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Self-regulated learning levels among elementary education students: Thorndike's law of readiness analysis in hybrid learning

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ABSTRACT

Students with strong self-regulated learning (SRL) skills can effectively regulate their motivation and learning strategies to achieve academic success. However, many students face significant challenges in their academic journey, especially experiencing stress from heavy coursework loads during hybrid learning, which often causes delays and disrupts their academic progress, resulting in students' SRL not being as expected. This study aims to assess the self-regulated learning levels of elementary school teacher education (PGSD) students in hybrid learning environments from the perspective of Thorndike's Law of Readiness. Using a quantitative survey approach, data were collected from 108 undergraduate students of elementary school teacher education at Universitas Sebelas Maret using questionnaires. This study employed content validity through expert judgment and Cronbach Alpha for reliability testing. Data analysis was conducted using descriptive statistics. The results indicate varying levels of self-regulated learning among undergraduate students of elementary school teacher education: 36.1% exhibited very high SRL, 40.7% high, 21.3% moderate, and 1.9% low. Analysis through Thorndike's Law of Readiness indicates that most students are well-prepared to handle their responsibilities in hybrid learning environments. This study contributes to a deeper understanding of SRL in hybrid settings, helping students enhance self-regulation and enabling them to better manage, stay motivated, and achieve their academic goals.

1. Introduction

Teaching and learning activities in higher education require students' independence, active participation, and an understanding of learning objectives and strategies to achieve them. The success of students' learning activities can be measured by their academic performance and learning outcomes [1]. Two elementary factors influence students' academic achievement: internal factors, including physiological, psychological, and physical-mental maturity, and external factors, such as social, cultural, and environmental aspects [2]. These factors also play a crucial role in determining students' learning outcomes in hybrid learning settings. Hybrid learning is an instructional approach that integrates face-to-face (in-class) and online learning [3]. It emerged as a solution to the challenges caused by fully online learning, which often leads to academic burnout, emotional exhaustion, and stress due to increased workloads [4]. Hybrid learning facilitates student engagement in both online and in-person sessions. The integration of technology in hybrid learning aligns with 21st-century developments, enhancing students'

technological literacy and fostering active participation in scientific and technological knowledge acquisition [5]. Preliminary interviews with Elementary School Teacher Education (*PGSD*) students revealed that online learning has contributed to increased stress levels due to heavier workloads. Many students expressed a preference for face-to-face (in-class) learning. Online learning has led to a decline in students' motivation as they cannot interact directly with their peers. As a result, students seek an approach that integrates both online and face-to-face learning. Hybrid learning requires students to be prepared for both learning modalities. Those unable to attend face-to-face sessions can still engage in learning activities through various e-learning platforms [6], such as WhatsApp, Google Classroom, Google Meet, and Zoom [5]. A key advantage of hybrid learning is its capacity to deliver diverse and engaging instructional media, minimizing student disengagement [7].

Self-regulated learning (SRL) is a fundamental determinant of students' capacity to manage their learning efficiently. Students with strong self-regulation skills tend to set clear academic goals, develop learning strategies, and stay motivated throughout the learning process [8]. Self-regulated learning is an active and constructive process in which students regulate, monitor, and control their thoughts, motivation, and behavior to achieve their learning goals [9]. Effective SRL involves goal setting, resource selection, self-monitoring, and self-evaluation while maintaining motivation and self-efficacy [10]. However, many students struggle with self-regulation, as they lack the initiative, interest, and motivation to manage their learning independently [11]. Students with poor SRL often face difficulties in selecting suitable learning techniques, understanding cognitive processes, and maintaining motivation [12]. Zhu, Au, & Yates [13] emphasized the importance of SRL in academic performance, particularly in blended learning environments. Students with high SRL are more likely to implement effective learning strategies and achieve their goals, while those with low SRL struggle to do so. Blended learning combines face-to-face and online learning approaches. From the perspective of Thorndike's Connectionism Theory, learning is understood as a behavioral change resulting from the relationship between stimulus and response. The relationship between stimulus and response can be reinforced by individual readiness to accept behavioral change (Law of Readiness), repetition through practice (Law of Exercise), and reinforcement through rewards (Law of Effect) [14]. According to Thorndike's Law of Readiness, individuals are more likely to engage in learning when they are mentally prepared; otherwise, they may experience dissatisfaction and resistance. In other words, the more prepared an individual is to undergo behavioral change, the more likely they are to find the learning experience rewarding and the stimulus-response association reinforced [15].

This study examines the level of self-regulated learning (SRL) among elementary school teacher education undergraduate students in a hybrid learning environment. SRL is crucial for students as self-regulation and self-monitoring enhance task completion time and mastery of learning skills. Furthermore, SRL fosters self-efficacy, competence, and resilience, which are higher among students with strong SRL compared to those without [16]. SRL explains procedural and conditional knowledge related to cognitive, motivational, and behavioral regulation strategies, which help students improve their learning process, maintain effort, and improve academic performance [17]. Students with SRL can set learning goals, monitor their progress, seek help when needed, and reflect on their learning to assess their strategies' effectiveness in achieving their goals [18]. A previous study on the impact of self-regulated learning (SRL) training on procrastination in completing final theses among senior students found that those who received SRL training exhibited lower levels of procrastination than those who did not [19]. Another study examined the SRL levels of accelerated students at Junior High School 1 Sidoharjo [20], revealing that 17% of students had very high SRL, 58% had high SRL, and 25% had moderate SRL. Another study investigating the reasons behind students' academic procrastination in online learning from an SRL perspective found that procrastination was linked to students' perceptions of the learning context, personality traits, and motivational beliefs [17]. Students who found course materials intellectually engaging were more likely to participate in learning activities and less likely to procrastinate. Students who perceived that the use of technology and multimedia in learning was not disruptive experienced lower emotional stress and were more likely to complete academic tasks on time. Furthermore, diligent students were less prone to procrastination in online learning. Research conducted by [19] and [20] was carried out in offline learning, while research conducted by [17] on online

research. This investigation was not conducted during hybrid learning, as in this study, due to the Covid-19 pandemic. This research is essential to assess the level of self-directed learning readiness among elementary school teacher education students in hybrid learning, enabling the provision of recommendations to maintain high productivity and learning autonomy. During the Covid-19 time, both online and offline learning were not feasible. This creates issues in learning concerning the individual, the machine (learning media), and the methodologies employed [21]. This hybrid learning model was selected as it effectively addresses the limitations of both online and offline education.

This study focuses specifically on undergraduate students of elementary school teacher education engaged in hybrid learning to measure SLR. This study will analyze SRL levels through Thorndike's Connectionism Theory. This study contributes to improving students' self-regulated learning and provides recommendations for educators to help students effectively complete coursework through instructional models or methods by their SRL levels. Furthermore, the findings of this study contribute to the embodiment of the independence characteristic within the Pancasila student profile. The aspects of this independent character are cultivated during the learning process when students engage in Self-Regulated Learning [22]. The findings of this study can assist educators in delivering a balanced approach to online and offline learning activities. The goal is to effectively enable students to address learning challenges in a hybrid environment.

2. Method

This study employed a quantitative approach, utilizing a survey to assess students' self-regulated learning (SRL) levels in a hybrid learning environment. The participants comprised second-, fourth-, and sixth-semester undergraduate students enrolled in the Elementary School Teacher Education (*PGSD*) program at Universitas Sebelas Maret. The population of this study were all PGSD students from Universitas Sebelas Maret. This study employed cluster random sampling as its sampling technique. This sample strategy is employed due to the presence of student cohorts in semesters 2, 4, 6, and 8. The total sample consisted of 108 students. Data were collected using a questionnaire based on a Guttman scale, adapted from [23]. The survey measured key SRL indicators, which included goal setting, time management, self-monitoring, and motivation regulation. The validity of this questionnaire instrument is established through content validity by expert assessment [24]. The instrument used in the study is presented in Table 1.

Table 1. Self-Regulated Learning Instrument [23]

Indicator	Descriptor	Question Number
Planning	Understands learning objectives and goals.	1
	Develops strategies to achieve goals.	2
	Establishes a structured learning plan.	3
	Prepares a semester-long study plan.	4
Monitoring	Consistently works toward set goals	5
	Tracks academic progress.	6
	Manages daily learning activities effectively.	7
	Balances study time and personal activities.	8
Controlling	Submits assignments on time.	9
	Prioritizes tasks despite challenges.	10
	Adapts learning strategies as needed.	11
	Resolves learning obstacles promptly.	12
Reflection	Evaluates learning effectiveness.	13
	Learns from mistakes for self-improvement.	14
	Experiences a sense of achievement upon goal completion.	15
	Sets new academic goals based on previous progress.	16

The data analysis used in this study is descriptive statistics in the form of minimum, maximum, and interval scores. Following the acquisition of results from the respondents' questionnaires, the findings are substantiated through the presentation of data in tables, graphs, and images, accompanied by interpretative analysis and discussion.

3. Results and Discussion

3.1. Result

Based on the findings of data collecting that has been carried out, the following descriptive statistical data was obtained. According to Table 2, the SRL questionnaire for *PGSD* students has a maximum score of 16 and a minimum score of 6. The mean SRL score of pupils is 11.45, with a mode of 10. The median SRL score for pupils is 11, with a standard deviation of 2.59. Pratama states that SRL levels are categorized into five groups: very low, low, moderate, high, and very high [20].

Table 2. Data Deskriptive Self-Regulated Learning of Elementary School Teacher Education Undergraduate Students

Data	Mean	Minimal	Maximal	Mode	Median	Standard deviation
Score	11.45	6	16	10	11	2.59

Note: Score range 0-16

The SRL score classification was determined based on the total score obtained by each respondent, calculated as follows:

X max = 1 x 16 = 16

X min = 0 x 16 = 0

$$\text{Score interval} = \frac{\text{X max} - X\ min}{\text{number of levels}} = = \frac{16-0}{5} = 3.2 \approx 3 \quad (1)$$

Based on this calculation, the SRL level classification is presented in Table 2. According to Table 3, a student's SRL score ranging from 0 to 3 is classified as very low. A student's score of 4-6 indicates a classification of low Self-Regulated Learning (SRL). If a pupil attains a score between 7 and 9, it is deemed moderate. A student's SRL category is classified as high with a score of 10-12 and extremely high with a score of 13-16. The distribution of SRL levels among elementary school teacher education undergraduate students is detailed in Table 3.

Table 3. Score Intervals for Undergraduate Students of Elementary School Teacher Education's SRL Levels

Interval Score	Category
13–16	Very High
10–12	High
7–9	Moderate
4–6	Low
0–3	Very Low

According to Table 4, the self-regulated learning (SRL) level of elementary school teacher education students predominantly falls under the high category, comprising 40.7% or 44 pupils. Thirty-nine pupils, including 36.1%, fall into the extremely high SRL category. There are 23 students in the moderate SRL category, constituting 21.3% of the total. For students categorized with low self-regulated learning (SRL), there are two students, representing 1.9%. The mean scores for each SRL indicator are presented in Table 5, providing insights into the student's strengths and areas requiring improvement

Table 4. Distribution of SRL Levels Among Undergraduate Students of Elementary School Teacher Education

Category	Frequency	Percentage
Very High	39	36.1 %
High	44	40.7 %
Moderate	23	21.3 %
Low	2	1.9 %
Very Low	-	-

According to Table 5, the most significant self-regulated learning aspect among S1 elementary school teacher education students is "*Controlling*." The least influential element affecting kids' self-regulated learning level is "*Monitoring*." The most significant SRL component following "*Controlling*" is "Reflection," succeeded by "*Planning*." All SRL indicators are classified

in the high category except for the "*monitoring*" indicator, which is categorized as moderate. The implementation of category levels encompassing high, medium, and low is derived from [25].

Table 5. Average Scores of SRL Indicators

SRL Indicator	Question Numbers	Average Score	Category
Planning	1 – 4	0,69	High
Monitoring	5 – 9	0,62	Moderate
Controlling	8 – 12	0,80	High
Reflection	13 – 16	0,74	High

Note: Score range 0–1
Category range 0 – 0,33 = low
0,34-0,66 = moderate
0,67 -1 = high

3.2. Discussion

Based on the findings, the majority of undergraduate students of elementary school teacher education demonstrate a high level of self-regulated learning (SRL), even in a hybrid learning environment. Students can plan, monitor, control, and reflect on their coursework effectively without experiencing a significant loss of motivation or learning. This is supported by the percentage distribution of SRL levels among undergraduate students of elementary school teacher education: 36.1% fall into the "very high" category, 40.7% in the "high" category, 21.3% in the "moderate" category, and only 1.9% in the "low" category. The majority of students exhibit elevated self-regulated learning (SRL) in hybrid learning environments, as this modality allows for greater flexibility and independence in their studies while maintaining direct engagement with lecturers and peers. Previous studies indicate that hybrid learning can address and mitigate the challenges associated with online learning and the underdevelopment of learning autonomy [26]. Moreover, prior studies indicated that hybrid learning significantly influences learning autonomy, reducing reliance on others [27]. Students with a high level of SRL tend to have strong time management and self-regulation skills, allowing them to complete their academic responsibilities effectively. Self-management is indirectly influenced by motivation through self-monitoring [28]. Other than that, effective self-management reduces procrastination behavior and increases students' readiness to complete academic tasks [29].

According to Thorndike's Law of Readiness, the findings suggest that students are prepared to take on their academic responsibilities. Through Thorndike's connectionism theory, the law of readiness states that when an individual is prepared to perform an action, doing so is experienced as rewarding, whereas failing to act results in discomfort or dissatisfaction [16]. The theory of andragogy, which focuses on adult learning, also incorporates Thorndike's law of readiness. If individuals are forced to learn before they are mentally prepared, they may not engage wholeheartedly, leading to dissatisfaction and disrupting those who are fully committed to learning [30]. In contrast, students with high SRL will prepare their study materials beforehand, ensuring readiness for learning. This is corroborated by Thorndike's Law of Readiness, which posits that effective learning occurs when individuals exhibit readiness, thereby facilitating their engagement in the learning process and resulting in satisfaction with their outcomes [31]. The study further delineates that learning readiness encompasses students' physical, mental, and emotional states, as well as their needs and prior knowledge.

In an instructional context, this concept implies that when students are prepared to learn a particular subject (aligned with their developmental stage and skill mastery), their efforts will be reinforced and rewarded. Attempting to learn when unprepared or lacking the necessary skills can feel punishing and a waste of time. This aligns with Skinner's reinforcement theory, which suggests that positive reinforcement strengthens learning behaviors while negative consequences weaken them [32]. Providing appropriate reinforcement in learning contexts enhances student motivation [33]. According to [34], sources of motivation drive individuals to pursue desired goals or interests. Concerning the findings of this study, students with high SRL strive to maintain, monitor, and control their motivation, ensuring that their interest in learning remains consistent, even in a hybrid learning environment. An analysis of the SRL indicators reveals that the highest score was obtained in the "controlling" indicator, with an average score of 0.80 on a scale of 0 to 1. This is superior to the other indicators: "Reflection," which has an average score of 0.74; "Planning," with a score of 0.69; and "Monitoring," with a score of 0.62. This indicates that during hybrid learning, students made significant efforts to regulate their

cognition, motivation, behavior, and contextual factors to enhance learning outcomes. Maslow's hierarchy of needs suggests that human actions are driven by specific needs, including physiological needs, safety, social belonging, esteem, and self-actualization [35]. In relation to this study, students regulate their motivation to fulfill self-actualization needs. In higher education, both instructors and students require opportunities to express opinions, critique discussions, and evaluate learning outcomes. Fulfilling these needs contributes to improved learning processes and outcomes. Cognitive and metacognitive regulation encompasses students' strategies to adapt and refine their cognitive processes. Through cognitive monitoring, students assess their learning progress, determine the effectiveness of their strategies, and adjust them when necessary [36].

On the other hand, the lowest score was observed in the "monitoring" indicator, with an average score of 0.62. The "monitoring" indicator in this SLR is classified within the moderate level. This suggests that students' awareness and attention to their learning behaviors and outcomes remain relatively low. As noted by [36], cognitive monitoring includes metacognitive assessments, which involve recognizing what is understood and identifying gaps in knowledge. The item-level analysis of the data indicates that many students struggle to assess their learning progress and goal attainment. They also face difficulties managing their study time in relation to other activities, such as attending lectures, participating in organizations, and taking breaks. Some students attend classes without a clear understanding of the tasks they need to complete and do not plan or organize their daily academic activities in advance. The "reflection" indicator achieved an average score of 0.74. It is included in the high category due to its score range of 0.67-1. This suggests that while students can evaluate their learning outcomes, they still require guidance in this area. Many students struggle to reflect on and understand the mistakes made during the learning process. Due to their limited self-evaluation skills, they are often unable to accurately measure their learning progress. As a result, their learning strategies do not evolve, as they lack follow-up actions based on evaluation outcomes. The "planning" indicator received an average score of 0.69 and was included in the high category. While some students clearly define their academic goals, many remain uncertain about the strategies required to achieve them. This uncertainty often leads to a loss of motivation to pursue their intended learning objectives.

These findings are consistent with previous studies on SRL in STAD-based blended learning [37]. The study found that a higher proportion of students exhibited strong self-regulated learning (52.94%) in a blended STAD learning environment compared to those with low SRL (47.06%). The findings of this study align with previous research indicating that in hybrid or blended learning environments, most students exhibit high levels of self-regulated learning (SRL). Previous studies indicated that students' time management skills were the primary element influencing elevated self-regulated learning (SRL). This study identifies the primary influencing factors as controlling and regulating their cognition, motivation, behavior, and contextual factors to improve learning outcomes. Another study confirmed that students with high SRL demonstrate stronger critical thinking skills than those with lower SRL levels [38]. SRL has been shown to contribute to increased learning motivation and metacognitive abilities [39]. Intrinsic motivation, extrinsic motivation, task value, control beliefs about learning, and self-efficacy all positively contribute to self-regulation [40]. This study also indicates a strong relationship between SRL and academic performance, where students with high SRL tend to achieve better academic outcomes. Previous studies on SRL in blended learning environments have examined SRL across three stages: preparation, implementation, and post-learning reflection [13]. In the preparation stage, students establish learning motivation and plan activities to achieve their learning goals. During the implementation stage, they follow planned strategies, which include task management, time management, help-seeking, and environmental structuring. Finally, in the post-learning stage, students reflect on and evaluate their learning performance based on their outcomes and strategies used. These findings offer valuable insights for enhancing students' self-regulation in learning, particularly in managing their motivation and achieving their learning objectives. Furthermore, the findings of this study enhance and facilitate pupil's preparedness for learning, fostering their independence in the educational process. This study has limitations due to its insufficient scope. Future studies should explore the development of models or media that can further improve students' SRL

skills. A key limitation of this study is the relatively narrow sample scope, which was confined to urban areas.

4. Conclusion

The statistics indicate that the SRL levels of the majority of undergraduate students in elementary school teacher education are classified as high as 40,7%. About Thorndike's Law of Readiness, these results suggest that most students are well-prepared to take responsibility for their learning in a hybrid setting. The self-regulated learning indicators that most significantly impact students are controlled, followed by reflection, planning, and monitoring. Consequently, in hybrid learning, students must prepare and organize all facets, including physical, psychological, and material components, to ensure satisfactory learning results; sustaining, monitoring, and regulating learning following the established plan is essential. This study provides valuable insights into how students regulate their learning, particularly in managing their study habits, staying motivated, and achieving their academic goals. Additionally, these findings can help educators design teaching models or methods that support students in handling their coursework effectively based on their SRL levels. Future studies should explore ways to further enhance SRL in hybrid learning by developing strategies, models, or media that foster better self-regulation.

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