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Correlation Between Students' Online Self-Regulated Learning Skills and Performance in Mathematics

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Abstract: This study aimed to analyze and correlate the students' academic performances concerning their self-regulated learning in a high school in Lanao del Norte. A survey through an online questionnaire was used during the study for 113 students, of whom 71 were female, and 42 were male. The types of questions follow the Self–Regulated Learning Questionnaire of Kocdar et al. (2018). To determine the degree of self-regulation, the performance level of students, and the relationship among variables, statistical tools based on percentage, mean, standard deviation, and correlation coefficient were used. Results have shown that the students responded to a great extent to the different components of the self–regulated learning questionnaire. It has also shown that students have achieved a very satisfactory rating in their performance. Findings reveal that there is a significant relationship between students' self–regulated learning skills and their performance in mathematics. Furthermore, gender, devices used in online learning, and internet connectivity significantly relate to their performance.

Keywords: correlation, learning, performance, online, self-regulated

1. Introduction

Self-regulated learning entails learners' deliberate and willful behaviors to maximize learning. These activities include goal setting, time management, task methods, environment structuring, and help-seeking. These self-regulated learning behaviors and talents, as well as the skills and strategies demonstrated by learners, are critical aspects of the learners' motivation to learn independently. Thus, self-regulated learning is a function of learners' skills and will (Woolfolk, Winne, & Perry, 2006). As a result of this paradigm, self-regulated learning is viewed as a mechanism to help explain student achievement variations and as a strategy to enhance achievement. Self-regulated learning skills and strategies have the dual purpose of differentiating among individuals concerning academic achievement and strengthening educational achievement outcomes.

With the unexpected shift in the classroom setting, students adjust to fit in and adopt the new approach. It may be familiar to other countries, but remote learning is a novelty in the Philippines. Self-regulation becomes vital for success as the online learning

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environment is considered self-sufficient. Some studies have shown the enhancing effects of self-regulatory behaviors on students' academic performance in regular face-to-face classrooms. Still, more evidence must be found in remote settings, especially in the Philippines. Only during the first full year of remote learning, from 2020 to 2021, did the fundamental difficulties emerge through circumstantial evidence and surveys performed as the epidemic raged.

Suppose these self-regulatory learning skills are essential to the success of learning in the traditional face-to-face classroom. In that case, these self-regulatory learning skills will play an even more critical role in learning in an online environment. Students needing self-regulatory learning skills may need to comprehend the essence of the online learning environment. As a result, they may not accomplish the learning tasks they are expected to in online courses. However, the role of self-regulatory skills in the online learning environment has received more attention than in the traditional face-to-face setting.

Hence, this research aims to assess whether a significant relationship exists between the learners' self-regulated learning skills and their performance in mathematics in the online learning environment.

2. Objectives of the Study

This study determines the correlation between self-regulatory learning skills and performance in mathematics among junior high science high school students utilizing online learning. Specifically, it aims to determine:

- students' profiles include demographic variables such as age, gender, device used in the online class, internet connection, and the
- relationship between the variables and learners' performance in the online learning environment.

2.1 Research Questions

- What is the respondents' profile concerning demographic variables such as age, gender, device used, and internet connection?
- What is the learners' level of self-regulated learning skills?
- What were the learners' performances in mathematics during the first semester?
- Is there a significant relationship between learners' performance in mathematics and their self-regulated learning skills?
- Is there a significant relationship between learners' performance and the demographic variables?

2.2 Conceptual Model

The reviewed literature clearly shows that students' demographic characteristics and self-regulated online learning play an essential part in online learning. The conceptual model for the study is depicted as follows:

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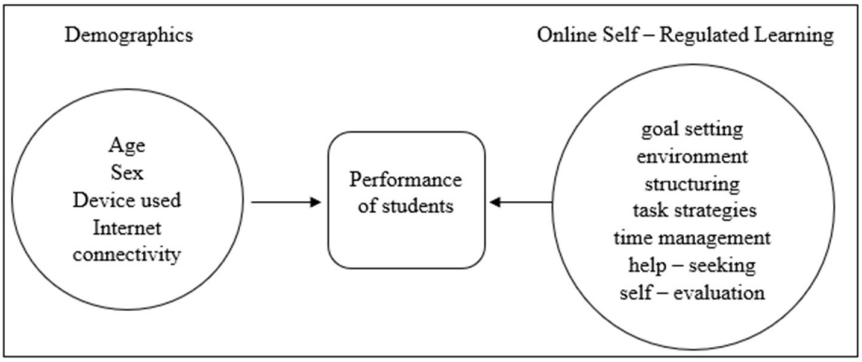


Figure 1: Interrelationship between variables

3. Literature Review

Self-regulated learning is a process that may differ and change with each variation within the learning context. The advantage of using the Online Self-Regulated Learning Questionnaire (OSLQ) is that it expands self-regulation research into the online learning domain. Researchers can employ the OLSQ to assess self-regulatory learning skills and changes in the use of these skills in an online learning setting and therefore provide essential information about the students and the context in which the learning occurs. Schraw (2007) has suggested that the computer-based instruction found in online and blended learning environments can enhance self-regulatory learning skills.

As cited in the study of Barnard et al. (2009), they noted that vast amounts of research on learning and performance are evidence of the importance of self-regulated learning in any learning context, whether online or blended, or face-to-face. The development of self-regulated learning is a proactive process, and thus, as the context of students' learning changes and develops, so must the methods of measuring self-regulation evolve.

4. Methodology

4.1 Research Design

The study's participants are junior high school learners from a science high school in Lanao del Norte. This study employs a descriptive–correlational research design to determine the profile of the respondents and the relationship between the learners' self-regulatory learning skills and their performance in mathematics during the first semester.

4.2 Sampling

The target population in this study is the 7th, 8th, and 9th-grade high school learners of Lanao del Norte. Purposive random sampling determines the number of respondents who will participate in the survey. A total of 113 students responded to the online survey through Google Forms.

4.3 Research Instrument

The instrument used by the researcher in gathering the data is an adopted questionnaire from Kocdar et al. (2018). The questionnaire has two parts. Part I deals with the profile of the participants, and Part II includes questions on self–regulated learning. There are five components: Goal Setting, Environment Structuring, Task Strategies, Time Management, Help-Seeking, and Self-Evaluation. These components are modified, validated, and tested using the reliability test. The result is shown in Table 1. The Cronbach alpha values show the reliability coefficients for each element, which is higher than 0.6, which means that the items have relatively high internal consistency and are

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acceptable. These findings indicate that the Self-Regulated Learning Questionnaire is a useful tool for measuring the self-regulated learning skills of junior high school students.

Table 1. Reliability Test Results of the Instrument

COMPONENTS	CRONBACH ALPHA VALUE	INTERPRETATION
GOAL SETTING	0.76	Good and acceptable
ENVIRONMENT STRUCTURING	0.80	Good and acceptable
TASK STRATEGIES	0.77	Good and acceptable
TIME MANAGEMENT	0.72	Good and acceptable
HELP-SEEKING	0.68	Acceptable
SELF-EVALUATION	0.74	Good and acceptable

The evaluators utilized the given criteria to evaluate the instrument used as shown in Table 2. The result shows that the overall mean rating of 3.96 implies that the tool is suitable for use.

Table 2. Validation Results of the Instrument

CRITERIA FOR VALIDATING THE RESEARCH INSTRUMENT (Good and Scates)	Eval. 1	Eval. 2	Eval. 3	Mean	SD	Remark
The questionnaire is short enough that the participants respect it and would not drain much of his/her precious time.	2	4	3	3		Good
The questionnaire is interesting and has a fair appeal such that participants will be induced to respond it fully.	4	5	4	4.33		Excellent
The questionnaire can obtain some depth to the responses and avoid superficial answers.	3	4	4	3.67		Very good
The items / questions and their alternative responses are not too suggestive nor too unstimulating.	4	5	4	4.33		Excellent
The questionnaire can elicit responses, which are definite but not mechanically forced.	3	5	4	4		Very good
Question items are formed and stated in such a way that the responses will not be embarrassing the person/s concerned.	4	5	4	4.33		Excellent
Questions / items are formed in such a manner as to avoid suspicion on the part of the participants concerning hidden responses in the questionnaire.	4	4	4	4.33		Excellent
The questionnaire is not too narrow, restrictive or limited in its philosophy.	4	4	4	4		Very good
The participants to the questionnaire when taken as a whole could answer the basic purpose for which the questionnaire is designed and therefore considered valid.	3	4	4	3.67		Very good
MEAN	3.44	4.56	3.89	3.96	0.71	Very good

4.4 Data Gathering Procedure

The researcher administered the survey online through Google Forms to facilitate data gathering. And for the open-ended questions, the responses are collected through Mentimeter.

4.5 Data analysis

Following the retrieval of the questionnaires from the participants, the data is tabulated and statistically treated, using percentage to determine the proportion of the total number of participants; mean to approximate the statistical norm or average or expected value; weighted mean to determine the index of the students' responses on a five-point Likert scale; and a Pearson correlation coefficient with the corresponding p-value to identify the link between demographic variables.

Students' Responses

The extent of the responses is determined using the five-point Likert scale shown in Table 3. A highest score of 5 if the student strongly agreed on the given statement and a lowest score of 1 if the student strongly disagreed.

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Table 3. Likert Scale and Description

Score	Qualitative Description
5	Strongly Agree
4	Agree
3	Slightly Agree
2	Disagree
1	Strongly Disagree

Students' Mean Responses

The students' mean responses on a 5-point Likert-type scale is determined along with its corresponding interpretation as show in Table 4. The means were interpreted as very high if the mean response is within the range of 4.21 – 5.00 and very weak if the mean response falls within the interval of 1.00 – 1.80.

Table 4. Likert Scale Interval and Interpretation

Likert Scale Interval	Interpretation
4.21 – 5.00	very high
3.41 – 4.20	high
2.61 – 3.40	moderate
1.81 – 2.60	low
1.00 – 1.80	very weak

Student Performance

The performance of the students is examined using the grades they obtained in mathematics during the first semester, with a grade of 1.00 as the highest passing grade, and 5.00 as the failing grade. The following adjectival rating shown in Table 5 is used to determine the degree of performance of the students:

Table 5. Grade and Adjectival Rating

Grade	Adjectival Rating
1.00 – 1.25	Outstanding
1.50 – 1.75	Very satisfactory
2.00 – 2.25	Satisfactory
2.50 – 2.75	Fair
3.00 – 5.00	Poor

The Pearson correlation coefficient is used to investigate the relationship between determinants of academic achievement as measured by students' demographics, specifically age, gender, device used, internet access, and academic performance as measured by grades.

5. Findings

5.1 Student Profile

In this study, more than half of the respondents (56.6%) are 13 years old, and most are female (62.8%). Regarding internet connectivity, most students (72.6%) obtained internet connections via postpaid and used laptops (50.4%) for online learning. These results are presented in Table 6.

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TABLE 6. Demographic Profiles of the Students

Variable	N = 113	N (100%)
Age (years)	12	18 (15.9)
	13	64 (56.6)
	14	23 (20.4)
	15	7 (6.2)
	16	1 (0.9)
Gender	Male	42 (37.2)
	Female	71 (62.8)
Internet Connection	Post paid	82 (72.6)
	Pre – paid	25 (22.1)
	Others	6 (5.3)
Device used	Laptop	57 (50.4)
	Desktop	28 (24.8)
	Tablet	13 (11.5)
	Cellphone	15 (13.3)

5.2 Student's Self–Regulated Learning Level

This study examines students' self-regulated learning by employing their responses to a 24-item online self-regulated learning questionnaire, the Online Self-Regulated Learning Questionnaire (OSLQ), which is intended to provide a means of assessing the self-regulatory learning skills of students in the online learning environment.

Table 7 shows the students' levels of responses to the different components of the OSLQ. Generally, the student's response level is high regarding setting their online learning goals. This result means that students can establish their learning goals in learning, although the quality of their work could be better because it is done online. In managing a structured learning environment, the student's level of response is high on every item. This finding means that the students can work on their learning well in the online setup.

Regarding establishing Self–study and task strategies, their response level is moderate in almost all items. It is apparent that students do not have thorough notes for online discussions, get distracted, and, most of the time, do not ask questions. Still, it is seen that students work on different problems in addition to the assigned ones to master the subject content. On exercising time management, students' level of response is high on every item. This result means that students can allocate their time and be able to manage their schedules in the online setting. In terms of help–seeking, the student's level of response is moderate. Although students ask someone knowledgeable in the subject content and consult them for help, and share with their classmates the problems they are struggling with, they are not that persistent in getting help from their teachers. In terms of self–evaluation, students' response level is high, which means that students can examine how much they have progressed, monitor their abilities, and evaluate their strengths and weaknesses in the online learning environment. Overall, the level of students' self–regulated learning is high. This result indicates that students can better handle and adjust their learning processes in online learning contexts.

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TABLE 7. Students' Level of Self – Regulated Learning

Components		Mean	Level
Goal Setting	I set standards for my assignments in online tasks.	3.781	High
	I set short-term (daily or weekly) goals as well as long-term goals (monthly or for the quarter).	3.875	High
	I keep a high standard for my learning in my online tasks.	3.969	High
	I set goals to help me manage study time for my online tasks.	3.813	High
	I don't compromise the quality of my work because it is online.	2.969	Moderate
	Mean	**3.681**	**High**
Environment Structuring	I choose the location where I study to avoid too much distraction.	4.125	High
	I find a comfortable place to study.	4.094	High
	I know where I can study most efficiently for online lessons.	3.656	High
	I choose a time with few distractions for studying for my online lessons.	3.844	High
	Mean	**3.930**	**High**
Task Strategies	I try to take more thorough notes for my online courses because notes are even more important for learning online than in a regular classroom.	3.313	Moderate
	I read aloud instructional materials posted online to fight against distractions.	3.219	Moderate
	I prepare my questions before joining in discussion forum.	2.875	Moderate
	I work extra problems in my online lessons in addition to the assigned ones to master the subject content.	3.625	High
	Mean	**3.258**	**Moderate**
Time Management	I allocate extra studying time for my online lessons because I know it is time-demanding.	3.750	High
	I try to schedule the same time every day or every week to study for my online lessons, and I observe the schedule.	3.594	High
	Although we don't have to attend daily classes, I still try to distribute my studying time evenly across days.	3.750	High
	Mean	**3.698**	**High**
Help-Seeking	I find someone who is knowledgeable in subject content so that I can consult with him or her when I need help.	3.969	High
	I share my problems with my classmates online, so we know what we are struggling with and how to solve our problems.	3.594	High
	If needed, I try to meet my classmates face-to-face.	2.500	Low
	I am persistent in getting help from the teachers through e-mail.	3.313	Moderate
	Mean	**3.344**	**Moderate**

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TABLE 7 (Cont')

Components		Mean	Level
Self-Evaluation	I summarize my learning in online lessons to examine my understanding of what I have learned.	3.781	High
	I ask myself a lot of questions about the instructional material when studying for an online lesson.	3.688	High
	I communicate with my classmates to find out how I am doing in my online classes.	3.469	High
	I communicate with my classmates to find out what I am learning that is different from what they are learning	3.500	High
	Mean	**3.61**	**High**
Overall Mean		**3.587**	**High**

5.3 Students' Performances during the first semester

This study measures students' performance based on their first-semester grades. As shown in Table 8, most students (51.33%) obtained a particular level within 1.50–1.75, indicating a very satisfactory performance. Although the female performance level is very acceptable compared to the male, which is adequate, the mean of 1.643 shows that the students had a very satisfactory performance during the first semester.

TABLE 8. Students' Academic Performance

GWA	Frequency	Percentage	Adjectival Rating
1.00 – 1.25	39	34.51%	Outstanding
1.50 – 1.75	58	51.33%	Very Satisfactory
2.00 – 2.25	8	7.08%	Satisfactory
2.50 – 2.75	5	4.42%	Fair
3.00 – below	3	2.66%	Poor
Total	**113**	**100%**	
Male	1.89		Satisfactory
Female	1.396		Very Satisfactory
Mean	**1.643**		**Very Satisfactory**

5.4. Relationship between Students' Performance and Self–regulated learning

The self–regulated learning questionnaire is utilized to investigate whether the level of students' self-regulatory skills in online learning is associated with positive results in overall academic performance. As shown in Table 9, there is a weak but positive relationship ($r = 0.433$) between students' self–regulated learning level and their academic performance. The p-value of 0.013 indicates that the positive connection, however small, is significant. Hence, sufficient evidence exists to conclude a meaningful linear relationship between students' self-regulated learning levels and academic performance because the correlation coefficient is significantly different from zero. This result indicates that the high level of self–regulation in online learning and students' very satisfactory performance are related.

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TABLE 9. Correlation between Students' Self – regulated Learning and their academic performance

Variables	n	Pearson correlation	p – value	Remark
SRL Performance	113	0.433	0.013	significant

*p < 0.05

5.5. Relationship between Students' academic performance and Demographic variables

In this study, the demographic characteristics associated with students' academic performance are also explored. Demographic factors such as age, gender, device used, and internet connectivity are studied as potential determinants of academic performance.

As indicated in Table 10, the Pearson correlation coefficient is used to analyze the relationship between determinants of academic success as evaluated by students' demographics, namely, age, gender, device utilized, internet connectivity, and academic performance as determined by their grades.

Among all variables included in the study, the correlation value of -0.079 shows no correlation between age and academic performance. This result implies that students 'age is not associated with their academic performance. Also, results show a significant correlation between gender, device use, internet connectivity, and students' academic performance. This finding indicates that these variables are associated with and significantly related to students' academic performance in the online learning environment. The very satisfactory performance of females during the first quarter is significantly associated with their great extent of online self–regulated learning. Also, laptops and a good internet connection improve their performance.

TABLE 10. Correlation between Students' Demographic Profiles and Their Performance

		Performance	Gender	Device	Internet	age
Performance	Pearson Correlation	1.000	.364	-.604	-.473	-.079
	Sig. (2-tailed)		.041	.000	.006	.669

p < 0.05

6. Discussion

Findings have shown that the components of students' self-regulated learning are related to their academic performance. These results are consistent with others and were cited in the study of Sahranavard, S., Miri, M. R., & Salehiniya, H. (2018). In describing this, students with high self-regulated learning successfully manage online independently. Students with better self-regulation can have better academic performance. In other words, the higher the student's level of self-regulation, the better he succeeds and can attain many accomplishments. Accordingly, although the teachers need information about the strengths and weaknesses of their students, the goal is to help students know how to self-regulate. These findings have provided evidence in support of theories such as Garner, R. (1990). Based on his results, students only spontaneously practice self-regulation if they are taught to use these approaches.

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Another interesting finding is that gender plays a vital role in online self–regulated learning, as there is a significant correlation between gender and students' performance. This study is quite similar to previous studies by Sheard, M. (2009) and Al-Mutairi, A. (2011) in that they investigated the relationship between gender and students' performance. Both studies found that academic performance is associated with variables such as students' gender.

Moreover, according to the findings, the device used in online learning is significantly associated with students' academic performance. This finding is backed by the research of Asio, J. M. R., Gadia, E., Abarintos, E., Paguio, D., and Balce, M. (2021), where they discovered that the majority of students have cell phones with the capability of allowing them to learn online. They stated that laptops and smartphones are beneficial due to their numerous functions, particularly in online learning.

Furthermore, findings show that home internet connectivity significantly impacts academic performance in an online learning environment. The study by Ivwighreghweta, O., and Igere, M.A. (2014) yielded similar results. They stated that with the assistance of the Internet, learners are better prepared for the tests. Kamba, MA. (2009) also discussed the impact of the Internet on student academic performance, stating that using the Internet for learning is seen as a way to improve accessibility, efficiency. We can improve learning quality by making materials and services more accessible, as well as by facilitating remote exchanges and cooperation.

The results explain whether the demographic characteristics correlate with the student's performance. In testing these determinants, it has been found that all determinants except age are significantly related to the student's academic performance.

The study's limitations include the need for more cooperation from all students in completing questionnaires online. The study sample only comprises students of the same grade level from the same high school; therefore, generalizing the results to other groups of students should be taken cautiously.

7. Conclusion and Implications

Students with strong self-regulation skills successfully manage their online learning. Students with better self-regulation can have better academic performance. In other words, the higher the students' level of self-regulation, the better they succeed and can achieve many accomplishments.

Based on these findings and the significance of self-regulated learning for students' academic success online, students should pay attention and learn how to acquire these skills.

The findings of this study have positive implications for teachers and students in managing the teaching and learning processes in an online setting. Also, students can further develop and benefit from their acquired and learned self-regulated learning skills by integrating them into their learning approaches, which may help them be independent, responsible, and effective in their online learning to achieve the desired level of performance.

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