Research Article

SELF-REGULATION, SELF-EFFICACY AND STUDENTS' MATH PERFORMANCE IN MODULAR DISTANCE LEARNING DURING THE COVID-19 PANDEMIC

1, * Emerson D. Peteros, 2Rene Vel A. Lucino, 3Jordan H. Yagong, 4Mark Jayson D. Bacus, 5John V. de Vera, 6Gerly A. Alcantara, 1Margie D. Fulgencio

1College of Education, Cebu Technological University-Main Campus, Cebu City, Philippines.
2Chief Analyst, Philippine Navy, Armed Forces of the Philippines, Lapu-Lapu City, Cebu, Philippines.
3Instructor 1, Cordova Public College, Cordova, Cebu, Philippines.
4Teacher 1, Uling Senior High School, City of Naga, Cebu, Philippines.
5College of Education, Cebu Technological University-NEC, City of Naga, Cebu, Philippines.
6College of Education, Cebu Technological University-Danao Campus, Danao City, Cebu, Philippines.

ABSTRACT

The spread of Coronavirus Disease 2019 (COVID-19) swiftly struck the whole world which led to the change of educational system. This research aimed to determine the relationship of Grade 10 students' self-regulation, self-efficacy and academic performance in mathematics in three identified public high schools. There were 568 randomly selected Grade 10 students who answered an adopted survey questionnaire that was used to measure their self-regulation and self-efficacy while their first quarter grades in mathematics were used to assess their performance. Descriptive and inferential statistics were used to treat the data. The results show high level of students' self-regulation and self-efficacy towards modular distance learning approach while they had a very satisfactory performance in mathematics. Moreover, results revealed that their self-regulation as to reflecting was significantly related to their mathematics performance while planning, monitoring, and adjusting are not related to their mathematics performance. Furthermore, self-efficacy was highly correlated with the students' mathematics performance.

Keywords: self-regulation, self-efficacy, math performance, modular distance learning.

INTRODUCTION

Coronavirus Disease 2019 (COVID-19), a pandemic, has struck the entire planet in an unprecedented and rapid manner. It is a newly identified coronavirus that causes an infectious sickness (World Health Organization [WHO], n.d.). Because the virus was previously unknown, it is highly contagious, and it spreads swiftly from one person to the next, public health and government officials around the world are working hard to stop it from spreading while a vaccine is still being developed. The broad shutdown of public spaces has resulted from efforts to restrict the development of COVID-19 by non-pharmaceutical therapies and precautionary services such as physical separation and self-isolation. The COVID-19 pandemic led to near-total closures of schools, universities, and colleges affecting the educational systems worldwide. Despite being four months behind schedule, the Philippine Department of Education (DepEd) has resumed classes with the new way of learning across the country. The government adopted the Modular Distance Learning (MDL), one of the categories of distance learning, to maintain the education of millions of Filipino students. This was adopted since it is quite handy for most Filipino students. According to the Learning Enrollment and Survey Form (LESF), it was the most favored learning method by the majority of parents/guardians (Mean-Chin, 2020). MDL is an approach wherein the DepEd teachers provide and distribute the self-learning modules to every student every week through their individual schools. Students are expected to finish the activities in the module and turn in their work on the designated day of the week. Open

contact between teachers and students, as well as between teachers and parents/guardians, is also the standard in order to ensure and monitor children' progress at home, with parents being permitted to obtain and submit modules at school. This is the new normal way of educating students. Meanwhile, MDL instructional materials are designed to guide the students on their learning while staying at home due to the COVID-19 pandemic. This setup leaves the student to study at their own pace. It is upon to the students when and how he will answer the modules, what strategy to use, how many hours to spend studying, and who to ask for help; since there is no more direct supervision from the teacher, which is incorporated to self-regulation. The employment of modules, it should be noted, fosters individual study. One of the advantages of employing modules for instruction is that students develop greater self-study or learning skills. Students actively participate in understanding the concepts provided in the module. They gain a sense of responsibility as they complete the tasks in the module. The students progress on their own with little or no help from others. They are learning how to learn and are becoming more self-assured (Dangle & Sumaoang, 2020). Subjects that are considered difficult by students like mathematics demands more time from them in order to grasp the concepts discussed in the modules. When students have difficulty in understanding the lessons they are left alone in their struggles to cope up with what should be learned to enable themselves to answer the provided activities. Students can assess their learning by the way they deal with these situations. Students' self-efficacy while learning at home can be a factor that could influence their learning. Further to that, because self-efficacy influences the choices learners make and the courses of action they undertake, it is a critical contributing factor to learners' success in education. Indeed, self-efficacy is the personal dedication of one's own ability to deal with a specific task, given the recent educational set-up (Taipjutorus *et al.,* 2012). However, in most cases,

Corresponding Author: Emerson D. Peteros,
1College of Education, Cebu technological University-Main Campus, Cebu City, Philippines.

public schools that adopted MDL have encountered issues on students' noncompliance of the activities provided in the modules. Teachers have observed late submissions of modules and questionable authenticity of students' outputs. Since teachers cannot monitor the students while doing their school tasks at home, it is imperative to check how the students feel towards their learning through MDL. Students are not used to this educational set up thus they are expected to adjust to this new mode of learning. It is in this premise that the researchers felt the need to assess their self-efficacy and self-regulation while they are engaged in MDL. Furthermore, this study would look into the effects of these factors to their academic performance in mathematics.

MATERIALS AND METHODS

This study utilized the descriptive correlational design which aimed to test the relationship between self-regulation, self-efficacy and academic performance of the Grade 10 students in MDL at the three public high schools in Cebu, Philippines. The 568 respondents out of 1, 020 Grade 10 students were identified using simple random sampling. A two-set survey questionnaire was used to gather the data needed in the study. Part I contains statements that assess the respondents' self-regulation by Gaumer Erickson & Noonan (2020) that has four areas such as planning, monitoring, adjusting, and reflecting. Part II contains statements that assess the respondents' self-efficacy by Gaumer Erickson *et al.,* (2018). The questionnaires utilize the 5-point Likert scale in which the respondents would rate the statements from 1 (Not All Like Me) to 5 (Very Much Like Me), that corresponds to their perceptions towards the statements that best describe their self-regulation and self-efficacy. To gather the data on the respondents' academic performance in mathematics, the researchers asked the assistance of their class advisers. With the help of the subject teachers, the survey questionnaires were distributed together with the distribution of the modules. The respondents returned the answered survey questionnaires during the time their parents submitted the answered activities in the modules. The data gathered were sorted, tallied, tabulated, analyzed, and interpreted. These serve as the bases to test the hypotheses and in making conclusions. Weighted mean was used to determine the level of self-regulation and self-efficacy of the respondents. On the other hand, the performance of the respondents was categorized using DepEd Order no. 58 series 2017. Pearson Product Moment Correlation (PPMC) was used to test the significance of the relationship of self-regulation, self-efficacy, and the respondents' math performance.

RESULTS AND DISCUSSION

This section presents the results of the data gathered in terms of the students' math performance, self-regulation, and their self-efficacy. This also includes the test of hypotheses of these variables. Table 1 presents the academic performance of the students in math with a mean of 85.41 which indicates that they have a very satisfactory performance having 4.77 standard deviation. Out of the 568 students, 223 (39.26%) of them have a grade from 85 – 89 indicating that they have a very satisfactory math performance. This is followed by 169 (29.75%) students having satisfactory performance and 116 (20.42%) students having outstanding performance. Notably, there are 59 (10.39%) students who have fairly satisfactory performance and one (0.17%) of the students who did not meet the expectations.

Table 1. Level of academic performance of the students in Mathematics

Level	Numerical Range	f	%
Outstanding	90 – 100	116	20.42
Very Satisfactory	85 – 89	223	39.26
Satisfactory	80 – 84	169	29.75
Fairly Satisfactory	75 – 79	59	10.39
Did not meet the Expectations	Below 75	1	0.17
Total		568	
Mean		85.41	
St. Dev.		4.77	

The data suggest that majority of students have good academic performance in Mathematics while learning independently. Academic performance is the ability to prove academic achievement in acquiring the planned outcome (Nabizadeh *et al.,* 2019).This could indicate that modular distance learning was influential on the knowledge and academic performance of the students. The use of teacher-made teaching materials (modules) makes it easier for students to learn (Hasibuan, 2021). However, some students show struggles in learning through the modules as reflected in their grades. The students who have fairly satisfactory performance should be looked into because they are at risk of failing the subject (Peteros *et al.,* 2022). In line with this, it can be noticed that students do not maintain the same learning habits to minimize the long-term side effects of COVID-19 which could foster sustainable education within and beyond school, as well as enhancing capabilities, (Tran et. al. 2020). In addition, it shows that self-learning module did not lesser the students' capacity to learn outside the school. Table 2 shows the students' level of self-regulation in terms of planning with a weighted mean of 3.49. This indicates that they highly plan towards positively stated indicators while they have a low level of self-regulation in the negatively stated indicators. This implied that respondents highly plan on the accomplishment of their math modules. The personalized goal setting and study planning appeared to significantly improve continuous engagement with

Table 2. Level of self-regulation of the students (Planning)

S/N	Indicators	WM	Verbal Description
1	I make a list of projects that I want to finish.	3.92	High
2	If I have a big test coming up, I develop a study plan.	3.57	High
3	I think about all the things I need to get done before I do something fun.	3.86	High
4	I can typically anticipate how long it will take me to finish my schoolwork.	3.59	High
5	I have a hard time formulating plans to assist me achieve my objectives.	2.53	Low
Aggregate Mean		**3.49**	**High**

Legend: 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 Low

learning, focus on academic goals, and academic performance (Yusuff, 2018). Self-regulation is the student's ability to supervise and handle their vigor, feelings, opinions, and actions in appropriate manner that yields positive results. A person can take control of goal completion by creating if-then designs (i.e., from achievement goals) that identify a potential critical condition and relate it to a goal-directed instrumental response. Students set plans to finish their self-learning modules with less trouble since planning plays a significant role to

finish self-learning modules on time (Khalil, *et al.,* 2010). They schedule their activities so that they can complete their self-learning modules on time and avoid wasting time after obtaining their modules. This is a manifestation that students were responsible enough in terms of planning the things to be done to finish their assigned tasks. Table 3 shows that the students' level of self-regulation in terms of monitoring with a weighted mean of 3.38 indicating that they moderately tracked their progress. This suggests that the respondents were responsible enough in terms of tracking the progress towards accomplishing their modules.

Table 3. Level of self-regulation of the students (Monitoring)

S/N	Indicators	WM	Verbal Description
6	I kept track of how my projects are going.	3.51	High
7	I know when I'm behind on a project.	3.63	High
8	I keep track of my progress toward my goal.	3.75	High
9	At any given time, I'm aware of my grades.	3.29	Moderate
10	I make a list of things I need to do every day and keep track of what I accomplish.	3.65	High
11	I have a hard time remembering everything I need to do.	2.46	Low
	Aggregate Mean	3.38	Moderate

The students were dependable enough as far as observing the advancement towards accomplishing their modules. Self-monitoring intervention is an effective procedure for increasing academic engagement and productivity, as well as for maintaining accuracy in students (Rock, 2005). It can be gleaned from Table 4 that the students' self-regulation in terms of adjusting have a weighted mean of 3.48 which denotes that they have a high level of self-regulation in terms of adjusting to the new

Table 4. Level of self-regulation of the students (Adjusting)

S/N	Indicators	WM	Verbal Description
12	I go to great extents to complete my work on time.	3.92	High
13	I make decisions that will help me achieve, even if they aren't the most enjoyable at the time.	3.81	High
14	I want to take action as soon as I notice something isn't working.	3.82	High
15	To succeed, I continue to attempt as many diverse options as possible.	3.87	High
16	When it comes to projects that take a long time to accomplish, I find it difficult to stay focused.	2.35	Low
17	When I'm behind on my work, I'm prone to giving up.	3.12	Moderate
	Aggregate Mean	3.48	High

learning modality. This suggests that students were able to adjust in working with their self-learning modules in Mathematics during this pandemic. This is a great help for them because academic achievement is greatly based upon the adjusting abilities of the students to the changes around them (Lakhani *et al.,* 2017). More importantly, if students concentrate on their studies, obstacles will not be a concern because they will be able to adapt and manage the difficulties posed by their surroundings. Notably, making a plan and adjusting in studying may help the students to feel a slight sense of control while learning (Hager, n.d.).

Table 5. Level of self-regulation of the students (Reflecting)

S/N	Indicators	WM	Verbal Description
18	I consider how well I'm doing on my homework.	3.60	High
19	When I complete all of my tasks on schedule, I feel accomplished.	4.01	High
20	When I create new goals, I consider how well I've done previously.	3.80	High
21	I attempt to learn from my mistakes when I fail at something.	4.10	High
22	Time after time, I make the same error.	3.10	Moderate
	Aggregate Mean	3.72	High

Table 5 shows that the students manifested a high level of self-regulation in terms of reflecting when it comes to modular distance learning with a weighted mean of 3.72. Through reflection, students develop their comprehension that aids in solving more complex mathematics problems they will encounter along the path. The students were able to reflect on the value of completing their work and how significant it was for their personal development. Students use metacognition as a result of reflection; they learn to think about their thinking, gain insights into the types of thinking that allow them to solve complex mathematics problems, and recognize the pitfalls to avoid along the route (Lewis *et al.,* 2018).

Table 6. Summary on the level of self-regulation of the students

Components	WM	Verbal Description
Planning	3.49	High
Monitoring	3.38	Moderate
Adjusting	3.48	High
Reflecting	3.72	High
Grand Mean	3.52	High

As presented in Table 6, the students have a high level of self-regulation towards the modular distance learning approach in terms of the four sub-indicators with an average weighted mean of 3.52. However, they only have a moderate level in monitoring the progress of their modules and how it was going with a weighted mean of 3.38. Students have a high level of planning, adjusting, and reflecting on their self-learning modules. It could be said that the students were able to do the task on their self-learning modules without the guidance of their teachers. Students who believed their capacity to employ in relevant efforts, notions, desires, and actions would achieve valuable scholastic goals (Di Benedetto, 2011). In general, students were responsible enough for doing the assigned task with their different ways and strategies, which were essential during this time of pandemic where they were given self-learning modules.

Table 7. Level of self-efficacy of the students

S/N	Indicators	WM	Verbal Description
1	This year, I will be able to understand what has been taught in class.	3.35	Moderate
2	If I work hard enough, I can figure out anything.	3.76	High
3	If I practiced every day, I could developed just about any skill.	3.95	High
4	I keep attempting to complete anything essential to me once I've decided to do it, even if it's more difficult than I anticipated.	3.98	High
5	I feel confident in my ability to attain the objectives I have set for myself.	4.05	High

6	Instead of getting discouraged when I'm working on a difficult task, I concentrate on my progress.	3.85	High
7	Whatever career track I select, I will be successful.	3.92	High
8	Whatever college major I choose, I will be successful.	3.86	High
9	I believe hard work pays off.	4.20	High
10	My ability grows with effort.	4.20	High
11	I believe that the brain can grow and expand similarly to a muscle.	4.11	High
12	I believe that anyone, regardless of background, can dramatically improve their depth of talent.	4.24	Very High
13	I have a lot of control over my basic level of skill.	3.93	High
Aggregate Mean		**3.95**	**High**

Legend: 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 Low

Table 7 presents the level of self-efficacy of the students while learning mathematics through self-learning modules which has a weighted mean of 3.95 indicating that they have a high level of self-efficacy in learning. This meant that the modular distance learning approach increases the capacity of the students to do things; however, it would not assure the high level of learning for the students. Students with high self-efficacy contribute to higher goals than students with low self-efficacy (Ahmad & Safaria, 2013). According to Bandura (1991), high self-efficacy increases the likelihood of successfully achieving a given task. Generally, the modular distance learning approach was an effective method during this pandemic, specifically in increasing the level of self-efficacy of the students. Table 8 shows the test of significant relationship between the students' self-regulation and the academic performance of the students in mathematics. The computed statistics for the four sub-indicators of self-regulation when tested to its correlation to the academic performance of the students yielded the following values; planning (r=0.068, P = 0.11), monitoring (r=0.067, P = 0.11), adjusting (r=0.079, P = 0.06), and reflecting (r=0.156, P = 0.000). Among the four sub-indicators, only reflecting indicates a significant correlation with the students' academic performance in mathematics.

Table 8. Correlation analysis on self-regulation and academic performance

Academic Performance vs:	r-value	Strength of Correlation	P-value	Decision	Result
Planning	0.068	Negligible Positive	0.11	Accept Ho	Not Significant
Monitoring	0.067	Negligible Positive	0.11	Accept Ho	Not Significant
Adjusting	0.079	Negligible Positive	0.06	Accept Ho	Not Significant
Reflecting	0.156*	Negligible Positive	0.000	Reject Ho	Significant

significant at P< 0.001

This implied that the level of self-regulation of the respondents in terms of planning, monitoring, and adjusting does not affect the students' academic performance in mathematics, in contrast, self-regulation of the students in terms of reflecting affects their academic performance in mathematics. In general, the result supported the study of Montroy *et al.,* (2014) and Nabizadeh *et al.,* (2019) which found that students who use self-regulating have a higher academic performance. Table 9 illustrates the test of significant relationship between the students' self-efficacy and academic performance in

mathematics which yielded the following statistics(r=0.138, P=0.001). This suggests that there is a significant relationship between the students' self-efficacy and their performance in the subject. This implied that a higher self-efficacy level of the students towards their modules would lead to an excellent academic performance in Mathematics since students with high self-efficacy exert more efforts

Table 9. Correlation analysis on self-efficacy and academic performance

Variables	r-value	Strength of Correlation	p-value	Decision	Result
Self-efficacy and Academic Performance in Mathematics	0.138*	Negligible Positive	0.001	Reject Ho	Significant

significant at p<0.01

in doing school tasks than those with lower self-efficacy (de Vera et al., 2022). This finding supports that of Hayat (2020) who found that self-efficacy is one of the most important elements in students' school performance suggesting that trusting in one's capabilities to organize and execute a task produces positive results. This is comparable to the study of Matoyu (2020) which found that students with strong academic self-efficacy do better academically than those with lower educational self-efficacy. Furthermore, Matoyu (2020) cited that students' academic self-efficacy is a critical factor in nurturing the ability of the learners to focus and also strive for higher academic excellence.

CONCLUSION

During the time of COVID-19 pandemic, the assessment on the students' self-regulation and self-efficacy provides significant information on how these variables affect their performance in mathematics when they are engaged in modular distance learning. Despite learning away from school, students have high self-regulation and self-efficacy which brought positive results towards their math performance. Results suggest that the way a student thinks of what he is doing in his task can greatly affect his learning in the subject. This is an interesting aspect in modular distance learning because students are learning alone at home without the teachers monitoring them. Thus, students rely on themselves on how they think about their performance of the subject. On the other hand, students' assessment of themselves regarding the effectiveness of their learning through modular distance learning has an impact on their performance. Students' self-efficacy has great influence on their math performance. Hence, it is important that students maintain their high self-regulation and self-efficacy when learning at home in order to maintain better performance in mathematics.

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