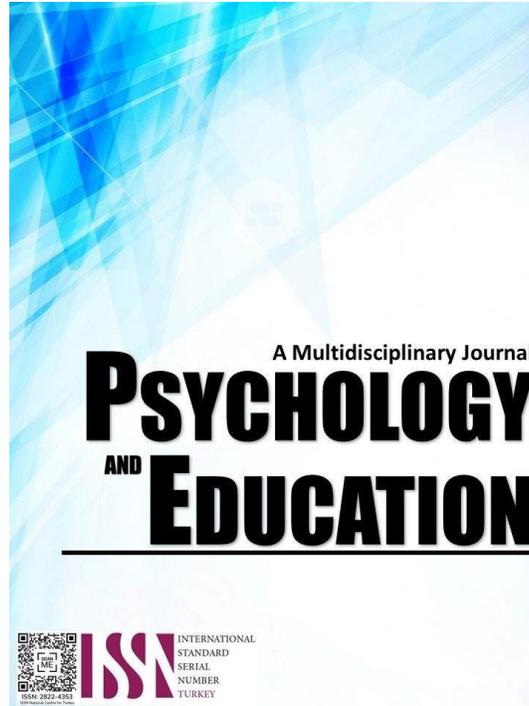


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PSYCHOLOGY AND EDUCATION: A MULTIDISCIPLINARY JOURNAL

Volume: 16

Issue 8

Pages: 867-873

Document ID: 2024PEMJ1507

DOI: 10.5281/zenodo.10669910

Manuscript Accepted: 12-18-2023

Factors Affecting Mathematics Performance in Modular Learning

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Abstract

Modular learning has been implemented by the Department of Education as one of the learning delivery modalities for the school year 2020-2021 as the outbreak of the COVID-19 pandemic which has brought phenomenal challenges. The DepEd introduced Modular Distant Learning in order to achieve its vision, purpose, and aim of providing quality education to Filipino learners. Self-Learning Modules (SLM's) are then provided by the DepEd particularly in rural areas wherein online learning is not possible due to lack of internet connectivity. This type of learning modality has certain advantages and disadvantages for the students specifically in mathematics subject. According to Kuhfeld, & et al. (2020), pupils in mathematics were expected to have significant fewer learning improvements from the previous year. The main purpose of the study is to identify factors that affect students' mathematics performance of the Grade 8 Junior High School students of Bangwalog High School in modular learning as the new normal education system in the Philippines. Also, this aims to determine the factor that contributes on students' mathematics performance. The data were generated through the distribution of researcher-modified questionnaires to the students, and were analysed and interpreted. The results of this study can serve as a catalyst for the enhancement and betterment of learning mathematics as well as the students' mathematics performance.

Keywords: *cognitive factors, mathematics performance, modular learning, non-cognitive factors, parents involvement, peer assistance, reading comprehension, self-learning module, study habits*

Introduction

The Department of Education implemented Modular Distance Learning for the school year 2020-2021 in response to the challenges posed by the COVID-19 pandemic. This approach aims to provide quality education to Filipino learners, particularly in rural areas with limited internet connectivity. Self-Learning Modules (SLMs) are distributed to different types of learners across the Philippines, allowing students to engage with the materials independently. The modular approach is seen as beneficial for optimizing learning in mathematics, enabling students to identify goals, select strategies, and evaluate their own progress. It fosters self-study skills, active participation, a sense of responsibility, and accessibility, aligning with parents' preferences (Adonis, 2021).

However, there are challenges associated with modular learning. Students' cognitive and non-cognitive abilities, study habits, technical engagement, focus in a home setting, module reliability, and parental involvement can impact the effectiveness of this approach (Chin, 2020). Some students may resort to copying responses or struggling to comprehend lessons, leading to incomplete modules. The study acknowledges that these obstacles, especially in mathematics, could significantly affect students' performance. Reports indicate a decline in learning improvements in mathematics, with students returning with less than half of the expected average increases (Kuhfeld, et al., 2020).

The researcher aims to investigate the factors influencing students' mathematics performance in modular learning. The unexpected and low mathematics performance observed during the 1st to 2nd quarter of the school year 2020-2021 prompts the need to identify and understand these factors accurately. The study intends to contribute insights that can serve as a foundation for teachers and administrators to take actions and improve the quality of learning mathematics, ultimately enhancing students' mathematics performance in the context of modular learning.

Research Questions

This study used a descriptive research design to determine the factors affecting academic performance in modular learning of the Grade 8 students of Bangwalog High School in the school year 2020-2021.

Particularly, this research aimed to address the following questions:

1. What are the levels of mathematics performances of the grade 8 students?
2. What are the cognitive factors that affect students' mathematics performance in terms of:
 - 2.1. Study habits
 - 2.2. Reading Comprehension?
3. What are the non-cognitive factors that affect students' mathematics performance in terms of:
 - 3.1. Parental Involvement
 - 3.2. Peer assistance?

4. What is the contribution of each factor to the mathematics performance

Literature Review

The use of modular learning, a self-contained instructional unit, allows learners to independently attain mathematical objectives at their own pace. Rooted in cognitive theories such as Piaget's Cognitive-Constructivism and Bruner's Constructivism, modular learning fosters active student participation, enabling them to invent, understand, and construct knowledge based on their existing understanding. The Department of Education (DepEd) adopted modular learning as part of Alternative Learning Modalities, distributing Self-Learning Modules (SLMs) to address the challenges posed by the COVID-19 pandemic.

Cognitive factors, encompassing study habits, attention, memory, and reasoning, play a crucial role in student performance. The researcher utilized a standardized questionnaire by Dr. Brenda Corpuz and Dr. Maria Rita D. Lucas, adapted for cognitive factors. Non-cognitive factors, including interpersonal skills and interactions, also influence academic performance. Study habits, as explored by previous studies, demonstrate a significant link between good study habits and mathematics achievement.

Motivation, organizational skills, stress management, and preparedness are identified sub-factors within study habits that impact academic performance. Additionally, academic performance is correlated with reading comprehension, parental involvement, and peer tutoring. Modular learning, although less researched compared to traditional methods, has shown positive effects in some experimental studies.

The researcher aims to identify and determine the factors influencing mathematics performance in modular learning among Grade 8 students in Bangwalog High School, Bangwalog, Duero, Bohol. The study delves into cognitive and non-cognitive aspects, incorporating various sub-factors within study habits, parental involvement, and peer tutoring. The findings are expected to contribute insights for educators and administrators to enhance the quality of mathematics education in the context of modular learning.

Methodology

The study employs a descriptive research design to systematically describe and identify factors affecting academic performance in modular learning among Grade 8 students at Bangwalog High School, situated in a rural area of Duero, Bohol. The school, established in 2012, caters to 365 students, and the researcher, handling mathematics for Grades 7, 9, and 10, chose Grade 8 students as respondents to minimize biases. A total of 56 students, comprising 30 males and 26 females, participated in the study.

The research utilized a Three-Likert scale questionnaire divided into two parts: cognitive factors, encompassing study habits and reading comprehension, adapted from Dr. Brenda Corpuz and Dr. Maria Rita D. Lucas' questionnaire; and non-cognitive factors, exploring parents' involvement and peer assistance, addressed through a researcher-made questionnaire.

To ensure data validity, a pilot test was conducted with 30 students, followed by content validation and feasibility checks by expert panel members. The Cronbach's Alpha reliability test indicated acceptable internal consistency (81%).

Ethical approvals were sought from the Dean of the College of Education and Graduate Studies, the DepEd Schools Division superintendent, and the Ethics Review Board. The researcher distributed printed questionnaires alongside self-learning modules (SLMs) with parental consent. The questionnaires were collected weekly with the returned SLMs, and parental permission for participation was secured through an assent form. The general weighted average grades in Mathematics for the school year 2020-2021 were obtained from the students' advisers.

The data collection, done without face-to-face interaction due to the COVID-19 pandemic, involved careful adherence to ethical procedures and permissions. The collected data were then statistically analyzed to derive findings for the formulation of conclusions and recommendations.

Results And Discussions

The findings derived from the data the presentation, analysis, and interpretation of the gathered data on the Mathematics Performance of the Grade 8 students with the factors in terms of cognitive factors such study habits and reading comprehension, and non-cognitive factors such as parental involvement and peer assistance. The information was collected, tabulated, and statistically processed. The findings and conclusions were stated based on the interpreted and evaluated data.

Table 1. *Level of Mathematics' Performance of the Grade 8 Students*

<i>Level</i>	<i>Numerical Rating</i>	<i>Frequency (F)</i>	<i>Percent %</i>
Outstanding	90-100	3	5%
Very Satisfactory	85-89	4	7%
Satisfactory	80-84	10	18%
Fairly Satisfactory	75-79	39	70%
Did not meet the expectation	Below 75	-	-
Total		56	100%

In Table 1, presents the general weighted average of grade 8 respondents in Mathematics for the First to Fourth grading in the school year 2020-2021. Based on the 2019 DepEd K to 12 Grading System, out of 56 students, the data reveals the highest number of respondents composing 70 percent or 39 students/respondents rated to 75-79 have fairly satisfactory grades in Mathematics. Only few of them with 5 percent got an outstanding performance. This meant that mathematics performance of the students in Modular Learning in this pandemic has a fairly performance.

Table 2. *Study Habits, Cognitive Factor Affecting Mathematics Performance*

<i>Study Habits</i>	<i>Weighted Mean</i>	<i>Description</i>
Motivation	1.74	Sometimes
Organizing and planning Activities	1.68	Sometimes
Managing School Work Stress	1.98	Sometimes
Preparing Assignments/Activities/Projects	1.74	Sometimes
Overall Mean	1.79	Sometimes

Legend: 2.34-3.00 – Never, 1.68-2.33 – Sometimes, 1.00-1.67 – Always

The students' study habits as a cognitive factor affecting performance in mathematics is exhibited in table 2. The table shows that among the study habits' sub factor, motivation and preparing assignments/projects/activities are both had weighted mean of 1.74 which described as "Sometimes". However, managing school work stress rendered the lowest weighted mean of 1.98 and is also described as "Sometimes". And with all the study habits' sub factors; they all rated as "Sometimes" having an overall mean of 1.79. This means that in this Modular learning due to COVID-19 Pandemic, students have their own study skills or academic work but sometimes exercise due to this mode of learning where learning is not at school and is very opposite to the traditional setting.

Besides, study habits are the usual behavior or habitual practices by a certain person in order to study and learn effectively. Accordingly, Orias (2008) emphasized that students can benefit greatly from improving their study habits in order to get higher academic results. Study habits help students to enhance and improve their academic performances.

Table 3. *Reading Comprehension, Cognitive Factor Affecting Mathematics Performance*

<i>Item Statement</i>	<i>Mean</i>	<i>Description</i>
1. I take down notes the main ideas, rather than merely repeat what has been said.	1.77	Sometimes
2. I always find for key words in the Mathematics' concepts in modules.	1.59	Always
3. I underline or highlight key ideas on Math concepts so I stand out.	2.04	Sometimes
4. I approach tutors for help when I don't understand the concepts of Math modules.	2.02	Sometimes
5. I check the contents page for relevance before reading.	1.57	Always
6. I look for summaries at the end of the Math module's concepts.	1.80	Sometimes
7. I always make sure that when I read, I should understand.	1.48	Always
8. I organize or file my notes in Mathematics regularly.	1.68	Sometimes
Overall	1.74	Sometimes

Table 3 shows the mean of each indicator in reading comprehension as a cognitive factor of students' mathematics performance. It can be seen that the highest weighted mean of 1.48 described as "Always" in item no. 7 while the lowest weighted mean of 2.04 described as "Sometimes" in item no. 3. The table also exposes that their reading comprehension in Mathematics modules is exhibited "Sometimes", having an overall result of 1.74. Even so, it is still important to comprehend not just by understanding the concept of Math modules as they always find key words, make sure to understand, and find relevance before reading the Mathematics Modules.

Consequently, reading comprehension involves the quality of thinking about the words that were just read and deriving a meaning (Rutzler, 2020). It has a process which needs to recall such knowledge based on what have just read, and comprehend certain concepts in order to be able to construct new ideas. According to Bruner's Theory on Constructivism, it emphasized the critical role of learners in making sense of knowledge and structuring comprehension. Students learn to invent, understand, and build their own representations into their pre-existing knowledge. Besides, reading comprehension contributes positively to the success in Math results as well as in Science (Akbash & et.al, 2016).

Table 4. *Parents Involvement, Non-cognitive Factor Affecting Mathematics Performance*

<i>Item Statement</i>	<i>Mean</i>	<i>Description</i>
1. My parents' guide me in my Mathematics modules.	2.20	Sometimes
2. My parents ask me if I'm struggling in my subjects especially in Mathematics.	1.84	Sometimes
3. My parent/s is/are the one who deed the modules in Math on my behalf.	2.41	Never
4. My parent/s encourages me to do the Mathematics' activities in the modules seriously.	1.61	Always
5. My parent/s always checks my Mathematics modules before submitting it.	1.86	Sometimes
6. My parent/s allots time for me to do the modules particularly Mathematics.	2.07	Sometimes
Overall Mean	1.95	Sometimes

As seen in table 4, parents have been sometimes involved in their children's academic lives with a weighted mean of 1.95. Students' parents always encourage them to do Mathematics activities in the Modules but never the one who deed the Mathematics Modules. However, parents should need to provide their child or children with emotional support.

Thus, this is accentuated by Fang & Williams (2010), as cited by Cabagnot (2013), that parental involvement as well as advising must be enhanced as they positively predicted the academic self-efficacy of the students.

Table 5. *Peer assistance, Non-cognitive Factor Affecting Mathematics Performance*

<i>Item Statement</i>	<i>Mean</i>	<i>Description</i>
1. I ask questions to my classmates related to mathematics.	1.88	Sometimes
2. I listen out for key ideas when someone is sharing.	1.80	Sometimes
3. I copied Mathematics answers from my classmates.	2.30	Sometimes
4. I also share my resources in Mathematics with other students.	2.02	Sometimes
5. I depend on my classmates' answer in Mathematics.	1.79	Sometimes
6. I understand some concepts in math because my classmates taught me.	2.07	Sometimes
Overall	1.96	Sometimes

Table 5 presents that the overall weighted mean has described as "Sometimes" in which all indicators of peer assistance rated also "Sometimes". The only indicator which has the highest weighted mean, 1.79, is the item no. 5 stated that students "Sometimes" depend on classmates' answers in mathematics modules. This depicts that students have answers copied from others even though they sometimes understand the concept of mathematics modules. Students can do whatever they want since teachers cannot control them where both students and teachers are geographically separated in this type of learning delivery, Modular Learning.

Table 6. Summary on Factors Affecting Students' Mathematics Performance

<i>Factor</i>	<i>Mean</i>	<i>Description</i>	<i>Rank</i>
Cognitive Factor			
Study Habits	1.77	Sometimes	2 nd
Reading Comprehension	1.74	Sometimes	1 st
Non-Cognitive Factor			
Parents Involvement	1.95	Sometimes	3 rd
Peer Assistance	1.96	Sometimes	4 th
Grand Mean	1.86	Sometimes	

Table 6 shows the mean of the different factors of students' mathematics performance. Reading comprehension as a cognitive factor has been ranked as first with 1.74 mean, second is the study habits as a cognitive factor with 1.77 mean, the third rank is the parents involvement as a non-cognitive factor with a mean of 1.95, and lastly, the peer assistance as a non-cognitive factor ranked as fourth with 1.96 mean. All of the given factors of students' mathematics performance have been described as sometimes in which the students have seldom exercise the aforementioned factors in this modular learning due to pandemic.

Table 6 supports the idea that in this current learning delivery which is modular learning due to the COVID-19 pandemic, the students of Bangwalog High School have insufficient learning and even not being serious of their learning which has been resulted to a "fairly satisfactory" grade in mathematics as the highest number of frequency based on Table 1.

Table 7. Factors towards Students' Mathematics Performance

	<i>Model</i>	<i>Unstandardized Coefficients</i>		<i>Standardized Coefficients</i>	<i>T</i>	<i>Sig.</i>
		<i>B</i>	<i>Std. Error</i>	<i>Beta</i>		
1	(Constant)	92.620	5.407		17.131	.000
	Study Habits	-.136	.140	-.235	-.972	.336
	Reading Comprehension	-.006	.391	-.004	-.015	.988
	Parents Involvement	-.279	.224	-.173	-1.245	.219
	Peer Assistance	-.215	.292	-.100	-.739	.463

In the last table, it shows the factors towards students' mathematics performance. The significant value Study habits are .336, reading comprehension is .988, parents involvement is .219, and peer assistance is .463. The aforementioned significant value of the factors are greater than the level of significance at 0.05, the researcher accepts the null hypothesis. This meant that the study habits and reading comprehension as cognitive factors, and parents involvement and peer assistance as non-cognitive factors are depicted to be not significant predictors or insufficient contribution on students' mathematics performance in modular learning.

In the previous years, study on the Relationship of Study Habits with Mathematics Performance by Odori (2015) discovered that there was link between students' study habits and their achievement and found that students' study habits are a predictor of their Mathematics performance. However, in this learning modality, it was found out the study habits are not a predictor of students' Mathematics performance. Students have a fairly satisfactory performance in Mathematics. Students have distractions since learning placed at home and do not even have a serious study habits.

Moreover, Akbash & et.al (2016) on his study on The Effect of reading Comprehension on the Performance of science and Mathematics is opposed to this study. During the face-to-face learning, there was a link between reading comprehension towards students' success in math and science classes. But, during this time, modular learning, reading comprehension was not a predictor of students' Mathematics performance. Students just making sure to understand but did not totally comprehended the concepts.

On the other hand, David & et. al (2011)'s research is parallel to the result of this study. During the traditional method of teaching, parents are positively involved and have been found to be linked towards their child's academic performance.

From the previous study of Oloo (2016) emphasized that peer teaching has been found to improve students' mathematics achievement and increase students' enthusiasm to learn mathematics. His research is contrary to this study. In which, peer teaching is not a contributor of the student's performance in mathematics. Students depend and copy responses from their classmate even sometimes

taught by the classmate and sometimes understand the Mathematics modules.

According to Danili & et. al (2006), Cognitive Factors are personal attributes that influence performance learning and modulate performance. On the other hand, Non-cognitive Factors have an impact on students' performance and have earned an increasing prominence in education (Garcia, 2014). Besides, Danili and Garcia's studies were conducted during the Face-to-Face interaction between students and teachers which have a positive impact to predict students' Mathematics Performance. Their studies were contradictory in the result of this study. Neither Cognitive nor Non-cognitive Factors contribute much on Mathematics performance in Modular Learning.

Conclusion

Based on the findings of the study, the researcher concluded that students' mathematics performance are not affected by cognitive factors such as study habits and reading comprehension, and non-cognitive factors such as parents involvement and peer assistance in modular learning due to unserious learning skills in this COVID-19 pandemic.

Based on the findings and conclusions drawn, the following recommendations are hereby given: (1) It has been found out that the students' mathematics performance are not affected by cognitive and non-cognitive factors, with this, future researchers may conduct similar study given that the questionnaire herein must much more enhanced and revised in order to specify items and include interviews from the learners. (2) Further studies may also conduct compromising other factors that would be related to academic performance of the learners through Modular Learning.

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