The Effect of Digital Technology Learning Based on Guided Discovery and Self-regulated Learning Strategy on Mathematical Creativity

Flavia Aurelia Hidajat*, Leny Dhianti Haeruman, Eti Dwi Wiraningsih, and Didik Sugeng Pambudi

***Abstract*—Considering that teachers can not directly supervise or control students' real activities during online learning, students need to manage their learning without the teacher's presence. However, students cannot manage their learning process independently and tend to do other activities during the online learning process. On the other hand, students need to combine previous knowledge to form new and creative ideas. This contradictory condition causes students not to focus on learning, students are not able to combine previous knowledge, and there is no effort to form new and creative ideas. So students' mathematical creativity is very low. As a result, teachers must implement strategies that guide students to find new or creative ideas by activating students' self-regulation abilities during online learning. This study applied digital technology learning through the LMS (learning management system) based on guided discovery and self-regulated learning strategies to overcome these problems. This research employed the quantitative research method. The subjects of this study were 67 high school students in Malang. The sampling technique was the distribution of the questionnaire. The data were first tested to gain normality by using the Kolmogorov Smirnov test. Data analysis employed multiple-linear regression tests. Meanwhile, the data analysis process employed the SPSS-23 application. The results show that digital learning technology based on guided discovery and self-regulated learning strategies positively affects students' mathematical creativity during online learning. The higher implementation of digital technology learning based on guided discovery and self-regulated learning strategies will improve students' mathematical creativity. This research provides information to develop learning for educators. using Digital technology learning based on guided discovery and self-regulated learning strategies, guided discovery-based digital technology learning, and independent learning strategies have increased students' mathematical creativity.**

***Index Terms*—Digital technology learning, guided discovery, self-regulated learning, mathematical creativity**

I. Introduction

Guided discovery is a practical learning approach to improve students' academic achievement. Sani (2013) [1] defines guided discovery as a learning approach that triggers students to find concepts independently. Teachers guide students in the learning process so that the students can find their ideas independently to solve problems [2]. The method of finding ideas independently can improve students' understanding. The discovery of this independent concept leads to the discovery of new and creative ideas [3]. Therefore, guided discovery is a fundamental learning approach to improve students' learning.

Guided discovery is suitably applied in digital technology learning. Technology provides in-depth opportunities to discover concepts and knowledge [4]. Teachers should guide and facilitate students when they learn and apply technology [5]. Applying digital technology to learning can improve students' performance to find new things [6]. Previous research has discovered that the application of digital technology learning based on guided discovery can improve students' performance in discovering new things. The process of discovering new things refers to the students' creativity [7, 8]. However, other studies have not tested the effects of digital technology learning based on guided discovery of students' creativity [4–6]. Thus, testing the effects of digital technology learning based on guided discovery of students' creativity will be one of the basic hypotheses of this research.

This study employed the learning management system (LMS) as digital technology learning. Duin and Tham (2020) state that digital LMS supports the learning process because LMS is a place to share knowledge and experiences in this digital technology era [9]. LMS offers an environment that guides students to use their knowledge and skills more effectively [10]. Moreover, LMS supports students' self-regulation to improve their behavior in learning and gain a better understanding [11]. LMS is also an effective technology learning system to overcome wicked problems through instruction [12]. Thus, LMS provides an opportunity to create a series of guided online learning to find new ideas [13]. The process of finding new ideas refers to creativity. Luck *et al*. (2012) mention that LMS supports students' creativity [14].

Creativity is a learning skill focusing on finding new and original ideas [15] and constitutes a higher-order thinking skill [16]. Someone is said to think creatively if they can generate new and original ideas [17]. Mathematical creativity is a higher-order thinking skill that leads students to discover mathematical concepts with various original solutions [18]. However, students' mathematical creativity is difficult to develop in the learning process. Li and Yang *et al*. (2022) [19] explain that inactive communication can lower students' creativity. Thus, teachers must familiarize themselves with innovative and flexible learning designs [20]. On the other hand, integrated learning combines creativity, self-concept, or other correlated skills [21]. Therefore, instructional design should combine other skills to encourage students' creativity. One of the skills predicted to increase students' creativity is

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F. A. Hidajat, L. D. Haeruman, and E. D. Wiraningsih are with Universitas Negeri Jakarta, Indonesia.

D. S. Pambudi is with Universitas Jember, Indonesia.

*Correspondence: Flaviaaureliahidajat@unj.ac.id (F.A.H.)

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the self-regulated learning strategy.

The self-regulated strategy is a learning strategy that focuses on the process of self-regulation, regulation of motivation, and independent learning processes to increase learning goals [22]. Self-regulated strategies can improve students' learning performance [23] and enhance their understanding [24]. The application of an excellent self-regulated strategy can help students find new ideas [25]. However, several studies have not examined the effects of self-regulated strategies on increasing students' creativity in mathematics [23–25].

Some literature has reviewed the implementation of self-regulated strategies in digital technology learning, in which Digital technology learning significantly triggers the implementation of students' self-regulated learning [26] and improve the academic achievement of students [27]. The application of digital technology learning, especially LMS digital technology learning, can increase students' motivation through self-regulation skills [28] and support students' achievement and learning [29].

On the other hand, the development of digital technology learning can support students' self-regulation skills, cognitive abilities, and creativity. Therefore, this study considers that the application of digital technology learning is suitably combined with the application of self-regulated skills for students' academic achievement. Previous research has discovered that digital technology learning could support students' self-regulated learning to gain academic achievement [26–28] and creativity. Al-Mamary (2022) [11] implicitly states that learning digital technology with the help of LMS supports students' self-regulation in learning. LMS supports the students' learning process [30] and the flexibility to find new ideas. Moreover, digital LMS supports group learning and students' creativity [14]. This study partially examines the effects of learning digital technology based on self-regulated learning on students' creativity. The previous studies mentioned above only partially show the role of learning digital technology of LMS that supports students' self-regulation and creativity. Thus, this study examines the effects of learning digital technology (LMS) based on self-regulated learning on students' creativity. This becomes the second hypothesis of this study.

Based on the description above, the guided-discovery learning approach, creativity, and self-regulated learning strategies are interrelated with the application of LMS digital technology learning. Amela and D ́ez *et al*. (2011) [10] state that LMS is a new framework that controls the learning system by guiding students in a directed manner to gain new knowledge. Duin and Tham (2020) [9] also mention that LMS supports the instructions that lead to problem-solving. Thus, LMS allows students to regulate their learning process independently [11], [30]. LMS also affects students' flexibility in contributing new concepts. Discovering new concepts or ideas leads to creativity [31]. Luck and Hashim *et al*. (2012) [14] also confirm that digital LMS supports students' creativity to acquire new knowledge.

Based on the description above, previous research indicates that digital technology learning (LMS) supports students' self-regulation behavior toward their learning process and serves as a directed guidance system to find new or creative ideas in online learning. However, the previous studies only partially examine the effectiveness of LMS on guided discovery, self-regulation, and creative learning and have not explained the effects of these three variables in detail. Therefore, this study uses the LMS as digital technology learning as well as develops and tests the digital technology learning from LMS based on the guided discovery and self-regulated learning strategies for students' mathematical creativity. To date, no studies have investigated these topics. Therefore, this research is crucially conducted. This research can provide information to develop learning for educators. Students' mathematical creativity can also increase through the implementation of digital technology learning based on guided discovery and self-regulated learning strategies. This research objective is "what are the effects of digital technology learning based on guided discovery and self-regulation strategies on students' mathematical creativity?". Based on these research objectives, this study formulates three research questions.

1) What are the simultaneous effects of digital learning technology based on guided discovery strategies and self-regulation on students' mathematical creativity
2) What are the partial effects of learning digital technology based on self-regulation strategies on students' mathematical creativity?
3) What are the partial effects of learning digital technology based on guided discovery strategies on students' mathematical creativity?

These three questions are adjusted to the hypothesis statement.

1. Simultaneous Hypothesis Test

Hypothesis 1 for research question-1

H_0: $\beta_0 = \beta_1 = 0$

(There is a simultaneous insignificant effect between the application of digital learning technology based on guided discovery and self-regulation strategies on students' mathematical creativity)

H_1: $\beta_0 \neq \beta_1 \neq 0$

(There is a simultaneous significant effect between the application of digital learning technology based on guided discovery and self-regulation strategies on students' mathematical creativity)

2. Partial Hypothesis Test

Hypothesis 2 for research question-2

H_0: $\beta_0 = 0$

(There is a simultaneous insignificant effect between the application of digital learning technology based on self-regulation strategies on students' mathematical creativity)

H_1: $\beta_0 \neq 0$

(There is a simultaneous significant effect between the application of digital learning technology based on self-regulation strategies on students' mathematical creativity)

Hypothesis 3 for research question-3

H_0: $\beta_1 = 0$

(There is a simultaneous insignificant effect between the application of digital learning technology based on guided discovery strategies on students' mathematical creativity)

H_1: $\beta_1 \neq 0$

(There is a simultaneous significant effect between the application of digital learning technology based on guided discovery strategies on students' mathematical creativity).

II. METHOD

This research is quantitative research [32] and consisted of several stages. The first stage was the problem identification process with a preliminary study to test the creativity. This test was adapted from the question of [33]. The mean of students' initial creativity is 67.7 < 75 (minimum standard), showing that students' initial creativity is very low. The results of interviews with teachers show that students need self-regulation skills in their learning process, but they also need directed guidance to find creative ideas during online learning because the teachers cannot directly supervise or control creativity in online learning. In addition, the teachers have not provided a place for students to express their creative ideas. Therefore, this study applies the digital technology learning design through LMS based on guided discovery and independent learning to overcome these problems during online learning.

The second stage was implementing digital technology learning through LMS based on guided discovery and self-regulated learning strategies to test students' mathematical creativity. Digital technology learning through LMS was designed by referring to creativity indicators adapted from Kim (2006) [31], self-regulated learning indicators adapted from Barnard *et al*. (2009) [34], and the syntax of guided discovery learning adapted from Jacobsen *et al*. (2009) [35].

Instructional design related to the application of digital technology learning through LMS based on guided discovery and independent learning strategies for the surface area of a cube is shown in Table I.

TABLE I: INSTRUCTIONAL DESIGN

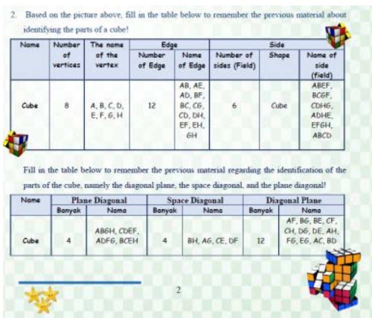
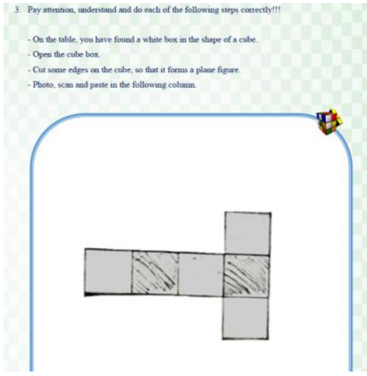
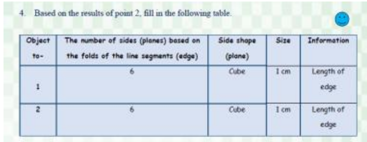
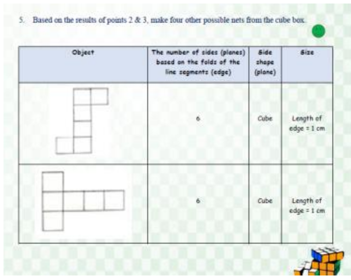
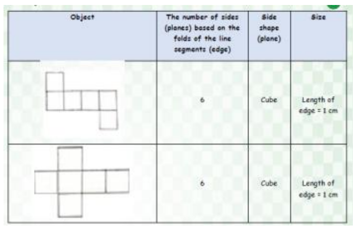
Guided discovery strategies	**Self-regulated learning strategies**	**Instructional design with LMS**
Review stage		The teacher and students review the previous material about the elements in the cube, such as the number of vertexes, sides (or edges), diagonal plane, diagonal space, diagonal plane, etc. **Examples of students' answers regarding E-Module in LMS** 
Closed stage	Task strategy	The teacher gives an example of a cube, and students determine the side lengths of the cube, calculate six of the area of the squares of the cube, and add up all the areas of the squares in the cube. At this stage, students regulate their task strategies. **Examples of students' answers regarding E-Module in LMS**  
Open stage	Task structuring	The teacher guides the students in making the variance of the cube shape with different side lengths. Next, students do the same activities based on the previous task strategy. Students arrange the structure of the next task. In this open stage, students provide the variance of the cube shape with different side lengths. **Examples of students' answers regarding E-Module in LMS**   Students are fluent and flexible in giving the variance of the cube shape with different and original side sizes.
Evaluation stage	Self-evaluation	Students concluded their findings about the meaning of making a cube nest. **Examples of students' answers regarding E-Module in LMS**

Fig. 1. Evidence of LMS implementation.

The third stage was to identify the influence of guided discovery-based digital technology learning and self-regulated learning strategies on students' mathematical creativity. The fourth stage is concluding.

The research instruments were questionnaires for self-regulated learning, guided discovery, and creativity. The self-regulated learning questionnaire was adapted from Barnard *et al*. (2009) [34] and had three indicators: task strategy, task structuring, and self-evaluation. The self-regulated learning questionnaire in this study consisted of three items. The mathematical creativity questionnaire was adapted from Kim (2006) [31] and had three indicators: fluency, flexibility, and originality. The creativity questionnaire consisted of three items. Meanwhile, the guided discovery questionnaire was adapted from Jacobsen *et al*. (2009) [35] and consisted of four syntaxes: the review stage, closed stage, open stage, and conclusion stage. The guided discovery questionnaire consisted of three items. This study employed a four-point Likert scale: (4) strongly agree, (3) agree, (2) disagree, and (1) strongly disagree.

TABLE II: INDICATORS AND ITEMS OF RESEARCH INSTRUMENTS

Aspects	Indicators	Item	Number
Self-regulated learning Barnard *et al*. (2009) [34]	Task strategy	If the learning strategy that I apply fails, I will try to modify the learning strategy to achieve the next learning goal	4
	Task structuring	I make a schedule independently for the plan to achieve my study goals based on the task of the teacher	1
	Self-evaluation	After the final exam results come out, I always do a self-evaluation by comparing the process, the things that have been done, and the previously planned study objectives with the final results	7
Mathematical creativity Kim (2006) [31]	Fluency	I made various cube shapes with different sizes	2
	Flexibility	I use a variety of problem-solving strategies to create variations of the shape of the cube net	5
	Originality	I made different shapes of cube nets with other friends	8
Syntax of guided discovery Jacobsen *et al*. (2009) [35]	Review stage	Learning always begins with material review activities	10
	Closed stage	The teacher always guides us to do experiments to find a mathematical concept	3
	Open stage	We get a opportunity to be creative by making different shapes of cube nets	6
	Evaluation stage	We get the opportunity to independently conclude mathematical concepts on the E-module given to us through the LMS application	9

Self-regulated learning, guided discovery, and creativity questionnaires were tested to gain validity and reliability. Three mathematics education lecturers tested the validity of the questionnaires. The validity test was analyzed using the Aiken-V Index. The Aiken-V index of the self-regulated learning questionnaire instrument is 0.73 > 0.3. The Aiken-V index of the creativity questionnaire instrument is 0.67 > 0.3. Meanwhile, the Aiken-V index of the guided discovery questionnaire instrument is 0.63 > 0.3. The value of the Aiken-V index for all instruments is more than 0.3, an instrument with such a score is considered valid for research [36].

The reliability test was conducted on 30 students, who were not the participants of the study. The reliability test employed Cronbach's Alpha formula. Cronbach's alpha from the self-regulated learning questionnaire instrument is 0.93 > 0.60. The Cronbach's alpha from the creativity questionnaire instrument is 0.87 > 0.60. Meanwhile, the Cronbach's alpha from the guided discovery questionnaire instrument is 0.78 > 0.60. The value of Cronbach's alpha for all instruments is more than 0.60. Thus, the instrument is considered reliable for the research.

The research participants were 67 high school students aged 16-18 years in Malang, Indonesia. They consisted of 43 female students and 24 male students. The participants were selected using a purposive sampling technique because they had applied online learning. Thus, the application of digital technology learning was appropriate for the participants. The participants received three questionnaires. The questionnaire data were first tested to gain the normality of the data. The normality test was conducted using the Kolmogorov Smirnov test [37]. The data were considered normal if the Sig. > 0.05. The results of the Kolmogorov Smirnov test are shown in

Table III.

Table III shows Sig. = 0.200 > 0.05. This score indicates that the data are normally distributed. The normal distribution of the data is also shown in the graph in Fig. 2 and Fig. 3.

TABLE III: KOLMOGOROV-SMIRNOV TEST

N		67
Normal Parameters[a,b]	Mean	0.0000000
	Std. Deviation	11.006163
Most Extreme Differences	Absolute	0.366
	Positive	0.198
	Negative	-0.246
Test Statistic		0.256
Asymp. Sig. (2-tailed)		0.200[c]

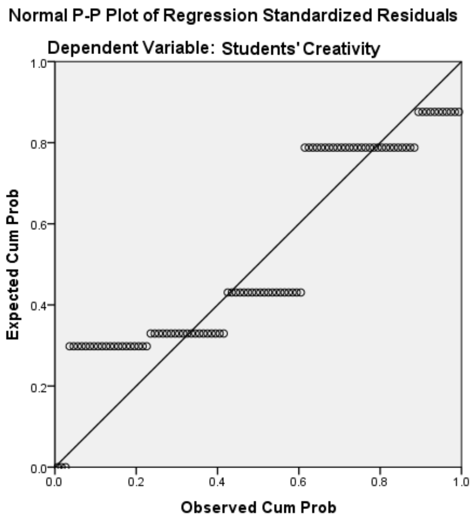


Fig. 2. Graph of normal distribution.

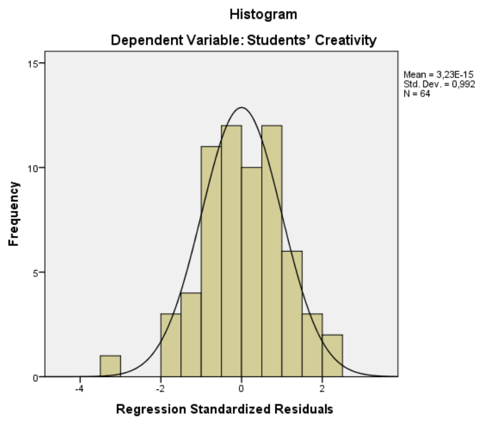


Fig. 3. Histogram of normal distribution.

The data were then tested for homogeneity. The homogeneity test was conducted using Levene's test. The results of this test are presented in Table IV.

TABLE IV: LEVENE'S TEST

	Levene's Test	F	Sig.
Students' creativity	1. Equal variances assumed 2. Equal variances not assumed	0.137	0.713

The Levene's test has discovered the F-statistic = 0.137 and the probability (Sig.) = 0.713 > 0.05. These findings show that students' mathematical creativity in applying digital technology learning based on guided discovery learning and self-regulated strategies is homogeneous.

After the data had been considered normal and homogeneous, they were analyzed using the multiple regression analysis. This study has two independent variables (guided discovery learning and self-regulated learning strategies) and one dependent variable (students' mathematical creativity). The probability (Sig.) < 0.05 indicates that digital technology learning based on guided discovery learning and self-regulated strategies significantly affects students' mathematical creativity.

The first hypothesis was examined using the F-test in the multiple linear regression analysis as a simultaneous hypothesis test. The second and third hypotheses were examined using the t-tests in the multiple linear regression analysis as a partial hypothesis test. This study also shows an empirical model to identify the positive or negative effects of digital technology learning based on guided discovery and self-regulated learning strategies on students' mathematical self-regulation creativity.

III. RESULTS

The first hypothesis test has revealed that digital technology learning based on guided discovery and self-regulated learning strategies simultaneously affect students' mathematical creativity. The results are shown in Table V.

TABLE V: SIMULTANEOUS HYPOTHESIS TEST

Model	Df	Mean Square	F	Sig.
Regression	2	30.090	34.897	0.000
Residual	65	76.660		
Total	67			

Table V shows the F-statistics = 34.897 and probability (Sig.) = 0.000 <0.05. These findings interpret that digital technology learning based on guided discovery learning and self-regulated strategies significantly affects students' mathematical creativity.

The t-test on the second hypothesis has revealed that digital technology learning based on self-regulated learning strategies partially affects students' mathematical creativity. Meanwhile, the t-test on the third hypothesis has revealed that digital technology learning based on guided discovery strategies partially affects students' mathematical creativity. These partial effects are shown in Table VI.

TABLE VI. PARTIAL HYPOTHESIS TEST

Model	T	Sig.
Guided Discovery Learning	2.566	0.000
Self-regulated Strategy	2.782	0.000

Table VI shows the t-statistics for self-regulated learning strategies = 2.782 and the probability (Sig.) = 0.000 <0.05. These findings interpret that digital technology learning based on self-regulated learning strategies partially affects students' mathematical creativity.

Furthermore, Table VI also shows the t-statistic values of the guided discovery learning strategies = 2.566 and the probability (Sig.) = 0.000 < 0.05. These findings interpret that digital technology learning based on guided discovery strategies partially affects students' mathematical creativity.

Based on the results of the hypothesis test, this study further identified the positive or negative effects of the partial hypothesis test using the empirical model analysis. The empirical models of this test are presented in Table VII.

TABLE VII: EMPIRICAL MODELS

Models	Unstandardized Coefficients	
	B	Std. Error
(Constant)	17.137	8.176
Guided Discovery Learning	16.470	24.271
Self-regulated Strategy	31.441	24.474

Table VII shows the empirical model of Y = 17.137 + 16.470 X1 + 31.441 X2. The variable from Y was identified as students' mathematical creativity, the variable from X1 was identified as guided discovery strategies, and the variable from X2 was identified as self-regulated learning strategies in the application of digital technology learning.

The constant value is 17.160, indicating that digital technology learning based on guided discovery learning (X1) and self-regulated strategy (X2) is constant. Meanwhile, the constant value of the students' mathematical creativity (Y) is 17.137. This shows the increased creativity without the application of digital technology learning based on guided discovery learning (X1) and self-regulated strategies (X2). The coefficient of guided discovery learning (X1) is 16.470, indicating that digital technology learning based on guided discovery learning (X1) positively affects students' mathematical creativity (Y). This finding means that the application of digital technology learning based on guided discovery learning (X1) increases the students' creativity (Y).

The coefficient of self-regulated strategy (X2) is 31.441. This finding denotes that digital technology learning based on self-regulated strategy (X2) positively affects students' mathematical creativity (Y). Moreover, this finding shows that digital technology learning based on self-regulated strategy (X2) increases students' mathematical creativity (Y).

IV. DISCUSSION

This study employs the learning management system (LMS) as digital technology learning. This system is used with the creativity indicators adapted from Kim (2006) [31], self-regulated learning indicators adapted from Barnard *et al.* (2009) [34], and the syntax of guided discovery learning adapted from Jacobsen *et al.* (2009) [35].

The result of the first hypothesis test shows that LMS based on guided discovery learning and self-regulated strategies significantly affects students' mathematical creativity. This finding is supported by previous studies, which discover that guided discovery can improve students' understanding [38] and help students find new ideas [39]. Guided discovery consists of four stages, and this research adapts them from Jacobsen *et al.* (2009) [35]. These stages are the review stage, the closed stage, the open stage, and the evaluation stage. The review stage shows that students review the concept of the previous knowledge. The closed stage shows the introduction of the material from the teacher. The open stage shows that students try and find new ideas. Meanwhile, the evaluation stage shows that students conclude the discovered concepts. Amela *et al.* (2011) confirm that technology learning through LMS provides an environment that guides students to find new ideas [10]. The process of discovering new ideas refers to creativity [40].

Based on the second hypothesis, LMS based on a self-regulated learning strategy is an approach that can improve students' mathematical creativity. This finding agrees with Al-Mamary (2022) [11], who states that LMS supports independent behavior and self-regulation in the learning process of students. Self-regulation strategies escalate students' understanding [41], improve their achievement [42], and allow them to discover new ideas [43]. The discovery of new ideas is a hallmark of creativity [7]. No previous research has examined the effects of self-regulated strategies on students' mathematical creativity.

Creativity is a particular skill that focuses on discovering new ideas [44]. Creativity is a high-level skill required by every student. Creativity increases the level of more complex cognition [45] and enables students to find new ideas by combining previous knowledge with problems [46]. Therefore, creativity is a skill that everyone must possess.

The results also show that LMS based on self-regulated learning positively affects students' creativity. This finding is supported by several studies, which discover that LMS supports students' learning achievement [30] and supports students to think flexibly and find new concepts [47]. This case shows that applying digital technology learning through LMS greatly affects the discovery of new concepts or ideas. This finding agrees with Norouzi *et al.* (2021) [48], who argue that digital technology learning serves as an excellent mediator to trigger the imagination of new ideas, work flexibly, and regulate self-independence during the learning process. Digital technology learning encourages students' thinking processes, learning activities, and self-regulated learning [49]. Digital technology learning, self-regulated learning, and creativity are correlated to motivate students and improve their academic achievement [50]. Therefore, this study strengthens previous research on digital technology learning based on self-regulated learning that can increase students' creativity. This positive effect has not been proven by previous studies [48–50], because they only explain the positive effects and relationships between digital technology learning and the development of self-regulated learning that combines new and creative ideas.

The result of the third hypothesis test shows that learning digital technology using LMS and designed with a guided discovery syntax could positively affect students' mathematical creativity. This finding is in line with the research result of Hutchison (2019) [12], who discovers that LMS is a digital technology learning system that effectively solves problems and finds new ideas through guided instructions. Tong *et al.* (2021) state that digital technology learning with the right guidance can improve communication skills to find new ideas [51]. The guided discovery approach refers to the teacher's role in creating students' self-construction to find new ideas [52]. Learning digital technology can provide opportunities to discover new knowledge [4]. Finding new ideas is the construction of creativity [31, 40].

Several previous studies have proven a small relationship between the guided discovery approach and the discovery of new ideas that lead to creativity [4, 51, 52]. However, these studies have not partially discussed the effects of learning digital technology based on a guided discovery approach on students' mathematical creativity. Therefore, the positive effects of learning digital technology (LMS) based on guided discovery learning on students' mathematical creativity is a new finding of research on creativity. In addition, the previous studies do not combine a guided discovery approach and self-regulated strategies in learning digital technology using LMS to raise students' mathematical creativity. Therefore, this research is essentially conducted to develop students' creativity using digital technology learning based on guided discovery and self-regulated strategies. However, this study has several limitations, which can be completed by future research.

No previous research has examined the simultaneous effects of digital technology learning based on guided discovery learning and self-regulated strategy on students' mathematical creativity. Therefore, this research is essentially conducted to gain research development. However, this study has several limitations, that can become future research questions.

V. Conclusion

This study shows that digital technology learning based on guided discovery learning and self-regulated strategy positively affects students' mathematical creativity. This finding indicates that continuous digital technology learning based on guided discovery and self-regulated strategy can improve students' mathematical creativity. This research can provide information for the development of learning for educators

Furthermore, this study shows that digital technology learning using LMS based on guided discovery learning and self-regulated strategies positively affects students' mathematical creativity. This finding shows that digital technology learning through LMS designed with indicators of guided discovery and self-regulated strategies can improve students' mathematical creativity. This research can provide information to develop learning for educators.

VI. Limitation

This study did not determine the correlation between digital technology learning development, guided discovery strategies, self-regulation learning strategies, and creativity. Besides that, the study did not examine the dominant influence of digital technology learning based on guided discovery learning and self-regulated strategy on students' mathematical creativity. Moreover, this research only involved a small number of participants.

VII. The Future Research

Based on the limitations of this study, the future question is necessarily developed. This future research question is what the dominant influence of guided discovery learning and self-regulated strategy is on students' mathematical creativity. In addition, future research needs to determine the correlation between digital technology learning development, guided discovery strategies, self-regulation learning strategies, and creativity. Therefore, future research can add the number of participants with heterogeneous variants.

Conflict of Interest

The authors declare no conflict of interest.

Author Contributions

Flavia Aurelia Hidajat – instrument development; data collection, manuscript writing, data analysis, and manuscript submission.

Leny Dhianti Haeruman – research discussion, data collection, editing, and correction

Eti Dwi Wiraningsih – research discussion, data collection, editing, and correction

Didik Sugeng Pambudi – research discussion, editing, and correction

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Flavia Aurelia Hidajat is a Dr. from the Department of Mathematics Education, Universitas Negeri Jakarta. Her research interests include digital technology learning, creativity, self-regulated learning, and mathematics education.

Leny Dhianti Haeruman is a lecturer from the Department of Mathematics Education, Universitas Negeri Jakarta. Her research interests include space geometry, transformation geometry, and ICT-based mathematics learning.

Eti Dwi Wiraningsih is a Dr. from the Department of Mathematics, Universitas Negeri Jakarta. Her research interests include applied mathematics, mathematical modeling, and mathematics education.

Didik Sugeng Pambudi is a Dr. from the Department of Mathematics Education, Universitas Jember. His research interests include outdoor learning, mathematical connections and realistic mathematics education.