Secondary School Students' Critical Thinking Skills: A Comparison Between Impulsive and Reflective Students in Learning Geometry

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Abstract: This study aims to examine secondary school students' critical thinking skills and compare differences between reflective and impulsive cognitive styles in geometry learning. The participants were 69 eighth-grade students: 25 were classified as reflective, 18 as impulsive, and 26 were not categorized. Critical thinking skills were measured utilizing a geometry problem-solving test, while cognitive styles were identified using the Matching Familiar Figures Test (MFFT). Because the data were non-parametric, the Mann-Whitney U test was used for analysis. The results showed that, among the 43 students classified as reflective or impulsive, reflective students demonstrated significantly higher critical thinking skills than the impulsive ones. The former represented 36.2% of the sample, while the latter accounted for 26.0%. Moreover, the proportion of reflective and impulsive students (62.2%) was higher than that of students classified only by speed and accuracy (37.8%). Lastly, reflective students achieved higher average critical thinking scores because they tended to spend more time analyzing problems and answering carefully. In contrast, impulsive students responded more quickly but less thoroughly, which often resulted in incorrect answers.

Keywords: *Critical thinking, cognitive style, reflective, impulsive*

INTRODUCTION

Learning mathematics at school plays a crucial role in developing students' critical-thinking skills. It helps students solve problems and prepares them for various daily challenges (Tong et al., 2020). The ability to think critically is also one of the essential competencies in contemporary education (Iskandar & Juandi, 2022), which is also relevant in learning mathematics and essential in various aspects of life (Elder & Paul, 2020). Furthermore, critical thinking involves analyzing information, evaluating arguments, and making rational decisions based on proof (Yang et al., 2024). In the context of learning, the ability to think critically enables students to understand concepts thoroughly, solve problems effectively, and adapt to complex situations.

Critical thinking is the foundation of effective and sustainable learning (Rachmawati & Siswono, 2020). Having critical thinking skills not only makes students passively accept information but also actively process, evaluate, and apply it (El Sadik & Al Abdulmonem, 2021). In today's ever-changing world filled with complex information, critical thinking enables students to identify relevant information, make appropriate decisions, and solve problems using innovative approaches (Warli & Nofitasari, 2021). Therefore, critical thinking should be emphasized in mathematical problem-solving activities (Tang et al., 2020). Another important factor in mathematics learning is individual differences in students' cognitive styles (Mann et al., 2021). The two cognitive styles most frequently discussed are reflective and impulsive, which influence how students process information and ultimately affect the effectiveness of mathematics learning (Xu et al., 2023).

Students with reflective characteristics tend to think carefully before making decisions (Shanta & Wells, 2022). They consider various alternatives, analyze information deeply, and give more accurate and detailed answers (Tang et al., 2020). However, their thought process is slower. This can make them look insufficiently responsive in situations requiring quick response (Bellaera et al., 2021). On the other hand, impulsive students tend to respond quickly without considering various alternatives (Alsaleh, 2020). They often give answers rapidly, but the decisions they take are usually shallow and are more prone to error. Thus, the speed at which they respond can become superior in certain situations (Fadilla et al., 2021).

Cognitive styles have been reported to significantly impact mathematical learning (Ahdhianto et al., 2020). It is suggested that students who are reflective are more likely to be successful in solving problems that require in-depth analysis and logical reasoning (Toker & Baturay, 2022). However, they might find difficulties in situations requiring a fast response (Dolapcioglu & Doğanay, 2022). On the other hand, students who are impulsive can finish a simple task faster, but might have difficulty with complex and demanding problems. Cases of students who are impulsive and reflective were also found in mathematical learning at the secondary level. At SMPN 1 Ambarawa, after identifying impulsive and reflective eighth-grade students with equal (high) mathematical skills, it turned out that the two were very different in solving problems. Impulsive students in mathematical problem-solving tended to respond spontaneously without profoundly considering the strategies used. Furthermore, they often rushed in solving mathematics problems and tended to make mistakes that could have been avoided if they were more patient. In addition, impulsive students also tended to ignore the understanding of fundamental mathematical concepts, so they focused more on the result without understanding the basis of problem-solving. This led to the possibility of frequent errors in mathematical problem-solving and a lack of deep understanding.

Impulsive and reflective characteristics significantly impact the quality of mathematical solutions produced by students. Impulsive students tend to create solutions more quickly but less thoroughly, making them prone to errors (Jamil et al., 2024). They also tend to use a trial-and-error approach without deep thinking, which results in solutions that may not be optimal. On the other hand, reflective students usually produce more thorough solutions and use a logical and systematic thinking approach, although it takes longer. This impacts the quality of mathematical solutions produced, where reflective students' solutions tend to be more accurate and correct (Mihail, 2022). Therefore, understanding the impact of these differing characteristics is essential in developing more effective mathematics teaching and learning strategies (Dolapcioglu & Doğanay, 2022).

This study is expected to contribute to improving educational quality by supporting the development of students' critical thinking and problem-solving abilities. Critical thinking goes beyond basic understanding as it involves applying, analyzing, evaluating, and creating knowledge, which are key components of Higher-Order Thinking Skills (HOTS). Therefore, developing critical thinking for all students, both with reflective and impulsive characteristics, is essential in mathematics learning. Teachers need to design instructional strategies that accommodate diverse student characteristics, for example, through structured problem-solving activities, guided reflection, and self-regulation strategies to support impulsive learners. Furthermore, research on differences between reflective and impulsive students and their impact on critical thinking can provide valuable insights for educators. A deeper understanding of students' cognitive styles enables teachers to implement more adaptive and effective teaching approaches, ultimately improving learning processes and student outcomes.

METHODS AND DESIGN

This study employed an exploratory-descriptive approach to examine the critical thinking skills of students with reflective and impulsive cognitive styles. It also utilized a comparative design to investigate the differences in critical thinking skills between these two cognitive style groups. The participants were 69 eighth-grade students from classes 8A to 8I at a junior high school. To identify their cognitive styles, all students were administered a cognitive style identification questionnaire, adapted from previous research, consisting of 15 items that assessed tendencies in decision-making speed and accuracy. Based on the questionnaire results, 25 students were identified to have the reflective cognitive style, while 18 students fell under the impulsive style. The remaining 26 students were uncategorized. The study was conducted in two stages. In the first stage, students' cognitive styles were identified using the Matching Familiar Figures Test (MFFT), originally developed by Kagan et al. (1964) and adapted by Warli (2010). The instrument was used to validate the initial categorization of students' cognitive styles. The MFFT consists of one standard picture accompanied by eight similar variations. Students were required to select the picture identical to the standard image. Two variables were recorded: the time taken to provide the first response and the number of attempts required to obtain the correct answer.
Based on the combination of response time and error frequency, students were categorized into four cognitive-style groups: fast–accurate, reflective (slow–accurate), impulsive (fast–inaccurate), and slow–inaccurate. The classification followed the median-split procedure proposed by Warli (2010), in which the median values of response time and error frequency were used to divide students into four quadrants.
The MFFT procedure included the following steps: (1) students individually completed the cognitive-style test by identifying the picture that matched the standard image; (2) the time required

to produce the first response was recorded; (3) the number of attempts until the correct answer was obtained was documented; (4) the average response time and error frequency were calculated; and (5) median values of time and frequency were used to construct classification quadrants.

In the second stage, students identified as reflective and impulsive were selected as research subjects and were given geometry-based problem-solving tasks. Students' critical thinking skills were measured using five essay questions on circle geometry designed to assess four indicators: clarification, evaluation of evidence, drawing conclusions, and making judgments (see Figure 1).

The pipes in the form of a tube with a length of 2 m and a radius of 14 cm will be tied with a rope. Given the condition, determine

a. The length of rope needed to tie the 2 pipes. Explain how you found it.
b. The length of rope needed to tie 3 pipes. Explain how you found it
c. If the number of pipes is 4, determine the length of rope needed to tie the four pipes. Explain how you found it.
d. If the number of pipes is 5, determine the length of rope used to tie the five pipes, explain how you found it.
e. Draw a conclusion from points a, b, c, and d.

Figure 1: The problem-solution instrument

The questions were utilized to measure critical thinking skills that refer to subindicators (Ennis, 1996), which include: (1) identifying or establishing criteria to consider possible answers; (2) providing explanations; (3) identifying inaccuracies; (4) demonstrating the ability to give reasons; and (5) selecting criteria to consider possible solutions. Additionally, to determine the critical thinking skills score referring to standardization, the assessment criteria of Paul and Elder (2007) was consulted, which include: clarity, accuracy, precision, depth, breadth, and logic, adjusted to mathematical learning about geometry in particular circles.

The next stage involved conducting in-depth interviews with selected participants representing reflective and impulsive cognitive styles. One student from each cognitive style category was purposively selected based on their communication skills to ensure the richness and relevance of the data obtained. Furthermore, the data on students' critical thinking skills, categorized by reflective and impulsive cognitive styles, were analyzed using the SPSS software through the non-parametric Mann Whitney U test.

RESULTS

This section presents the results of the analysis of students' cognitive styles. The subjects in this study were eighth-grade students of SMPN 1 Ambarawa. To identify the cognitive styles of the subjects, cognitive style measurements were carried out on each student. In this study, students with reflective cognitive styles were identified as those who typically take more time to analyze a problem and carefully check their responses before answering. In contrast, students with impulsive cognitive styles tend to respond quickly, often without sufficient consideration, which can lead to more frequent errors. These tendencies were observed during the test sessions and further supported by the students' answer patterns. The aspect was observed and recorded in cognitive style measurements, which included the time (t) the student took for the first answer and the frequency (f) the student answered the response and got the correct answer. The mean time (t) and frequency (f) for each student were calculated, followed by the mean time (t) and frequency (f) of all students, which were tabulated in a table to determine the median time and frequency. The results of cognitive style measurements are presented in Table 1.

Amount student	Time (seconds)			Frequency			Total of reflective students	Total of impulsive students
	max	**min**	**med**	**max**	**min**	**med**		
69	62.01	13.29	39.12	2,923	1,231	2,000	25	18

Description: Max: maximum, Min: minimum, Med: median
Table 1: *Results of Cognitive Style Measurement*

The MFFT measurement results show four cognitive types thinkers, presented in Figure 2.

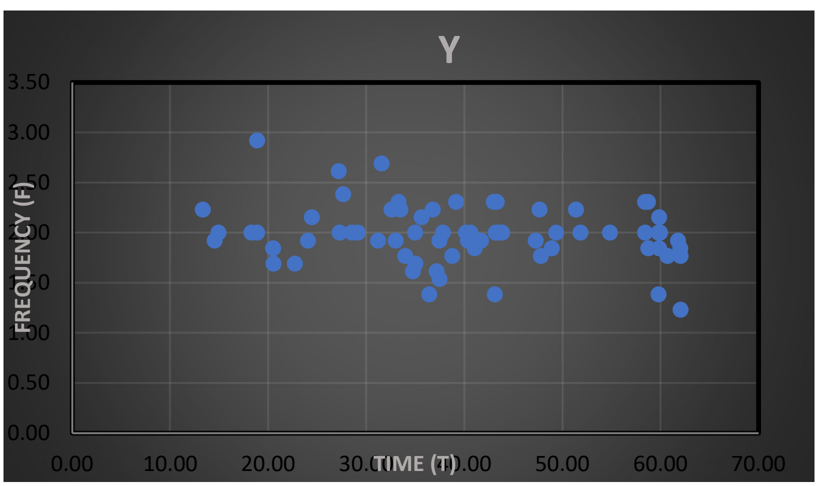

Figure 2: Distribution of MFFT scores representing four cognitive style categories (reflective, impulsive, fast-accurate, and slow-inaccurate)

Based on Table 1, 25 students (36.2%) were categorized as reflective, while 18 students (26.0%) were categorized as impulsive. In addition, 14 students (20.3%) were classified as fast-accurate, and 12 students (17.4%) as slow-inaccurate. Overall, the proportion of students categorized by cognitive style (reflective, impulsive, fast-accurate, and slow-inaccurate) provides a more comprehensive representation (62.2%) compared to classification based solely on response speed and accuracy (37.8%). These findings indicate that cognitive style classification offers a broader analytical framework than relying only on observable response behavior during testing. Furthermore, this result is consistent with previous studies, such as Rozencwajg and Corroyer (2005), which reported that the proportion of students exhibiting reflective-impulsive cognitive styles reached 76.2%, and Warli (2010), who found similar tendencies in students' cognitive processing characteristics

Critical Thinking Skills Across Reflective and Impulsive Cognitive Styles

The measurement of students' critical thinking skills based on their cognitive styles (reflective and impulsive) was conducted outside of regular school hours following participants' consent, after completing a lesson on the topic of circles. The assessment employed a geometry problem-solving test comprising five open-ended questions. Each question was scored on a scale of 1 to 10, giving a maximum total score of 50 points. Table 2 displays the distribution of total scores for both cognitive style groups. The reflective group consisted of 25 students, while the impulsive group included 18 students. Due to the small sample size and limited score range, several students obtained identical scores, leading to repeated frequency values for specific score intervals.

Scores of critical thinking	Reflective (f)	Impulsive (f)
12-20	3	5
21-25	6	6
26-30	7	3
31-35	4	2
36-40	2	1
41-45	2	1
46-50	1	0
Total students	**25**	**18**
Total Score	**649.5**	**296.5**
Average score	**25.98**	**16.47**

Table 2: Distribution of students' critical thinking scores across reflective and impulsive cognitive styles

To facilitate interpretation, individual scores were grouped into score intervals. The distribution indicates that students with a reflective cognitive style tended to achieve higher critical thinking scores than those with an impulsive style. Because the data did not meet the assumption of normality, the non-parametric Mann–Whitney U test was employed. The results of this analysis are presented in Table 3.

	Cognitive-Style	N	Mean Rank	Sum of Ranks
CT Scores	*Reflective*	25	25.98	649.50
	Impulsive	18	16.47	296.50
	Total	43		
Mann-Whitney U			125.50	
Wilcoxon W			296.50	
Z			-2.453	
Asymp . Sig. (2-tailed)			0.014	

a. Grouping Variable: Cognitive-Style

Table 3. Results of the Mann–Whitney U Test Comparing Critical Thinking Scores Between Reflective and Impulsive Students

Based on Table 3, the Asymp. Sig. (2-tailed) value for the Mann–Whitney U test was 0.014, which was below the significance threshold of 0.05. In this test, the null hypothesis (H_0) stated that there is no significant difference in students' critical thinking scores between reflective and impulsive cognitive styles. If the p-value was greater than 0.05, H_0 would be accepted; otherwise, it must be rejected. Since the p-value was 0.014, H_0 was rejected. This result indicates a statistically significant difference in critical thinking performance between the two cognitive style groups, especially in the context of geometry learning involving circle geometry problems. As shown in Table 2, students with reflective cognitive styles had higher average scores in critical thinking skills than students with impulsive cognitive styles. According to Rozencwajg and Corroyer (2005), students who have reflective cognitive processes prefer to take their time and consider questions carefully before answering, usually resulting in accurate answers. On the other hand, students with an impulsive cognitive style are known for answering questions in a hurry and tend to give incorrect answers within a given limited time. Figures 3 and 4 illustrate selected responses from students representing each cognitive style category.

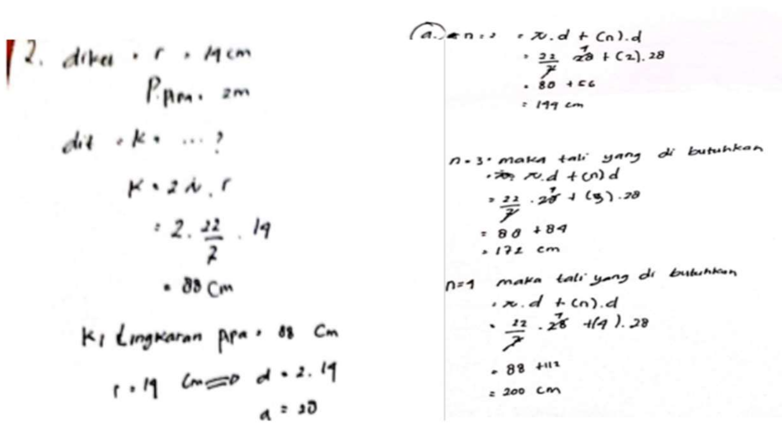

Figure 3: Sample answer of an impulsive student

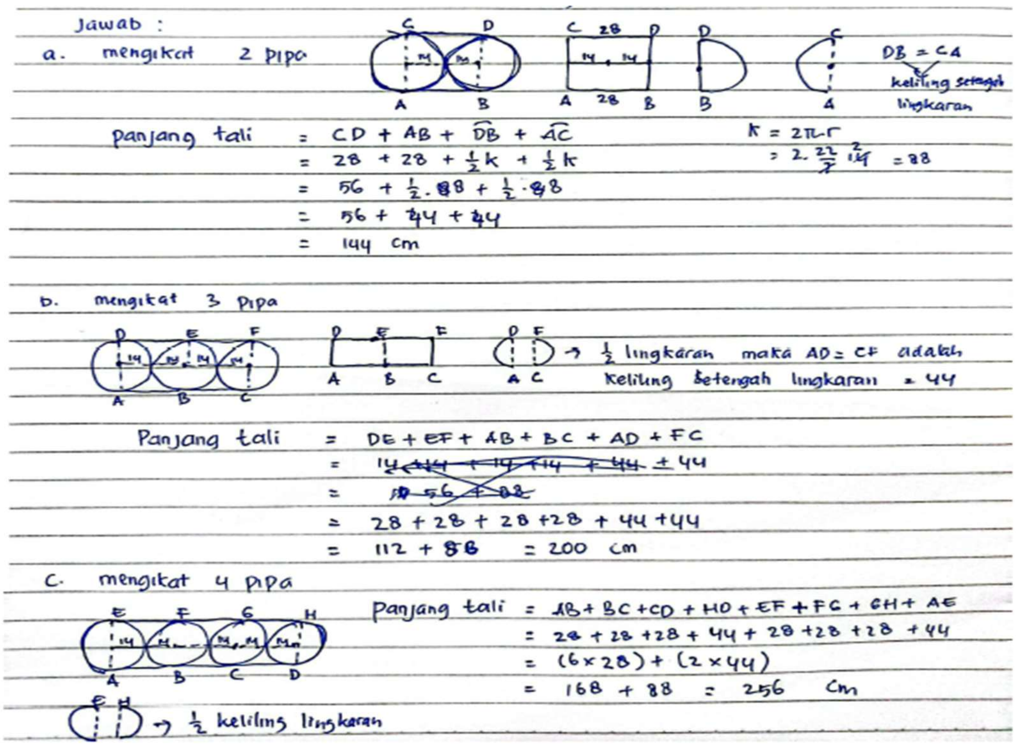

Figure 4: Sample answer of a reflective student

To gain deeper insights into students' cognitive processes, semi-structured interviews were conducted with two selected participants representing reflective and impulsive cognitive styles. The following excerpt illustrates an interview with the impulsive student (S1) after completing the geometry problem:

P: How did you begin solving the problem?

S1: First, I wrote down the known information, namely r =14cm. Then I identified that the problem involved a circle.

P: What did you do next?

S1: The question asked about the length of a rope around the pipe, so I interpreted it as finding the circumference of a circle. I used the formula $k = 2\pi r = 2\frac{22}{7}14 = 88\ cm$. *Substituting* $r = 14$, *I obtained* $d = 28$ *and calculated the result.*

P: How did you determine the method to use?

S1: (S1 writes n=2) *Then the length of the rope is* $\pi d + n.d = \frac{22}{7}.28 + 2.28 = 144\ cm$

P: Can you tell me why it is like that?

S1: Because the teacher had previously taught us to use this formula for similar problems.

As seen from the transcript above, the student responded quickly by immediately applying a memorized formula without first verifying whether the formula was appropriate for the specific context of the problem. This reflects a tendency to focus on procedural recall rather than conceptual understanding. Evidently, the student's justification, "this formula was already taught by the teacher," shows reliance on rote learning, which is typical of impulsive problem-solving behavior. This lack of deeper analysis can lead to mechanical answers that may not always be accurate or contextually correct.

Meanwhile, a snippet of the interview with the reflective student (S2) is as follows:

P: *How did you solve the problem?*

S2: *First, I identified the known information in the problem: the pipe has a length of* 2 *m and a radius of* 14 *cm. Then, I analyzed each sub-question: (a) determining the length of rope required to tie two pipes, (b) determining the length for three pipes, and (c) comparing different tying methods to identify which requires a longer rope, whether arranged linearly or combined.*

P: *What did you do next?*

S2: *I began by solving part (a). I illustrated the situation using two circles representing the pipes. The distance between points C and D corresponds to the diameter of the circle, which is 28 cm. The curved part represents half of the circle's circumference. Since there are two pipes, the total curved length equals one full circumference. With a radius of 14 cm, the circumference is 88 cm. Therefore, the total rope length required is: 28 cm + 28 cm + 88 cm =* 144 *cm*.

P: *What about part (c)?*

S2: *The approach is similar to part (b), but it involves three pipes, so the configuration differs. Based on the illustration, the total rope length is:*28 *cm* + 28 *cm* + 28 *cm* + 28 *cm* + 44 *cm* + 44 *cm* = 200 *cm*.

P: *Are there any alternative methods?*

S2: *Yes, the pipes can also be arranged using a combined configuration, as shown there.*

DISCUSSION

Based on the results of the data analysis, including student responses as shown in Figures 3 and 4, and supported by interview findings, several differences were identified between impulsive and reflective students. These differences are related to aspects such as speed and accuracy in problem-solving, strategy use, and responsiveness to instructions, as summarized in Table 3 below. The data were collected from 26 students: 13 identified as having an impulsive cognitive style and 13 with a reflective cognitive style. The classification was determined using the Matching Familiar Figures Test (MFFT), where time taken and response accuracy were the main indicators. The characteristics presented in Table 3 represent typical patterns observed from each group, supported by both written test results and qualitative interview data.

Impulsive Student	Reflective Student
Speed and Accuracy - Tend to finish problems fast without thinking a lot - Missing important details or making error in calculating - Focus on speed - Not checking the answer - Ignore or not realizing errors due to a lack of reflection	**Speed and Accuracy** - Spend more time thinking and examining each step in problem solving - Be more thorough and tend to consider various possibilities before making a decision - Focus on rigor and accuracy even though it is slower to complete - Errors are often identified and fixed before resolving the problem
Solving Strategy Problem - Directly choosing the first strategy that comes to mind without considering whether there was another better approach - Relying often on instinct or answer intuitively rather than doing deep analysis - Tend to look for solutions fast, even when failing to look for the correct answer	**Solving strategy Problem** - Tend to consider some strategies before choosing a more approach effective - Use analysis deep and thoughtful critical for selecting and implementing strategies - Solving complex problems becomes more minor and more gradual.
Reception to Instructions - Tend to ignore instructions or only skim through, directly trying to solve problems without understanding the instructions better.	**Reception to Instructions** - Understand instructions and context problems before starting to do the task. - Tend to follow the steps given systematically.

Table 4: *Differences Student Impulsive and Reflective in Finish Problem*

From the differences shown in Table 4, it was observed that students with a reflective cognitive style had the tendency to demonstrate a greater variety of indicators of critical thinking compared to the impulsive students. These tendencies included more thorough reasoning, careful problem analysis, and more accurate responses, as observed in both their written work and interviews. Interestingly, these patterns are consistent with a number of other studies on reflective and impulsive cognitive styles and critical thinking, including those conducted by Fridiamanti et al. (2018), Amriwati and Cintamulya (2017), Muryani and Cintamulya (2018), Rofifah and Masriyah (2018), and Rahayu and Warsono (2018). Furthermore, Ennis (1985) describes the following criteria for critical thinking:

1. *Focus* – the ability to understand and clearly define the problem
2. *Reasoning* – the ability to provide logical arguments based on relevant facts or evidence throughout the problem-solving process.
3. *Inference* – the ability to draw appropriate conclusions based on valid reasoning
4. *Situation* – the ability to consider and utilize all relevant information related to the problem

5. *Clarity* – he ability to clearly explain terms, provide relevant examples, and articulate conclusions.
6. *Overview* – the ability to review and evaluate the entire problem-solving process systematically.

Additionally, other criteria for critical thinking include clarity, accuracy, precision, depth, breadth, and logic (Paul & Elder, 2007). Understanding these criteria is essential for educators, particularly in recognizing differences in students' cognitive styles, such as reflective and impulsive tendencies, which influence how they engage in learning processes. Griggs (1991) emphasized that the development of critical thinking requires an awareness of students' learning styles. When instruction aligns with students' preferred learning styles, their attitudes toward learning can improve, leading to increased productivity, academic achievement, and creativity. Thus, cognitive style plays a significant role in shaping the effectiveness of the learning process (Dekker, 2020).

Teachers, therefore, need to consider students' cognitive styles to enhance their critical thinking abilities (Cortázar et al., 2021). By doing so, they can create a more inclusive learning environment that fosters critical thinking through appropriate instructional strategies (Bağ & Gürsoy, 2021). Previous studies have shown a positive relationship between a reflective cognitive style and critical thinking, and a negative relationship between an impulsive cognitive style and critical thinking (Afdareza et al., 2020; Shanta & Wells, 2022). These findings, alongside the ones generated in this study, highlight the importance of adapting instructional design to students' cognitive characteristics. As a response, this study has developed a lesson plan tailored to low-achieving students with impulsive cognitive styles in learning geometry, specifically on the topic of circles. The lesson is designed to enhance students' critical thinking skills through structured activities, scaffolded problem-solving, and cognitive regulation strategies. The detailed structure of the lesson plan is provided in the Appendix.

CONCLUSION

In conclusion, the critical thinking skills of students with reflective cognitive styles are better than the critical thinking skills of students with impulsive cognitive styles in learning geometry. Students with reflective cognitive styles have the characteristics of taking a long time to answer questions carefully so that the answers given tend to be correct, while students who have the characteristics of impulsive cognitive styles tend to respond quickly and answer questions more perfunctorily, so the answers given tend to be wrong. This cognitive style affects not only how students solve problems, but also the end result of solving those problems. The reflective cognitive style encourages careful, analytical, and evaluative thinking, which is the foundation of critical thinking. Therefore, students with reflective cognitive styles are better critical thinkers, resulting in a strong positive relationship between the two. Impulsive cognitive styles, on the other hand, often neglect the process of deep reflection and analysis, which can reduce the effectiveness of critical thinking. This creates a negative relationship between impulsive cognitive style and critical thinking ability. By understanding these relationships, teachers can tailor their teaching approach to help students with impulsive cognitive styles develop more reflective thinking habits, thereby improving their critical thinking skills. Based on this, teachers are advised to design lessons with explicit step-by-step instructions and clear learning objectives for impulsive students. Each task should be broken down into smaller components, with regular checkpoints for feedback and guided reflection. Interactive activities should be structured to include brief pauses, allowing students to self-monitor their work before moving on. This approach can help students slow down, stay focused, and improve the quality of their learning outcomes.

There were several limitations of the study that were acknowledged, including: 1) Individual Variability: Reflective and impulsive characteristics can vary greatly between individuals, making it difficult to generalize findings. Each student has different levels of reflectivity and impulsivity depending on the specific situation, which can affect the consistency of the research results. 2) Difficulty in Measurement: Accurately measuring reflective and impulsive levels can be challenging. The instruments used to measure reflective or impulsive behavior may have limitations in validity and reliability, thus affecting the findings' soundness. 3) Influence of Contextual Factors: The environment, time pressure, and difficulty level of the problems faced can affect student performance, both reflective and impulsive. These variables can be difficult to fully control in research, so the results can be biased. 4) Researcher Bias: The researcher's interpretation of reflective and impulsive behavior can be affected by subjective bias. This can occur during data observation or analysis, which can reduce the objectivity of the research results. 5) Difficulty in Distinguishing Behaviors: In practice, reflective and impulsive behaviors are not always easy to distinguish clearly. Some students may exhibit a combination of these two traits depending on the context, which can complicate data analysis and interpretation.
These limitations need to be considered when assessing the findings of the study. Some ideas for future research that can be carried out include: 1) Subsequent research can focus on developing or validating more accurate and reliable instruments to measure reflective and impulsive tendencies. This could involve using technologies such as eye-tracking or click pattern analysis to get more objective data on how students process geometry problems. 2) Longitudinal Studies: Conducting longitudinal research to observe the development of reflective and impulsive tendencies over time in the context of solving geometric problems can give a more elaborate outlook on the matter and its trends.

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APPENDIX

1. Lesson Identity and Objectives

Component	Description
School Level	Junior High School (Grade VIII)
Semester	Second Semester
Subject	Mathematics
Topic	Geometry - Circle
Duration	2 x 40 minutes
Student Characteristics	Low-achieving students with impulsive cognitive style
Learning Objectives	1. Identify and illustrate the elements of a circle accurately. 2. Apply formulas to calculate circumference and area of a circle. 3. Solve circle-related geometry problems in a structured and careful manner. 4. Practice self-regulation before answering.

2. Learning Activities

Stage	Learning Activities	Time Allocation
Introduction	Teacher greets students and builds motivation. Explain the learning objectives and introduce "STOP – THINK – ANSWER" strategy.	10 minutes
Main Activities	**a. Concept Introduction (15 min)** Explain elements of a circle with visual aids. Students redraw and annotate diagrams with pause time. **b. Formula Practice (20 min)** Guided explanation and practice with structured problem steps. **c. Simulation and Evaluation (15 min)** Solve contextual problems with "think aloud". Immediate feedback from teacher. **d. Mini Test (10 min)** - Structured response format: Steps – Answer – Reason.	60 minutes
Closing	Joint summary of lesson. Student self-reflection: how to avoid rushing. Assign scaffolded homework.	10 minutes

3. Assessment and Follow-Up

Component	Description
Assessment Techniques	Written tests. Observation of problem-solving behavior Student reflections Think-aloud responses
Instruments	Worksheets with structured thinking columns Reflection rubric
Remedial Actions	✓ Step-by-step problem exercises ✓ Paused response simulation ✓ STOP – THINK – CHECK strategy
Enrichment	Advanced contextual problems Mini project on circular measuring tools