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The effect of cognitive style on the analysis ability of grade 4 elementary school students

Wahyu Susiloningsih¹, Herawati Susilo^{1*)}, Mohammad Zainuddin¹, Dedi Kuswandi¹, Oktaviani Adhi Suciptaningsih¹, Hanim Faizah²

¹Universitas Negeri Malang, Malang, Indonesia

²Universitas PGRI Adi Buana, Indonesia

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ABSTRACT

The purpose of this study was to determine the relationship between cognitive style (reflective and impulsive) on students' analytical abilities. Analytical ability is part of learning outcomes. There are seven levels of cognitive learning outcomes which include knowledge, understanding, application, analysis, synthesis, evaluation, and creative problem-solving. Students' analytical abilities are influenced by many things, one of which is cognitive style. Cognitive style is a way of accepting and managing attitudes towards information, as well as habits related to the world of individual learning. Reflective and impulsive cognitive styles are cognitive styles with indicators of time understanding concepts. Reflective cognitive styles usually take a long time to respond, but consider all available options, and have high concentration while learning. Meanwhile, students with an impulsive cognitive style are the opposite. The approach used in this study is a correlational and multiple regression approach. The variables in this study are reflective cognitive style and impulsive cognitive style as independent variables and analytical skills as the dependent variable with a population of 130 students. The results showed that there was a relationship between students' cognitive style and analytical skills. The greater the cognitive style score, the greater the analytical ability score. Then the cognitive style affects the analytical ability of 19.9%, where the other 80.1% is influenced by other factors.



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Corresponding Author:

Herawati Susilo,
Universitas Negeri Malang
herawati.susilo.fmipa@um.ac.id

Introduction

Analysis ability refers to the capacity to examine, evaluate, and interpret information to make informed decisions or solve problems. It involves the use of critical thinking, logical reasoning, and problem-solving skills. Analytical ability is an ability that must be owned by students to master problem-solving in learning. Analytical ability is a powerful thinking tool for understanding parts of a situation defined as the ability to research, break down facts and thoughts into strengths or weaknesses, and develop the capacity to think wisely, use intelligent methods, solve problems, analyze data, and remember and use information (A. A. Setiawan et al., 2022). Analytical ability is one of the elements in the cognitive domain of student learning outcomes (Nykyoprets & Chopliak, 2023). So, analysis ability can be influenced by cognitive style, which is the way individuals process and interpret information (Anthycamurty et al., 2018a).

Cognitive style refers to the way individuals process information and make decisions. Reflectivity and impulsivity are two ends of the spectrum within this cognitive style (Amin et al., 2023). Reflective individuals tend to think carefully and consider multiple options before making a decision, while impulsive individuals make decisions quickly and may not consider as many alternatives. Reflective learners are more likely to produce accurate work, while impulsive learners may rush through tasks and make more errors (Ledzińska et al., 2014). These differences can be observed as early as preschool and can affect how students learn and perform in academic settings. Studies have found that traditional classrooms may favor reflective learners over impulsive ones and that there is some environmental influence on the level of reflectivity-impulsivity and its expression in student behavior (Marashi & Gholami, 2020).

Cognitive style can have an impact on job performance, as it can affect leadership, interpersonal skills, problem-solving abilities, and adaptability in the workplace. Understanding one's cognitive style can help individuals improve their skills and adapt to different work environments (Exacta et al., 2024). Students with a reflective cognitive style usually take a long time to respond, but consider all available options, have high concentration when studying. While students with an impulsive cognitive style, on the other hand, they are faster in solving problems that arise but are also less thorough in solving them (Ismaeel & Mulhim, 2021). This has an impact on the analytical skills of students who have a reflective cognitive style tend to take longer to do the analysis because it requires more concentration. The opposite happened to students with an impulsive cognitive style. Impulsive and reflective cognitive styles have an important contribution to analytical skills, this allows students with different cognitive styles to have different analytical abilities (Engin, 2021).

In education, Cognitive style influences students' learning processes in class. It has been studied by various researchers in the world. (Bahrami et al., 2020) studied that cognitive style influences attention and student's performance in learning. (Giancola et al., 2022) found that cognitive style was affected the result on the students' creativity skill test on their research. They suggest to investigate the influence of cognitive style on learning process by more accurate empirical explorations. In other research, it is known that cognitive style also has an influence on communication skills (Saputra & Zulmaulida, 2020). Furthermore, cognitive style has a positive influence on students' understanding of concepts, so that it can improve student learning outcomes (Saputri, 2018). However, there is still very little research that explores the influence of cognitive style on students' analytical abilities. Even though students' analytical abilities are greatly influenced by cognitive style according to research held by (Lacko et al., 2023). However, (Lacko et al., 2023) conducted research only on middle school students while there is still very little information that can be explored on the analytical skills of elementary school students.

From the description above, there is a relationship between impulsive and reflective cognitive styles with analytical skills. Because, when analytical skills students are influenced by tendencies in processing information (receiving, remembering, thinking, and analyzing) or better known as cognitive style. Every student has a different cognitive style. The form of analytical skills in learning is in the form of a Matching Familiar Figures Test (MFFT) which was adopted from (Warli, 2014). Therefore, the aim of this research was to determine the effect of cognitive style on analytical skills for elementary school students.

Method

This research is a quantitative study conducted at SDN Margorejo 1, Margorejo Surabaya from August 2023 to October 2023. It was experimental research using experiment and control class to explore the effect of the students' cognitive style on the analysis ability. The approach used in this study is a correlational and multiple regression approach. The variables in this study were reflective cognitive style and impulsive cognitive style as the independent variables and analytical skills as the dependent variable with a population of 130 students. Data collection techniques using tests and non-tests. The instruments used were tests and questionnaires. The researcher used random sampling to determine the sample for this research, where each class selected 10 people randomly who were then given a test to determine cognitive style and a test in the form of questions to determine students' analytical abilities.

Results and Discussions

In table 1 the Kolmogorov-Smirnov normality test on the reflective cognitive style indicator is 0.10 ($p > 0.05$) so that based on the Kolmogorov-Smirnov normality test the data is normally distributed. on the indicator of impulsive cognitive style is 0.13 ($p > 0.05$) so that based on the Kolmogorov-Smirnov normality test the data is normally distributed. Furthermore, the variable Analysis Ability of Elementary School Students is 0.86 ($p > 0.05$) so that based on the Kolmogorov-Smirnov normality test the data is normally distributed.

Table 1. Normality Test

	Kolmogorov-Smirnov ^a		
	Statistic	df	Sig.
Reflective cognitive style	.105	130	.010
Impulsive cognitive style	.130	130	.013
Analysis Ability of Elementary School Students	.073	130	.086

Table 3. Linearity Test Results

	N	F	Sig.
Reflective cognitive style with analytical skills	131	1.266	,221
Impulsive cognitive style with analytical skills	131	1.050	,413

Based on the table above, the results of the linear test on the indicator variable Reflective cognitive style with analytical skills obtain an F value of 1,266 with Sig. 0,221 > 0,05. This shows that the reflective cognitive style variable with analytical skills has a linear relationship. Meanwhile, the results of the linear test on the indicator variable Impulsive cognitive style with analytical skills obtained an F value of 1,050 with Sig. 0,413 > 0,05. This shows that the indicator variable Impulsive cognitive style with analytical skills has a linear relationship.

Table 4. Correlational Test

	N	Student Analysis Ability	
		Pearson Correlation	Sig
Reflective cognitive style	130	164	0.000
Impulsive cognitive style	130	163	0.000

Table 5 Correlation Test Results, it is known that there is a positive correlation between the indicators of the variable cognitive reflective style and the analytical abilities of elementary school students, namely ($r = 0,164$, $p < 0,05$). This means that the indicator variable cognitive reflective style with the analytical abilities of elementary school students has a moderate positive correlation significantly. The relationship between the indicator variables of the impulsive cognitive style and the analytical abilities of elementary school students was found to be of value ($r = 0,163$, $p < 0,05$). This means that the indicator variable of the impulsive cognitive style with the analytical abilities of elementary school students is significantly positively correlated.

Table 5. Regression Equation Test

R Square	F	Sig	Regression Equation
,199	2.624	,000	$\hat{Y} = 22.502 + 0.91X_1 + 0.83 X_2$

The results of the calculations carried out, the results obtained that cognitive style plays a role in students' analytical abilities ($F = 2.624$, $p = 0,000$). So that the research hypothesis is accepted. Besides that, it is known that the coefficient of determination is equal to 0,199. The magnitude of the coefficient of determination shows the size of the role in percent, which is 19.9%. So, it can be concluded that cognitive style plays a role in the analysis of students' ability variables by 19,9%, which 80,1 % others are influenced by other factors. Based on the table above, a linear equation is also obtained $\hat{Y} = 22.502 + 0.91X_1 + 0.83 X_2$.

Based on the results of this study, cognitive style plays an important role in students' analytical abilities. Theoretically, individuals who have cognitive styles have differences in accepting or responding to a learning process, including analyzing a concept in learning. students with a reflective cognitive style have higher grades than students with an impulsive cognitive style. This is known from the Pearson correlation value which shows a value of 164 for reflective while 163 for impulsive. It was in line with the result of the study held by Anthycamurty et al., (2018b), who stated that the students' analysis ability in problem-solving was affected by cognitive style. Cognitive style has a positive influence on students' understanding of concepts, so that it can improve student learning outcomes (Saputri, 2018).

A more analytical and methodical approach to decision-making is encouraged by a reflective cognitive style, which has a substantial influence on the process. Reflective cognitive types are known for their meticulous analysis of information before to action, which makes them slower and more accurate workers (Cintamulya, 2019; Satriawan et al., 2018). A reflective cognitive style helps in decision making because it facilitates a more in-depth analysis of the information at hand, the weighing of possibilities, and the contemplation of possible consequences. The best students who require an intuitive reaction while making decisions are those with

reflective cognitive styles. Because reflective decision-making entails the logical, analytical, and systematic processing of information that might result in more informed and effective conclusions, they will be appropriate in complicated or unique scenarios (Exacta et al., 2024). Contrary to reflective, People with an impulsive cognitive style typically work more rapidly and make more mistakes when addressing problems. This method differs from reflective cognitive style, which is characterized by a thoughtful, deliberate approach to problems that frequently yields superior accuracy (C. Chen, 2021). Based on the results of the study that has been presented, it can be concluded that cognitive abilities can influence problem solving steps and can further influence student learning outcomes.

Understanding a student's cognitive style can help educators tailor their instruction to better suit the student's learning needs (M. R. A. Chen & Hwang, 2022). Teachers can group students based on their cognitive style to create learning environments that cater to their individual needs (Anthycamurty et al., 2018a). Teachers can use a variety of teaching strategies to accommodate different cognitive styles. Teachers can design assessments that are more effective for students based on their cognitive style (A. Setiawan et al., 2020). Teachers can participate in professional development programs that focus on understanding cognitive style and its implications for teaching and learning (Stoyanov & Kirschner, 2007). Parents can be informed about their child's cognitive style and how it affects their learning. This can help parents better understand their child's learning needs and work with teachers to support their child's education (Jones & Wright, 2011). Further research is needed to fully understand the relationship between cognitive style and analysis ability in elementary school students. This can help educators develop more effective teaching strategies and support students in their learning.

The limitation of the research that has been carried out is that the research was only carried out at the identification stage of the influence of students' cognitive styles on analytical abilities. So it cannot be concluded completely about students' problem solving abilities on more complex problems. Apart from that, this research can also be developed into finding appropriate learning strategies for students with different cognitive styles. Therefore, it can be recommended that further research be conducted on testing appropriate learning methods or strategies to provide solutions for teachers to teach in classes with diverse student cognitive styles.

Conclusions

The results showed that there was a relationship between students' cognitive style and analytical skills. The greater the cognitive style score, the greater the analytical ability score. Then the cognitive style affects the analytical ability of 19.9%, where the other 80.1% is influenced by other factors. The research implied that understanding cognitive style can help educators design curricula that are more effective for students. The results of the research that has been carried out can provide an overview for teachers in designing learning in the classroom to take into account differences in cognitive styles, so that better learning outcomes are obtained.

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