based on the homogeneity test on the post-test value, the results obtained a significance value of 0.893 > 0.05 so that the $H_0$ value was accepted, which means that the critical thinking ability of the experimental class and the control class came from the same variant.

After testing the normality test and the homogeneity test, it was then continued to test the four achievement criteria of the Guided Inquiry learning model assisted by Artificial Intelligence. The first criterion is that the average critical thinking of students exceeds the Actual Completion Limit Score 52. The score is determined by $(\bar{x} \pm 0.25\ SD)$ which is the average score and SD is the default deviation. In the first criterion, the t-test used is a one-party t-test. The result is $t_{count}$= 9.992. Based on the distribution of t table = 1.721 with a significance level of 0.05. Thus $t_{count} \geq t_{table}$ was then $H_0$ rejected. This means that the average score of critical thinking abilities is higher than 52.

The second criterion is the ability to think critically to achieve a minimum graduation score of 75%. To test the second criterion, use a merit test or a one-party proportion test that results in $z_{count} = 2.142$. Based on a distribution $z_{table}$ =of 1.64 with a significance level of 0.05. Thus, $z_{count} \geq z_{table}$ So it $H_0$ was rejected. That is, the proportion of critical thinking abilities is higher than 75%, or it can be stated that critical thinking abilities achieve classical learning higher than 75%.

In the third criterion, the mathematical critical thinking abilities of students taught with the Guided Inquiry model assisted by Artificial Intelligence were better than the critical thinking abilities of students taught using the expository model. On the third criterion, the variance test yielded $t_{count}$ = 2.861. Based on the distribution of t-table obtained $t_{table}$ = 2.086 with a significance level of 0.05. Thus, $t_{count} \geq t_{table}$ so it was rejected. In the third criterion, it can be seen that the mathematical critical thinking abilities of students taught with the $H_0$Guided Inquiry model assisted by Artificial Intelligence are better than the mathematical critical thinking abilities of students taught with the expository model.

In the third criterion, the mathematical critical thinking abilities of students taught with the Guided Inquiry model assisted by Artificial Intelligence were better than the critical thinking abilities of students taught using the expository model. On the third criterion, the variance test yielded $t_{count}$ = 2.861. Based on the distribution of t-table obtained $t_{table}$ = 2.086 with a significance level of 0.05. Thus, $t_{count} \geq t_{table}$ so it $H_0$ was rejected. In the third criterion, it can be seen that the mathematical critical thinking abilities of students taught with the Guided Inquiry model assisted by Artificial Intelligence are better than the mathematical critical thinking abilities of students taught with the expository model.

In the fourth criterion, the proportional difference test yields $z_{count}$ = 1.836. Based on the distribution of the z-table obtained $z_{table}$ = 1.64 with a significance level of 0.05. So, $z_{count} \geq z_{table}$ so it $H_0$ was rejected. This means that the proportion of mathematical critical thinking abilities of students taught with the Guided Inquiry model based on Artificial Intelligence is better than the mathematical critical thinking abilities of students taught with the expository model.

Based on these criteria, it can be known that the learning achievement requirements have been met. Thus, it can be concluded that the Guided Inquiry model assisted by Artificial Intelligence is able to improve students' critical thinking abilities.

*3.2 Description Critical thinking abilities of students based on mathematical disposition*

At the beginning of the meeting, students looked unaccustomed to working on questions that tested critical thinking abilities. In addition, students are also still lacking in applying indicators regarding critical thinking abilities such as interpretation, analysis, evaluation, and inference. The students are used to working on problems that have been discussed previously by the teacher, resulting in less critical thinking abilities. In this study, the learning process will be discussed using the model *Guided Inquiry* assisted by *Artificial Intelligence* where students are required to be active in learning. Type *Guided Inquiy* assisted by *Artificial Intelligence* make their students to take part in obtaining learning materials and also solving problems.

In this section, it will be shown how students' critical thinking abilities are seen through their mathematical disposition. Students' critical thinking abilities will be seen through indicators of critical thinking abilities according to Facione, such as *Interpretation*, *Analysis*, *Evaluation,* and *Inference* indicators. Students' critical thinking abilities will be based on mathematical disposition. The mathematical disposition in this study is divided into three, namely high mathematical disposition, moderate mathematical disposition, and low mathematical disposition. Mathematical disposition is a student's attitude such as self-awareness, perseverance, interest, assessment and appreciation for mathematics lessons. The following will be shown the achievement of students' critical thinking abilities based on Mathematical Disposition.

**Table 3.** Presentation Mathematics Disposition and Value Statistics of Critical Thinking Abilities

| Classification Mathematics Disposition | Number of students | Presentation | Value Statistics |
|---|---|---|---|
| High | 5 | 23.81% | Average : 92.8<br>Maximum : 96.00<br>Minimum :90.00 |
| Medium | 14 | 66.67% | Average : 78.21<br>Maximum : 95.00<br>Minimum : 53.00 |
| Low | 2 | 9.52% | Average : 62.50<br>Maximum : 75.00<br>Minimum : 50.00 |

The following is a detailed description of critical thinking abilities at high mathematical disposition, medium mathematical disposition, and low mathematical disposition.

- **Critical thinking abilities at High Mathematical Disposition**

From the results of the analysis and continued triangulation of several subjects with those included in the high mathematical disposition. The following are the results of the analysis of critical thinking abilities with high mathematical disposition presented in the table below.

**Table 4.** Critical Thinking Ability Analysis at High-Level Mathematical Dispositions

| No | Student Code | Mathematics Disposition Categories | Mathematics Disposition Score | Indicators of Critical Thinking Ability | | | |
|---|---|---|---|---|---|---|---|
| | | | | Interpretation | Analysis | Evaluation | Inference |
| 1 | E - 01 | High | 69 | √ | √ | √ | √ |
| 2 | E - 02 | | 71 | √ | √ | √ | √ |
| 3 | E - 03 | | 70 | √ | √ | √ | √ |
| 4 | E - 09 | | 86 | √ | √ | √ | √ |
| 5 | E - 11 | | 70 | √ | √ | √ | √ |

In the table, data was obtained on the subject of high-level mathematical disposition, as many as 5 students were included in the high-level mathematical disposition group. This group had the highest average score compared to the group of medium-level mathematical disposition and low-level mathematical disposition, which was 92.8. In this high-level mathematical disposition group, all members meet the indicators of critical thinking ability ranging from interpretation, analysis, evaluation, and also inference.

In the group of high mathematical dispositions the subjects were able to perform interpretations. The ability of the S-1 subject to achieve the indicators of interpretation can be seen from the picture of the subject's work below.

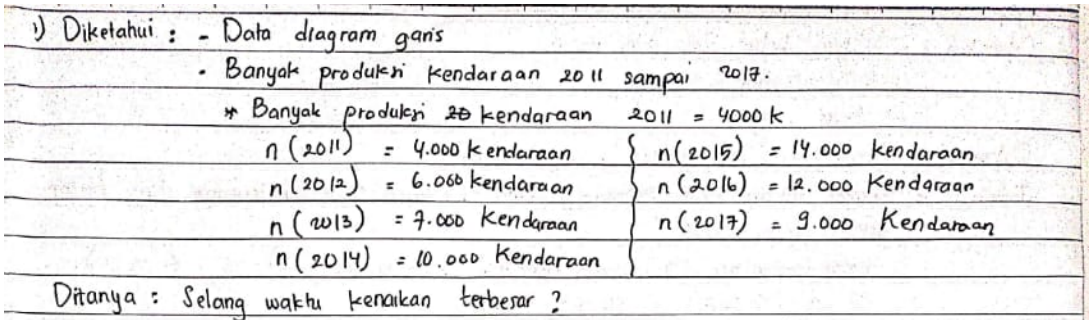



**Figure 1.** Results of S-1 Work for Interpretation Indicators

In figure 1 above, it can be seen that the subject in the Interpretation Indicator is able to understand and interpret the meaning in the problem, as evidenced by being able to write down what is known and asked according to the problem. Subject S-1 can also understand the intent of the line diagram so that they are able to write correctly and accurately information about the amount of vehicle production of each vehicle.

In addition to interpretation indicators in S-1 subjects, it is also able to meet other indicators of critical thinking ability, namely analysis indicators. The achievement of S-1 subjects in the analysis indicators can be seen from the test results below.

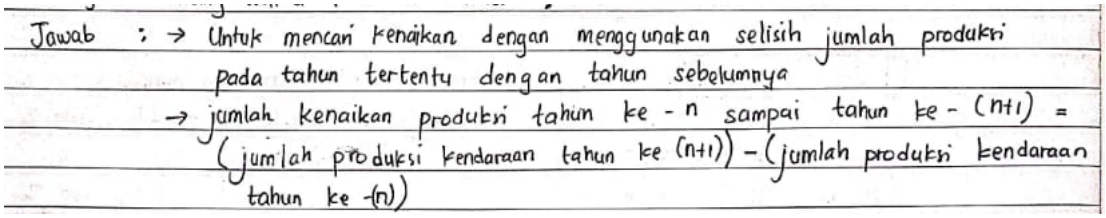



**Figure 2.** Results of S-1 Work for Analysis Indicators

In figure 2 above, it can be seen that the subject S-1 in the Analysis Indicator is able to identify the relationship between the statement and the concepts to solve the problem, as evidenced by S-1 being able to write the concept of settlement correctly, namely with the concept of difference or subtraction if they want to find an increase in the number of vehicle production. In addition, the subject is also able to model the answer of the question in accordance with the solution strategy. S-1 writes a formula for settling the increase in the interval of the nth year to the n+1st year using the subtraction between the amount of production in the year to (n+1) and the amount of production in the nth year.

Not only interpretation and analysis indicators. S-1 subjects are also able to meet the achievement of evaluation indicators. The achievement of the Evaluation indicator can be seen in the completion Figure 3. In the evaluation indicator, S-1 subjects are able to use strategies and calculations completely and precisely. Figure 3 shows that the S-1 subject was able to investigate the difference at a certain time interval using the correct calculations. Subject S-1 is also able to investigate whether there is an increase or decrease in vehicle production from the results of the search using the concept of reduction. All the steps of the solution are written in detail and accurately.

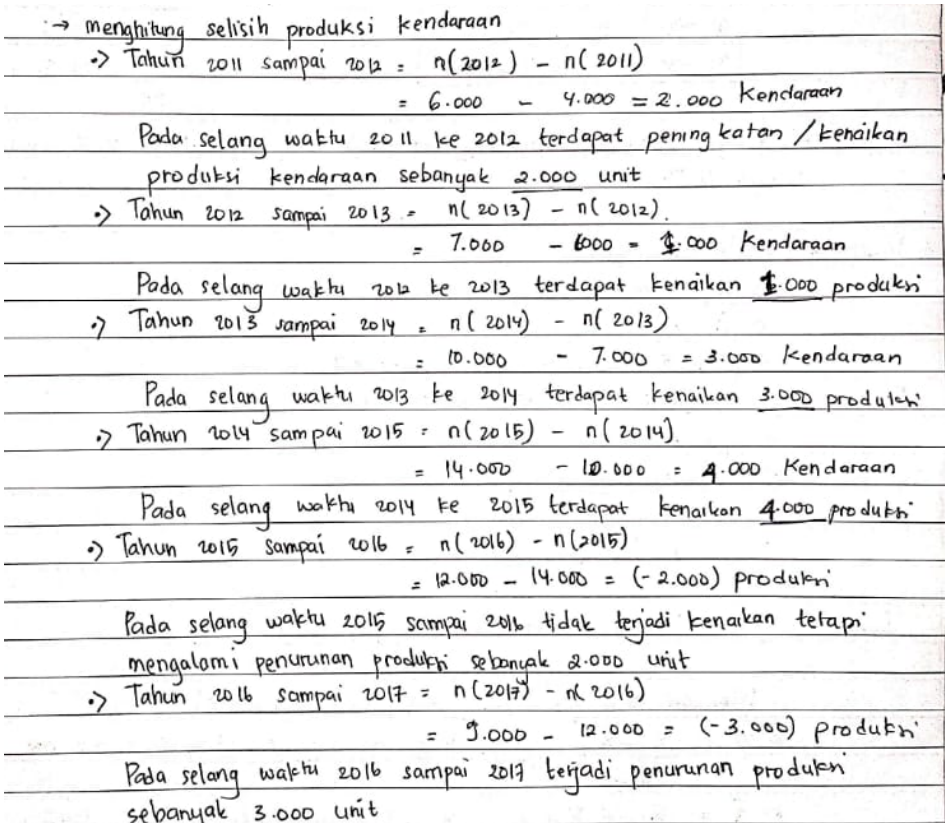



**Figure 3.** Results of S-1 (High Mathematical Disposition) for Evaluation Indicators

In addition to the indicators of Interpretation, Analysis, Evaluation, S-1 subjects also meet the inference indicators. The fulfillment of inference indicators can also be seen from the results of the work of the S-1 subject. Below are the results of the work on subject S-1 on the Inference indicator.

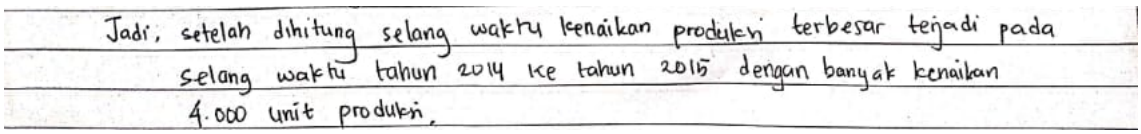



**Figure 4.** Results of S-1 (High Mathematical Disposition) for Inference Indicators

In the above inference indicator, it can be seen that the S-1 subject is able to draw conclusions precisely according to the context of the existing problem. The conclusions drawn by the subject S-1 are in accordance with the context asked from the question. In addition, the S-1 subject also writes completely and correctly according to the results of the calculation on the steps to solve the problem.

Based on this explanation, it can be seen that it is clear that the critical thinking ability in research subjects with high mathematical disposition has very good critical thinking abilities, this is in line with previous research which states that students with high positive mathematical dispositions have excellent ability to analyze problems and good ability to explain, evaluate, and choose strategies (Susilo et al., 2020). Another research result that is in line with this is the research of (Annisa et al., 2025) which states that the students in the group of high mathematical disposition are able to meet the indicators of critical thinking abilities of interpretation, analysis, evaluation, and inference.

- **Critical thinking abilities at medium mathematical disposition**

From the results of the analysis and continued triangulation of several subjects with those included in the moderate mathematical disposition. The following results of the analysis of critical thinking abilities of mathematical dispositions are presented in the Table 5.

In the table, data was obtained that there were 14 students who were included in the group of low mathematical disposition. The average score in this low disposition group was 78.21. In this group of moderate mathematical dispositions, there are several differences in abilities in each indicator of critical thinking ability. There are 5 different patterns in this group of moderate mathematical dispositions. Pattern 1 is a pattern where students meet all indicators of critical thinking ability ranging from Interpretation, Analysis, Evaluation, and Inference. There is only 1 student who is included in this Pattern 1. Pattern 2 is a pattern where students who meet the indicators of critical thinking abilities Interpretation, Analysis, and Evaluation. There are 6 students who are included in this Pattern 2 group. Pattern 3 is a pattern where students fulfill the ability of Interpretation, Analysis, and Inference. There are 5 students who are included in this Pattern 3. Pattern 4 is a pattern where students fulfill the ability of Interpretation and Analysis. There is 1 student who is included in this Pattern 4. Pattern 5 is a pattern in which students meet the ability of interpretation only. There is 1 student who is included in this Pattern 5. In the moderate mathematical disposition group, most of the errors lie in evaluation and inference indicators.

**Table 5.** Critical Thinking Ability Analysis at Medium-Level Mathematical Dispositions

| No | Student Code | Mathematics Disposition Categories | Mathematics Disposition Score | Indicators of Critical Thinking Abilities | | | |
|---|---|---|---|---|---|---|---|
| | | | | Interpretation | Analysis | Evaluation | Inference |
| 1 | E – 04 | Medium | 57 | √ | √ | √ | - |
| 2 | E – 05 | | 52 | √ | √ | - | √ |
| 3 | E – 06 | | 65 | √ | √ | √ | - |
| 4 | E – 07 | | 48 | √ | - | - | - |
| 5 | E – 08 | | 56 | √ | √ | √ | - |
| 6 | E – 10 | | 54 | √ | √ | - | √ |
| 7 | E – 13 | | 57 | √ | √ | √ | - |
| 8 | E – 14 | | 55 | √ | √ | - | √ |
| 9 | E – 15 | | 58 | √ | √ | √ | - |
| 10 | E – 17 | | 51 | √ | √ | - | - |
| 11 | E – 18 | | 50 | √ | √ | - | √ |
| 12 | E – 19 | | 56 | √ | √ | √ | - |
| 13 | E – 20 | | 50 | √ | √ | - | √ |
| 14 | E – 21 | | 62 | √ | √ | √ | √ |

Errors in subjects who are in the moderate disposition group (S-4) will be discussed in the picture of the results of the problem work below.

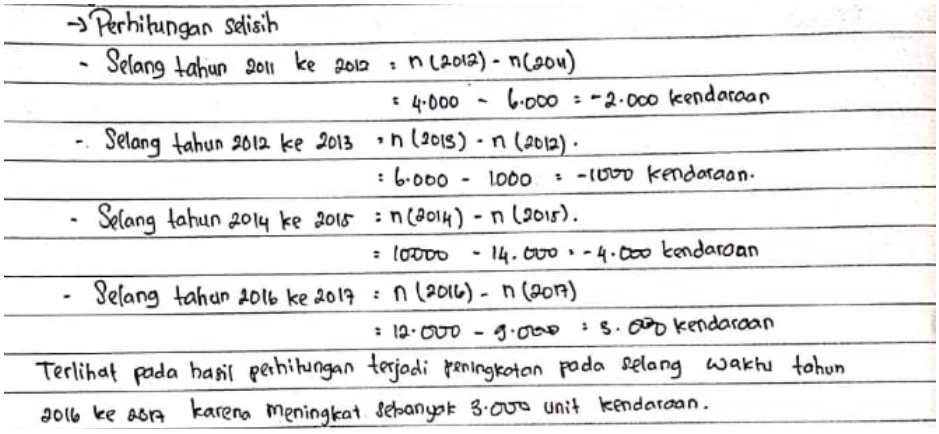



**Figure 5.** Results of S-4 (Medium Disposition) for Evaluation Indicators

The picture above is one of the results of the work of the subjects of the moderate disposition group (S-4) which shows that it has not shown the achievement of the critical thinking ability indicator in the evaluation indicator section. In the drawing, it can be seen that the subject is still wrong in using the method of completion. How to determine the correct selisish by subtracting the amount of vehicle production in a

certain year by the amount of vehicle production in the previous year. But in the work on the subject of S-4, it is the opposite. When looking for the difference in production between 2014 and 2015, the subject should reduce the amount of production in 2015 or n(2015) by the amount of production in 2014 or n(2014) so that for the difference in production from 2014 to 2015 = n(2015) - n(2014) = 14,000 vehicles - 10,000 vehicles = 4,000 vehicles. The use of the wrong settlement formula also makes the results obtained wrong. Not only was there an error in determining how to solve it, the S-4 subject was also incomplete in calculating all the completion steps, the subject was only looking for an interval of production increase in a certain year.

Errors in the process of processing the solution cause errors in the process of drawing conclusions that affect the inference indicators. The inability of the S-4 subject to determine the inference indicator can be seen from the figure below.

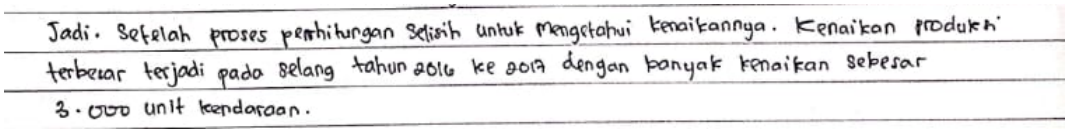

Jadi. Setelah proses perhitungan selisih untuk mengetahui kenaikannya. Kenaikan produksi terbesar terjadi pada selang tahun 2016 ke 2017 dengan banyak kenaikan sebesar 3.000 unit kendaraan.

**Figure 6.** Results of S-4 (Medium Disposition) for Inference Indicators

In the picture of the work of the S-4 subject which is included in the medium disposition group, it can be seen that the subject inference indicator still has errors in determining the final result even though the conclusion made is in accordance with the context of the requested problem but there are still errors in the final result.

- **Critical thinking abilities at low mathematical disposition**

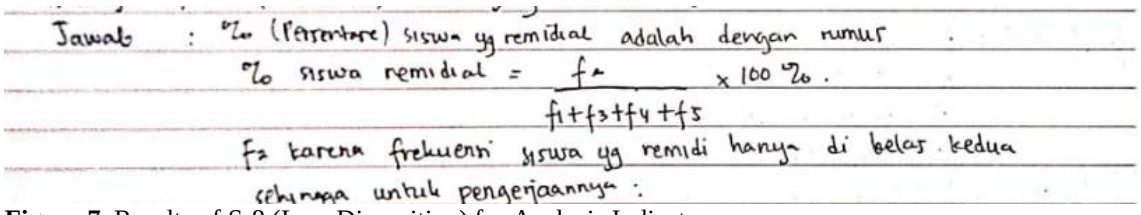
From the results of the analysis and continued triangulation of several subjects with those included in the low mathematical disposition. The following are the results of the analysis of critical thinking abilities with low mathematical disposition presented in the table below.

**Table 6.** Critical Thinking Ability Analysis at Low-Level Mathematical Dispositions

| No | Student Code | Mathematics Disposition Categories | Mathematics Disposition Score | Indicators of Critical Thinking Ability | | | |
|---|---|---|---|---|---|---|---|
| | | | | Interpretation | Analysis | Evaluation | Inference |
| 1 | E - 12 | Low | 40 | - | - | - | √ |
| 2 | E – 16 | | 42 | √ | √ | - | √ |

In the table, data was obtained that there were 2 students who were included in the group of low mathematical disposition. The average score in this low disposition group is 62.50. In this group of low mathematical dispositions, there are several differences in ability in each indicator of critical thinking ability. There are 2 different patterns in this group of low mathematical dispositions. Pattern 1 is a pattern where students meet the indicators of critical thinking ability Interpretation, Analysis, and Inference. There is 1 student who is included in this Pattern 1. Meanwhile, Pattern 2 is a pattern where students who only meet the indicators of critical thinking ability to inference. There is 1 student who falls into this Pattern 2.

In the low mathematical disposition group, only one of the critical thinking abilities in the Interpretation indicator is still not met, but the Analysis, Evaluation, and Inference Indicators are still not met. The Critical Thinking Ability Indicator for Analysis in the Low Thematic Disposition Group will be discussed in the figure below.


Jawab : % (Persentase) siswa yg remidial adalah dengan rumus .

% siswa remidial = $\frac{f_2}{f_1+f_3+f_4+f_5} \times 100\%$ .

$f_2$ karena frekuensi siswa yg remidi hanya di kelas kedua sehingga untuk pengerjaannya :

**Figure 7.** Results of S-8 (Low Disposition) for Analysis Indicators

In the image above, it can be seen that the S-8 subject has not been able to meet the Analysis indicator. Subject S-8 is still wrong in determining the method or formula of the percentage of cumulative frequency in the completion step. At the conclusion, it can be seen that the subject S-8 uses the method of dividing the second-class frequency ($f_2$) by the sum of the first-class frequency, the third-class frequency, the fourth-class frequency, and the fifth-class frequency. Subject S-8 wrote how to find the percentage of cumulative frequency (fk) $\leq 70.5 = \frac{f_2}{f_1+f_3+f_4+f_5} \times 100\%$. Subject S-8 argues that this is because the value of $\leq 70.5$ is in the second frequency. After that, S-8 assumes that because the frequency of both has been used, it is only divided by this $f_1 + f_3 + f_4 + f_5$ and then multiplied by 100This is still wrong because to determine the %. cumulative frequency (fk) $\leq 70.5 = \frac{f_1+f_2}{f_1+f_2+f_3+f_4+f_5} \times 100\%$. Based on this work, it can be seen that the subject is still wrong to find the analysis indicator.

Not only the analysis indicators that have not been met by the S-8 subject but also the critical thinking ability indicators in the evaluation indicators. The non-fulfillment of the indicators of critical thinking ability in the evaluation section can be seen from the picture of the completion answer below.

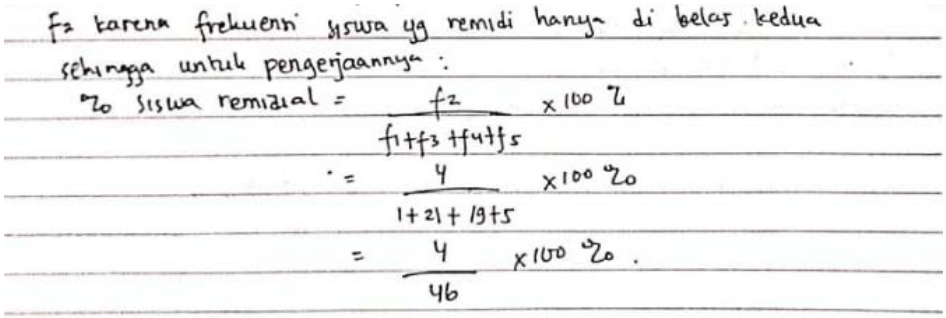



**Figure 8.** Results of S-8 (Low Disposition) for Evaluation Indicators

In the image of the evaluation indicators of S-8 subjects, it can be seen that they have not been able to determine the right formula to find the percentage of students who are remidial. Although the concept used is correct, namely choosing a cumulative frequency of less than ($\leq 70.5$). However, the formula that the subject uses to find a cumulative frequency percentage of less than ($\leq 70.5$) is still wrong. The correct formula should be (fk) $\leq 70.5 = \frac{f_1+f_2}{f_1+f_2+f_3+f_4+f_5} \times 100\%$. In addition, the subject of S-8 has not completed the results of his work.

In the inference indicator, the ability to think critically in subject S-8 does not meet these indicators, this can be seen from the S-8 subject who cannot draw an existing conclusion. The inability of the S-8 subject on the inference indicator can be seen from the absence of the conclusion that the S-8 subject wrote in his worksheet. Moreover, when asked what conclusions the subject could draw, the subject could not mention it.

## 4. Conclusion

Based on the results and discussions that have been presented, it is concluded that model learning Guided Inquiry with the help of Artificial Intelligence good quality of critical thinking abilities; (1) On the planning stage, learning tools and research instruments are included in the valid category; (2) the implementation stage, the implementation of learning is categorized as good; (3) the evaluation stage, the fulfillment of learning effectiveness, namely (a) the critical thinking ability of students who use the learning model Guided Inquiry Assisted Artificial Intelligence achieving actual completion limit, (b) the proportion of students in the learning model Guided Inquiry Assisted Artificial Intelligence more than 75%, (c) the critical thinking ability of model students Guided Inquiry Assisted Artificial Intelligence More than the critical thinking abilities of model students expositors; (d) the proportion of students' completeness in the model Guided Inquiry Assisted Artificial Intelligence more than the proportion of students' completeness in the expository model.

In the high mathematical disposition group, almost all of them were able to meet the indicators of interpretation, analysis, evaluation, and inference. In the moderate mathematical disposition group, most of them were only able to meet three of the four indicators. However, in moderate mathematical disposition,

one student was also found who was able to meet all indicators. In addition, there was also 1 person who only met two indicators and one person who only met one of the four indicators of critical thinking ability. In the low mathematical disposition group, there are two different patterns, namely one student is able to meet three indicators of critical thinking ability and one person is only able to meet one indicator.

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