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SELF-REGULATED LEARNING AND CREATIVE THINKING SKILLS OF ELEMENTARY SCHOOL STUDENTS IN THE DISTANCE EDUCATION DURING THE COVID-19 PANDEMIC

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Abstract. The research aimed to know the relation between self-regulated learning and creative thinking skills of elementary school students in the distance education during COVID-19 pandemic. Self-regulated learning and creative thinking skills are needed by elementary school students. They train the students' cognitive development during the learning process and prepare them for the next educational level. Teachers should guide, encourage, and implement appropriate learning strategies to improve the students' self-regulated learning and creative thinking skills. It employed a quantitative approach with *ex post facto* and survey methods. The sample was 121 elementary school students taken randomly in Sleman Regency, Indonesia. The data were collected using a Likert scale questionnaire. The results showed that the students' self-regulated learning level was in the moderate category, which was the highest frequency. The creative thinking skills also reached the same level and frequency. Further, self-regulated learning and creative thinking skills were correlated with a high correlation coefficient rate (R = 0.856). Therefore, it is recommended that teachers use a learning method that can activate and develop the self-regulated learning to increase the students' creative thinking skills.

Keywords: creative thinking, elementary school, narrative writing skills, self-regulated learning, vocabulary mastery.

Introduction

COVID-19 pandemic has caused school closure in all parts of the world. A million students globally can only learn outside the classroom setting. The condition has encouraged professional educators to think about an alternative teaching method during the COVID-19 pandemic (Radha et al., 2020). Another change caused by the COVID-19 pandemic is the change of educational pattern; it simultaneously shifted from face-to-face to virtual learning

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through e-learning. It is implemented all over the world, including in Indonesia, with various digital platforms. Previous studies revealed that online learning has proven to improve information retention, accessibility, and shorter learning period (Panigrahi et al., 2018). Online learning is claimed to have equal effectiveness compared to face-to-face learning (Nguyen, 2015). However, for teachers, the shift to an online platform means rethinking the lesson plan to adjust to the different format (Gorey, 2020). Besides, students' readiness cannot be abandoned (Nguyen, 2015).

Cases from Indonesia the high number of positive cases of COVID-19 pandemic requires the government, particularly the Minister of Education and Culture (Indonesia), to implement several policies, including the student learning process carried out at home via distance education, the mechanism for accepting new students must follow health protocols and, if possible, be done online, and school operational assistance funds can be used to finance the. Furthermore, grade promotion and graduation are determined based on report cards and the cancellation of the 2020 national examination (NE), and the NE is not a requirement for graduation or selection to enter an appropriate level of higher education. Education is critical for advancing the nation's next generation, but health factors must also contribute to the long-term viability of the nation's future.

In Indonesia, online learning success during the COVID-19 pandemic is determined by the technological readiness and the national humanitarian curriculum, support, and collaboration with the stakeholders, including the government, school, teachers, parents, and society (Rasmitadila et al., 2020). Besides, the learning essence is self-regulated learning (SRL) of the students during online learning. SRL includes cognitive, metacognitive, behavioral, motivational, and emotional/affective aspects of learning. Therefore, SRL becomes a large umbrella variable and affects learning success (Panadero, 2017). SRL supports students in online learning to work independently through the stages of planning, performing and evaluating (Carter et al., 2020).

Hence, understanding the students' SRL capability is important to achieve successful learning (Sulisworo et al., 2020). SRL is part of the metacognitive skills, and it measures the extent to which an individual implements his highest cognitive dimension. Various studies about Indonesian students' SRL have been conducted. Sulisworo et al. (2020) proposed that the highest score percentage of the students' SRL in Indonesia was smaller than the moderate and low category. Tanu et al. (2020) found that female students' SRL was better than males, especially in applying dynamic mathematics software. Anam and Stracke (2016) concluded that sixth graders feel more comfortable learning with strategies that provide them the space to explore their surroundings independently. SRL develops the students' positive inquiry community, attitude, and self-efficacy (Cho et al., 2017).

Effective and efficient guidance is required for learning success in SRL. However, the students' ability to regulate their learning is influenced by their significant diversity (Peng & Tullis, 2020). SRL has four important components: planning, monitoring, controlling, and reflecting. Accurate monitoring and adequate control are significant for effective self-regulation in solving the problems. Previous studies showed that independent learning is dangerous for students with inadequate prior knowledge because they may find difficulties monitoring and controlling (Mihalca & Mengelkamp, 2020). Nevertheless, it does not apply to the planning and reflecting aspects.

Various learning models have been applied for the students' SRL success. Flipped classroom model with the technological modification proves to significantly impact the students' SRL compared to the conventional flipped classrooms (Blau & Shamir-Inbal, 2017). Flipped classrooms encourage students to learn and communicate with each other in small, heterogeneous groups to achieve learning goals by combining online learning and face-to-face learning (Han et al., 2020; Lo & Hew, 2019). Student activities during discussions, experiments, and evaluations give students the opportunity to think creatively in conveying ideas (Blau & Shamir-Inbal, 2017; Park & Howell, 2015).

Furthermore, the flipped project-based learning class has a significant effect on students' self-regulation performance (Zarouk et al., 2020). Self-regulation of students in this class provides opportunities to creatively design and implement projects to find solutions (Fisher & Baird, 2005; Zarouk et al., 2020). The prototypes will be different from each other depending on their creativity. Students in high-SRL having interest in their work and do not need any helps. So, the creativity is theirs whole (Bayuningsih et al., 2018).

In other studies, Sahyar et al. (2017) found that in a problem-based learning classroom, SRL influences the physics problem-solving ability. Problem-based learning combined with simulation were significantly improved the students' problem-solving skills and their creative thinking skills (CTSs) (Sahyar et al., 2017; Purnama Simanjuntak et al., 2021). Students who have above average SRL able to manage themselves in preparing himself in learning, maintain motivation, set goals, monitor progress, and engage in self-reflection (Anderton, 2006; Purnama Simanjuntak et al., 2021).

Creative thinking encourages the progress of all disciplines, benefiting individuals and society. Many individuals can demonstrate and improve their creativity (DaVia Rubenstein et al., 2018). Creativity supports the advancement of all disciplines, providing both individual and societal benefits. Most individuals can demonstrate and improve their creativity; therefore, understanding the creative process is of particular interest to facilitate deliberate development of creative thinkers (DaVia Rubenstein et al., 2018). Creative students regulate themselves in taking control over the process; they highly believe in their self-efficacy (Katz & Stupel, 2015). SRL is considered an appropriate tool to improve creativity because it can be used in autonomous learning and self-actualization (Özyaprak & Leana-Taşcılar, 2019). The SRL aspects are predicted to work on creative thinking aspects. Research on a standardized language test showed that planning could significantly predict fluency, smoothness, originality, and flexibility. Reflecting can explain the usefulness of ideas but significantly has a negative correlation with originality. Although the strategy is correlated with fluency and flexibility, it does not explain the unique variation in the creative result (Callan et al., 2021).

Although SRL and CTSs are successfully improved, and both are mutually supporting variables, previous findings have not concluded how students regulate themselves during the creative process. In particular, they did not identify how the internal psychological condition, external behavior, and explicit strategy influence the creative process (DaVia Rubenstein et al., 2018). Therefore, the present study predicts the relation between SRL and creative thinking and the relation among the aspects. The results are expected to provide recommendation for teachers to design teaching method that empowers the SRL or CTSs for the context of learning. According to the explanation, this study aims to predict the relation between SRL and students' CTSs.

1. Methodology

1.1. Type of research

The present study belongs to quantitative research with an *ex post facto* approach and survey method to examine the relation between the dependent and independent variables. *Ex post facto* was used to analyze the causal relation that was not manipulated and untreated by the researchers. A survey was selected because it helps to answer the research problem about the relation between the predicted variables.

1.2. Population and sample

The research population included all fifth and sixth graders of elementary schools in Sleman Regency, in Special Region of Yogyakarta. The fifth and sixth graders were selected to represent the highest elementary school level, considering them having maximized their SRL. At both levels, students are considered ready to understand the research instruments. As many as 121 students consisting of 48 male and 73 female students were selected using the random sampling technique. This study took subjects in grades 5 and 6 because they represented the highest elementary school level. SRL requires that self-directed learners be aware of their academic strengths and weaknesses, and that they have a list of strategies that they implement appropriately to cope with academic challenges (Adodo, 2013). SRL assists students in managing their thoughts, behaviors, and emotions in order to successfully navigate their learning experiences. The higher the school level, the more independent students are in learning.

1.3. Data collection

The data were collected through a survey. Besides, two questionnaires are used: 1) SRL (Schunk & Zimmerman, 2013; Schunk & Greene, 2018), 2) CTSs (Torrance, 1990; Kim, 2017). The questionnaires were in the form of a Likert scale ranging from 1 to 5, consisting of favorable and unfavorable questions. They included the aspects of SRL: metacognition (planning, monitoring, evaluating), motivation (self-efficacy, self-attribution, interest in intrinsic tasks), and behavior (effort regulation, time/study environment, and help-seeking). Meanwhile, the CTSs aspects included fluency, flexibility, originality, and elaboration.

The questions listed in the questionnaire were validated in two stages. The first stage was content validity by expert judgment, which was conducted by two professionals. The questionnaires were revised based on their suggestions. The second was construct validity tests, concluding that the questionnaires were valid and reliable. The construct validity tests resulted in 18 valid items for SRL and 8 for CTSs. The reliability test using Cronbach's alpha produced SRL R_{alpha} of 0.905 and CTSs R_{alpha} 0.840. Hence, both are reliable. The questionnaires were transferred into a *Google* form to take the data from the samples. The students could only fill in the questionnaires once, although they could edit their answers.

1.4. Ethical research

All subjects gave their informed consent for inclusion before they participated in the study. The study was conducted in accordance with the protocol was approved by the Ethics

Committee of Universitas Ahmad Dahlan, Indonesia, number: 011905048. Informed consent was distributed to parents to be filled out as a form of consent. In it there is an explanation of the risk that students might feel tired when filling out the instrument. This risk can be minimized by having a break between questionnaires.

1.5. The statistical methods of data processing

The data were analyzed using descriptive statistics consisting of mean, standard deviation, and categorization. Further, cluster analysis was performed. Meanwhile, the hypotheses were tested using Pearson correlation coefficient (PCC), of which the normality was tested using Kolmogorov–Smirnov test and the variables using linearity tests.

2. Results and discussion

2.1. Results

2.1.1. Descriptive analysis of self-regulated learning

The data about SRL obtained from the questionnaires were tabulated and calculated, especially the mean, median, modus, and standard deviation, using the *SPSS* program. The descriptive analysis results of the students' SRL can be seen in Table 1.

Table 1. Descriptive statistics of students' self-regulated learning (source: created by authors)

Formula	Data
N	121
Mean	75.07
Median	75.00
Mode	70
Standard deviation	8.679

After the mean, median, modus, and standard deviation scores were obtained, they were categorized into three groups, as seen in Figure 1.

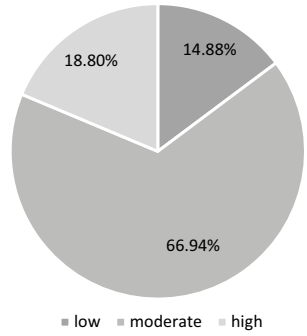

Figure 1. Self-regulated learning category (source: created by authors)

Figure 1 shows that 18 (14.88%) students have low SRL, 81 (66.94%) students moderate, and 22 (18.8%) students high. The highest percentage was reached by the moderate SRL category, while the lowest was a low category.

2.1.2. Descriptive analysis of creative thinking skills

The data of the fifth graders CTSs were obtained through questionnaires consisting of 8 items with 1–5 scales. Below are the data results of the questionnaire. The descriptive analysis results of the students' CTSs can be seen in Table 2.

Table 2. Descriptive statistics of the students' creative thinking skills (source: created by authors)

Formula	Data
N	121
Mean	33.20
Median	33.00
Mode	35
Standard deviation	3.987

After the mean, median, modus, and standard deviation scores were obtained, the CTSs were categorized, and the results can be seen in Figure 2.

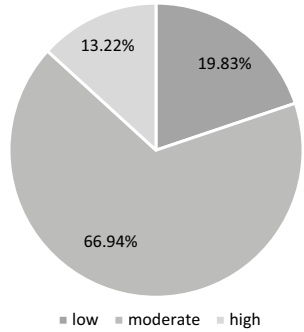

Figure 2. Creative thinking skills category (source: created by authors)

Based on Figure 2, 24 (19.83%) students have low CTSs score, 81 (66.94%) moderate, and 16 (13.22%) high. The highest percentage was the one with moderate category, while the lowest was the high category.

2.1.3. Prerequisite analysis results

2.1.3.1. Normality test

Normality test can be performed using Kolmogorov–Smirnov test with *SPSS 23.0* for *Microsoft Windows*. The data were normally distributed if the asymptotic significance (AS) (2-tailed) ≥ 0.05, while they were not normally distributed if the AS (2-tailed) < 0.05 (Aishah Ahad et al., 2011; Razali & Bee Wah, 2011). The normality test of the SRL and CTSs variables is presented in Table 3.

Table 3. Normality test results (source: created by authors)

Variables	Asymptotic significance (2-tailed)
Self-regulated learning	0.689
Creative thinking skills	0.312

Table 3 revealed that the SRL significant value was 0.689 and the CTSs 0.312. The significance value of both variables was above 0.05, meaning that the data were normally distributed.

2.1.3.2. Linearity test

In the present study, a linearity test was performed with a 5% significance level using the *SPSS* program. The results were observable through the F-test in the deviation from linearity. If the F significance value < 0.05, the relation is not linear; conversely, the relation is linear if the F significance value > 0.05. (Aishah Ahad et al., 2011; Razali & Bee Wah, 2011). The SRL and CTSs linearity test results are presented in Table 4.

Table 4. Linearity test results (source: created by authors)

Variable	F significance	F significance count	Conclusion
Self-regulated learning *versus* creative thinking skills	0.05	0.522	Linear

Table 4 concludes that the relation between SRL and CTSs was linear because the sig value of the deviation from linearity was above 0.05, which was 0.522.

2.1.4. Cluster analysis results

Based on the SRL and CTSs results, the cluster analysis was employed to divide the data into three clusters based on the characteristics. The final cluster center data were related to the standardization process referring to the standard score with the following criteria: 1) negative score (–), meaning that the data were below the total average; 2) positive score (+), meaning that the data were above the total average (Erisoglu et al., 2011; Kumar & Reddy, 2017). The descriptive analysis results of the final cluster centers are shown in Table 5.

Table 5. Descriptive analysis of self-regulated learning and creative thinking skills final cluster centers (source: created by authors)

Final cluster centers			
	Cluster		
	1	2	3
Standard score: self-regulated learning	–.06907	–1.39023	1.15114
Standard score: critical thinking skills	–.02885	–1.42934	1.11125

Table 5 concluded that there were two clusters below the average; those were clusters 1 and 2. Meanwhile, one cluster was above the average, which was cluster 3. Cluster 1 comprised students with moderate SRL and CTSs scores, while cluster 2 consisted of low SRL and CTSs scores. Meanwhile, cluster 3 included those with high SRL and CTSs scores. It means that in cluster 1, the standard score for the SRL variables was –0.06907 in the moderate category, and –1.39023 in cluster 2 in the low category, while cluster 3 1.15114 in the high category. Meanwhile, the standard score for the CTSs of cluster 1 reached –0.02885 (moderate), –1.42934 in cluster 2 (low), and in cluster 3 reached 1.11125 (high).

A partial F-test was employed in the descriptive analysis of SRL and CTSs final cluster centers in the cluster validity tests. The significance of the analysis of variance test result is shown in Table 6.

Table 6. Analysis of variance of self-regulated learning and creative thinking skills c-means (source: created by authors)

	Cluster		Error		F	Significance
		Degree of freedom	Mean square	Degree of freedom		
Standard score: self-regulated learning	48.458	2	.196	118	247.719	.000
Standard score: creative thinking skills	48.195	2	.200	118	240.869	.000

Based on Table 6, the SRL partial F-test reached 247.719 with 0.000 significance. It means that the SRL clusters 1, 2, and 3 are significantly different. Meanwhile, the partial F-test of the CTSs reached 240.869 with 0.000 significance. Hence, like the SRL results, the three clusters of CTSs are different.

2.1.5. Hypothesis testing

The hypothesis of the research was tested using PCC analysis with *SPSS 23.0* for *Microsoft Windows*. The hypothesis testing calculation is as follows.

Table 7. Hypothesis testing result (source: created by authors)

Correlation	Correlation coefficient	Significance (2-tailed)
Self-regulated learning–creative thinking skills	0.856	0.000

Based on the PCC shown in the Table 7, the correlation coefficient value was positive, reaching a score of 0.856. To know the significance of the hypothesis testing, the significance value (p) of the significance (2-tailed) was compared to 0.05. If $p < 0.05$, the correlation among variables is significant, but it will not if the p-value is below 0.05. From the result, the p-value or significance (2-tailed) was 0.000, or below 0.05. Therefore, the proposed hypothesis was accepted. In other words, there is a positive and significant relation between SRL and

CTSs of the students. The correlation coefficient value which is positive and close to +1 indicates that SRL and CTSs have a strong positive relationship. The higher the student's SRL, the higher the CTSs will be. On the other hand, when the SRL is lower, the CTSs will be lower.

Discussion

The descriptive analysis of SRL variables showed a sequence based on the highest percentage: moderate-high-low. Students with high self-regulation tend to encourage themselves to prepare and complete their tasks. They are aware of their competence and willing to show their self- efficacy (Panadero, 2017; Vrieling-Teunter et al., 2021). Individuals with self-regulation start learning by exposing great efforts and perseverance during the learning process (Ziegler & Opdenakker, 2018). Besides, they can create an interesting learning situation (Sulisworo et al., 2020, 2021). When most students have self-efficacy, they will not depend on their peers to complete their tasks, especially during distance education. Independence in SRL is the main key to successful distance education. Therefore, teachers are expected to consider this aspect in preparing for learning.

A skill component can help with self-regulation, but it is not enough. The will or desire of students to engage in self-regulation is not only crucial, but also primary. To generate the will to self-regulate, students must recognize that they are creative agents who are responsible for and capable of achieving self-development and self-determination goals, and they must appreciate and comprehend their abilities to achieve these goals. Self-regulation and the attempt to enhance self-regulation abilities follow. Integration of skill and will is thus required in interventions to promote SRL. Implications for more holistic interventions are discussed, as well as additional research on the self-as-agent framework that is required (McCombs & Marzano, 1990).

The CTSs data shows the moderate category. The percentage sequence was moderate-low-high. The students' abilities in creating ideas and finding answers or solutions indicate CTSs (Al-Zahrani, 2015; Titikusumawati et al., 2019). They can express their thought effortlessly, answer necessary questions, provide many solutions for a problem, and giving examples based on reality or experiences. However, in terms of originality, they cannot express great ideas to solve a problem or answer questions in their own way. This is a recommendation that the teacher guides students to take responsibility for developing their personal talent, which is critical in assisting students in transferring their skills to different contexts. Educators and researchers are attempting to determine which intellectual skills can be developed, as well as the most effective methods of encouraging learning in the classroom. Such concerns have prompted a renewed emphasis on the development of children's critical and creative thinking abilities (Rodd, 1999).

The relation between SRL and CTSs was analyzed using the PCC test. The PCC result of the SRL–CTSs was 0.856, which was in a strong positive category (Puth et al., 2014; Schober et al., 2018). The analysis showed that the relation between the fifth graders SRL and CTSs was significant. SRL refers to the condition where participants actively use their metacognition, motivation, and behavior in the learning process (Zimmerman, 2013). Creative thinking attitude and habit are essentially included in SRL. Further, SRL is defined as a form of learning following the learners' motivation. They autonomously develop their own measurement (cognition, metacognition, and behavior) and monitor the learning progress (Abar & Loken, 2010; Valle et al., 2008).

The research about the students' SRL and CTSs revealed that the students should regulate themselves to achieve the goals. The increase of students' self-confidence helps students think better and initiate new ideas to solve a problem. However, they need the teachers' guidance through the teaching strategies and appropriate learning media during the learning process. This way, the SRL and CTSs can be improved. The recommended learning model to encourage these two variables are problem-based learning (Sahyar et al., 2017; Purnama Simanjuntak et al., 2021), project-based learning (Zarouk et al., 2020), flipped classroom (Blau & Shamir-Inbal, 2017; Han et al., 2020; Lo & Hew, 2019), problem solving (Callan et al., 2021), and other models that provide opportunities for students to work independently and involve creative thinking.

SRL determines students' internal motivation to organize their learning strategies and CTS is important to prepare elementary school students to become creative human resources when they are productive. The goal is that teachers, lecturers, researchers, or stakeholders understand the importance of these two variables so that efforts are made to develop learning that empowers these two variables. Since CTSs affect learning achievement, the empowerment of these skills can lead to increased learning achievement (Fatmawati et al., 2019).

Creative thinking involves skills in trying different solutions to these problems and generating new ideas. Those who have CTSs get an important place in society. Because they are quick minded and possess leadership qualities, they are always appreciated by those around them (Aldig & Arseven, 2017). Comparing and making connections between creative thinking abilities and other skills can enrich teachers' insight into the potential or talents of their students. there is a significant effect of students' CTSs on student achievement (Resien et al., 2020). At the end, suggestions are proposed for distance teaching methods that can empower CTSs such as hybrid-project based learning (Rahardjanto et al., 2019) and web-based teaching (Lin & Wu, 2016).

Conclusions

There is a positive and significant relation between SRL and CTSs. The correlation coefficient shows a strong positive relationship between SRL and CTSs. The higher the student's SRL, the higher the CTSs will be. On the other hand, when the SRL is lower, the CTSs will be lower. As a recommendation, students' SRL must be considered in planning the learning process. CTSs can be affected by the active SRL when students are involved in the learning process. Teachers can identify pre-learning to map students based on their SRL, then choose a learning model that empowers them.

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