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Analysis of Self-Regulated Learning Levels in Prospective Elementary School Teacher Students in Surakarta

Fadhil Purnama Adi[1], Idam Ragil Widianto Atmojo[2], Matsuri[3], Chumdari[4], Roy Ardiansyah[5] & Dwi Yuniasih Saputri[6]

[1,2,3,4,5,6] Elementary School Teacher Education Study Program, Sebelas Maret University, Surakarta, Indonesia

✉ idamragil@fkip.uns.ac.id

Abstract. This study focuses on self-regulated learning (SRL), a process in which individuals actively control their learning process through planning, monitoring, and self-evaluation. The purpose of this study was to analyze the level of SRL in the Surakarta Elementary School Teacher Education Study Program. The method used was a survey. The population in this study consisted of students from the Elementary School Teacher Education (ESTE) Program at the Faculty of Teacher Training and Education, UNS Surakarta. The sample comprised 105 students. The instrument used in this study was a questionnaire encompassing aspects of metacognition, motivation, and behavior. The data analysis technique employed descriptive statistics. The results showed that the level of SRL of Surakarta Elementary School Teacher Education students was in the moderate category. Although students have demonstrated adequate SRL abilities, several aspects still need to be improved, especially in terms of time management and learning strategies. This shows that although students have managed their learning quite well, there is still room for improvement in these aspects. These findings provide valuable insights for curriculum development and teaching strategies in the Surakarta Elementary School Teacher Education Study Program. By understanding weaknesses in time management and learning strategies, curriculum development and teaching methods can be focused on these areas to further support the improvement of students' SRL, thereby improving the effectiveness of their learning and academic outcomes.

Keywords: Self-Regulated Learning; Profile; Analysis; Students; Elementary School Teachers.

1. Introduction

Students are young adults pursuing higher education and are in a transitional period intellectually, socially, and physically (Thompson et al., 2021). They must adapt to social expectations, new lifestyle patterns, and a campus environment that differs from school, such as time management for studying and adjusting to a new environment (Ivemark & Ambrose, 2021). Effective adaptation helps students fulfill their academic responsibilities and complete their studies on time (Hussain & Shen, 2019). First-year students, who are in the transition from adolescence to emerging adulthood, face greater challenges in making decisions and taking responsibility for their lives. Moreover, the academic tasks assigned during their studies are part of the development of students' potential (Feyisa et al., 2022).

Self-regulated learning (SRL) is the ability of individuals to regulate their learning process. This involves a series of activities such as planning, monitoring, and evaluating the ongoing learning process. SRL is important for the development of independence in learning, which is very much needed in the current information and technology era where lifelong learning is a must. Students must take the initiative to use this technology to develop learning strategies and engage in an active learning process called self-regulated learning (SRL) (Xia., 2023). Students' previous expertise can predict SRL. This is supported and explained by the four phases of Winne and Hadwin's (2008) SRL model. Students with different prior knowledge process information differently at each stage. Students with sufficient prior knowledge tend to use a more effective approach to completing SRL tasks (Wei, 2023). Several studies on SRL generally agree that the

purpose of using the SRL method can trigger some metacognitive activities, which occur during the learning process and problem-solving activities. In addition, a study by Paans et al. argues that student-directed SRL activities that occur at the micro and macro levels, including goal setting and knowledge acquisition, can be developed and occur simultaneously (Chang., 2023).

Self-regulated learning (SRL) is a cyclical process in which students become active and reflective in their learning. Self-regulated learning shapes students into subjects in the learning process by initiating metacognitive, cognitive, motivational, and emotional processes to acquire knowledge and skills. They believe that SRL skills can be developed and the use of strategies and the conscious activation of metacognitive knowledge are essential to effectively address learning challenges (Karlen., 2023). Therefore, children need to become independent and self-directed lifelong learners. This means that students need to learn independently outside the classroom and use various SRL strategies. Self-directed learning is considered an important form of competence in the 21st century. This is the basis of the idea of lifelong learning. Specifically, three motivational beliefs (growth, self-efficacy, and intrinsic value) and three types of SRL strategies (monitoring, effort regulation, and goal setting and planning) were included in this study (Bai & Wang, 2023). SRL is a broad character formation that includes cognitive, behavioral, and affective aspects of learning (Panadero, 2017) that focuses on the active role of students, who self-regulate their learning process in a recursive cycle that is considered to involve three main phases: preparation, implementation, and reassessment. In other words, self-regulated learners set functional goals and organize their studies; know and use learning strategies; and have metacognitive awareness of their learning process (Feraco., 2023). SRL has been found to be related to learning performance, especially in situations where students apply knowledge and skills to new situations and problems. Previous research has shown that metacognitive activities promote a deeper understanding of learning content and monitoring activities are associated with increased use of learning strategies (Lim., 2023). Self-regulated learning adjusts students' learning methods and attitudes toward time management throughout their learning activities at school and at home. Students who show a high level of discipline when studying. These students are as follows. Being on time and attending class usually results in better academic achievement. Self-regulated learning (SRL) is a method and philosophy in education where students acquire their own knowledge and develop their ability to research and think critically (Respati & Atun, 2023). Therefore, every teacher must be able to facilitate and socialize SRL among students. Recently, the focus of research on SRL has shifted from directly training students' self-regulation to training teachers to support students' self-regulation in learning. Despite evidence that SRL can be improved through education, there is a lack of understanding of how teachers can effectively improve SRL. Furthermore, little is known about teachers' intentions that guide different approaches to supporting SRL in the classroom (Dignath & Veenman, 2021). Students will have intrinsic motivation to achieve something and will have positive emotions to get good grades. If students have intrinsic motivation to engage in an activity because they feel it will be useful for their future or because they recognize the importance of the skills they can develop through the activity. External and innate constraints relate to undesirable behaviors such as reluctance or passive compliance (El-adl & Alkharusi, 2020).

To support the development of students' SRL skills, teachers can show students how the skill can be performed and clarify why, when, and how to use the skill. At the imitation level (Level 2), students can perform the skill in a way that approximates the general strategic form of the model, for example, the type of self-generated metacognitive questions asked during task completion, rather than the exact wording of the questions. To reach this level, it is generally beneficial for students to also practice the skill (and reflect on this practice) and receive guidance, feedback, and social reinforcement from the teacher (Granberg, 2021). This suggests that students with strong SRL knowledge are more likely to relearn previously learned learning content. In addition, goal setting and strategic planning predict goal achievement, whereas help-seeking is associated with lower goal achievement (Jivet, 2020).

1.1. Problem Statement

In teacher education, especially the Elementary School Teacher Education Study Program (ESTE), SRL skills are very important. ESTE students are not only required to have pedagogical knowledge and skills but must also be able to manage their own learning in order to implement effective learning methods when teaching later. Therefore, good SRL skills are expected to prepare prospective teachers who are not only competent but also able to teach SRL skills to their students. In other words, independent learning is when students who set goals in the learning process use metacognitive, motivational, behavioral strategies to plan, monitor, adjust, reflect on their learning process actions referring to their own learning processes and behaviors. It can also be considered a learning style that emphasizes students actively motivating themselves and actively implementing appropriate learning strategies. Research shows that independent learning has a significant impact on student academic achievement (An., 2024). To achieve this goal, independent learners develop and use a variety of learning strategies. They ask for feedback. Engage in self-reflection, monitoring, evaluation have the ability and willingness to adjust functional flexibility according to the needs of each situation. In contrast, students who struggle with SRL often misunderstand task standards and are unable to plan their approach to tasks effectively (Brenner, 2024).

In the Surakarta ESTE Study Program, the importance of SRL has been recognized, but the extent to which this ability is mastered by students still needs to be analyzed. The learning experience in college should provide a strong foundation for the development of SRL. However, various factors such as curriculum, teaching methods, and learning environments can affect students' SRL levels. In addition, a meta-analysis by Dignath & Veeman (2021) showed that the impact of approaches that promote SRL is more significant when implemented by researchers than by lecturers who use standard written protocols to teach SRL. Research clearly shows that the need for lecturers to be trained in the explicit teaching of SRL strategies also includes the requirement to integrate this explicit teaching in a domain-specific manner (Sins., 2024). Several studies have shown that many students still have difficulty managing study time, setting learning goals, and evaluating their progress.

Self-regulated learning (SRL) is an essential skill for prospective elementary school teachers, as they are not only required to master the subject matter but also to serve as role models in fostering independent learning. However, the extent to which students in Surakarta have developed this ability remains underexplored. Understanding SRL levels can assist higher education institutions in designing more effective learning programs. To address this gap, a quantitative survey study is necessary, as it allows for the efficient collection of data from a large number of respondents, providing representative insights and yielding generalizable findings. This study is also relevant because SRL encompasses three main aspects: metacognition, motivation, and behavior. Metacognition helps students plan, monitor, and evaluate their learning processes, while motivation serves as the primary driver for achieving learning goals. The behavioral aspect involves tangible actions such as time management and the use of learning resources. By measuring these three aspects, the study can provide a comprehensive overview of SRL among prospective teachers in Surakarta. Additionally, it can serve as a foundation for improving curricula, supporting the development of SRL skills, and preparing students to face the challenges of the 21st century.

In addition, with a better understanding of students' SRL levels, study programs can develop more effective learning strategies. For example, integrating SRL exercises into the curriculum, using technology that supports independent learning, and providing constructive feedback can help improve students' SRL abilities. Thus, this study aims to measure and analyze the SRL levels of Surakarta ESTE students and provide relevant recommendations for improving the learning process.

1.2. Related Research

Research on the Level of Students' Critical Thinking Ability Based on Self-Regulated Learning Through the Guided Discovery Learning Method. The results show that the use of the guided discovery learning method has a significant influence on students' critical thinking and self-regulated learning abilities (Wayudi et al., 2020).

The second relevant study is "Differences in Students' Mathematical Critical Thinking Skills in Terms of Self-Regulated Learning" (Gusmawan et al., 2021). This finding shows that students' mathematical critical thinking skills differ significantly between students with high, medium, and low self-regulated learning categories. This study also serves as a reference for the relationship between critical thinking skills and self-regulated learning.

The last relevant research is "Effects of Self-regulated Learning and Procrastination on Academic Stress, Subjective Well-being, and Academic Achievement in Secondary Education" (García-Ros et al., 2022). This research is associative quantitative research with variable X1 being self-regulated learning, variable Y1 being academic stress, Y2 being subjective well-being, Y3 being academic achievement, and variable academic procrastination as a moderating variable. The results of this study show the importance of self-regulated learning. This is because SRL can reduce procrastination and academic stress of learners, and can improve the achievement, and self-well-being of learners.

This study presents a theoretical perspective on the relationship between personality and self-regulated learning, by trying to examine more deeply the understanding of the relationship between these two constructs based on the results of previous studies. The studies analyzed presented various results, but most of them claimed that personality traits represent important predictors of self-regulated learning and academic achievement. The results of the studies analyzed support, especially the importance of conscientiousness as a predictor of self-regulated learning, which is considered by some authors to be the most important component of personality. However, some studies also identified a positive relationship between extraversion, openness, neuroticism, and agreeableness, as well as the use of self-directed learning strategies.

This study differs from previous research. The topic of this study highlights 21st-century skills that are relevant to the current context. Self-regulated learning is an important variable and a novel contribution to this research, as it refers to an individual's ability to manage thoughts, control emotions and actions, and provide self-reinforcement. Self-regulated learning can strengthen self-motivation in achieving academic success, particularly in problem-solving using critical thinking skills (Napis & Rahmatulloh, 2021). The skills required for the 21st century include critical thinking, collaboration, communication, creativity and innovation, self-regulation, global connectivity, local connectivity, and the use of technology as a learning tool. Essentially, every individual is a critical thinker, with differences lying in their characteristics (Fauzi & Abidin, 2019). Therefore, it is important for students to understand their own characteristics to plan learning strategies and self-regulation processes according to their individual traits.

1.3. Research Objectives

The aim of this study is to analyze the level of self-regulated learning (SRL) among prospective elementary school teachers in Surakarta, focusing on identifying SRL levels across three main aspects: metacognition, motivation, and behavior. This research seeks to provide a comprehensive overview of the extent to which students have developed independent learning skills necessary for their future careers as educators. The findings of this analysis are expected to serve as a basis for understanding the strengths and weaknesses of students' SRL and to offer recommendations for the development of more effective educational programs. The results of this analysis are expected to provide insight into the development of curriculum and teaching strategies that can improve students' SRL abilities in the study program.

2. Theoretical Framework

Describe concepts that represent the framework of the research topic. It is derived from the variables or focus of the problem raised in the research. Use well-established reference sources to build a theoretical framework.

2.1. Self-Regulated Learning

Self-regulated learning is an active, constructive process in which students set learning goals, manage cognition, motivation, and behavior to achieve learning objectives (Valente et al.,

2024). A self-regulated learner sets goals and plans to achieve them, applies strategies they believe will help them reach these goals, and monitors their learning activities to assess the effectiveness of their learning behaviors (Raković et al., 2022). Kusniawati et al. (2020) argue that there are four indicators of self-regulated learning: learning continuity, learning activity, awareness of goals, and responsibility for learning. Individuals with good self-regulation tend to achieve optimal learning outcomes (Radović et al., 2024). A self-regulated learner will set goals and plans to achieve them, implement strategies that they believe will help them achieve their goals, and monitor learning activities to determine the effectiveness of the learning behavior carried out (Raković et al., 2022).

Self-regulated learning is defined as independent learning because students can control their learning process by using strategies that are in accordance with their understanding of the tasks given, reinforcement in decision-making, and self-motivation (Azmi, 2016). Self-regulated learning is an integrated learning process combined with a set of motivational beliefs, behaviors, and metacognitive activities that are planned and adapted to support the achievement of personal goals (Sun et al., 2018). Furthermore, self-regulated learning is a process of learning independently and actively by planning, observing, controlling, and evaluating oneself systematically to achieve learning goals (Anwar et al., 2022). Based on several opinions, it can be synthesized that SRL or self-regulation in learning is an ability within a person to be able to plan, control, and evaluate their learning behavior aimed at achieving learning goals.

2.2. Self-Regulated Learning Indicators

Zimmerman (1989) explains that self-regulated learning includes three indicators, namely metacognition, motivation, and behavior.

1. Metacognition includes the process of understanding and self-awareness in determining the learning approach as a thinking process. Cognition in this context is a person's ability to plan, control, direct, supervise, and evaluate learning activities (Zimmerman, 1990).

2. Motivation is an internal drive that includes their perception of self-efficacy and their abilities. Motivation is an indicator that shows high efficacy characteristics, interest in tasks, and perceptions of self-ability (Zimmerman, 1990). Motivation can help someone achieve certain goals because motivation is related to emotions so it can provide self-motivation. (Wesarg-Menzel et al., 2023).

3. Behavior is an individual's effort to control themselves, select, and create an environment that supports learning activities. This indicator is a real action that arises with the intention of achieving goals in learning activities (Gufron & Risnawita, 2011).

Gestiardi & Dahlan (2020) in their research stated that self-regulated learning indicators broadly include the cognitive phase, process phase, and self-reflection phase. Self-regulated learning indicators include initiative desire to learn direction, and decision-making (Lesmanawati et al., 2020). Competencies in self-regulated learning include students' ability to monitor and regulate their cognition, emotions, motivation, and behavior to achieve goals (Hertel & Karlen, 2021). Furthermore, cognitive, motivational, and behavioral strategies are indicators of self-regulated learning (Rahmawatia et al., 2022).

Based on the above opinion, it can be synthesized that the indicators that form self-regulated learning include cognition which is the process of understanding and awareness in determining the learning approach, motivation from within which includes perceptions of one's abilities and behavior which is an individual's effort to regulate themselves and their environment to support their learning activities. (Zimmerman, 1990; Gufron & Risnawita, 2011; Mulyana et al., 2015; Gestiardi & Dahlan, 2020; Lesmanawati et al. 2020; Hertel & Karlen, 2021; Rahmawatia et al., 2022).

3. Method

3.1. Research Design

This study employed a quantitative research method. Sugiyono (2018) states that the quantitative method can be defined as the research method based on the positivist philosophy, used to study the population or certain samples. The data was collected using the survey as a research instrument, followed by quantitative/statistical analysis, aiming to draw and test the hypothesis. According to Sukmadinata (2011), a survey is used to obtain a general overview of the population characteristics. There are three main characteristics of the survey; they are: 1) the data obtained from the big group aiming to describe many aspects and characteristics such as knowledge, behavior, beliefs, and skills, 2) the data obtained from either written or verbal questions from the population, 2) the data gained from the sample, not the population. In addition, the quantitative descriptive method was used to analyze the data based on descriptive statistics. Additionally, the study utilized a quantitative descriptive method to analyze the data, based on descriptive statistics. This approach allowed for an in-depth examination of the data's central tendencies, distribution, and variation, providing a clear and organized presentation of the findings. The use of these methods aligns with the study's aim to quantitatively assess the levels of self-regulated learning among students, offering reliable insights into the factors affecting their academic performance and learning behaviors.

3.2. Respondent

The population in this study consisted of all students in the Elementary School Teacher Education program. The sample for this study comprised 105 prospective elementary school teachers. Second-semester students were purposefully selected because in that semester students got environmental pollution material. Students involved in the study were students who took human and environmental courses. Cluster Random sampling was the sampling technique employed, by the purpose/focus of this study.

The sampling selection for students in the 2022 cohort of the Elementary School Teacher Education Program was based on the following: (1) Random sampling is the sampling technique used in this study. This sampling method is based on a previous sampling approach, where probability sampling is employed with cluster random sampling. (2) The selection of first-year students from the Surakarta Elementary School Teacher Education Program was made because, at this stage, students typically experience cognitive development at the formal operational stage, allowing them to think more abstractly, ideally, and logically. This stage requires students to be independent in dealing with changes, both physically and psychologically, which is why the researcher chose this sample of students.

Cluster random sampling is a sampling technique that selects groups rather than individuals at random. These groups are heterogeneous in nature (Mweshi & Sakyi, 2020). In this method, clusters or areas are chosen, and then these clusters are used for sampling. The selection of this sampling technique was due to the large population size, where students were selected based on their groups or classes. The cluster random sampling method was implemented by first identifying the population area, which consisted of the first-year students of the Elementary School Teacher Education Program in the cohort. There were 213 students in total, divided into six classes: A, B, C, D, E, and F. The population was randomly sampled, and the selected classes for sampling were 2B, 2E, and 2F, with a total of 105 students.

3.3. Data Collection

The measurement of self-regulated learning variables in this study used the Assessing Academic Self-Regulated Learning measuring instrument developed by Wolters, Pintrich, and Karabenick in 2005, which was composed of 32 items. This measuring instrument was then adapted and adjusted to the conditions at the research site. This scale is designed to observe self-regulation carried out by students in general and this instrument is intended for use on students at the college level. The components in this scale are divided into three, namely the metacognition scale, the motivation scale, and the behavior scale. The metacognition factor measures the process of understanding and self-awareness of students in determining learning as a thinking

process. The motivation factor analyzes the values of students' goals and beliefs about their abilities, and their anxiety for exams. The behavior factor evaluates individual efforts to regulate themselves, choose, and create a supportive learning environment. The assessment on the scale uses the Assessing Academic Self-Regulated Learning with a modification from a 5-point Likert scale to a 4-point Likert scale with the options strongly agree (SS), agree (S), disagree (TS), and strongly disagree (STS). Modification of the Likert scale eliminates the middle or neutral answer category, this is done to eliminate the weaknesses of the five-level scale. This occurs because of differences of opinion among researchers in Indonesia in using the middle alternative because Indonesians have several characteristics that encourage the tendency to choose the middle answer alternative when there is a Likert scale (Widhiarso, 2012). Statements in the scale consist of favorable and unfavorable statements. The self-regulated learning questionnaire assessment scores can be seen in Table 1 below.

Table 1. Self-Regulated Learning Answer Values

Favorable Items		**Unfavorable Items**	
Strongly Disagree (STS)	1	Strongly Agree (SS)	1
Disagree (TS)	2	Agree (S)	2
Agree (S)	3	Disagree (TS)	3
Strongly Agree (SS)	4	Strongly Disagree (STS)	4

The following Table 2 is the blueprint of the self-regulated learning instrument developed by the researcher, encompassing three aspects: motivation, metacognition, and behavior.

Table 2. Self Regulated Learning Instrument Grid

No	Aspect	Indicator	Descriptor
1	Metacognition	Rehearsal Strategies	Reread the notes taken during the face-to-face meeting. Remember and note down the keywords for each material
		Elaboration Strategies	Linking materials. Searching for information from other sources
		Organizational Strategies	Reorganizing lecture notes Grouping lecture materials
		Metacognitive Self Regulation	Planning activities before learning Prepare questions related to tomorrow's lecture material.
2	Motivation	Memory Self Task	Instill a mindset in yourself to learn. Give yourself encouragement
		Relevance Enhancement	Have a mindset that all materials are useful for life Studying various kinds of materials.
		Situational Interest Enhancement	Looking for interesting learning media. Using appropriate learning methods
		Performance/Relative Ability Self Talk	Motivate yourself with other people's achievements. Looking for motivation through motivational words
		Performance/Extrinsic Self Task	Trying to get better results Instilling a mindset to be the best
		Self Consequating	Give rewards if you reach the target.
		Environmental Structuring	Eliminate distractions while studying Arranging the learning environment
3	Behavior	Effort Regulation	Trying to do the task. Learn what you like and dislike.
		Regulating time and study environment	Make the most of your time
		Help Seeking	Ask for help if you have difficulties. Ask if you don't understand

Source: Zimmerman (1989)

3.4. Data Analysis

In this study, researchers used a quantitative data analysis method with a descriptive approach. A quantitative method is a study approach that primarily uses a postpositivist paradigm in developing science (such as exploring cause and effect, reduction to variables, hypotheses, and specific questions, using measurement and observation, and theory testing), using research strategies such as experiments and surveys that require statistical data (Emriz, 2008).

The categorization of self-regulated learning scale scores in this study is based on the normal categorization according to Azwar (2016) which can be used as follows (See Table 3).

Table 3. Self-Regulated Learning Score Categories

Category	Criteria
X < M - 1.5 SD	Very Low
M - 1.5 SD < X ≤ M - 0.5 SD	Low
M - 0.5 SD < X ≤ M + 0.5 SD	Currently
M + 0.5 SD < X ≤ M + 1.5 SD	Very high
M + 1.5 SD < X	Tall

Source: (Azwar, 2016).

3.5. Validity and Reliability

Validity testing aims to determine the validity of an instrument, with the assumption that the data used is the data that actually occurs in the object. This study uses internal validity in the form of content validity. Researchers use content validity testing to determine the extent to which the items in the research instrument are able to represent the components of the contents of the object to be studied. Examined/measured and the extent to which the items can represent the behavior to be measured (Azwar, 2016). The content validity test of the self regulation scale instrument were carried out by expert judgment or consultation with experts in terms of construct, material, and language. The experts who became expert judgment of the self regulated learning were 6 people. The content validity test used Aiken's V. Item assessment was carried out by giving a value of 1 which means very irrelevant to the number 5 which means very relevant (Azwar, 2016). Content validity uses the Aiken's V statistic as follows.

$$V = \frac{\sum s}{n(c-1)} - 1$$

Information:

s = r – lo

lo = The lowest validity assessment number (in this case 1)

c = The highest validity assessment number (in this case 5)

r = Number given by an appraiser

n = Number of experts who assessed

Source: Azwar (2016).

Based on the calculation of the Aiken's V formula, the validity of the self-regulated learning scale instrument, assessed by 6 raters using a 4-point scale, resulted in a V value of 0.78. Reliability is the consistency and stability of respondents in answering questions or statements related to question constructs which are dimensions of a variable and are arranged in the form of a questionnaire (Sujarweni & Utami, 2019). The purpose of the reliability test is to ensure that respondents have consistent answers when filling out the scale. The reliability testing of the descriptive and scale test instruments in this study used the Alpha Cronbach technique. The Alpha Cronbach technique was chosen because it can be used to find the reliability of instruments in the form of scales or descriptive tests. The reliability formula using Alpha Cronbach is as follows:

$$r_{11}\left(\frac{n}{(n-1)}\right)\left(1-\frac{\sum\sigma_i^2}{\sigma_i^2}\right)$$

Information:

r_{11} = the reliability of the instrument to be sought

n = number of questions

$\sum o_{i^2}$ = sum of score variance for each item

o_{i^2} = Total variance

The reliability coefficient indicates whether an instrument is reliable or not. The results of the reliability coefficient of 0.70 or more ($r_{11} \geq 70$) can be said that the instrument is reliable in the sense that the instrument can be used for research or measurement (Budiyono, 2015). The results of the instrument reliability obtained were 0.84 so it can be concluded that the self-regulated learning instrument is reliable.

4. Findings

The results of the analysis show that the average SRL level of Surakarta ESTE students is in the moderate category. The average score for the planning aspect is 3.5 (scale 1-5), monitoring 3.2, and self-evaluation 3.0. This shows that students have basic skills in managing their learning process, but still need improvement, especially in the aspect of self-evaluation. Based on the results of self-regulated research on students, the following results were obtained (See Figure 1).

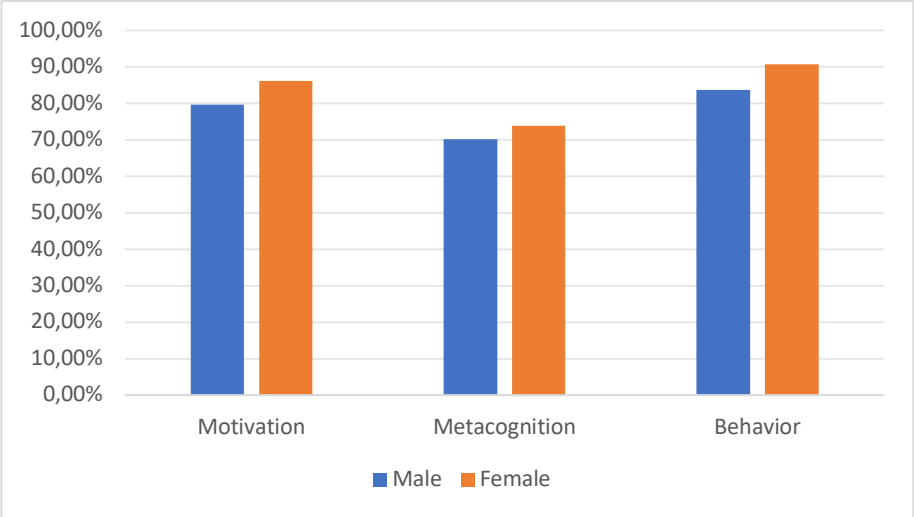

Figure 1. Research Data on Self-Regulated Students

From the results above, it can be concluded that female and male students have differences regarding self-regulated learning. In the metacognition aspect, female students get results of 73.93% while male students get results of 70.18%. In the motivation aspect, female students get results of 86.07% and male students get results of 79.73% while in the behavioral aspect, female students get results of 90.71% and male students get results of 83.75%. These results are a comparison of self-regulated learning between female and male students at the college level that affects student academic achievement.

As many as 60% of students showed good ability in setting learning goals and planning the steps needed to achieve them. However, there are still 40% of students who find it difficult to organize their study schedules and set priorities. The ability to monitor or monitor learning progress also varies. Around 55% of students can monitor their learning process well, while the other 45% still have difficulty identifying weaknesses and improving them during the learning process. Self-evaluation is the weakest aspect of SRL with an average score of 3.0. Only 50% of students routinely evaluate their learning outcomes and use feedback for improvement. This shows that there are still many students who do not reflect on their learning outcomes.

Self-regulated learning data is data obtained from the scale filled by students as respondents. The average test score is 98.06; median 96; mode 101; maximum value 124; minimum value 79; standard deviation 10.406; and variance 108.293. The table and histogram of the frequency distribution of self-regulated learning data for the research sample can be seen in Table 4 below.

Table 4. Frequency Distribution of Self-Regulated Learning Data

No	Class Interval	Frequency (f)	Frequency Percentage (f%)	Cumulative Frequency Percentage (fk%)
1	79-84	6	6%	6%
2	85-90	22	21%	27%
3	91-96	25	24%	50%
4	97-102	23	22%	72%
5	103-108	8	8%	80%
6	109-114	11	10%	90%
7	115-120	9	9%	99%
8	121-126	1	1%	100%
Total		105	100%	

The frequency distribution data of self-regulated learning of ESTE UNS students can be described through a data histogram to determine the differences in class intervals in detail. The following is Figure 2 histogram of self-regulated learning frequency data below.

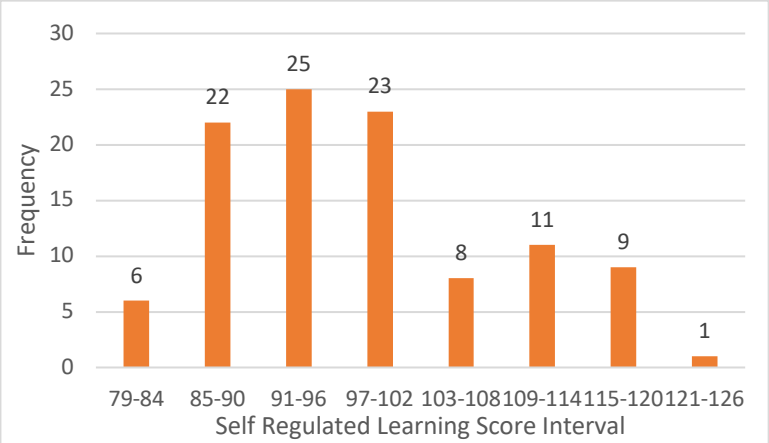

Figure 2. Histogram of Self-Regulated Learning Frequency Data

Based on Figure 2, the highest frequency of self-regulated learning scores is in the score interval 91-96 with a total of 25 students. The second highest frequency is in the interval 97-102 with 23 students. The third highest frequency is in the interval 85-90 with 22 students. The fourth highest frequency is in the interval 85-90 with 22 students. On the other hand, the lowest frequency of self-regulated learning scores is in the score interval 121-126 with 1 student. The second lowest frequency is in the interval 79-84 with 6 students. The third lowest frequency is in the interval 103-108 with 8 students. The fourth lowest frequency is in the interval 115-120 with 9 students. The data collected is appropriate, namely with a total of 105 students with a percentage of 100%. The following are the results of sample data from the research on the self-regulated learning category of UNS ESTE students, which are presented in the following Table 5.

Table 5. Data on Self-Regulated Learning Category of UNS ESTE Students

No	Interval	Category	Frequency	Percentage
1	X < 82.46	Very Low	3	3%
2	82.46< X ≤ 92.86	Low	35	33%
3	92.86 < X ≤ 103.27	Currently	42	40%
4	103.27< X ≤ 113.68	Tall	13	12%
5	113.68< X	Very high	12	11%

Based on Table 5, the self-regulated learning score with a very low category with an interval of X <82.46 was achieved by 3 students, the low category with an interval of 82.46 - 92.86 was achieved by 35 students, the medium category with an interval of 92.86 - 103.27 was achieved by 42 students each, the high category with an interval of 103.27 - 113.68 was achieved by 13 students and the very high category with an interval of 113.68 <X was achieved by 12 students. This shows that the majority of the self-regulated learning levels of UNS ESTE Class of 2022 students are classified as moderate.

5. Discussion

In Racingumi's research (2015), there are 4 factors that can explain academic performance, including SRL, including other aspects, namely achievement goals, previous learning experiences, metacognitive knowledge awareness, faculty SRL support, and peer influence and family influence. In addition, there are several main and different factors that influence academic success. In general, it is divided into two categories: intellectual factors and non-intellectual factors. The results of this study also show that academic success is influenced by two factors, namely external and internal. This is supported by Chung (2002) who stated that learning is not only an external aspect but also an internal aspect controlled by Independent Learning Rules (SRLs). Self-regulated learners require high-level metacognitive knowledge skills to monitor and regulate their cognitive activities during the learning process. This contains metacognitive knowledge about various metacognitive strategies that allow students to plan, monitor, and adjust their learning effectively (Karlen., 2024).

In addition to these two factors, a student's academic success also depends greatly on their ability to utilize their potential. According to Zimmerman (1990), one of the psychological aspects that greatly determines a person's success in realizing their potential is self-regulated learning. This allows people to observe and evaluate more effective learning methods, allowing them to monitor themselves and evaluate their learning methods. Design your own learning strategy that combines cognitive, motivational, and behavioral aspects to achieve success (Karlen., 2024).

Self-regulated learning (SRL) is a process of acting independently without the help of others, especially in determining learning objectives, sources of materials to be used, learning process strategies, and assessment methods to be carried out. In the planning process, a person can prepare needs such as learning resources, learning methods, learning environments, and others, and in the implementation process, they can create and control themselves if they encounter difficulties in carrying out the learning process and finally, the evaluation process must be able to accept mistakes and try to improve the results obtained if they do not match the expected results. SRL skills are essential for all individuals, as they increase the likelihood of becoming lifelong learners, along with higher academic performance and success in the business world. (Scale, 2020) . SRL is important in measuring success in an online educational environment and is therefore considered one of the factors for the success of online learning. Therefore, to improve learning outcomes, it is important to develop students into independent learners (Mengying & Mohammed, 2024). Self-regulation skills include goal setting, self-formation, self-instruction, and self-reinforcement. SRL is self-aware, self-driven, and can learn to achieve its goals. SRL combines learner motivation, metacognitive awareness, cognitive skills, and beliefs about learning (Samin., 2022). Self-regulated learning refers to students' ability to choose their learning methods. Students who are motivated to learn, solve problems, and be responsible for fulfilling their obligations because of the existence of independent learning

arrangements. However, the low level of self-regulated learning is caused by a lack of self-confidence in one's abilities, low motivation for independent learning, and a poor learning environment (Sari., 2022). The indicators of self-regulated learning are arranged into (1) intrinsic learning initiative and motivation, (2) habits of diagnosing learning needs, (3) setting learning targets, (4) choosing and implementing learning strategies, and (5) self-confidence (Yuni., 2021). The five indicators are one of the efforts to develop students' reflective thinking skills by implementing a learning model according to the characteristics of reflective thinking skills. Therefore, problem-based learning is one of the environments that supports the development of students' reflective thinking skills (Fan., 2022).

These strategies are used as input for further self-regulation through monitoring. Therefore, SRL and cognitive strategy use form a circular process in learning. The impact of SRL on cognitive learning strategy use may explain why previous studies reviewed consistently show that SRL is associated with higher academic performance in college students. Therefore, cognitive strategies influence the impact of SRL on performance. However, since this review focuses on the effectiveness of SRL interventions, engagement in cognitive learning activities is beyond the scope (Jansen., 2019) . Therefore, Cognitive influences the impact of SRL on performance. However, the current review focuses on the effectiveness of SRL interventions, so engagement in cognitive learning activities is beyond the scope. Due to the importance of SRL to student performance, much research has been conducted on how interventions aimed at supporting student engagement in SRL activities impact academic performance (Yang., 2022). Developing SRL interventions that specifically target college students is important for several reasons. At the college level, performance-based assessments are an important performance outcome and are often an integral part of student grades. Therefore, the skills needed to study effectively for exams are important academic competencies that need to be taught, practiced, and repeated, especially for students who are struggling academically. There is a wealth of information in the literature on preparation skills (Mohammed et al., 2023). Regarding concerns about the appropriateness of SRL practices in everyday life, several researchers have conducted research on other factors that may contribute to SRL, such as motivation (S. L. Lim & Yeo, 2021). For example, Bandura argues that self-regulation of SRL depends in part on the accuracy, consistency, and temporal proximity of self-monitoring, which requires motivation as a consistent driver. In addition, people's attention fluctuates due to many competing factors at the same time. Therefore, motivation is needed to help individuals focus on desired goals. Consistent with this assumption, several previous studies have shown that motivational constructs are positively related to or predict cognitive engagement such as self-regulatory strategies demonstrated (Azizah & Nasrudin, 2021).

Previous research on self-regulated learning Dradeka (2018) found significant differences in self-regulation of Saudi Arabian students in favor of students with high academic achievement. In addition, male students tend to report higher levels of academic self-regulation than female students (El-adl & Alkharusi, 2020). People who learn by self-regulation tend to have better success. This tendency is further strengthened when students engage in independent learning, set higher learning goals, learn more effectively, and excel in class (Mengying & Mohammed, 2024). Cheng's research (2011) explains that there is a relationship between self-regulated learning and students' perceptions of learning effectiveness. Determining a self-regulated learning model based on experiential events related to learning motivation, goal setting, behavioral control, and learning strategies. Montalvo and Torres (2004) emphasize that self-regulated learning is a combination of ability and desire. One of its characteristics is being able to control one's motivation and emotions. Students who are oriented toward performance goals are characterized by a pattern that is motivated, knowledgeable, and action-oriented. Strategic students have learned to plan, manage, and evaluate their knowledge, motivate themselves, take action, and respond to situations (Tsz., 2024).

Based on these findings, it is recommended to integrate SRL exercises into the curriculum, provide training on time management and learning strategies, and increase the use of technology that supports self-directed learning. In addition, providing constructive and regular feedback can also help students improve their self-evaluation.

6. Conclusion

This study shows that the level of Self Regulated Learning of students of the Surakarta Elementary School Teacher Education Study Program is in the moderate category with several aspects that need improvement. Learning planning and monitoring are quite good, but self-evaluation is still a major challenge. To improve students' SRL abilities, a more structured learning strategy and continuous support from lecturers and study programs are needed. These findings provide important insights for the development of more effective curriculum and teaching strategies in supporting students' SRL development. Improving the Quality of Learning: These findings can be used to design and implement more effective strategies in teaching and curriculum, which in turn can improve the quality of learning and students' academic outcomes. Implications for a More Independent Education. With improved SRL, students can become more independent in their learning process, which can improve their motivation and overall learning outcomes. Students who have good SRL are better prepared to face challenges in the professional world after graduation, thereby increasing their competitiveness in the job market.

Limitation

This study involved only 105 students from the Surakarta Elementary School Teacher Education Study Program. Therefore, the limitation lies in the small sample size, which may affect the generalizability of the results to the entire student population within the program or similar programs in other institutions. The results of this study are specific to the Surakarta Elementary School Teacher Education Study Program, so the application of the findings and recommendations may differ if applied to other study programs or institutions. The use of questionnaires as the only data collection instrument may limit a deeper understanding of SRL aspects. Questionnaires may not be able to capture all the nuances and details of students' learning experiences. This study did not discuss external or individual factors that may influence students' SRL, such as personal motivation, family support, or learning environment conditions. These factors may have a significant impact on students' SRL levels.

Recommendation

To address the limitations of this study, several recommendations are proposed for future research. First, it is essential to expand the sample size and scope by involving a larger and more diverse group of students, including those from various teacher education programs or institutions. This would enhance the generalizability of the findings and allow for meaningful comparisons across different contexts. Second, integrating a mixed-methods approach, such as incorporating interviews, observations, or focus groups alongside questionnaires, could provide deeper insights into the nuances of self-regulated learning (SRL) and enrich the understanding of students' learning experiences. Third, future studies should explore external and individual factors that may influence SRL, such as personal motivation, family support, and the learning environment. Examining these factors could lead to a more comprehensive understanding of SRL and inform the design of tailored interventions.

Moreover, given the specificity of this study to the Surakarta Elementary School Teacher Education Study Program, future research could develop and evaluate context-specific interventions aimed at improving SRL within similar institutions. These interventions could address identified areas for improvement, such as time management and learning strategies. Finally, conducting longitudinal studies on SRL development could provide insights into how SRL evolves over time and across different stages of students' academic journeys. This approach would offer a deeper understanding of the dynamics of SRL and its long-term impact on academic success. By addressing these recommendations, future research can build on the findings of this study to provide a more holistic and impactful understanding of SRL among prospective teachers.

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Conflict of Interest

The Author(s) declare(s) that there is no conflict of interest.

References

An, F., Xi, L., & Yu, J. (2024). The relationship between technology acceptance and self-regulated learning: the mediating role of intrinsic motivation and learning engagement. Education and Information Technologies, 29(3), 2605–2623. https://doi.org/10.1007/s10639-023-11959-3

Azizah, U., & Nasrudin, H. (2021). Metacognitive Skills and Self-Regulated Learning in Prospective Chemistry Teachers: Role of Metacognitive Skill-Based Teaching Materials. Journal of Turkish Science Education, 18(3), 461–476. https://doi.org/10.36681/tused.2021.84

Bai, B., & Wang, J. (2023). The role of growth mindset, self-efficacy, and intrinsic value in self-regulated learning and English language learning achievements. Language Teaching Research, 27(1), 207–228. https://doi.org/10.1177/1362168820933190

Brenner, C. A. (2024). The role of beliefs in teacher candidates' development of self-regulated learning promoting practices. Psychology in the Schools, 61(2), 647–656. https://doi.org/10.1002/pits.23074

Chang, D.H., Lin, M.P.C., Hajian, S., & Wang, Q.Q. (2023). Educational Design Principles of Using AI Chatbots That Support Self-Regulated Learning in Education: Goal Setting, Feedback, and Personalization. Sustainability (Switzerland), 15(17). https://doi.org/10.3390/su151712921

Dignath, C., & Veenman, M. V. J. (2021). The Role of Direct Strategy Instruction and Indirect Activation of Self-Regulated Learning—Evidence from Classroom Observation Studies. Educational Psychology Review, 33(2), 489–533. https://doi.org/10.1007/s10648-020-09534-0

El-adl, A., & Alkhusari, H. (2020). Relationships between Self-Regulated Learning Strategies, Learning Motivation, and Mathematics Achievement, Cypriot Journal of Educational Sciences, 2020. Eric - Ej1246489, 15(1), 104–111. https://eric.ed.gov/?q=learning+strategies&id=EJ1246489

Fan, Y., van der Graaf, J., Lim, L., Raković, M., Singh, S., Kilgour, J., Moore, J., Molenaar, I., Bannert, M., & Gašević, D. (2022). Towards investigating the validity of measurement of self-regulated learning based on trace data. Metacognition and Learning, 17(3), 949–987. https://doi.org/10.1007/s11409-022-09291-1

Feraco, T., Resnati, D., Fregonese, D., Spoto, A., & Meneghetti, C. (2023). An integrated model of school students' academic achievement and life satisfaction. Linking soft skills, extracurricular activities, self-regulated learning, motivation, and emotions. European

Journal of Psychology of Education, 38(1), 109–130. https://doi.org/10.1007/s10212-022-00601-4

Feyisa, B. R., Merdassa, A. B., & Biru, B. (2022). Psychological resilience and coping strategies among undergraduate students in Ethiopia: a cross-sectional study. *International Journal of Adolescence and Youth*, *27*(1), 515–527. https://doi.org/10.1080/02673843.2022.2151370

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

Hussain, M., & Shen, H. (2019). A Study on Academic Adaptation of International Students in China. *Higher Education Studies*, *9*(4), 80. https://doi.org/10.5539/hes.v9n4p80

Ivemark, B., & Ambrose, A. (2021). Habitus Adaptation and First-Generation University Students' Adjustment to Higher Education: A Life Course Perspective. *Sociology of Education*, *94*(3), 191–207. https://doi.org/10.1177/00380407211017060

Jansen, R.S., van Leeuwen, A., Janssen, J., Jak, S., & Kester, L. (2019). Self-regulated learning partially mediates the effect of self-regulated learning interventions on achievement in higher education: A meta-analysis. Educational Research Review, 28(June), 100292. https://doi.org/10.1016/j.edurev.2019.100292

Jivet, I., Scheffel, M., Schmitz, M., Robbers, S., Specht, M., & Drachsler, H. (2020). From students with love: An empirical study on learner goals, self-regulated learning and sense-making of learning analytics in higher education. Internet and Higher Education, 47(May), 100758. https://doi.org/10.1016/j.iheduc.2020.100758

Karlen, Y., Bäuerlein, K., & Brunner, S. (2024). Teachers' assessment of self-regulated learning: Linking and judgment accuracy. In Social Psychology of Education (Vol. 27, Issue 2). Springer Netherlands. https://doi.org/10.1007/s11218-023-09845-4

Karlen, Y., Hirt, C.N., Jud, J., Rosenthal, A., & Eberli, T.D. (2023). Teachers as learners and agents of self-regulated learning: The importance of different teachers' competence aspects for promoting metacognition. Teaching and Teacher Education, 125, 104055. https://doi.org/10.1016/j.tate.2023.104055

Lim, L., Bannert, M., van der Graaf, J., Singh, S., Fan, Y., Surendrannair, S., Rakovic, M., Molenaar, I., Moore, J., & Gašević, D. (2023). Effects of real-time analytics-based personalized scaffolds on students' self-regulated learning. Computers in Human Behavior, 139(July 2022). https://doi.org/10.1016/j.chb.2022.107547

Lim, S. L., & Yeo, K. J. (2021). A systematic review of the relationship between motivational constructs and self-regulated learning. International Journal of Evaluation and Research in Education, 10(1), 330–335. https://doi.org/10.11591/IJERE.V10I1.21006

Mengying, C., & Mohammed, L. A. (2024). A Study of The Effects of Feedback on College Students' Self-Regulated Learning in an Online Learning Environment. International Journal of Emerging Issues of Social Science, Arts, and Humanities, 2(3), 104–112.

Mohammed, S. A., Ahmed, N. S., & Region, K. (2023). Self-Assessment Tool For Improving Student's Skills Regarding The Exams In Higher Education. *Science Journal of University of Zakho*, *11*(3), 453–463.

Mweshi, G. K., & Sakyi, K. (2020). Application of sampling methods for the research design. Archives of Business Research, 8(11), 180–193. https://doi.org/10.14738/abr.811.9042

Raković, M., Bernacki, M. L., Greene, J. A., Plumley, R. D., Hogan, K. A., Gates, K. M., & Panter, A. T. (2022). Examining the critical role of evaluation and adaptation in self-regulated learning. Contemporary Educational Psychology, 68.https://doi.org/10.1016/j.cedpsych.2021.102027

Radović, S., Seidel, N., Menze, D., & Kasakowskij, R. (2024). Investigating the effects of different levels of students' regulation support on learning process and outcome: In search of the optimal level of support for self-regulated learning. *Computers and Education*, *215*(February). https://doi.org/10.1016/j.compedu.2024.105041

Respati, AA, & Atun, S. (2023). Effect of Electronic Modules on Self-regulated Learning and Cognitive Learning Outcomes on Chemical Bonding Materials. Journal of Science Education Research, 9(5), 2489–2496. https://doi.org/10.29303/jppipa.v9i5.2430

Samin, SM, Akzam, I., & Supriady, H. (2022). Strategies of Arabic Students' Self-Regulated Learning Improvement in Language Proficiency in The Disruption Era. Arabiyat: Journal of Arabic Language Education and Arabic Language, 9(2), 165–177. https://doi.org/10.15408/a.v9i2.22828

Sari, N., Nuraeni, Z., & Sukmaningthias, N. (2022). Interaction between RME-based blended learning and self-regulated learning in improving mathematical literacy. Journal of Elements, 8(2), 631–644. https://doi.org/10.29408/jel.v8i2.5751

Scale, S.L. (2020). Eurasian Journal of Educational Research www.ejer.com.tr. Eurasian Journal of Educational Research, 89(6), 47–70. https://doi.org/10.14689/ejer.2020.89.3

Sins, P., de Leeuw, R., de Brouwer, J., & Vrieling-Teunter, E. (2024). Promoting explicit instruction of strategies for self-regulated learning: evaluating a teacher professional development program in primary education. In Metacognition and Learning (Vol. 19, Issue 1). Springer US. https://doi.org/10.1007/s11409-023-09368-5

Thompson, M., Pawson, C., & Evans, B. (2021). Navigating entry into higher education: the transition to independent learning and living. *Journal of Further and Higher Education*, *45*(10), 1398–1410. https://doi.org/10.1080/0309877X.2021.1933400

Tsz, D., Ng, K., Wei, C., Jac, T., & Lok, K. (2024). Empowering student self-regulated learning and science education through ChatGPT: A pioneering pilot study. British Journal Of Educational Technology, 4(6), 1328–1353. https://doi.org/10.1111/bjet.13454

Valente, S., Lourenço, A. A., Paiva, M. O., Oliveira, H., Dominguez-lara, S., Carvalho, L., & Rebola, F. (2024). Students ' Self-Regulated Learning : The Role of Planning Time Management and Procrastination Students ' Self-Regulated Learning : The Role of Planning Time Management and Procrastination. *Preprints.Org*, 0–13. https://doi.org/10.20944/preprints202412.0736.v1

Wei, L. (2023). Artificial intelligence in language instruction: impact on English learning achievement, L2 motivation, and self-regulated learning. Frontiers in Psychology, 14(November), 1–14. https://doi.org/10.3389/fpsyg.2023.1261955

Wesarg-Menzel, C., Ebbes, R., Hensums, M., Wagemaker, E., Zaharieva, M. S., Staaks, J. P. C., van den Akker, A. L., Visser, I., Hoeve, M., Brummelman, E., Dekkers, T. J., Schuitema, J. A., Larsen, H., Colonnesi, C., Jansen, B. R. J., Overbeek, G., Huizenga, H. M., & Wiers, R. W. (2023). Development and socialization of self-regulation from infancy to adolescence: A meta-review differentiating between self-regulatory abilities, goals, and motivation. *Developmental Review*, *69*(August), 101090. https://doi.org/10.1016/j.dr.2023.101090

Wolters, C. A., Pintrich, P. R., & Karabenick, S. A. (2005). Assessing academic self-regulated learning. What do children need to flourish? Conceptualizing and measuring indicators of positive development, 251-270.

Xia, Q., Chiu, TKF, Chai, C.S., & Xie, K. (2023). The mediating effects of needs satisfaction on the relationship between prior knowledge and self-regulated learning through artificial intelligence chatbot. British Journal of Educational Technology, 54(4), 967–986. https://doi.org/10.1111/bjet.13305

Yang, L.F., Liu, Y., & Xu, Z. (2022). Examining the effects of self-regulated learning-based teacher feedback on English-as-a-foreign-language learners' self-regulated writing strategies and writing performance. Frontiers in Psychology, 13(November), 1–16. https://doi.org/10.3389/fpsyg.2022.1027266

Yuni, Y., Kusuma, AP, & Huda, N. (2021). Problem-based learning in mathematics learning to improve reflective thinking skills and self-regulated learning. Al-Jabar: Journal of Mathematics Education, 12(2), 467–480. https://doi.org/10.24042/ajpm.v12i2.10847

Zimmerman, B. J. 1990 Self-regulated learning and academic achievement: An overview. Educational Psychologist 25(1) 3–17 https://doi.org/10.1207/s15326985ep2501

Zimmerman, B. J. (1989). A Social Cognitive View of Self-Regulated Academic Learning. Journal of Educational Psychology, 81(3), 329–339. https://doi.org/10.1037/0022-0663.81.3.329