Jurnal Elementaria Edukasia
Volume 7, No. 2, Juni 2024, 28012814
DOI: 10.31949/jee.v7i2.9551

p-ISSN 2615-4625
e-ISSN 2655-0857

The Effect Of Discovery Learning In Mathematics Learning On Computational Thinking In Terms Of Self-Regulated Learning (Srl) In Student

Lensi Hariyani *
* Magister of Basic Education, Postgraduate Program, State University of Jakarta
lensyhariyani@gmail.com

Yurniwati Yurniwati **
** Magister of Basic Education, Postgraduate Program, State University of Jakarta
yurniwati@unj.ac.id

Ade Dwi Utami ***
*** Magister of Early Childhood Education, Postgraduate Program,
State University of Jakarta
ade.dwi.utami@gmail.com

Submitted: 2021-00-00
Revised: 2021-00-00
Accepted: 2021-00-00

ABSTRACT
Discovery learning is a learning process aimed at uncovering new knowledge through teaching and learning activities. This study investigates the effect of discovery learning in mathematics on computational thinking, considering students' self-regulated learning levels. Employing a quantitative approach with an experimental method, specifically the Posttest-Only Control Group Design, the research sampled VB class students as the experimental group and VC class students as the control group. Data were collected through computational thinking tests, focusing on decomposition, abstraction, algorithm design, and pattern recognition, and analyzed using a two-way ANOVA with a treatment by level 2 x 2 design. The findings reveal: (1) Computational thinking of students exposed to discovery learning differs from those taught with a scientific approach, (2) There is an interaction effect between learning models and self-regulated learning on computational thinking, (3) Students with high self-regulated learning exhibit higher computational thinking in mathematics through discovery learning compared to those taught with a scientific approach, (4) No significant difference exists in computational thinking outcomes between students with low self-regulated learning regardless of the teaching method. Consequently, discovery learning, combined with high self-regulated learning, leads to better computational thinking outcomes in mathematics.
***Keywords**: Discovery Learning; Computational Thinking; Self-Regulated Learning*

ABSTRAK
Discovery learning merupakan suatu proses pembelajaran yang bertujuan untuk mengungkap pengetahuan baru melalui kegiatan belajar mengajar. Penelitian ini menyelidiki pengaruh pembelajaran penemuan dalam matematika terhadap pemikiran komputasi, dengan mempertimbangkan tingkat pembelajaran mandiri siswa. Menggunakan pendekatan kuantitatif dengan metode eksperimen khususnya Posttest-Only Control Group Design, penelitian ini mengambil sampel siswa kelas VB sebagai kelompok eksperimen dan siswa kelas VC sebagai kelompok kontrol. Data dikumpulkan melalui tes berpikir komputasi dengan fokus pada dekomposisi, abstraksi, desain algoritma, dan pengenalan pola, kemudian dianalisis menggunakan ANOVA dua arah dengan perlakuan desain level 2 x 2. Hasil penelitian menunjukkan: (1) Berpikir komputasi siswa yang diberikan pembelajaran Discovery Learning berbeda dengan yang diajarkan dengan pendekatan saintifik, (2) Terdapat pengaruh interaksi antara model pembelajaran dan self-regulated learning terhadap berpikir

komputasional, (3) Siswa dengan kemampuan berpikir komputasional tinggi. self-regulated learning menunjukkan kemampuan berpikir komputasional yang lebih tinggi dalam matematika melalui pembelajaran penemuan dibandingkan dengan siswa yang diajarkan dengan pendekatan saintifik, (4) Tidak ada perbedaan yang signifikan dalam hasil berpikir komputasi antara siswa dengan self-regulated learning rendah apapun metode pengajarannya. Akibatnya, pembelajaran penemuan, dikombinasikan dengan pembelajaran mandiri yang tinggi, menghasilkan hasil berpikir komputasi matematika yang lebih baik.

Kata Kunci: *Discovery Learning; Computational Thinking; Self-Regulated Learning*

INTRODUCTION

Mathematics, as one of the fundamental sciences, plays a crucial role in both advancing knowledge and shaping human personality (Kurino, 2020). The National Council of Teachers of Mathematics (NCTM, 2000) states that the goals of mathematics education include communication learning (math communication), thinking about mathematics, problem-solving, learning to associate ideas (mathematical relationships), and developing a positive attitude towards mathematics. Therefore, one of the aims of learning mathematics is to enhance thinking skills, such as computational thinking (Marfu, 2022). Studying mathematics can have a significant positive impact on someone's future by assisting them in tackling common real-life situations and enhancing their computational thinking skills.

Computational thinking involves a set of problem-solving skills that are crucial in the digital age, including decomposition (breaking down complex problems into manageable parts), abstraction (focusing on important information while ignoring irrelevant details), algorithm design (creating step-by-step solutions), and pattern recognition (identifying trends and regularities). Mathematics inherently incorporates these aspects of computational thinking. For example, solving a complex mathematical problem often requires decomposing the problem into smaller, more manageable parts. Similarly, abstraction is used in mathematics to simplify problems and focus on the core principles. Algorithmic thinking is fundamental in creating methods to solve equations or prove theorems, and recognizing patterns is a common activity in various areas of mathematics, from number theory to geometry. By integrating computational thinking into mathematics education, students can develop a deeper understanding of mathematical concepts while also acquiring essential skills that are applicable in numerous real-world contexts. This integration supports the NCTM goals by promoting mathematical communication, enhancing problem-solving abilities, and fostering positive attitudes towards mathematics, ultimately preparing students for future challenges and opportunities.

However, the results of the observation conducted by Supiarmo et al., (2021) revealed that currently, students' computational thinking abilities are categorized as low. Based on interviews with mathematics teachers, it was reported that the learning approach predominantly relies on lecture methods, and students are not accustomed to solving non-routine mathematical problems. Additionally, the observations by Hidayat and Surmilasari (2023) showed that students are not yet able to describe problems and find patterns for solving exercises accurately. This illustrates that students have low computational thinking abilities and need improvement.

The various challenges mentioned underscore the importance of computational thinking in enhancing students' problem-solving skills. This is especially crucial in today's technologically advancing era, shaping the future of education. This is evidenced by Iran, a developing country, stating that they have a large mathematics education community to incorporate computational thinking into their official curriculum (Rafiepour and Farsani, 2021). This assertion is reinforced by Noviyanti et al., (2023) research, which states that elementary school students' computational thinking abilities improved after receiving differentiated learning treatments. The upcoming research differs in its approach, employing a discovery learning model with comic-based worksheets via the Canva for Education app. It will be evaluated from the standpoint of students' self-regulated learning. Research by Astuti et al., (2023) revealed improvements in students' computational thinking abilities, with the developed media demonstrating validity, practicality, and effectiveness. Computational thinking is highly relevant to the goal of mathematics learning, which is problem-solving ability. Computational thinking is a complex problem-solving skill that follows computer-like steps. However, the difference with the upcoming research lies in using a discovery learning model for computational thinking with comic-based worksheets using the Canva for Education app, examined from the perspective of students' self-regulated learning.

The research by Anggriani, (2023) indicates that students with high numerical abilities in solving HOTS problems can meet all the indicators of computational thinking skills such as decomposition, pattern recognition, algorithmic thinking, as well as generalization and abstraction. However, the difference with the upcoming research lies in using a discovery learning model with comic-based worksheets using the Canva for Education app, examined from the perspective of self-regulated learning in students. Supiarmo et al., (2021) suggest that the computational thinking abilities of students with high and moderate levels of self-regulated learning do not differ significantly, as their computational thinking abilities are limited to pattern recognition. The distinction in the upcoming research lies in employing a discovery learning model with comic-based worksheets using the Canva for Education app. Thus, the novelty in the forthcoming study lies in the implementation of a discovery learning model using engaging and enjoyable student worksheets based on comics, utilizing the Canva for Education app, aiming to create meaningful learning experiences for computational thinking in students, examined from the perspective of self-regulated learning.

By using the discovery learning model, students will be happier and more satisfied in learning because they can successfully find concepts or solutions to learning problems (Tampubolon et al., 2022). In line with the opinion of Asmara and Afriansyah (2018) that with discovery learning, students are given the widest opportunity to "work" in learning mathematics, they can develop their learning strategies independently or interact and work in groups with other students or with the teacher. With activities like that, students will feel more comfortable and less pressured during math lessons.

The results of Rindana's (2023) research indicate that the use of learning models in the classroom with discovery learning helps alleviate the teacher's workload because students can work independently and easily acquire knowledge. The discovery learning model is suitable, appropriate, and can assist mathematics teachers in delivering materials. Discovery learning can be an alternative method for teaching mathematics to develop students' computational thinking abilities (Kurniadi and Purwaningrum, 2018).

Computational thinking is also influenced by affective factors in students. One of the affective aspects referred to is self-regulated learning (SRL), which is the learning process of an individual who is able to establish learning goals and then attempts to monitor, regulate, control cognition, motivation, and behavior to align with the goals and contextual conditions of their environment. This can be interpreted as self-regulated learning providing opportunities for learners to conduct and manage their own learning (Zubaidah, 2020). Consistent with the opinion of Marbun et al., (2021) that with SRL, students engage in learning activities without coercion, are aware of learning objectives, and can solve problems based on appropriate concepts without assistance from others.

Self-regulated learning (SRL) becomes an important aspect to support the ongoing learning process. This is consistent with the opinion of Granberg et al., (2021) that self-regulated learning (SRL) can be described as a key competency that needs to be pursued by the education system in mathematics learning, which can influence the effectiveness of using strategies, methods, techniques, and materials, and impact their ability to make effective and appropriate decisions (Çetin, 2022). Self-regulated learning (SRL) can be observed if students with different levels of SRL have different computational thinking abilities in completing tasks. Students with high levels of SRL can achieve stages of decomposition, abstraction, algorithms, and pattern recognition. Students with moderate levels of SRL can achieve stages of decomposition, abstraction, and algorithms. Students with low levels of SRL can only achieve the decomposition stage. Thus, self-regulated learning can influence computational thinking in students.

Studies have shown that self-regulated learning significantly impacts students' ability to engage in computational thinking. According to Zimmerman (2002), self-regulated learning encompasses processes where learners systematically direct their thoughts, feelings, and actions toward the attainment of their goals . Further, research by Schunk and Greene (2018) emphasizes that students who develop strong self-regulated learning skills are more likely to excel in complex problem-solving and higher-order thinking tasks . Additionally, studies in educational technology indicate that SRL strategies can enhance computational thinking by enabling students to effectively break down problems, abstract key elements, devise algorithms, and recognize patterns (Kramarski & Michalsky, 2010) .

The facts observed in the field indicate that the level of self-regulated learning among students in the learning process is still low. This is evidenced by Afrizawati et al., (2021) research. This indicates that the absence of 'steady' learning independence includes behaviors such as arriving late to school, not completing school assignments due to being left behind at home, cheating during exams, underutilizing library facilities as learning resources, and statements from some students stating that learning at school will not affect their academic performance due to negative external perceptions about themselves. However, in theory and practice, self-regulated learning (SRL) in students is a form of learning independence that is worthy of development. Various studies on SRL recommend that it is a significant contributor to students' academic success (Purwoko, 2021). Therefore, self-regulated learning also plays a crucial role in students' success in learning; it can have a positive impact on their future lives.

Based on the results of empirical studies, it is suspected that using the discovery learning model can enhance computational thinking as assessed by self-regulated learning in students. Therefore, the researcher titled the study "The Influence of Discovery Learning in Mathematics Education on Computational Thinking as Assessed by Self-Regulated Learning (SRL) in Students." This study is novel in its approach as it integrates the discovery learning model specifically within the context of mathematics education to explore its effects on computational thinking. Unlike previous research, which has often focused on general educational strategies or isolated computational skills, this study uniquely combines these pedagogical elements to examine their synergistic impact on fostering both computational thinking and self-regulated learning in a mathematical framework.

METHODS

Type and Design

This research employs a quantitative approach by utilizing the experimental method within the Posttest-Only Control Group Design . Within this structure, two distinct groups are formed: the experimental group and the control group. The experimental group receives treatment through the application of the discovery learning model, while the control group follows the scientific approach. In terms of research variables, they encompass three interconnected aspects: computational thinking, discovery learning, and a moderator variable referred to as self-regulated learning (SRL), further subdivided into high and low self-regulated learning (SRL) categories.

Data and Data Sources

The study's population consists of all fifth-grade students at Nelgelri Elementary School, located in the Pullogadulng district of East Jakarta, within DKI Jakarta Province. Sample selection was conducted using cluster random sampling technique. The research focused on fifth-grade students at Pisangan Timur 13 Public Elementary School in Pulogadung District, East Jakarta, totaling 58 students, with 29 students allocated to both the experimental and control groups.

Data Collection Technique

Data collection in this study utilizes two instruments structured around predefined indicators. The computational thinking instrument includes essay questions designed to evaluate various facets of computational thinking, such as problem-solving strategies, algorithmic reasoning, and creative application of computational concepts. Additionally, a questionnaire assesses students' self-regulated learning, focusing on indicators like goal setting, monitoring progress, and reflective practices.

Before implementation in the research, both instruments undergo rigorous validation by expert professors. This process ensures that the essay questions effectively gauge computational thinking skills by aligning with established frameworks and best practices in the field. Similarly, the questionnaire undergoes validation to confirm its alignment with recognized models of self-regulated learning, ensuring that it accurately captures students' abilities to manage their learning processes effectively.

Following validation, both instruments are tested for validity to ensure they measure the intended constructs accurately. Reliability testing is also conducted to ensure consistency in results across different contexts and over time. These steps collectively strengthen the instruments' credibility and ensure robust data collection for the study..

Data Analysis

The study employed a 2x2 factorial analysis design for its analysis. The research findings revealed varying levels of students' computational thinking abilities alongside varying levels of self-regulated learning. Initial normality and homogeneity tests, vital for the analysis, were conducted using SPSS before performing a two-way analysis of variance (ANOVA) to assess the hypotheses. The hypotheses are outlined as follows: 1) Differences exist in computational thinking abilities between students learning with discovery learning and those learning with scientific methods; 2) An interaction occurs between discovery learning and self-regulated learning concerning students' computational thinking abilities; 3) Variances are observed in computational thinking between students learning with discovery learning and those learning with scientific methods among students with high self-regulated learning; 4) Variances are also present in computational thinking between students learning with discovery learning and those learning with scientific methods among students with low self-regulated learning.

RESULTS AND DISCUSSION

This research was conducted in the academic year 2023/2024, during the second semester, by preparing teaching modules based on the Merdeka curriculum. The teaching materials and learning media consist of student worksheets (LKPD) based on comics and instructional videos that align with the learning objectives being taught.

This description aims to present research data based on the mean, minimum, maximum, standard deviation, variance, and data range. The research data comprises scores from the computational thinking test, categorized based on high and low levels of self-regulated learning, as well as grouped by experimental and control research classes. In the experimental classes, the discovery learning model was implemented, while in the control classes, a scientific learning approach was adopted. The data is presented in Table 1 below:

Table 1. Descriptive Test of Computational Thinking

	N	Minimum	Maximum	Mean	Std. Deviation
Experimental	29	35.00	100.00	72.4138	20.32639
Control	29	30.00	97.50	58.6207	21.99418

The analysis presented in the table above reveals that, in the experimental class data, the minimum value for computational thinking is 35, and the maximum value is 100, with a mean of 72.41 and a standard deviation of 20.32. The mean exceeding the standard deviation suggests that the research data exhibits low variability.

Similarly, in the control class data for computational thinking, the mean value is 58.62, with a standard deviation of 21.99. This relationship, where the mean surpasses the standard deviation, indicates minimal data variation in the research. Additionally, the dataset includes a minimum value of 30 and a maximum value of 97.50. Furthermore, the description of the self-regulated learning test is provided in Table 2 below:

Table 2. Descriptive Test of SRL

	Minimum	Maximum	Mean	Std. Deviation
High_ SRL	105.00	137.00	117.4333	8.62508
Low_ SRL	75.00	104.00	95.0714	7.54703

The analysis results presented in the table above indicate that for the high SRL category, the average value obtained is 117.43, with a minimum of 105 and a maximum of 137. Conversely, in the low SRL group, the average value obtained is 95.07, with a minimum of 75 and a maximum of 104. Additionally, the description of the computational thinking test based on self-regulated learning is provided in Table 3 below:

Table 3. Descriptive Test of Computational Thinking Based on SRL Level

SRL Level	Class	N	Range	Minimum	Maximum	Mean	Std. Deviation
High	Experimental	14	20.00	80.00	100.00	88.93	6.10
	Control	16	67.50	30.00	97.50	63.13	22.68
Low	Experimental	15	47.50	35.00	82.50	57.00	16.26
	Control	13	60.00	30.00	90.00	53.08	20.62

Based on the analysis results in the table above, it is evident that within the high self-regulated learning group, the experimental class employing the discovery learning method achieved a higher average score in computational thinking (88.93) compared to the average score (63.13) attained by the control group utilizing the scientific learning method. This discrepancy highlights a variance in the average self-regulated learning scores among high-level learners based on the instructional methods utilized.

Within the low self-regulated learning group, it is observed that in the experimental class applying the discovery learning method, the average computational thinking score is 57.00. This figure does not significantly differ from the average computational thinking score of 53.08 in the control group employing the scientific learning approach. This suggests that the variation in average self-regulated learning scores at the low level is not substantial between the instructional methods employed.

The subsequent step in this research involves conducting an Analysis of Variance (ANOVA) to address the research hypotheses. However, before proceeding with the Analysis of Variance (ANOVA), preliminary analyses are necessary, specifically tests of normality and homogeneity.

1. Normality Test

The normality test aims to determine whether the computational thinking data as a whole (experimental and control groups) follows a normal distribution or not. If the significance value > 0.05, then the conclusion is that the data follows a normal distribution. The results of the normality test are presented in Table 4 below:

Table 4. Normality Test

Shapiro-Wilk	
Statistic	Sig.
0.930	0.061

In the table above, the analysis indicates a significance value of the normality test at 0.061, surpassing the threshold of 0.05. Consequently, it is inferred that the computational thinking data utilized in the study follows a normal distribution.

2. Homogeneity Test

At this stage, the analysis seeks to ascertain whether the population of computational thinking data exhibits consistent variance. A significance value greater than 0.05 leads to the conclusion that the data is homogeneous. The outcomes of the homogeneity test are detailed in Table 5 below:

Table 5. Homogeneity Test

Levene Statistic	df1	df2	Sig.
0.644	3	112	0.589

The results of the homogeneity test analysis in the table above reveal a significance value of 0.589, signifying that the computational thinking data demonstrates homogeneity and satisfies the assumptions.

In this study, a one-way ANOVA hypothesis analysis was conducted to examine whether there exists an impact of learning method groups and self-regulated learning scores on students' computational thinking. If the significance value falls below 0.05, it is inferred that there exists an impact due to the variance in learning method groups or self-regulated learning score groups. Subsequently, the outcomes of the ANOVA test for the learning method are presented in Table 6 below:

Table 4. ANOVA Test for Learning Method Groups

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	2758.621	1	2758.621	6.151	.016
Within Groups	25113.362	56	448.453		
Total	27871.983	57			

The analysis results in the table above show a significance value of 0.016, indicating the conclusion that there is an influence of the learning method on students' computational thinking scores. Thus, students who participated in classes using the discovery learning method and the scientific approach method yielded different computational thinking outcomes. The results of the ANOVA test for self-regulated learning are presented in Table 7 below:

Table 5. ANOVA Test for Self-Regulated Learning Score Groups

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	5786.209	1	5786.209	14.671	.000
Within Groups	22085.774	56	394.389		
Total	27871.983	57			

In the table above, a significance value of 0.000 was obtained, meaning the conclusion is drawn that there is an influence of self-regulated learning (SRL) scores on students' computational thinking scores. Hence, students with high and low SRL scores yield different computational thinking outcomes.

Furthermore, a hypothesis analysis using two-way analysis of variance (ANOVA) was conducted. The analysis aimed to determine whether there is an influence between the discovery learning model and the scientific approach on students' computational thinking. Additionally, it sought to ascertain if there is an interaction effect between the learning method and the level of self-regulated learning possessed by students. The ANOVA test results obtained are presented in Table 8 below:

Table 6. ANOVA Test

Source	Type III Sum of Squares	df	Mean Square	F	Sig.
Corrected Model	10864.881[a]	3	3621.627	11.499	.000
Intercept	247595.897	1	247595.897	786.153	.000
Class	3184.199	1	3184.199	10.110	.002
SRL	6349.271	1	6349.271	20.160	.000
Class * SRL	1725.133	1	1725.133	5.478	.023
Error	17007.102	54	314.946		
Total	276837.500	58			
Corrected Total	27871.983	57			

The analysis conducted on the table above reveals that the significant value for the student class variable is 0.002, indicating its significance at a level below 0.05. Consequently, it is inferred that there exists a disparity in computational thinking outcomes among students who undergo the discovery learning model compared to those who engage in the scientific approach.

Moreover, it is observed in the same table that the significant value for the SRL*Class interaction variable is 0.023, also falling below the 0.05 threshold. This leads to the conclusion that an interaction exists between discovery learning and self-regulated learning concerning students' computational thinking.

Following this, post-hoc tests were performed to assess the impact of each category. The outcomes of the post-hoc test for self-regulated learning are delineated in Table 9 below:

Table 7. Post-Hoc Test for SRL

(I) SRL	(J) SRL	Mean Difference (I-J)	Std. Error	Sig
High	Low	20.988*	4.674	.000

The post-hoc test conducted for SRL reveals a mean difference value of 20.988, indicating that the average computational thinking disparity between high and low SRL groups is 20.988. Additionally, a significance value of 0.000 was obtained, signifying it is less than 0.05. Therefore, it is established that there exists a difference in computational thinking outcomes between students with high SRL and those with low SRL, which is consistent with the one-way ANOVA findings. Moving forward, presented below are the outcomes of the post-hoc test for class:

Table 8. Post-Hoc Test for Class

(I) Class	(J) Class	Mean Difference (I-J)	Std. Error	Sig.[b]
Experiment	Control	14.863*	4.674	.002

The post-hoc test conducted for class reveals a mean difference value of 14.863, indicating that the average disparity in computational thinking between classes utilizing discovery learning and scientific methods is 14.863. Moreover, a significance value of 0.002 was obtained, signifying it falls below 0.05. Therefore, it is established that there exists a difference in outcomes between students employing the discovery learning model and those employing the scientific approach. Below, the ANOVA test results for each level of self-regulated learning are presented in Table 11:

Table 9. ANOVA Test for Each Level of SRL

(I) Group	(J) Kelompok	F	Sig.
High	Experiment Control	8.063	0.008
Low	Experiment	2.386	0.134

The analysis results in the table above indicate that for the high SRL group, a significance value of 0.008 was obtained, which means it is less than 0.05. Thus, the conclusion is drawn that there is a difference in computational thinking outcomes between students who learn using the discovery learning model and those who learn using the scientific approach based on high SRL values.

Furthermore, the analysis results in the same table also indicate that for the low SRL group, a significance value of 0.134 was obtained, which means it is greater than 0.05. Therefore, the decision is made that there is no difference in computational thinking outcomes between students who learn using the discovery learning model and those who learn using the scientific approach based on low SRL values.

The data analysis indicates a notable variance in computational thinking abilities among students exposed to the discovery learning model versus those engaged in the scientific approach. Ermawati et al., (2023) research supports this observation, revealing disparities in pre- and post-implementation test scores within the discovery learning framework. Consequently, the discovery learning model holds promise for enhancing mathematics

The researcher observed several differences in learning between the experimental and control classes. In the experimental class, students were seen enthusiastically engaging in learning with the discovery learning model using comic-based worksheets during the first stage, which involved a stimulus in the form of a story related to the material to be taught. Students were given fundamental questions regarding the volume material so that they could develop ideas during the experiment. Students were directed to have confidence in presenting and displaying their experiment results. They were also given the opportunity to actively participate in every stage of the learning activity. Thus, this learning could effectively develop computational thinking components.

In the control class implementing a scientific approach, students often exhibit passivity while receiving material explanations from the teacher, lacking training to voice opinions or present findings to their peers. This passivity persists as they await instructions from the teacher, hindering the development of their computational thinking skills. Additionally, the analysis of the data reveals an interaction between the learning model and self-regulated learning concerning computational thinking in students. This finding aligns with Yuliasari (2017) assertion that the learning model's impact on computational thinking abilities varies depending on students' self-regulated learning styles.

In the context of the discovery learning model, students exhibiting high levels of self-regulated learning also demonstrate elevated computational thinking abilities. These students undergo significant advancements in skills such as decomposition, pattern recognition, abstraction, and algorithmic thinking. This correlation arises from the nature of the discovery learning model, which demands independent problem-solving from students.Arsyad et al., (2022) affirm this relationship, emphasizing that high levels of self-regulated learning drive students to persistently strive for improvement, employ optimal learning strategies, and effectively navigate challenging concepts. Conversely, students characterized by low self-regulated learning encounter obstacles when engaging with the discovery learning model. This hindrance stems from their reduced activity levels, lack of confidence, and tendency to rely on external assistance rather than tackling problems autonomously. Consequently, students with low self-regulated learning often only grasp the decomposition aspect within the discovery learning framework. This observation aligns with Aminah et al., (2022) assertion that individuals with low self-regulated learning tendencies exhibit a reluctance to independently tackle unfamiliar material and frequently seek external assistance, leading to deficiencies in critical computational thinking components such as abstraction, pattern recognition, and algorithmic skills.

In the realm of education, discovery learning surpasses scientific learning, particularly for students exhibiting high levels of self-regulated learning. Because discovery learning is not only required to listen when the teacher explains the material, but students are required to be more active so that students are trained to search for information and understand the concepts of the material being taught (Agustin dan Adi, 2023). Within this framework, instructional materials are complemented by comic-based worksheets, igniting students' curiosity and drive to explore knowledge independently. This pedagogical approach is further substantiated by the research of Sariani dan Suarjana (2022), underscoring the effectiveness of worksheets in fostering students' autonomy in learning. Additionally, the practicality and innovative design of these worksheets serve to amplify students' enthusiasm for learning. Consequently, as students' capacity for independent learning and motivation increase, the quality of their learning outcomes correspondingly improves.

The research findings suggest that within the low self-regulated learning group, there is no discernible variance in computational thinking outcomes between students instructed through the discovery learning model and those taught via the scientific learning approach. Additionally, students with diminished levels of self-regulated learning exhibit a deficiency in robust metacognitive skills, including an awareness of their learning processes, the capacity to monitor progress, and the ability to evaluate learning strategies (Sagita dan Mahmud, 2019). Consequently, despite being presented with opportunities for learning activities employing either the discovery or scientific approach, they fail to fully leverage the learning experience effectively.

CONCLUSION

Based on the results and discussion regarding "The Influence of Discovery Learning in Mathematics Learning on Computational Thinking Reviewed from Self-Regulated Learning (SRL) in Students," it can be concluded that: (1) there is a difference in computational thinking outcomes between students who learn using the discovery learning model and students who learn using the scientific approach, (2) there is an interaction effect between the learning model and self-regulated learning on students' computational thinking in the topic of volume in fifth-grade classes, (3) there is a difference in computational thinking outcomes between fifth-grade students who learn using the discovery learning model and students who learn using the scientific approach based on high SRL values, (4) there is no difference in computational thinking outcomes between fifth-grade students who learn using the discovery learning model and students who learn using the scientific approach based on low SRL values. These findings suggest that implementing discovery learning, particularly for students with high levels of self-regulated learning, can significantly enhance computational thinking skills in mathematics, indicating the need for educators to consider individual differences in SRL when designing and implementing instructional strategies.

.

REFERENCES

Afrizawati, Anggraini, R., & Nurhayati. (2021). Hubungan Konsep Diri Dan Penyesuaian Sosial Dengan Self Regulated Learning Di Era Pandemi Covid-19. *Jurnal As-Said*, *1*(2), 13–24. https://e-journal.institutabdullahsaid.ac.id/index.php/AS-SAID/article/view/40

Agustin, P., & Adi Winanto. (2023). Efektivitas Model Discovery Learning dan Problem Based Learning dalam Rangka Peningkatan Kemampuan Literasi Numerasi Mapel IPAS Kelas IV SD. *Jurnal Elementaria Edukasia*, *6*(2), 800–813. https://doi.org/10.31949/jee.v6i2.5471

Aminah, S., Sembiring, M. G., & Prastiti, T. D. (2022). Analisis Kemampuan Pemecahan Masalah Matematis Ditinjau dari Kemandirian Belajar pada Pembelajaran Blended

Problem-Based Learning. *Jurnal Cendekia : Jurnal Pendidikan Matematika*, *6*(3), 2773–2787. https://doi.org/10.31004/cendekia.v6i3.1728

Ananda Jullailatul Azizia1*, Imam Kusmaryono2, Hevy Risqi Maharani3, A., & Arifuddin. (2023). Proses Berpikir Komputasi Siswa dalam Memecahkan Masalah Perubahan PISA dan Isi Hubungan Ditinjau dari Efikasi Diri Siswa. *EduMa: Pembelajaran Dan Pengajaran Pendidikan Matematika*.

Anggriani, D. L. (2023). *ANALISIS KEMAMPUAN BERPIKIR KOMPUTASI DALAM MENYELESAIKAN SOAL HIGHER ORDER THINKING SKILL BERDASARKAN KEMAMPUAN NUMERIK SISWA KELAS VIII PADA MATERI SISTEM PERSAMAAN LINEAR DUA VARIABEL DI SMP NEGERI 2 JEMBER*.

Ansori, M. (2020). Pemikiran Komputasi (Computational Thinking) dalam Pemecahan Masalah. *Dirasah : Jurnal Studi Ilmu Dan Manajemen Pendidikan Islam*, *3*(1), 111–126. https://doi.org/10.29062/dirasah.v3i1.83

Arsyad, R. N., Pomalato, S. W. D., Abbas, N., & Achmad, N. (2022). Hubungan Antara Self Regulated Learning dengan Hasil Belajar Matematika Pada Materi Trigonometri. *Jambura Journal of Mathematics Education*, *3*(1), 48–56. https://doi.org/10.34312/jmathedu.v3i1.12423

Asmara, R., & Afriansyah, E. A. (2018). Perbedaan Peningkatan Kemampuan Komunikasi Matematis Siswa antara Model Eliciting Activities dan Discovery Learning. *Suska Journal of Mathematics Education*, *4*(2), 78. https://doi.org/10.24014/sjme.v4i2.5714

Astuti1, Syahza2, A., & Zetra Hainul Putra3*. (2023). PENELITIAN COMPUTATIONAL THINKING DALAM PEMBELAJARAN MATEMATIKA. *AKSIOMA: Jurnal Program Studi Pendidikan Matematika*, *12*(1), 363–384.

Azmi, R. D., & Siti Khoiruli Ummah. (2021). ANALISIS KEMAMPUAN COMPUTATIONAL THINKING DALAM PEMBUATAN MEDIA PEMBELAJARAN MATEMATIKA. *Jurnal Pendidikan Matematika : Judika Education*, *4*, 34–40.

Çetin, B. (2022). *Investigation of fourth grade primary school s tudents' self-regulated learning strategies and successes in mathematics course in terms of socio-economic level*. *15*(1), 219–239.

Ermawati, D., Anisa, R. N., Saputro, R. W., & Azura, F. N. (2023). *Pengaruh Model Discovery Learning Terhadap Hasil Belajar Matematika Siswa Kelas Iv Sd 1 Dersalam the Effect of Discovery Learning Model on Mathematics Learning*. *2*, 82–92.

Fajri, M., Yurniawati, & Utomo, E. (2019). Computational Thinking, Mathematical Thinking Berorientasi Gaya Kognitif Pada Pembelajaran Matematika Di Sekolah Dasar. *Dinamika Sekolah Dasar*, *1*(1), 1–18.

Granberg, C., Palm, T., & Palmberg, B. (2021). A case study of a formative assessment practice and the effects on students' self-regulated learning. *Studies in Educational Evaluation*, *68*(November 2020). https://doi.org/10.1016/j.stueduc.2020.100955

Hidayat, T., & Surmilasari, N. (2023). *Pengaruh Model Mind Mapping Terhadap Kemampuan Berpikir Komputasi Siswa Pada Pembelajaran Matematika Di Kelas V SD*. *6*(2), 294–305.

Kurino, Y. D. (2020). Implementasi Model Problem Based Learning Untuk Meningkatkan Pemahaman Matematis Siswa Pada Pembelajaran Matematika Di Sekolah Dasar. *Jurnal THEOREMS (The Original Research of Mathematics)*, *5*(1), 86. https://doi.org/10.31949/th.v5i1.2260

Kurniadi, G., & Purwaningrum, J. P. (2018). Kemampuan Pemahaman Matematis Siswa melalui Discovery Learning Berbantuan Asesmen Hands on Activities. *ANARGYA: Jurnal Ilmiah Pendidikan Matematika*, *1*(1), 8–13. https://doi.org/10.24176/anargya.v1i1.2463

Marbun, O., Rohaeti, E. E., & Maya, R. (2021). Mathematical Understanding Ability And Self Regulated Learning Of Elementary School Students Using Snowball Throwing Approach. *(Jiml) Journal of …*, *4*(1), 22–30.

https://www.journal.ikipsiliwangi.ac.id/index.php/jiml/article/view/6991%0Ahttps://www.journal.ikipsiliwangi.ac.id/index.php/jiml/article/viewFile/6991/2419

Marfu, S. (2022). *Model Pembelajaran Matematika untuk Meningkatkan Kemampuan Penalaran Matematis Siswa*. *5*, 50–54.

Noviyanti, N., Yuniarti, Y., & Lestari, T. (2023). Pengaruh Pembelajaran Berdiferensiasi Terhadap Kemampuan Computational Thinking Siswa Sekolah Dasar. *Prima Magistra: Jurnal Ilmiah Kependidikan*, *4*(3), 283–293. https://doi.org/10.37478/jpm.v4i3.2806

Purwoko, B. (2021). Bimbingan Self Regulated Learning Siswa Pada Masa Pandemi Covid 19. *Jurnal Pengabdian Masyarakat*, *1*(1), 13–17.

Rafiepour, A., & Farsani, D. (2021). ANALISIS SEJARAH BUDAYA KURIKULUM MATEMATIKA SEKOLAH IRAN : PERAN PEMIKIRAN KOMPUTASI. *Jurnal Pendidikan Matematika*, *12*(3).

Rindana Sri Eka, I. (2023). *PENGARUH IMPLEMENTASI MODEL BELAJAR DISCOVERY LEARNING TERHADAP KEMAMPUAN SISWA MEMAHAMI KONSEP MATEMATIKA*. 8–15.

Sagita, N. N., & Mahmud, A. (2019). Peran self regulated learning dalam hubungan motivasi belajar. *Economic Education Analysis Journal*, *8*(1), 516–532. https://doi.org/10.15294/eeaj.v8i2.31482

Sariani, L. D., & Suarjana, I. M. (2022). Upaya Meningkatkan Belajar Matematika Melalui E-LKPD Interaktif Muatan Matematika Materi Simetri Lipat dan Simetri Putar. *MIMBAR PGSD Undiksha*, *10*(1), 164–173. https://doi.org/10.23887/jjpgsd.v10i1.46561

Satria, E., Udin Syaefudin Sa'ud, Cepi Riyana, Wahyu Sopandi, & Nur Rahmiani. (2024). Pengembangan Proyek Pemrograman Medıa Pembelajaran Interaktıf Untuk Tugas Pemecahan Masalah Pelatihan Berpıkır Komputasıonal Mahasiswa Dengan Scratch. *Jurnal Elementaria Edukasia*, *7*(1), 2320–2337. https://doi.org/10.31949/jee.v7i1.8728

Supiarmo M. Gunawan, Turmudi, S. E. (2021). Proses Berpikir Komputasional Siswa Dalam Menyelesaikan Soal Pisa Konten Change and Relationship Berdasarkan Self-Regulated Learning. *Numeracy*, *8*(1), 58–72. https://doi.org/10.46244/numeracy.v8i1.1378

Tampubolon, C. F. G., Manurung, S., & Sidabutar, R. (2022). Pengaruh Model Pencapaian Konsep Terhadap Kemampuan Kreativitas Matematis Siswa Pada Materi Pola Bilangan Di Kelas Viii Smp …. *Journak Of Mathematics Education and Science*, *8*(1), 91–97. http://36.91.151.182/handle/123456789/6317%0Ahttp://36.91.151.182/bitstream/handle/123456789/6317/ASIMA NAIBAHO.pdf?sequence=1&isAllowed=y

Yuliasari, E. (2017). Eksperimentasi Model PBL dan Model GDL Terhadap Kemampuan Pemecahan Masalah Matematis Ditinjau dari Kemandirian Belajar. *JIPM (Jurnal Ilmiah Pendidikan Matematika)*, *6*(1), 1. https://doi.org/10.25273/jipm.v6i1.1336

Zubaidah, S. (2020). Self Regulated Learning : Pembelajaran dan Tantangan pada Era Revolusi Industri 4 .0. *Publikasi Ilmiah*, *5*(April), 1–19. https://publikasiilmiah.ums.ac.id/xmlui/bitstream/handle/11617/12234/p.1-19 siti zubaidah.pdf?sequence=1&isAllowed=y

Zimmerman, B. J. (2002). Becoming a self-regulated learner: An overview. Theory Into Practice, 41(2), 64-70.

Schunk, D. H., & Greene, J. A. (2018). Handbook of Self-Regulation of Learning and Performance. Routledge.

Kramarski, B., & Michalsky, T. (2010). Preparing pre-service teachers for self-regulated learning in the context of technological pedagogical content knowledge. Learning and Instruction, 20(5), 434-447.