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Academic Performance in the Digital Era: The Role of E-Learning and Self-Regulated Approach Among Public High School Students

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Abstract

The study investigates the role of e-learning (EL) and self-regulated learning (SRL) in shaping the academic performance of Grade 9 students. Using a mixed-methods approach, it assessed students' perceptions of e-learning across four dimensions, including usefulness, ease of use, attitude, and intention to use e-learning, and examined ten SRL areas. It also showed that students had positive perceptions of e-learning and demonstrated strong SRL skills, particularly in academic self-efficacy, effort regulation, and social support. A high level of academic performance was observed. Multiple regression analysis revealed that SRL significantly influenced academic performance. Additionally, there was a strong positive relationship between all e-learning (EL) dimensions and SRL. Opportunities in using e-learning highlighted flexibility, autonomy, and improved focus, while challenges included internet issues, distractions, and a lack of motivation. These findings emphasize the importance of strengthening SRL strategies and improving digital infrastructure to enhance student success in e-learning environments.

Keywords

E-Learning, Self-Regulated Learning, Academic Performance

Introduction

The rapid advancement of digital technology has altered traditional education into a more online and hybrid approach. In the digital education era, e-learning platforms offer students greater freedom while also requiring self-discipline, time management, and motivation, making e-learning the primary mode of instruction worldwide (Dhawan, 2020). E-learning (EL) uses digital tools such as online courses, virtual classrooms, and multimedia resources to improve learning. It lets students connect with teachers and study materials from anywhere with internet access, making education more flexible, accessible, and affordable (Balachandran & Mahalakshmi, 2023). Self-regulated learning (SRL) is crucial for educational success. It includes cognitive, motivational, and behavioral strategies that assist students in planning, monitoring, and assessing their learning progress (Zimmerman & Schunk, 2021). As cited by Broadbent et al. (2020), students who are

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skilled at self-regulation tend to excel academically, especially in online settings. These skills are essential in e-learning (EL), where students receive less direct teacher support. Using self-regulated learning strategies is associated with better performance in online courses, underscoring the importance of developing these skills for student success (Xu et al., 2022).

The shift towards e-learning (EL) has highlighted the significance of self-regulated learning (SRL) as a crucial element of student success. Nevertheless, the education system in the Philippines faces further challenges, including frequent class interruptions caused by severe weather events, such as heat waves and typhoons. As noted by Mandigma et al. (2019), climate change has increasingly exacerbated weather-related disturbances in the Philippines in recent years, resulting in extended school closures and disruptions to the educational process. Heat waves have rendered classroom conditions intolerable, thereby impacting students' focus and efficiency (Preña & Labayo, 2024). Also, the increasing number and intensity of typhoons have led to significant flooding, power outages, and damage to educational infrastructure, thereby hampering students' academic performance (Tan & Esporas, 2021). The move to e-learning has been viewed as a remedy to these disruptions. However, students in remote locations frequently encounter problems such as inconsistent internet connectivity, a shortage of digital gadgets, and insufficient support networks (Fulgencio et al., 2021). Additionally, self-regulation is even more important in these situations, as students must adjust to independent learning despite external challenges (Carter et al., 2020).

Although research on e-learning and self-regulated learning is expanding, little of it has examined how SRL specifically mediates the relationship between students' academic performance and their perceptions of e-learning, especially in the public high school affected by frequent class disruptions due to climate-related events and technological limitations. The purpose of this study was to examine how self-regulation affects student performance in the e-learning approach and to identify significant characteristics that contribute to academic success.

Research Questions

The general problem of the study is “How may self-regulated learning affect students’ academic performance in an e-learning approach?”

Specifically, the researcher sought to answer the following questions:

1. How do students perceive e-learning in terms of:
    1.1. perceived usefulness of e-learning;
    1.2. ease of use of e-learning;
    1.3. attitude toward using e-learning; and
    1.4. intention to use e-learning?
2. How may the self-regulated learning of students be described in terms of:
    2.1. online academic self-efficacy;
    2.2. online intrinsic motivation;
    2.3. online extrinsic motivation;
    2.4. online negative achievement emotion;
    2.5. planning and time management;
    2.6. metacognition;

2.7. study environment;
2.8. online effort regulation;
2.9. online social support; and
2.10. online task strategies?

3. What is the academic performance of the high school students?
4. Is there a significant influence of self-regulated learning on the academic performance of high school students?
5. Is there any significant relationship between e-learning and the self-regulated learning of high school students?
6. What are the opportunities and challenges being experienced by high school students in using e-learning?

Methodology

This study employed a mixed-methods approach using a convergent parallel design to comprehensively examine the relationship between e-learning (EL), self-regulated learning (SRL), and academic performance. This design enabled the researcher to collect and analyze quantitative and qualitative data simultaneously and integrate the findings to obtain a deeper understanding of students' learning experiences (Creswell & Plano Clark, 2011). The use of mixed methods was particularly appropriate because several dimensions of self-regulated learning, such as self-efficacy, time management, metacognition, and social support, involve both measurable behavioral patterns and personal learning experiences. Quantitative methods were necessary to determine the extent to which these dimensions influence academic performance and to identify statistical relationships among e-learning, SRL, and achievement. However, these dimensions also involve internal processes such as motivation, reflection, and peer interactions, which cannot be fully explained by numerical data alone. Therefore, qualitative interviews were conducted to explore students' experiences, challenges, and opportunities in using e-learning, providing deeper insight into how these SRL processes occur in real learning contexts. By combining the two approaches, the study captured both the statistical trends and the lived experiences of students in e-learning environments.

The researcher collected data from high school students using a survey questionnaire and interview guide questions. Academic performance was quantitatively measured using students' grades. Moreover, e-learning and self-regulated learning were investigated through a survey questionnaire. An interview was conducted about the opportunities and challenges in using e-learning among public high school students.

In this design, quantitative data were collected from 172 Grade 9 students using survey questionnaires adapted from Mamattah (2016) on e-learning perceptions and from Broadbent et al. (2022) on self-regulated learning, along with students' grades to represent academic performance. The qualitative component involved interviews from purposively selected students representing both high-performing and lower-performing groups to explore the opportunities and challenges experienced in using e-learning.

Data from survey questionnaires and grades were analyzed using descriptive statistics, including frequencies, means, and standard deviations. Multiple regression and Spearman's rank correlation were used to determine both direct and indirect effects, including whether SRL mediates the impact of e-learning on academic outcomes. Inductive coding was used to explore students' reflections on the opportunities and challenges of e-learning, providing rich insights into SRL dimensions. Both data sets were collected concurrently, analyzed separately, and integrated to provide a comprehensive understanding of how SRL influences academic success in e-learning contexts.

Results and Discussion

Quantitative Results

The overall mean score of 3.80, along with a standard deviation of 0.70, indicates that students generally find e-learning platforms acceptable across all measured dimensions (Table 1). The responses were fairly consistent among respondents. These results suggest a mostly positive attitude toward e-learning, supporting its continued use and development in education, aligning with Faizul and Naffisah (2024) and Al-Fraihat et al. (2020), who noted that perceived usefulness and quality of e-learning systems enhance academic engagement. Moreno et al. (2016) and Wolniak & Stecuła (2024) similarly emphasize that ease of use boosts satisfaction and continued use.

Table 1. Dimensions of E-Learning

Dimension	Total Mean	Standard Deviation	Verbal Description
1. Perceived Usefulness of E-Learning	3.90	0.81	Acceptable
2. Ease of Use of E-Learning	3.80	0.72	Acceptable
3. Attitude Toward Using E-Learning	3.82	0.81	Acceptable
4. Intention to Use E-Learning	3.67	0.90	Acceptable
Overall Mean	3.80	0.70	Acceptable

Note: M – Mean, SD – Standard Deviation. Not Acceptable (1.00-1.80), Fairly Acceptable (1.81-2.60), Moderately Acceptable (2.61-3.40), Acceptable (3.41-4.20), Highly Acceptable (4.21-5.00).

The results show an average score of 3.72 (SD = 0.62), meaning that, on average, students rated their SRL skills as well based on the given scale (Table 2). However, the area of Online Negative Achievement Emotion had a mean score of 1.86 (SD = 0.34), with a verbal description of "poor". This implies that students experience a relatively low level of negative emotions, such as anxiety or frustration, related to their academic tasks. This is a positive sign because too much negativity can impair engagement and academic achievement.

Overall, the data indicate that students generally possess well-developed SRL strategies in the online learning setting. Broadbent et al. (2022) and Carter et al. (2020) support that self-regulation is a strong indicator of success in online learning environments.

Table 2. Students' Self-Regulated Learning

SRL	Total Mean	Standard Deviation	Verbal Description
1. Online Academic Self–Efficacy	4.33	0.94	Very Well
2. Online Intrinsic Motivation	3.86	0.80	Well
3. Online Extrinsic Motivation	3.88	0.74	Well
4. Online Negative Achievement Emotion	1.86	0.34	Poor
5. Planning and Time Management	3.74	0.79	Well
6. Metacognition	3.85	0.80	Well
7. Study Environment	3.90	0.89	Well
8. Online Effort Regulation	3.96	0.89	Well
9. Online Social Support	4.14	0.98	Well
10. Online Task Strategies	3.69	0.79	Well
Overall Mean	3.72	0.62	Well

Note: M – Mean, SD – Standard Deviation. Very Poor (1.00-1.80), Poor (1.81-2.60), Adequate (2.61-3.40), Well (3.41-4.20), Very Well (4.21-5.00).

The mean grade is 89.27 with a standard deviation of 4.85; students' performance was not only high on average but also relatively consistent across the sample (Table 3). The minimum grade was 78, and the maximum grade was 98, indicating that all students passed and performed at or above the satisfactory level. The data show a favorable impact on students' study techniques and the quality of the e-learning platform used. Strong self-regulated learning behaviors may also be connected with the high achievement levels in this area. The high academic performance, reinforced by Malabarbas and Gabuya (2024), indicated that e-learning approaches positively influence academic achievement.

Table 3. Students' Academic Performance Based on Grades

Grades	Frequency	Percentage	Description
90 – 100	78	45.3	Outstanding
85 – 89	66	38.4	Very Satisfactory
80 – 84	21	12.2	Satisfactory
75 – 79	7	4.1	Fairly Satisfactory
Below 75	0	0.0	Did not meet Expectations
Min	78	Mean	89.27
Max	98	Standard Deviation	4.85

Note: M – Mean, SD – Standard Deviation.

The data in Table 4 presents the results of a multiple regression analysis used to determine which components of self-regulated learning (SRL) significantly predict the academic performance of Grade 9 students. The multiple regression model showed a very strong influence, with an R^2 of 0.855, indicating that 85.5% of the variance in students' academic performance could be explained by their self-regulated learning behaviors. This aligns with Zimmerman and Schunk's (2021) assertion that SRL is central to academic achievement, particularly in self-directed environments such as e-learning. The overall model was statistically significant, with an F-value of 95.136 and a p-value of <0.001, indicating that the variables influence one another.

In summary, the overall SRL score (SRL-Final) was a strong positive predictor (B = 17.257, p = 0.000), indicating that self-regulated learning, when viewed as a whole, contributes positively to academic success.

Table 4. Students' Self-Regulated Learning as Factors of Academic Performance Via Multiple Regression Analysis

Self-Regulated Learning	Unstandardized Coefficients		Standardized Coefficients	t	Sig.
	B	Std. Error	Beta		
SRL-Final	17.257	3.574	2.216	4.829	0.000
R = 0.925					
R-square = 0.855					
F-value = 95.136					
p-value = 0.000					
Alpha = 0.05					

Note: R denotes multiple R, R2 denotes the coefficient of determination, β denotes the beta coefficient, and SE denotes the standard error. SRL-Final: self-regulated learning.

Table 5 summarizes the overall relationship between combined e-learning dimensions (EL-Final) and total SRL (SRL-Final). The results show a very strong positive correlation between overall e-learning experience (EL-Final) and total SRL (SRL-Final), with a correlation coefficient of r= 0.716, p<0.01, indicating a statistically significant relationship. This means that students who find e-learning systems beneficial are more likely to apply effective self-regulated learning strategies such as time management, metacognition, and effort regulation.

Overall, the findings suggest that the more students value and engage with e-learning, the more likely they are to develop strong self-regulation skills. Based on the findings of Alghanmi & Nyazi (2022) and Bismala et al. (2022), integrating e-learning and SRL leads to academic improvement.

Table 5. Relationship Between E-Learning (EL) and Self-Regulated Learning (SRL)

E-Learning Variable	SRL Variable	R	p-value	Decision	Interpretation
EL- FINAL	SRL FINAL	0.716**	0.000	Reject Ho	Very Strong Positive Relationship/ Significant

Note: r denotes correlation coefficient, Sig. denotes the p-value. EL-Final: e-learning. SRL-Final: self-regulated learning.

Qualitative Results

Opportunities for High School Students in Using E-Learning

The upper group highlighted emotional engagement, ease of use, and supportive learning environments, which likely helped maximize their performance. While the lower group

acknowledged autonomy and practical advantages, they also reported more challenges and mixed experiences, suggesting a need for more support, training, or better access to technology.

Overall, both upper- and lower-performing groups identified several similar opportunities for using e-learning. Both groups emphasized the flexibility and accessibility of e-learning platforms. They appreciated the ability to learn at their own pace, manage their schedules, and access educational materials anytime. Additionally, both groups reported improved understanding and the convenience of being able to search for lessons or answers when confused. These align with the findings of Almaiah et al. (2020), who stated that ease of access and digital usability are among the most influential factors in e-learning acceptance. Both groups also appreciated the comfort and convenience of studying at home. Aristovnik et al. (2020) found that students valued emotional comfort and reduced stress during online learning.

Challenges of High School Students in Using E-Learning

Upper group students face technical constraints related to connectivity and devices, as well as physical strain, indicating that better access to resources does not eliminate all challenges in e-learning. Lower-group students encounter multi-layered challenges: poor infrastructure, cognitive difficulties, emotional isolation, a lack of intrinsic motivation, and adverse home environments.

In summary, both student groups face digital learning barriers, but the upper group's challenges are more technical and physical, while the lower group's are more systemic and multifaceted, involving cognitive, emotional, and environmental constraints. This comparison emphasizes the need for differentiated interventions: some students need better devices and connectivity, while others require more pedagogical support, psychosocial engagement, and learning-conducive environments to succeed in e-learning.

Overall, the use of quantitative and qualitative findings strengthens the interpretation of the results. The quantitative analysis demonstrated that self-regulated learning significantly influences students' academic performance and is strongly associated with positive perceptions of e-learning. These statistical results were complemented by the qualitative findings, which provided contextual explanations for how these relationships occur in practice. Furthermore, students described how the flexibility of e-learning allowed them to manage their time effectively, monitor their learning progress, and seek support from peers and teachers when needed. At the same time, the challenges reported by students, such as unstable internet connection, distractions, and lack of motivation, help explain variations in students' ability to apply self-regulated learning strategies. Thus, the qualitative findings provided deeper insights into the mechanisms underlying the quantitative relationships, demonstrating how students' e-learning experiences shape their development of self-regulated learning skills and influence their academic performance.

Conclusion

This study examined the role of e-learning and self-regulated learning in shaping the academic performance of Grade 9 students. The findings revealed that students generally demonstrated positive perceptions of e-learning and exhibited well-developed self-regulated learning strategies, particularly in areas such as academic self-efficacy, effort regulation, and social support. The results also showed that students achieved relatively high academic performance, indicating that they were able to adapt to the demands of digital learning environments.

Statistical analysis confirmed that self-regulated learning significantly influences academic performance, suggesting that students who effectively manage their learning processes tend to achieve better academic outcomes. Furthermore, a strong positive relationship was found between e-learning perceptions and self-regulated learning, indicating that positive experiences with e-learning platforms encourage students to develop effective learning strategies.

The qualitative findings further supported these results by highlighting opportunities such as flexibility, autonomy, and improved access to learning resources, as well as challenges including unstable internet connectivity, distractions, and lack of motivation. Overall, the findings emphasize the importance of strengthening self-regulated learning skills and improving digital learning environments to support students' academic success in the digital era.

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