



Improving Self-regulated Learning for Student's Achievement During the COVID-19 Pandemic

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Abstract. Since the Covid-19 pandemic in early 2020, learning at several universities has taken place online. The purpose of this study was to determine the effect of Self-Regulating Learning (SRL) on Student's Learning Achievement (SLA). This research is an explanatory type with a survey research method. The research population is the students of the Faculty of Engineering (FE), State University of Surabaya (Unesa). The research sample was 249 students who were determined through stratified random sampling. The technique of collecting data is through the Self-Regulating Learning Questionnaire (SRLQ) with a five-option Likert scale, while SLA is collected through secondary data from test assessment results consisting of participation scores, assignment scores, and midterm exams, and final semester exam scores. The item analysis of the SRL uses classical theory and item response theory. Therefore, it can be concluded that all SRL items are in good categories. Hypothesis test using simple regression analysis technique. The results of the study prove that there is a significant positive effect between SRL and SLA during the Covid-19 pandemic at the FE-Unesa. The implication of the research results is the importance of lecturers and higher education administrators motivating and facilitating students to determine goal setting, metacognition strategy, environmental arrangements, computer self-efficacy, and social dimensions to support students' independence in learning.

Keywords: COVID-19 pandemic · Self-Regulated Learning · metacognition · Student's Learning Achievement

1 Introduction

The Covid-19 pandemic has had a significant impact on all sectors of society. The pandemic has had a wide-ranging effect on society, causing chaos and destruction in the education field [1]. The face-to-face learning process at all levels of education has ceased and been replaced by online learning [2]. The online policy is one of the strategic steps to minimize the possibility of Covid-19 spreading among students [1, 3]. Under the unforeseen circumstances of Covid-19, the interruption of traditional teaching and learning occurred. Due to the uncertainty of dealing with conventional models. Until recently, it was challenging to attend regular classes amid the Covid-19 outbreak, where

social distancing is paramount, so online education inevitably becomes a necessity, bringing both an organization and an individual into a thaw [4]. Online learning makes it easy for users to continue their learning at home [4]. Using digital media in higher education can be realistic and becomes a challenge for students to do better [4]. Using digital media in higher education can be realistic and becomes a challenge for students to do better [5, 6].

However, e-learning during a sudden and very rapid Covid-19 pandemic tends to have problems and obstacles. Most teachers and students without adequate training must complete e-learning, although some teachers have implemented e-learning. Not all students have the right strategies to adopt in online learning, so many faces various learning challenges. They haven't had an SRL for computer learning in a long time [7]. Students without SRL tend to have learning difficulties, affecting suboptimal learning outcomes. Students who do not have their sign will not complete it well when faced with a difficult task [8]. They see it as a burden, thus experiencing stress and frustration [9]. They lack confidence or self-efficacy. In online learning, students have difficulty because they do not understand theoretical concepts and homework [10]. This case causes them to lack confidence. They do not have a clear plan and goal for online learning. While having dreams is important because it can help students focus on their studies and achieve better results [11]. Students do not have clear plans and goals for their online learning.

Meanwhile, goals are essential in online learning as they can help students focus on education and achieve better results. However, students have difficulty online learning because they do not understand theoretical concepts and homework [10]. In addition, they may not understand the nature of education. This difficulty is exacerbated because, during the Covid-19 pandemic, the interaction between students and their teachers and friends is not optimal, so they cannot discuss effectively. To date, empirical research on e-learning strategies has mainly taken the form of peer-reviewed publications, some of which have tested SLR support in e-learning [12]. Given the lack of empirical studies on the learning success of e-learning, this study also addresses ideas and understandings about e-learning. Functions and strategies of e-learning in online learning [13]. Students with SLR can develop metacognition, motivation, and positive behavior in the learning process. He independently strives to learn directly to gain the desired knowledge and skills without depending on others [14]. Self-regulatory learning is the ability to present and monitor one's thoughts, feelings, and behaviors to achieve goals. Goals can be academic or social-emotional goals [15]. Students systematically orient their behaviors and perceptions to acquire knowledge, retain information, develop their learning capacity, and can predict learning outcomes.

Therefore, it is necessary to understand the idea and benefits of SRL to support successful learning in online learning. Furthermore, it is crucial to examine the effect of SRL on SLA. Therefore, this study will explore the SRL strategy students use in an online learning environment and further discuss the impact on academic achievement. This study aims to find out: (1) the Level of SRL in students who take online learning; (2) The suitability of SRLQ with data in the field; (3) The effect of SRL on the learning outcomes of students. The research hypothesis (H1) is that there is a positive influence between Self-Regulating Learning (SRL) and Student's Learning Achievement (SLA) on EED FT Unesa students in online learning during the Covid-19 pandemic.

2 Research Method

This research is an explanatory type with a survey research method. An analysis is causal or predictive to determine the relationship of the independent variable to the dependent variable. The research population was students of the Electrical Engineering Department (EED) of FE-Unesa. The sampling technique in this study used purposive sampling, which was calculated by the Slovin formula and found as many as 249 students.

The sample consists of 110 students of the Electrical Education Engineering Bachelor Program, 127 students of the Electrical Engineering Bachelor Program, and 12 students of Diploma IV of Electrical Engineering. The SLRQ consists of five aspects included: goal setting, metacognitive strategy, environmental arrangements, computer

Table 1. The factors and items of self-regulated learning

Factors	Items
Goal Setting	<ul style="list-style-type: none"> • I set clear daily, weekly, and monthly study goals • I don't stop with online learning until I realize my learning goals • I set my goals clearly before I started studying online.
Metacognition Strategy	<ul style="list-style-type: none"> • I summarize online materials to improve my understanding. • I use various online materials (theory reviews, powerpoints, diagrams, pictures, videos, tables, etc.) to understand certain concepts. • I find similar ones in different forms when certain learning materials are complicated. • In online learning materials, I actively ask myself and find answers.
Environmental Arrangements	<ul style="list-style-type: none"> • I study online in a comfortable space. • I know how to learn effectively online. • I study online with little or no distractions.
Computer Self Efficacy	<ul style="list-style-type: none"> • I am confident in my knowledge and skills when using online learning resources. • I can effectively use the Internet to find information related to online learning. • I quickly found the information I needed for my e- learning goals on the Internet. • In online learning, I can quickly distinguish between true and false information.
Social Dimensions	<ul style="list-style-type: none"> • To help with online learning, I communicate with my college friends • I feel comfortable communicating with my college friends. • I participate in online discussions to help my online learning. • Online learning mode (via zoom, google meet, etc.) is an excellent platform because we can communicate with other users.

self-efficacy, and social dimensions (Table 1), it has been composed of 19 items with five options of the Likert Scale.

The item validity of the research was constructed validity and content validity. Construct validity is the process of expert validity of the instrument to assess the suitability between items and indicators. Content validity was tested to determine whether the instrument items had covered the whole theoretical concept of a research construct. Content validity was determined using expert agreement using the validity index proposed by Aiken and the expert agreement index suggested by Gregory. At the same time, reliability is done to determine the extent to which the measurement results can be trusted or reliable. The content validity in the study was carried out utilizing an expert agreement with the modeling process [16].

Experts or expert judges are people who have expertise in their fields and are preparing research instruments. The rater process was carried out by giving these items to the professional judgment, which could be represented by experts in psychological instruments and experts from the field of research expertise. All the experts (rater or validator)

Table 2. Item analysis results of SLR

Items	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Cronbach' s Alpha if Item Deleted
SRL1	55.04	26,821	.479	.875
SRL2	55.04	26,599	.485	.875
SRL3	54.99	26,790	.436	.876
SRL4	54.99	26,335	.414	.877
SRL5	54.84	26,762	.447	.876
SRL6	54.92	27,227	.416	.877
SRL7	54.90	27,158	.401	.877
SRL8	54.91	27,218	.407	.877
SRL9	54.88	26,913	.408	.877
SRL10	55.07	25,898	.468	.875
SRL11	55.14	25,436	.601	.870
SRL12	55.14	24,882	.626	.869
SRL13	55.18	23,183	.732	.864
SRL14	55.12	23,601	.641	.869
SRL15	54.74	24,573	.707	.866
SRL16	54.92	25,816	.476	.875
SRL17	55.04	26,506	.452	.876
SRL18	55.01	26,274	.428	.877
SRL19	54.99	26,326	.374	.879

are recapitulated in tabulations. All items of SRLQ are very relevant for use. The magnitude of the rater agreement index of the expert agreement score for each item of the SRLQ has been calculated using the Aiken formula. After the instrument items were given to 3 experts to be validated, they provided input regarding the instrument items and fill in the items' suitability with the indicators. Based on the results of the calculation of the rater agreement index regarding the validity of the SRLQ, it has a very high truth of .84 ($> .8$), so it can be concluded that in general, the test items are very relevant to the indicator of the SRLQ.

The results of item analysis using classical theory and item responsiveness theory show that all SRL items are in the correct category. However, several points need to be improved, namely numbers 1, 2, 5, 8, 9, 15, and 18. The item analysis used the classical theory of SPSS ver 23.0 and the Item Response Theory [17, 18]. The item analysis results were determined based on the item-total correlation coefficient and the MNSQ value for weight-fit. If the value is $.5 < \text{MNSQ value for weight-fit} < 1.5$, it means that all items are in the fit category. The item analysis results show none of the things we committed because the corrected item- total correlation value was more significant than .3. The lowest Corrected Item-Total correlation score was in item number 19, which was .374, while the highest was in item number 13. Which was .732, as shown in Table 2. Therefore, it can be concluded that all items of SLRQ are in good categories for the data collection process.

3 Results and Discussion

3.1 Results

Data analysis influence of SRL on SLA is done by simple regression analysis. The SLA consists of participation scores, assignment scores, mid-semester examination scores, and end-semester examination scores. Assessment of class participation includes student attendance when conducting face-to-face, structured, and practicum activities, frequency, quality of student questions, quality of student arguments, frequency of consultations outside lecture hours, and the creativity of student reasoning. The weight of the work is adjusted to the importance of the course credits. Evaluation of learning achievement using an assessment reference. The results of the descriptive analysis include the score of minimum and maximum, mean, standard deviation (SD), variance, kurtosis, and skewness (Table 3).

Table 3. Descriptive statistics

	N	Min	Max	Mean	S.D.
	Stats.	Stats.	Stats.	Stats.	Stats.
SRL	249	47	71	58.05	5.366
SLA	249	2.60	3.83	3.2209	.27069
Valid N (listwise)	249				

The data description of the SRL variable is a minimum score of 47, a maximum score of 71, a mean of 58,058, and an SD of 5.37. The score of SLA of 2.6, the top score of 3.83, the mean 3.22, and the SD of .27. The level of SRL of research subjects is in the moderate (60%), high (21%), and low (19%) categories. This means of SRL is reasonable to the high class. The Student's Learning Achievement (SLA) are in the moderate (67%), high (20%), and low (13%) categories.

The normality test is carried out as a requirement for a correlational statistical technique that connects the two variables in this study. Hypothesis testing can use parametric statistical tests if the data is typically distributed. Conversely, if the information is not normally distributed, then hypothesis testing can use non-parametric statistical tests. In this study, the normality test using the Shapiro-Wilk technique was carried out through the SPSS 23.0 for Windows. The results of the SRL normality test and student learning outcomes displayed in the output window are as follows.

The significance value (p) in the Kolmogorov-Smirnov test for the SRL and Student's Learning Achievement variables each are .61 and .070 ($p > .05$), so it can be interpreted that the data for each variable are customarily distributed ($N > 50$).

The linearity test determines a linear relationship between the independent and the dependent variable. The linearity test was carried out by comparing the mean of the two variables through the SPSS 23.0 for the Windows program. The criteria for determining the relationship between linear variables or not are as follows if the level of significance ($p < .05$) then the relationship between the two variables is linear, conversely if the significance level ($p > .05$), then the relationship between the two variables is not linear. Table 7 shows the summary of the results of the linearity test among the research variables.

According to analytical results, significance level (Sig.) of .000 or less ($<$) compared with a probability value of .05, H_0 is discarded, and H_1 is accepted to be concluded. The results of the hypothesis test using regression analysis, a t-value of 39.927. The formula to find the table is: the score of $t / 2 = .05 / 2 = .025$. Degrees of freedom (df) = $n - 2 = 100 - 2 = 98$. Next, we look at the value (.025; 98) in the t-table distribution and get the achievable value of 2.36. Given that t-count is larger than t-table ($39.927 > 2.36$), it can be concluded that there is an impact of SLR on SLA. The R-square change value is .866, which means that the influence of SRL on SLA is 86.6%, while the other variables affect 13.4% rest.

3.2 Discussion

The study results show a strong influence of SLR on SLA. Online or distance learning implies that students are physically distant from their lectures and require specific strategies. This result was the statement that online learning is the best alternative learning method when offline learning methods cannot [19]. Online learning is the best alternative method when offline learning cannot be applied [2]. Academically, factors affecting academic success have always received much attention, and automated learning is no exception. College students need the SRL to participate in the learning process actively. SRL studies are strongly related to student academic success. SLR is a concept of how a person becomes their manager in his learning activities. SLR is the capacity by which a

person can activate and encourage systematically planned thoughts (perceptions), emotions (affects) and actions, and repetition to achieve learning goals [8]. SLR is a process in which students activate thoughts, feelings, and activities to achieve specific educational goals. SRL as students participating in SRL take control of their learning [8].

There are several models and frameworks of SRL but the main components of the models are similar. Students who self-regulate their learning have metacognitive, behavioral, and positive motivation in the learning process and go through three stages: preparation, implementation, and evaluation. During the preparation phase, set goals, and make work plans. Next, students engage in cognitive strategies during the implementation phase, learn about existing material, track their learning, adjust their learning strategies, and allocate their resources (e.g., time. And cost) in the most efficient manner. During the assessment phase, students reflect on their learning, the strategy's success, and the next steps. Learners can participate in different activities depending on their learning. In SRL activities, learners are actively involved in defining lesson goals and plans (preparatory phase), monitoring understanding, and adjusting strategies during the learning process (real-time step). Present) and reflect on the cognitive systems in the post-learning (evaluation phase). In addition to metacognitive activity, SRL is also involved in behavioral regulation and motivation. Behavioral aspects include time management, adapting to learning environments, and seeking help. The influence of SRL on cognitive learning strategies is a consideration in the association of SRL with better student learning outcomes [13]. Cognitive systems influence learning success. Because of the importance of SRL to student success, much research has been conducted on the effect of SRL interventions on student engagement on academic success.

The improvement of the independent SRL in e-learning covers five aspects, particularly related to goal setting, metacognitive strategies, environmental arrangements, self-efficacy, and social aspects. Self-regulating learning is not a mental capacity such as intelligence or learning ability, but rather the process by which students control their thoughts, behaviors, and emotions to succeed in the learning process [21]. While learning achievement can be cognitive, affective, and psychomotor. Learning achievement is the product of a learning activity planned and carried out individually or in groups.

Learning can be achieved if students have engaged in activities to change cognitive, affective, and psychological aspects. [22]. The study results showed that students did not encounter any problems, although online learning happened suddenly. These findings mean that students can adapt to the online learning model. Likewise, although students are not specially trained for online learning, they do not have learning difficulties as previously thought [23]. Besides, the research findings also show that SRL has a positive effect on academic success, demonstrating that students have the right strategies to apply in online learning so that they don't have learning difficulties. These findings mean that they have had independence and persistence in computer learning for a long time [7]. Students with a high SRL tend to take on challenging and gradual tasks and put more effort into achieving their goals [13]. This study showed SRL influences student assignment completion. People with good SRL choose tasks based on their abilities. Students with high SRL can grasp particular subjects, accomplish associated occupations, and apply them practically. Low SRL hinders learning and task completion. Studies reveal that metacognition in online learning contexts self-regulates cognitive, emotional, and

conscious interactions. Learning motivates students to work hard, even when they face obstacles, because they have high efficacy.

Motivation affects SRL in vocational education. Reasonable pupils have greater SRL. Low SRL suggests pupils are more likely to withdraw from learning activities. Students with high SRL, especially in reading and writing, used a complete learning method, according to another study. In contrast, those with low SRL tended to adopt a modest learning approach or strategy [7]. The research findings also show that the effectiveness of computers has a positive and significant effect on student learning outcomes. In this way, it has been proven that students with better computer skills will achieve better academic results independently. Learners with better computer independence will begin to master the more difficult tasks of online learning and achieve better results. Centered education is related to the concept of high- quality lifelong learning [13]. Independent learning can be achieved by providing real learning challenges and thinking skills to increase innovation [24]. Therefore, students should be trained on using e-learning platforms, enabling them to be more confident and achieve better results. This result is consistent with other research findings showing that students with SRL tend to be academically successful. Despite receiving complex and challenging tasks, students with SRL can do well.

The findings of the research, which show that SRL has a positive effect on academic success, have proven that in online learning, students can understand theoretical concepts and assignments. Students with low SRL do not understand concepts and theories, do not have thinking skills, independence, perseverance, self-efficacy, or lack of self-confidence, and cannot choose positive activities that hinder their learning process. There have been many obstacles in implementing online learning in universities, especially students' logic and reasoning [1, 2]. The scope of the subject matter is emphasized to encourage students to think at a higher level and hone their ability to innovate and create optimally. Characteristics of students in vocational colleges are different from academic education. They are directed to work preparation so that their learning orientation is focused on achieving work competence. The results of this study show how important the role of self-regulated learning is in honing students' cognitive abilities so that, in the end, they can improve the quality and competence of graduates. They understand the nature of education [10]. Students must apply metacognitive strategies to effectively manage their cognitive and learning processes. In this way, they should take responsibility for using metacognitive strategies to achieve better academic achievement [2, 8, 13, 25].

Thinking skills stimulate the development of students' oral and questioning skills. Thinking skills are also an essential part of the global education system. Students have a better learning experience and are more comfortable with learning activities. Students who have good cognitive skills can complete the task. A good SRL student will control his thoughts, behavior, and emotions to achieve success in the learning process [26]. The findings of this study are highly relevant and relate to the development of process skills. Students who have good SRL tend not to experience significant difficulties in learning [9]. He feels comfortable in education and can complete assignments well. Students who have SRL can complete complex and challenging tasks. Students who have good

metacognitive strategies can manage their cognitive processes efficiently. He finds new experiences to learn better to feel comfortable with the online learning process.

The results of the study also prove that there is good communication between students, lectures, and friends to discuss effectively while online learning is suddenly taking place during the Covid-19 pandemic. The result means that e-learning provides additional training opportunities for the course. This information showed that lectures are a very positive motivation in online teaching during of the Covid-19 pandemic. Findings from the study also showed that some students did not have sufficient learning space and online learning facilities, but they did not have learning disabilities. This result also explains that providing a good learning environment positively affects learning outcomes and has a positive impact on learning outcomes. A relaxed learning environment, digital devices, and internet networks will motivate the students. A relaxed learning atmosphere, digital facilities and equipment, and internet networks increase student motivation. Students will feel comfortable at home for hours and become more independent and confident. To achieve better results, students need to build social interactions between students, peers, and teachers. Good communication builds trust.

4 Conclusion

Due to the COVID-19 pandemic, universities around the world are canceling face-to-face lessons in favor of online learning. This learning model cannot completely replace on-campus learning, especially for practical learning materials. The sudden introduction of online learning means that universities are unable to properly prepare their strategies and agencies. Successful online learning also depends on the motivation of faculty and students, the quality of learning materials, the availability of facilities, and the internet. Instructors and students should use information and communication technology as much as possible to develop specific strategies for online learning. One of the key strategies for students is that they need self-adjusting learning skills to successfully achieve their learning goals.

The results of the study show a significant effect between the SRL on SLA. It means the importance of encouraging students to have SRL which consists of aspects of goal setting, metacognition strategies, environmental management, computer self-efficacy, and social dimensions in online learning. Students who have SRL will focus on learning, can overcome learning difficulties, and can even achieve academic achievement. As we know that online learning requires students to actively explore information through digital literacy and build communication with lecturers and colleagues. Students must effectively have metacognitive strategies to manage their cognitive processes. The results of this study also show that the university focuses on students, has meta-cognitive and self-efficacy strategies in information technology make the best use of learning facilities and facilities, and establishes good communication with faculty and peers. It suggests that you need to be encouraged to do so. The instructor also needs to teach the student about self-efficacy and metacognitive strategies. For online learning policies to work effectively, universities need to provide appropriate learning facilities and facilities.

Authors' Contributions. All authors have contributed in presenting this article. Tri Wrahatnolo prepared the instrument. Bambang Suprianto acquired and analyzed the data. IGP Asto Buditjahjanto and Yulia Fransisca interpreted the data and wrote the article.

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