Jurnal Pendidikan Matematika RAFA
p-ISSN :2460-8718
e-ISSN : 2460-8726

Available online at:
http://jurnal.radenfatah.ac.id/index.php/jpmrafa
June 2025, 11(1): 78-94

How impulsive VS reflective Students' self-regulated learning in mathematics with *Learning Management System*

Latifa Nur Hani[1)], Nurbaiti Widyasari [2)]

[1) 2)] Program Studi Pendidikan Guru Sekolah Dasar, Fakultas Ilmu Pendidikan, Universitas Muhammadiyah Jakarta, Jl. K.H. Ahmad Dahlan, Cirendeu, Ciputat, Jakarta, Indonesia
*email correspondence: nurbaiti.widyasari@umj.ac.id
(Received 03-09-2024, Reviewed 09-01-2025, Accepted 14-06-2025)

Abstract

This study aims to describe the learning independence of students with reflective and impulsive cognitive styles in learning mathematics with LMS, as well as the advantages and disadvantages of using LMS. The research was conducted in one of the madrasahs in the Jakarta area. The method used in this research is descriptive qualitative with a population of 24 fourth-grade students using a subject sample of 6 students through categorization using purposive techniques. Data collection techniques were observation, interviews, documentation, MFFT tests, and data analysis techniques using descriptive and triangulation techniques. The results showed that the learning independence of students with a reflective cognitive style has initiative, does not depend on others, and is confident, disciplined, and responsible. The learning independence of students with impulsive cognitive styles have initiative, rely on others, are confident and accountable, and do not behave disciplined. The advantages of LMS are that it makes it easier for students to learn math flexibly, and many features are available, while the disadvantages of LMS are signal-constrained problems. This research has a contribution for teachers in determining learning strategies based on student characteristics.

Keywords*: Cognitive Style, Impulsive, Learning independence, LMS, Reflective*

Abstrak

Penelitian ini bertujuan untuk mendeskripsikan kemandirian belajar siswa yang mempunyai gaya kognitif reflektif dan impulsif dalam pembelajaran matematika dengan LMS, serta mengetahui kelebihan dan kekurangan penggunaan LMS. Penelitian dilakukan di salah satu madrasah di wilayah Jakarta. Metode yang digunakan penelitian ini adalah kualitatif deskriptif dengan populasi sebanyak 24 siswa kelas IV menggunakan sampel subjek berjumlah 6 siswa melalui pengkategorian menggunakan teknik purposive. Teknik pengumpulan data menggunakan observasi, wawancara, dokumentasi dan tes MFFT. Teknik analisis data menggunakan analisis deskriptif melalui triangulasi teknik. Hasil penelitian menunjukkan kemandirian belajar siswa yang mempunyai gaya kognitif reflektif itu memiliki inisiatif, tidak bergantung pada orang lain, percaya diri, berperilaku disiplin dan bertanggung jawab. Kemandirian belajar siswa yang mempunyai gaya kognitif impulsif itu memiliki inisiatif, bergantung pada orang lain, percaya diri, bertanggung jawab dan tidak berperilaku disiplin. Kelebihan LMS adalah memudahkan siswa belajar matematika secara fleksibel dan tersedia banyak fitur sedangkan kekurangan LMS adalah masalah terkendala sinyal. Penelitian ini memiliki kontribusi untuk guru dalam menentukan strategi pembelajaran didasarkan karakteristik siswa.

Kata kunci: Gaya Kognitif, Impulsif, Kemandirian belajar, LMS, Reflektif

INTRODUCTION

Learning mathematics can improve the ability to think logically, systematically, critically, analytically, creatively, and learn independently or cooperate with peers (Rahayu & Aini, 2021). In addition, comprehension skills in mathematics learning are the primary basis of the learning process (Larasati & Widyasari, 2021; Widyasari & Hayyun, 2017). This means that learning mathematics in life can build students' learning independence. Learning independence, called self-regulated learning (SRL), is the ability of students to regulate themselves in learning activities (Jin et al., 2023). Rachmayani said that SRL develops from students' encouragement as a response to their desires to learn so that they can determine effective learning methods and be able to complete tasks independently (Yulistina et al., 2020). In line with the previous opinion, Schunk and Zimmerman stated that SRL is through the process that arises in learning in students, which is influenced by the way of thinking, feeling, strategy, and attitude of students that lead to the achievement of learning goals (Rahayu & Aini, 2021).

Learning independently does not mean learning on your own individually but rather having confidence in learning without the dependence on others. Students can try to solve a problem independently without needing help from others, including teachers and peers. However, SRL is also seen when students show high motivation to learn, as well as great parental social support for students (M. Hadi & Sovitriana, 2019). Another opinion, according to Suhendra and Mardalena, is that independence in learning is the ability that comes from a sense of freedom, responsibility, self-confidence, initiative, and specific skills in solving problems, be it in opinions, skills, or attitudes (Saputra & Fahrizal, 2019).

The phenomenon of SRL during the COVID-19 pandemic online and after online learning is still low. It is evident from the results of previous research that students' SRL in mathematics learning after online education is still not said to have good enough independence (Supiani & Firmansyah, 2023). The results of other studies show that the autonomy of learning mathematics during the pandemic is still not developing optimally (Sundari et al., 2022). The results of the study show that during online learning, the level of student learning independence decreases because students face difficulties in learning independently (Yahya & Warmi, 2021).

This condition requires educators to take suitable steps by using technological advances to foster student learning independence. The learning process that utilizes technology at this time is using a *Learning Management System* (LMS). LMS is an online learning management system that can foster student learning independence (Simanullang & Rajagukguk, 2020). LMS functions to deliver materials, support collaboration, evaluate student performance, record student data information, and create reports to improve

learning effectiveness (Maulidditya et al., 2020). LMS can provide interactive and exciting online learning media for teachers and students. The learning media is a physical means or tool that can motivate students to learn and contains educational materials in the student environment (Widyasari & Putri, 2019). LMS is a form of educational facility students and teachers use to carry out learning activities easily, especially mathematics learning. LMS makes it easy for students to use it with access available anytime via the internet using electronic devices, such as tablets or laptops. Also, it makes it easier for teachers to assign materials, check assignments, and assess student answers through LMS (Luckyardi & Rahman, 2021). LMS also provides opportunities for students to learn at their own pace (self-paced learning). Although LMS allows students to learn at their own pace, some students feel overwhelmed by the responsibility of managing their time and lack motivation to learn. Thus, online learning can cause students' learning independence to decline and result in inhibited achievement in achieving the best score to achieve success (Damayanti & Anando, 2021). Therefore, the researcher wanted to analyze the SRL of students using LMS.

One of the madrasas in Jakarta has used LMS to implement its learning process. Based on the researcher's observations, one of the madrasas in Jakarta started using LMS in 2022. The use of LMS in Madrasah has received a good response from students. However, at this time, the use of LMS in the madrasah is not known to the extent that it impacts student learning independence. Especially from previous research related to LMS, students' independence in learning physics through LMS can be categorized as very high (Hermansyah et al., 2020). This is in line with the study's results, which show that learning mathematics using Chamilo LMS can increase the learning independence of high school students by 72.56% (Maulidditya et al., 2020). The study results show that the increase in learning independence of high school students using LMS is because the material, assignments, and completion of mathematics have been fully recorded in the LMS system (Enmufida et al., 2021). Some of these studies show that the independence of learning using LMS in mathematics learning is still at the higher education or high school level, so there has been no research involving student learning independence at the elementary level.

This research also has a newness of student learning independence in mathematics learning, which can be observed through differences in cognitive styles. Teachers are especially concerned about students' cognitive styles. Warli said that cognitive style is a process of accepting ways of thinking based on the speed and accuracy of students' answers to the problems they face. It can be categorized into two, namely reflective

cognitive style and impulsive cognitive style (Wicaksono et al., 2023). The difference in cognitive style characteristics in students between reflective and impulsive is that students who have a reflective cognitive style take a long time to make decisions, but the results are accurate or correct, while students who have an impulsive cognitive style take a short time to make decisions but the results are less accurate or wrong (Rohmah et al., 2020). If teachers can recognize students' cognitive styles, it can help to categorize students' learning independence in mathematics learning with LMS. The categorization will provide input to teachers in determining learning strategies such as determining the right approach according to the needs and characteristics of students, especially in the use of LMS.

Based on this, the main problem of the research is the independence of student learning in mathematics with LMS in students with a reflective and impulsive cognitive style. This study aims to provide an overview of the learning independence of reflective and impulsive cognitive style students in mathematics learning with LMS. As well as providing information related to the advantages and disadvantages of LMS in mathematics learning.

METODE

The research method used is qualitative with descriptive analysis, which aims to describe the learning independence of students in learning mathematics with LMS. Students' learning independence in learning mathematics with LMS is arranged into six indicators: initiative, confidence, disciplined behavior, not depending on others, responsibility, and self-control (Lovez et al., 2023). The initiative in this study is a condition where students learn of their own volition, dare to ask questions without being asked, and look for reference sources independently. The indicator does not depend on others, emphasizing that students can do the assignment without help from anyone. In the confidence indicator, where students have confidence in their own abilities, the courage to argue or respond. Discipline indicators are related to students being able to follow learning activities well, listen to teachers' explanations, and also be able to do assignments on time.

The next indicator is responsibility which focuses on how students carry out learning activities and do assignments responsibly. The last is related to the indicator of self-control, which is that students can control themselves, and make good use of learning time. This grid is based on Lovez's theory, therefore the validity used is only the validity of the content, while in determining cognitive style the standard MFFT test is used.The research subject uses *purposive sampling* with specific considerations (Makwana et al.,

2023). Subject selection is made through the documentation criteria of students' math assessments, which are between high, medium, and low in each category of cognitive styles, between reflective and impulsive. So, that sampling was 6 out of 24 students in IV-D class.

The data collection techniques used in this study are observations and interviews with students regarding learning independence in mathematics learning with LMS. As well as documentation and supporting data in this study. In addition, an MFFT test is a measuring tool to distinguish students' reflective and impulsive cognitive styles. The MFFT test instrument used contains 13 question items that need to be answered correctly, and each question item consists of one standard image and five different variation images (Herianto, 2020). One of the MFFT question items can be seen in **Figure 1**.

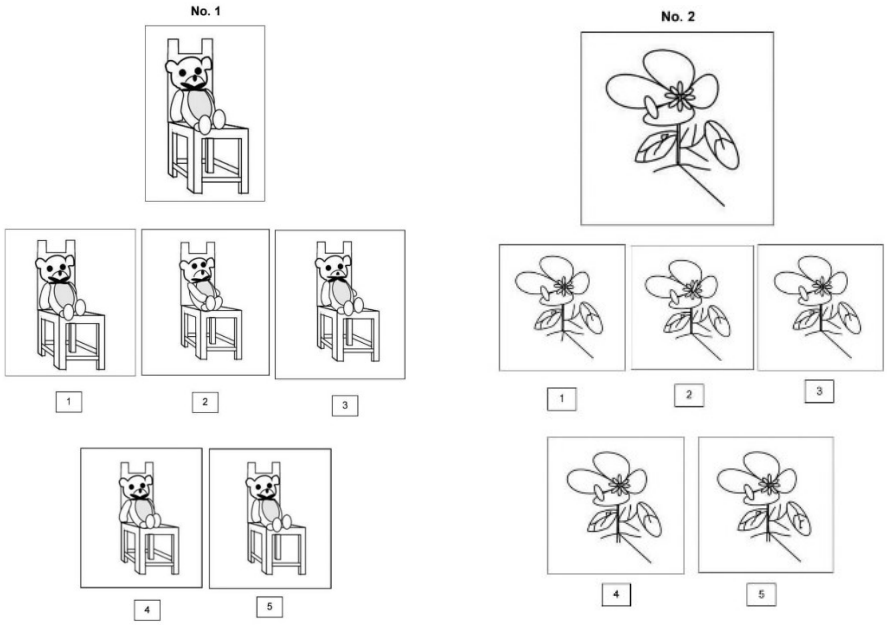

Figure 1. Examples of MFFT question items

The provisions for grouping cognitive styles in the MFFT are reflective students (t > 7.30 minutes, f > 7 questions), the longest time record (t), and the highest number of correct answers (f) in answering all questions. In comparison, impulsive students ($t \leq 7.30$ minutes, $f \leq 7$ questions), have the fastest time record (t) and tend to be less precise (f) in answering questions (Fitriana et al., 2023).

The data analysis techniques in this study are data reduction, data presentation, and conclusion (Sugiyono, 2021). As well as triangulation techniques to test the validity of the data studied by focusing on the same source through different data collection

techniques (Donkoh & Mensah, 2023). The primary source of the study is to use observation data on student learning independence in mathematics learning activities with LMS and conduct interviews with students regarding their learning independence. In addition, there is supporting documentation such as student math scores, student attendance, and pictures of student activities in mathematics learning.

RESULTS AND DISCUSSION

The research is about grade IV students' learning independence in mathematics with the *Learning Management System* (LMS) for the 2023/2024 school year. The research was adjusted to six indicators of student learning independence with the categories of reflective and impulsive cognitive styles through mathematics learning with LMS. The initial data collection in this study was done by administering the MFFT test to 24 students in grades IV-D. Then, there is a sampling technique from the documentation of students' mathematics summative test scores, which considers the criteria between high, medium, and low scores in each category of cognitive styles, namely reflective and impulsive. Documentation of grade IV-D students' score data in the mathematics summative exam and differences in students' cognitive styles can be seen in **Table 1**.

Table 1. Data on summative exam scores for Grade IV students and cognitive style

Absence No.	Student's Name	Categories Cognitive Styles	Average Summative Score	Absence No.	Student's Name	Categories Cognitive Styles	Average Summative Score
1	AAS	Reflective	90,5	13	DAF	Reflective	97
2	ANZ	Reflective	90,5	14	GS	Reflective	93,5
3	AAAF	Impulsive	80	15	HAF	Reflective	86,5
4	ANK	Reflective	68	16	KBA	Reflective	85,5
5	AAH	Reflective	71	17	KAR	Reflective	99
6	AZFS	Reflective	93,5	18	KAF	Reflective	93
7	AA	Reflective	77,5	19	KLA	Reflective	90
8	BKAF	Impulsive	75	20	LFR	Reflective	86
9	DKA	Reflective	83,5	21	MAA	Reflective	73,5
10	DAA	Reflective	81,5	22	SAP	Reflective	87,5
11	DFK	Impulsive	96,5	23	SNP	Impulsive	75,5
12	DFK	Reflective	93	24	YAO	Reflective	97,5

The researcher selected six students with the following criteria: students with a reflective cognitive style or impulsive cognitive style, and in each of these two categories,

students must have a high, moderate, and low level of mathematical ability. The data on the results of the selection of students in grades IV-D through the criteria of grades and categories of cognitive styles can be seen in **Table 2**.

Table 2. Data on the results of the cognitive style student selection category

No.	Student's Name	Categories Cognitive Styles	Average Summative Score	Criterion	Initial Subject
1	KAR	Reflective	100	High	SR1
2	LFR	Reflective	83	Medium	SR2
3	ANK	Reflective	65	Low	SR3
4	DFK	Impulsive	96,5	High	SI1
5	AAAF	Impulsive	80	Medium	SI2
6	BKAF	Impulsive	75	Low	SI3

The following are the results of data analysis on student learning independence in mathematics learning with LMS reviewed from reflective cognitive styles in grades IV-D. Based on the observations and interviews, it was found that SR1 had high initiative and did not depend on others. This can be seen from the fact that students can independently learn mathematics by utilizing learning media through LMS and various sources such as YouTube. Students also do not have difficulty understanding mathematics material and can work on math problems independently, so they do not ask teachers or friends. SR1 has high confidence in learning mathematics because students can play an active role in answering questions given by teachers, and students dare to provide opinions in front of the class regarding data processing materials in mathematics learning. SR1 has a disciplined and highly responsible attitude in learning mathematics.

Students always pay attention to the teacher's explanations, bring study supplies, and collect mathematics assignments on time through the LMS. In addition, SR1 can exercise self-control by showing that students continue to learn even though they are experiencing signal constraints in learning mathematics with LMS at school. This is due to the support of teachers who provide practice questions on the board, provide question sheets through worksheets, or share Wi-Fi internet connections with students. However, SR1 has not been able to exercise self-control in using free time to learn mathematics because the free time at school is minimal. In contrast, the free time available at home is used for other activities like watching TV.

Based on the observations and interviews, it was found that SR2 has high initiative and does not depend on others. This can be seen from the fact that students can learn regular mathematics independently by utilizing mathematics learning media through LMS and various sources such as Blooket, Quizizz, and Kahoot games. Students can also try to understand complex math material before taking the initiative to ask the teacher. Students can also work on math problems independently, so they do not need help from teachers or peers. SR2 has high confidence in learning mathematics because students can play an active role in answering teacher questions. Students dare to give opinions and work on math problems related to data processing materials in mathematics learning in front of the class. SR2 has a disciplined and responsible attitude in mathematics learning, such as students often paying attention to the teacher's explanations, always carrying study supplies, and collecting mathematics assignments on time through the LMS. In addition, SR2 has a moderate level of self-control because students continue to learn math when they experience problems with Wi-Fi signals when using LMS at school. This is supported by teachers who provide internet tethering to students. Meanwhile, students have not been able to exercise self-control in using their free time to study because their free time at school is limited, so students prefer to play rather than have to learn mathematics.

Based on the observations and interviews, it was found that SR3 had good learning initiatives and was still dependent on others. This can be seen from the fact that students can learn mathematics regularly independently by utilizing mathematics learning media through LMS and various resources such as Blooket, Kahoot, and Quizizz games. Then, students have the initiative to ask the teacher when they have difficulty understanding the math material, and students also still need help from the teacher when working on math problems. SR3 has high confidence in learning mathematics because students can actively answer questions from teachers and dare to give opinions in front of the class regarding data processing materials in mathematics learning. SR3 has an attitude of responsibility because they always bring school supplies, but students have a low attitude of discipline. This can be seen from the fact that students cannot pay attention to the teacher's explanation until it is completed and cannot collect math assignments on time through the LMS. In addition, SR3 can exercise self-control by showing that students continue to learn mathematics when experiencing signal constraints in using LMS at school. This is due to the encouragement of teachers who provide internet tethering to students and provide math problems written on the board. However, students showed they could not

use their free time to learn mathematics because their free time was used for other activities, such as playing *games* and cutting paper.

Based on the analysis of data from the three students above, namely SR1, SR2, and SR3, it can be concluded that students who have a reflective cognitive style in learning mathematics with LMS are shown from six indicators of learning independence, namely having the initiative to study regularly independently, tending not to have difficulty understanding the material but still having the initiative to ask the teacher, the initiative to use learning media through the LMS, tend not to depend on others when working on math problems, have the confidence to play an active role in learning such as daring to give opinions and work on issues in the learning process in front of the class, tend to have a disciplined attitude in learning such as paying attention to the teacher's explanations but not all students with a reflective cognitive style can collect assignments on time, responsible for bringing learning equipment to school, and can exercise self-control to continue learning even though they are constrained by signals. However, students with a reflective cognitive style have not been able to take advantage of their free time to study.

The following are the results of data analysis on student learning independence in mathematics learning with LMS reviewed from impulsive cognitive style. Based on the observations and interviews, it was found that SI1 has a high level of initiative but still depends on others. This can be seen from the fact that students can learn mathematics regularly independently by utilizing mathematics learning media through LMS and various sources such as Blooket games and YouTube. Students also do not have difficulty understanding the math material but still have the initiative to ask the teacher. However, Students still need help from others while working on math assignments in school. SI1 has high confidence in learning mathematics because students can actively answer questions from teachers and dare to give opinions in front of the class regarding data processing materials in mathematics learning. SI1 has a disciplined and responsible attitude in learning mathematics, such as consistently paying attention to the teacher's explanations until the end, always bringing study supplies, and collecting mathematics assignments on time through the LMS. In addition, students can exercise self-control by showing that they continue to learn mathematics even though they experience signal constraints in using LMS at school. This is due to the support of teachers who provide internet tethering to students. However, SI1 can still not exercise self-control in using free time to learn mathematics because the free time available is only short at school and is not used for any activities.

Based on the observations and interviews, it was found that SI2 has the initiative to learn but still depends on others. This can be seen from students taking the initiative to learn mathematics regularly by utilizing mathematics learning media through LMS and various sources such as Blooket games and YouTube. Students also have the initiative to ask teachers to understand mathematics material, and students still need the help of others when doing math assignments at school. SI2 has confidence in learning mathematics because students can actively answer teacher questions and dare to give opinions in front of the class regarding data processing materials in mathematics learning. SI2 has an attitude of responsibility, as seen from students always bringing learning supplies to school. However, SI2 has a low discipline attitude because students have not been orderly in learning; they have not been able to pay attention to the teacher's explanations until they are finished, and they have not been able to collect math assignments on time through the LMS. In addition, SI2 can exercise self-control by showing that students continue to learn mathematics when experiencing signal constraints in using LMS at school. This is due to the encouragement of teachers who provide math problems by writing them on a whiteboard or using a worksheet. Meanwhile, students still cannot exercise self-control in their free time to learn mathematics because they have little free time at school, so they are used to joking with their friends.

Based on the observations and interviews, it was found that SI3 has the initiative to learn but still depends on others. This can be seen from students taking the initiative to learn mathematics regularly by utilizing mathematics learning media through LMS and various resources such as the Blooket game. Students also have the initiative to ask teachers questions when they have difficulty understanding mathematics material. Then, when working on math problems, students still need the help of others, such as teachers, to be asked about issues considered problematic in learning mathematics with LMS. SI3 has confidence in learning mathematics because students can play an active role in answering questions given by teachers, and students dare to provide opinions in front of the class regarding data processing materials in mathematics learning with LMS. SI3 has a responsibility, as seen from students always carrying learning supplies, and SI3 has a reasonably low discipline attitude in learning mathematics with LMS. This shows that students can be orderly; they can pay attention to the teacher's explanations until they finish, but they are still unable to collect math assignments on time through the LMS. In addition, SI3 can exercise self-control by showing that students continue to learn mathematics when experiencing signal constraints in using LMS at school. This is due to the encouragement of teachers who provide internet tethering to students. And students

can also take advantage of their free time at school to repeat math material while playing *Blooket* games.

Based on the analysis of data from the three students above, namely SI1, SI2, and SI3, it can be concluded that students who have an impulsive cognitive style in learning mathematics with LMS are shown from six indicators of learning independence, namely having regular learning initiatives independently, tending to have difficulty understanding the material so that they have the initiative to ask the teacher, the initiative to utilize learning media through LMS, Students still depend on others when working on math problems, have high confidence to play an active role in learning such as giving opinions in the learning process, tend not to have a disciplined attitude in learning such as not paying attention to the teacher's explanation until the end and not collecting assignments on time. However, students can be responsible for bringing learning equipment to school. In addition, they can exercise self-control to continue learning even though signals constrain them, and they tend not to be able to use their free time to study well.

The following is a list of recaps of mathematics scores for the second semester obtained from documentation to support student learning independence by the criteria for student mathematics scores:

Table 3. Mathematics Scores for Even Semester Students in 2023/2024

No.	Student Name	Initial Subject	Average Math Score
1.	KAR	SR1	99
2.	LFR	SR2	91
3.	ANK	SR3	83
4.	DFK	SI1	96
5.	AAAF	SI2	88
6.	BKAF	SI3	85

From the data obtained through observations and interviews related to student learning independence and supporting documentation of student activities, the results were obtained that the learning independence of students who have a reflective cognitive style is considered independent, while the learning independence of students who have a reflective cognitive style is considered entirely independent. This can be seen from the documentation of the recap of students' mathematics scores, showing that the six students have good learning independence because while learning mathematics, students get pretty high mathematics scores.

Based on the analysis conducted by the researcher on three students with a reflective cognitive style and three students with an impulsive cognitive style, the results were obtained that the student's learning independence varied. Students with a reflective cognitive style and a good level of autonomy have high learning initiative, tend not to depend on others, have high confidence, are responsible, tend to behave disciplined, and can exercise self-control. This is in line with Marfu'ah's opinion, which states that students who can take initiative in the learning process will be independent in learning at home even though there is no direct supervision from a companion. Students actively learn by looking for additional reference sources besides those found in school to expand and deepen their knowledge (Rofiiqoh & Qosyim, 2023). Students who have an independent category are students who learn mathematics material from various sources to gain a good understanding, students work on challenging problems without considering it as an obstacle to learning success, and students can do math assignments because they like it and do not depend on others (Enmufida et al., 2021).

Meanwhile, students with an impulsive cognitive style and a pretty good level of independence have high learning initiative, depend on others, have high confidence, are responsible, tend not to behave disciplined, and can exercise self-control. The findings align with the opinion that students' learning independence is seen from students carrying out regular mathematics learning without coercion from teachers, parents, or friends. Students always express their views and ask the teacher questions when there is material that is not understood, and students always prepare learning materials before learning starts (Wulandari, 2022).

The learning process at school has a limited time, so to increase learning independence, teachers need to create a learning environment that supports and builds students' confidence so that they can complete their assignments well. And teachers must also encourage students to control themselves when learning at school or when students face difficulties (Fitriani & Yusri, 2022). Furthermore, research results show that the level of learning independence of grade IV students in elementary school is quite good. However, some students lack discipline and are still not independent from their dependence on others. The main factors that affect the learning independence of grade IV students are parental parenting and student awareness in the mathematics learning process, and solutions that parents can implement include setting a balanced schedule between learning and playing or being able to give rewards (Sulistyowati et al., 2022). Regarding the difference in behavior, the results of cognitive and impulsive styles are certainly influenced by several factors. This is because a person's cognitive style is shaped by the complex interaction of cultural, educational, personality, and environmental

factors. Previous research has found that cognitive style is determined by genetics and environmental factors. Genetics plays a role in the formation of students' cognitive styles. Previous research has looked for a correlation between cognitive style and genetic factors, where genetics influence individual formation such as personality and self-confidence (Luo et al., 2024). Furthermore, environmental factors provide significant factors, especially socioeconomic status (Tucker-Drob et al., 2013). Students who have opportunities and a positive learning environment can shape how they act and make decisions. However, the limitation of this study is that it has not been explored more deeply about the factors that cause the research subjects to differ in student behavior based on their cognitive style.

Furthermore, it is related to the advantages and disadvantages of LMS, which is based on interviews and observations finding several things. The results of the interviews with the six students stated that the advantages of using LMS through SmartMP in mathematics learning already have complete features and help students learn to understand mathematics material more efficiently. There are complete features in the SmartMP application for mathematics learning, such as learning schedules at school, student attendance, e-modules, learning videos, sample or practice questions, educational games, platforms for collecting assignments, and even exam cards for student review activities are also available in the application. In addition, the advantage of using LMS through SmartMP in mathematics learning is that it is flexible, meaning that SmartMP can be used anywhere and anytime. The benefits of LMS are flexibility of time and place, easy storage of learning materials, and students can collect assignments easily, easy-to-understand learning videos, interactive availability between teachers and students, and automation of administrative processes in learning (Multazam et al., 2022).

Meanwhile, the disadvantage of using SmartMP in learning mathematics is that it often experiences signal-related problems. Internet signal instability frequently occurs from time to time with limited signal coverage, especially if the learning process is in rural areas (T. S. Hadi et al., 2021). This problem is also often caused by excessive Wi-Fi usage and causing interruptions. This shows that slow or unstable internet connections are usually one of the main challenges teachers and students face when conducting *online learning* (Cao, 2023).

CONCLUSION

Based on the research that has been conducted, it can be concluded that the learning independence of students who have a reflective cognitive style in learning mathematics with LMS have the initiative to learn regularly independently by utilizing mathematics

learning media through LMS, does not depend on others in working on mathematics problems, has confidence so that they dare to argue mathematics material in front of the class, behaves disciplined and is responsible in math learning with LMS. Meanwhile, the learning independence students who have an impulsive cognitive style in learning mathematics with LMS have the initiative to study regularly independently by utilizing learning media through LMS, depend on others, have confidence so that they dare to speak in front of the class, do not behave disciplined but are responsible in learning mathematics with LMS.

The advantage of *the Learning Management System* (LMS) in learning mathematics in schools is that it makes it easier for students to learn flexibly, which can be accessed according to time and place. In addition, LMS provides features such as subjects, lesson schedules, student attendance, e-modules, learning videos, practice questions, assignment *collection platforms*, and exam cards. Meanwhile, the disadvantage faced in LMS applications is the problem of signal constraints.

The suggestion that can be given from the results of this study is that by knowing the cognitive style, a teacher can determine the right learning strategy according to the characteristics of the students. Therefore, it is necessary to carry out diagnostic assessments using MFFT instruments which can be a guide for teachers in designing learning according to student needs. Furthermore, the limitations of using LMS in signal constraints can be anticipated by using *blended learning*, *hands on activities*, and the use of multimedia that can be accessed without the need for the internet.

REFERENCES

Cao, T. X. L. (2023). Benefits and challenges of using LMS in blended learning: Views from EFL teachers and students at a Vietnamese public university. *International Journal of TESOL & Education*, *3*(3), 78–100. https://doi.org/10.54855/ijte.23335

Damayanti, H. L., & Anando, A. A. (2021). Peran guru dalam menumbuhkembangkan kemandirian siswa melalui pembelajaran inkuiri. *Jurnal Sinestesia*, *11*(1), 52–59. https://doi.org/10.53696/27219283.59

Donkoh, S., & Mensah, J. (2023). Application of triangulation in qualitative research. *Journal of Applied Biotechnology & Bioengineering*, *10*(1), 6–9. https:// doi.org/10.15406/jabb.2023.10.00319

Enmufida, Jupri, A., & Yulianti, K. (2021). Analisis kemandirian belajar matematika siswa menggunakan lms dalam blended learning. *Journal on Mathematics Education Research*, *2*(2), 101–110. https://doi.org/10.17509/j-mer.v2i2.53933

Fitriana, D., Suhendra, & Juandi, D. (2023). Self-efficacy siswa SMA bergaya kognitif impulsif dalam pembelajaran matematika. *Jumlahku: Jurnal Matematika Ilmiah*, *9* (1), 121–133. https://doi.org/10.33222/jumlahku.v9i1.2642

Fitriani, A., & Yusri, F. (2022). Tingkat kemandirian belajar pada remaja. *Consilium: Berkala Kajian Konseling Dan Ilmu Keagamaan*, *9*(1), 9–18. https://doi.org/10.37064/consilium.v9i1.11332

Hadi, M., & Sovitriana, R. (2019). Model kemandirian belajar siswa Madrasah Aliyah Negeri 9 Jakarta. *Ikra-Ith Humaniora: Jurnal Sosial Dan Humaniora*, *3*, 26–32.

Hadi, T. S., Mastur, Z., Wardono, & Khotimah. (2021). Implementation of Learning Management System (LMS) in mathematics learning. *Journal of Physics: Conference Series*, *1918*(4), 1–4. https://doi.org/10.1088/1742-6596/1918/4/042106

Herianto. (2020). *Matching Familiar Figures Tes (MFFT): Instrumen tes untuk mengukur gaya kognitif siswa reflektif dan impulsif* (pp. 1–8). https://doi.org/10.31219/osf.io/34ut8

Hermansyah, Yahya, F., Fitriyanto, S., Musahrain, & Nurhairunnisah. (2020). Kemandirian belajar calon guru fisika melalui pembelajaran berbasis LMS: Schoology. *Indonesian Journal of STEM Education*, *2*(1), 34–42.

Jin, S. H., Im, K., Yoo, M., Roll, I., & Seo, K. (2023). Supporting students' self-regulated learning in online learning using artificial intelligence applications. *International Journal of Educational Technology in Higher Education*, *20*(1), 1–21. https://doi.org/10.1186/s41239-023-00406-5

Larasati, N. I., & Widyasari, N. (2021). Penerapan media pembelajaran berbasis Augmented Reality terhadap peningkatan pemahaman matematis siswa ditinjau dari gaya belajar. *FIBONACCI: Jurnal Pendidikan Matematika Dan Matematika*, *7*(1), 45–50. https://doi.org/10.24853/fbc.7.1.45-50

Lovez, E., Rustam, Silvia, & Sayu. (2023). Analisis kemandirian belajar matematika siswa pada pembelajaran kooperatif tipe jigsaw di kelas VIII SMP. *Jurnal Ilmiah Matematika Realistik (JI-MR)*, *4*(1), 26–32. https://doi.org/10.33365/ji-mr.v4i1.2486

Luckyardi, S., & Rahman, L. (2021). Application of e-learning system in the world of education. *Jurnal Teknologi Informasi Dan Pendidikan*, *14*(1), 47–52. https://doi.org/10.24036/tip.v14i1

Luo, X., Liu, M., Han, Z., Jiang, W., Wang, Z., Li, K., Gu, Y., & Shidujaman, M. (2024). A study on cognitive style type test and its application in teaching activities. In *Lecture Notes in Computer Science* (Vol. 14687, pp. 254–274). https://doi.org/10.1007/978-3-031-60441-6_17

Makwana, D., Engineer, P., Dabhi, A., & Chudasama, H. (2023). Sampling methods in research: A review. *International Journal of Trend in Scientific and Development (IJTSRD)*, *7*(3), 762–768. https://www.researchgate.net/publication/371985656

Maulidditya, D., Sudiana, R., & Pamungkas, A. S. (2020). Pembelajaran matematika pada LMS Chamilo untuk meningkatkan kemandirian belajar siswa. *Jurnal Penelitian Dan Pembelajaran Matematika*, *13*(2), 344–356.

Multazam, M. N., Korompot, C. A., & Munir, M. (2022). Benefits and difficulties in using Learning Management System (LMS) in paragraph writing class: A study of a lecturer's and her students' perception. *Journal of Excellence in English Language Education*, *1*(1), 1–12. https://doi.org/10.26858/joeele.v1i1,%20January.31230

Rahayu, I. F., & Aini, I. N. (2021). Analisis kemandirian belajar dalam pembelajaran ma-

tematika pada siswa SMP. *Jurnal Pembelajaran Matematika Inovatif*, *4*(4), 789–798. https://doi.org/10.22460/jpmi.v4i4.789-798

Rofiiqoh, N., & Qosyim, A. (2023). Analisis kemandirian belajar siswa SMP dalam pembelajaran IPA di masa pandemi Covid-19. *PENSA: E-Jurnal Pendidikan SAINS*, *11* (1), 106–115. https://ejournal.unesa.ac.id/index.php/pensa

Rohmah, W. N., Septian, A., & Inayah, S. (2020). Analisis kemampuan penalaran matematis pada materi bangun ruang ditinjau dari gaya kognitif siswa SMP. *JP: Jurnal PRISMA*, *9*(2), 179–191. https://jurnal.unsur.ac.id/prisma

Saputra, E., & Fahrizal, E. (2019). The development of mathematics teaching materials through geogebra software to improve learning independence. *Malikussaleh Journal of Mathematics Learning (MJML)*, *2*(2), 39–44. https://doi.org/10.29103/mjml.v2i2.1860

Simanullang, N. H. S., & Rajagukguk, J. (2020). Learning Management System (LMS) based on moodle to improve students learning activity. *Journal of Physics: Conference Series*, *1462*(1), 1–8. https://doi.org/10.1088/1742-6596/1462/1/012067

Sugiyono. (2021). *Metode penelitian kuantitatif kualitatif & RnD* (Sutopo (ed.); 2nd ed.). Alfabeta.

Sulistyowati, M. A. R., Sutoyo, S., & Prihastari, E. B. (2022). Analisis kemandirian belajar peserta didik kelas IV dalam mengerjakan soal matematika di masa pandemi. *Jurnal Ilmiah Pendidikan Dasar*, *9*(1), 68–82. https://doi.org/10.30659/pendas.9.1.68-82

Sundari, S., Fuadi, D., & Hidayati, Y. M. (2022). Kemandirian belajar matematika masa pandemi Covid-19 pada siswa sekolah dasar. *Jurnal Basicedu*, *6*(1), 1389–1397. https://doi.org/10.31004/basicedu.v6i1.2233

Supiani, E. M., & Firmansyah, D. (2023). Analisis kemandirian belajar siswa dalam pembelajaran matematika pasca pembelajaran daring. *JPMI: Jurnal Pembelajaran Matematika Inovatif*, *6*(3), 1125–1134. https://doi.org/10.22460/jpmi.v6i3.17066

Tucker-Drob, E. M., Briley, D. A., & Harden, K. P. (2013). Genetic and environmental influences on cognition across development and context. *Current Directions in Psychological Science*, *22*(5), 349–355. https://doi.org/10.1177/0963721413485087

Wicaksono, F. E., Utami, R. E., & Purwati, H. (2023). Analisis kemampuan pemahaman konsep matematis pada materi statistika berdasarkan teori apos ditinjau dari gaya kognitif reflektif dan impulsif. *JIPMat: Jurnal Ilmiah Pendidikan Matematika*, *8*(2), 236–247. https://doi.org/10.26877/jipmat.v8i2.15829

Widyasari, N., & Hayyun, M. (2017). *Pengembangan Pembelajaran Matematika SD*. Universitas Muhammadiyah Jakarta.

Widyasari, N., & Putri, A. K. P. (2019). Pengembangan media pembelajaran scrapbook berbasis budaya palembang pada topik bangun datar. *Jurnal PINUS: Jurnal Penelitian Inovasi Pembelajaran*, *5*(1), 92–98. https://doi.org/10.29407/pn.v5i1.13756

Wulandari, A. (2022). Analisis kemandirian belajar siswa pada pembelajaran matematika. *Journal of Mathematics Learning Innovation (JMLI)*, *1*(2), 151–162. https://doi.org/10.35905/jmlipare.v1i2.3648

Yahya, I., & Warmi, A. (2021). Analisis kemandirian belajar matematika saat pembelajaran daring pada siswa SMP. *Jurnal Maju*, *8*(2), 336–347.

Yulistina, E., Nurkamilah, M., & Fitri, S. (2020). Efektivitas pembelajaran kooperatif tipe Student Teams Achievement Divisions (STAD) terhadap kemandirian dan prestasi belajar peserta didik pada materi perangkat lunak pengolah angka. *Jurnal Produktif*, *4*(2), 367–376. https://doi.org/10.35568/produktif.v4i2.1009