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Teacher-Made Offline Video Lecture (T-MOViLe): Its Effect to Students' Performance in Mathematics

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Abstract
Aim: The study was conducted to determine the effectiveness of T-MOViLe or the Teacher-Made Offline Video Lecture in improving the academic performance in Mathematics of selected Grade 11 ABM students in Bińan Integrated National High School.
Methodology: The study used true experimental design to identify the effectiveness of T-MOViLe. Eighty (80) students randomly selected from the Grade 11 ABM strand in a public school in Biñan City were equally assigned to the control group and the experimental group. The control group utilized the Self-Learning Module (SLM) while the experimental group made use of the T-MOViLe. The test of difference was used to determine the equivalence of both groups as well as the effectiveness of the treatment using a 0.05 level of significance.
Results: Results showed that the two groups obtained no significant difference in their pretest scores (α = 0.893), but a significant difference was found between the pretest and the posttest scores of both the control group (α = 0.000) and the experimental group (α = 0.000). This implies that both learning delivery modes are effective. However, a significant difference was found in the post-test scores of the groups where the T-MOViLe utilized by the experimental group is shown to be more effective than the SLM used by the control group.
Conclusion: Delivering Mathematics lessons using T-MOViLE (Teacher-Made Offline Video Lecture) improves the academic performance of the students in Mathematics and is proven more effective than modules. It gives more time for the students to understand the lesson because of its pause-and-play property. In a situation where the teacher cannot give face-to-face instructions, the T-MOViLE, like any other offline video, is essential in conveying Mathematical concepts and processes. It eradicates the digital divide that suppresses learning among MDL students.

Keywords: Distance Learning; Mathematics performance; teacher-made videos, offline video lecture; Mathematics

INTRODUCTION

In times of crises like a pandemic, war, or natural disaster, the academic needs of the learners in distance learning can be hardly met. However, teaching Mathematics in distance learning modality affects the learners' ability to learn. Modules have limited capability to deliver lessons especially when it comes to numeracy (Anzaldo, 2021). Learning Mathematics requires modeling procedures and processes before students can analyze and answer the more comprehensive question. Thus, students, who rely on modules, have encountered difficulties and struggles that went through a domino effect. Difficulty understanding the lessons results in poor academic performance.

Makuka (2021) identified that self-study using hard copies of various learning resources is not only the most accessible but is also rated as the most used mathematics learning option during the COVID-19 school closure. Indeed, Philippine education relies mostly on the modules provided by the institution. This results in parents having a hard time teaching their children at home, especially those in the higher grades and among the secondary students whose lessons are more complicated, and no one could better teach them than the teacher. Some illiterate parents do not know how to read and write making it more difficult to teach their children ~~the~~ lessons in different subject areas (Geraldine, 2021).

Pe Dangle and Sumaoang (2020) identified the different challenges of the students in modular distance learning. These include difficulty in answering modules and insufficient time to accomplish the modules within a week. It was also mentioned that Mathematics is the most difficult subject. Students said that most of the Math problems are difficult to solve and no detailed explanation is provided. The main challenges that the students have encountered are studying by themselves, poor internet connection, lack of sleep, and not enough time to answer all the modules due to the great number of activities, distractions, and lack of focus. Problem-solving does not only include and require computation but there is a need to understand and analyze the problem. It is important that the students understand the problems (Salma & Rodrigues, 2013). Nabayra (2022c) found out that students perceived mathematics learning in the new normal as difficult and challenging thereby urging educational institutions to craft solutions to this challenge through technology integration and curricular innovations.

The purpose of learning is to improve and develop knowledge and to do this it should be selected and established, and educators must develop an optimum education acquisition technique to achieve the desired outcome. Reigeluth (2018) defined learning design as a process used to determine the most appropriate methodology that effectively works to enable learners to experience a change in knowledge and skills in the right direction. Reigeluth uses the term "blueprint" for the model to be developed which is in the same process as an architect building.

Thus, it has become an urgent need to explore other innovative learning modalities that will facilitate migration from traditional to flexible teaching and learning options. As learners are differently situated in terms of time, pace and place, these options allow customization of delivery modes responsive to students' need for access to quality education. This shall also give students the option to choose the delivery mode most convenient to them as early as the time of their enrollment, and institutions to deploy available distance learning, e-learning, and other alternative modes of delivery in place of residential learning if they have the resources to do so (CHED COVID-19 ADVISORY NO. 3). Llego (2021) also mentioned that learners can access electronic copies of learning materials on a computer, tablet PC or smartphone. CDs, DVDs, USB storage, and computer-based applications can all be used to deliver e-learning materials, including offline e-books.

In line with this, the Department of Education OUCI-2020-307 suggests flexible learning options that will recalibrate the strategy of assigning teaching responsibilities to teachers and learning activities to the learners. Learners and home learning facilitators found to be experiencing difficulties shall be provided additional support by the teachers/learning support aides. A flexible learning option is defined as a design and delivery of programs, courses, and learning interventions that address learners' unique needs in terms of place, pace, process, and products of learning (Commission on Higher Education Memorandum No. 4, s. 2020). It involves the use of digital and non-digital technology and covers both face-to-face/in-person learning and out-of-classroom learning modes of delivery or a combination of modes of delivery. It ensures the continuity of inclusive and accessible education when the use of traditional modes of teaching is not feasible as in the occurrence of national emergencies.

The researcher believes that a lack of consistent internet connection is not a hindrance ~~in~~ to delivering quality education. The city government of Biñan, Laguna launched a free Wi-Fi system for all ~~its~~ 24 barangays. The project aims to enable students to access online learning materials now that face-to-face classes are restricted due to the coronavirus disease (COVID-19) pandemic (Deña, 2020). With this project, students can have short access to online materials the teacher made for them, and made these available offline, instead of using modules alone.

While modules take primarily linguistic approaches, videos can take a variety of approaches to address the needs of a wider range of learners. Mulenga (2020) found that students use YouTube for watching mathematics tutorial videos online and download these to be available offline. One recommendation suggests that Modular Distance Learning Students should be blended with ODL students if possible so the parents and pupils can gain better assistance from teachers (Geraldine, 2021).

Moreover, studies on video-based mathematics learning advanced that the use of videos improve student performance and class engagement. Sharma (2018) found out that the mathematics achievement of the classes receiving consistent exposure to videos and real-life activities was greater than classes receiving only some of the special instructional treatments. Insorio and Macandog (2021) have established that the video lessons made by the teacher helped the students obtain understanding of the mathematics lessons and encouraged enjoyment among the students because they visually see their teacher on screen. The students' experiences on video-based mathematics instruction revealed that videos are student-friendly learning material, easy to understand, and flexible (Nabayra 2020a; 2020b; 2022a).

To resolve these gaps and consider these recommendations, the T-MOViLe or the Teacher-Made Offline Video Lecture is introduced as an intervention or innovation designed by the researcher to provide a better learning experience to Modular Distance Learning (MDL) students. This T-MOViLe was distributed to MDL students through a network system, starting from Online Delivery Learning (ODL) students, and shared to MDL students via the share-it app. The MDL students made use of the tablets borrowed from the school to watch the offline videos. Health protocol was strictly followed during the conduct of the study.

Objectives of the Study

This study was conducted to determine the effectiveness of teacher-made offline videos in improving the academic performance in Mathematics of selected Grade 11 ABM students in Binan Integrated National High School. Specifically, it aimed to answer the following questions:

1. What is the level of performance of the students in Mathematics in the:
    1.1 control Group?
    1.2 experimental Group?
2. Is there a significant difference between the pretest and posttest scores of the students in the:
    2.1. control group?
    2.2. experimental group?

3. Is there a significant difference between the scores of the students from the experimental and control group in the:
    3.1. pretest scores?
    3.2. posttest scores?

Hypothesis

There is no significant difference between the pretest and posttest scores of the control group and the experimental group, respectively, at 0.05 alpha level of significance.

There is no significant difference between the pretest scores of the control group and the experimental group at 0.05 alpha level of significance.

There is no significant difference between the posttest scores of the control group and the experimental group at 0.05 alpha level of significance.

METHODS

Research Design

True experimental design was used to identify the effectiveness of the researcher-designed T-MOViLe. According to Swanson and Holton (2005), the key aspect to experimental designs involves the random assignment to a treatment or a control group. This helps to ensure that the two groups are equivalent in terms of history and other preexisting circumstances or conditions that may influence the results. In this study, students were randomly assigned to two groups. All Grade 11 students, MDL and ODL, who were able to connect to the internet for the week of experiment attended an orientation conducted by the researcher. Eighty students were electronically selected using the assignment of values in Excel file. Then, they randomly selected one of the 2 Google classrooms, namely, the ODL and the T-MOViLe. Specifically, this study made use of the pretest-posttest control group design to determine the effectiveness of the T-MOViLe by comparing the scores of the control group and the experimental group.

Procedure

Treatments: The students from the two groups took the same pretest in Google form. Group A, the control group, used a module in PDF file while Group B, the experimental group, used the T-MOViLe – the treatment of this study. T-MOViLe was demonstrated by the teacher. It contained the same content in the Student Learning Manual. Groups took similar posttests. The test questions, as well as the content of the lesson, were taken from the SLM provided by the Department of Education. Module used by Group A and T-MOViLe for the Group B were validated by the Mathematics Master Teachers. The reliability coefficient of the pretest and the posttest was 0.85 and 0.89, respectively, which showed that the tests had high consistency. The whole experiment was closely monitored to ensure that the experiment was performed based on its purpose. The pretest and posttest scores were recorded and analyzed.

Ethical Consideration

The ethical considerations observed in the conduct of the research were based on ~~the~~ Republic Act No. 10173, also known as "The Data Privacy Act of 2012.

Treatment of Data

Appropriate statistical tools were employed by the researcher to arrive with valid and accurate findings. These are essential to interpret the data gathered, as well as to make a sound inference of the population.

The students' performance on pretest and posttest were evaluated using mean, $\bar{x}$ = (total number of correct items)/(total number of items), and the individual mean ~~were~~ was interpreted using the interpretation of students' performance in Figure 2. The study considered 75% as the passing score, as well as the 3-scale results of 33.33% in assigning intervals. It was adjusted to better interpret the mean scores obtained.

Figure 2. Interpretation for Students' Performance in Pretest and Posttest

Level	Performance in Mathematics
Satisfactory	25 – 30
Good	18 – 24
Poor	0 – 17

The students' performance was obtained by finding the difference between their pretest and posttest scores. The significant difference between their performance was obtained by using the dependent and the independent t test. The independent t-test was used to discuss the difference between the performance of the two groups in terms of pretest and posttest scores while the dependent t-test was used to determine the significant difference in the pretest and posttest scores of each group.

RESULTS and DISCUSSION

Level of Performance of the Control Group and the Experimental Group

Table 1
Frequency Distribution of Pretest Scores

	SLM		T-MOViLe	
	f	%	f	%
Satisfactory	0	0	0	0
Good	1	2.50	0	0
Poor	39	97.50	40	100
TOTAL	40	100	40	100
MEAN PERCENTAGE SCORE	**8.8**		**8.6**	
INTERPRETATION	**Poor**		**Poor**	

Table 1 presents the scores of the two groups ~~on~~ in the pretest. It showed that majority of the students using SLM (f = 39, 97.5%) and T-MOViLE (f = 40, 100%) performed poorly ~~on~~ in the pretest. The mean percentage score of 8.8 and 8.6 also indicated poor performance of students using the SLM and the T-MOViLe, respectively. Hence, it implies that they totally have no knowledge yet about the topic to be discussed. Berry (2008) stated that pretests can be used at the beginning of a course to establish a subject knowledge baseline and then related to an end of the course exam to look at the knowledge added. It covers materials that the instructor has not covered, and that the student is not expected to know.

Table 2
Frequency Distribution of Posttest Scores

	SLM		T-MOViLe	
	f	%	f	%
Satisfactory	2	5.00	9	22.50
Good	12	30.00	17	42.50
Poor	26	65.00	14	35.00
TOTAL	40	100	40	100
MEAN PERCENTAGE SCORE	**14.45**		**19.68**	
INTERPRETATION	**Poor**		**Good**	

Table 2 shows the scores of the two groups ~~on~~ in the posttest. The scores revealed that students who used the SLM performed poorly (x=14.45), while the students who used the T-MOViLE were categorized as "Good" (x=19.68). According to Ali (2019), among the many advantages of using videos in instruction, the respondents could understand the lesson easily (73.1%) and remember them for a long time (59.5%). He concluded that the students' academic results get better by watching video content. Karmila et al. (2020) had established that videos contributed to the improvement of students' conceptual understanding and learning outcomes.

Difference Between Pretest and Posttest Scores

Table 3
Test of difference within groups

		Mean	Degrees of Freedom	Critical t value	Interpretation
SLM	Pretest	8.05	39	0.00	Significant
	Posttest	9.08			

T-MOViLe	Pretest	8.6	39	0.00	Significant
	Posttest	21.10			

*p < .05

Table 3 shows the test of difference between the pretest and the posttest scores of each group. It revealed the significant difference on both the control (α = 0.000) and the experimental (α = 0.000) groups. This implies that the use of the Self-Learning Modules (SLM) and the Teacher-Made Offline Video Lecture (T-MOViLe) was effective in delivering the lessons in Mathematics since the results show improvements on test scores.

Difference Between Pretest Scores

Table 4
Test of difference between groups

		Mean	Degrees of Freedom	Critical t value	Interpretation
Pretest	SLM	8.05	39	0.893	Not Significant
	T-MOViLe	8.6			

*p < .05

Table 4 presents the test between the groups' pretests. It revealed that there was no significant difference in the pretest scores (α = 0.893) which implies that the two groups had similar entry knowledge about the topic, and is a good indication to proceed the experiment.

Difference Between Posttest Scores

Table 5
Test of difference between groups

		Mean	Degrees of Freedom	Critical t value	Interpretation
Posttest	SLM	14.450	39	0.000	Significant
	T-MOViLe	19.680			

*p < .05

Table 5 indicates the test scores in the groups' posttests. It showed that there was a significant difference in the posttest scores (α = 0.000) between the two groups. This implies that the T-MOViLe is more effective in teaching Mathematics than the modules.

More than that of printed modules, Kosterelioglu (2016) advanced that videos can be listed as making learning independent from time and space, providing group learning opportunities, facilitating learning in dimensions of movement, color, and sound. Because of its pause-play-replay characteristic, Rasi and Poikela (2016) suggested that the use of video is clearly a superior tool to written materials for visually demonstrating "how-to" that is very necessary to teach mathematics procedures. Nabayra (2022b) also found out that students performed better in their posttest scores after being exposed to teacher-made videos in Mathematics.

Conclusion

In view of the established findings, it is proven that the use of the T-MOViLE (Teacher-Made Offline Video Lecture) improves the academic performance of the students in Mathematics and is more effective than modules. It provides the students adequate time ~~for~~ to understand the lesson because of its pause-and-play property. In a situation where the teacher could not give the face-to-face instructions, offline videos can convey mathematical concepts and processes. Thus, it prevents digital divide that may hamper learning among MDL students.

Its accessibility across time and place is of great help to students who have no access to a stable internet connection. Maximizing the use of available resources provided by the government, the school, and most importantly, the teacher is very necessary as this will pave the way in the delivery of quality education not only during the COVID 19 pandemic but in other situations where distance learning is the only option.

Thus, the use of the T-MOViLE in delivering mathematics instruction among MDL students is recommended. This innovation is useful whenever the student is not capable of attending classes for varied reasons, particularly during emergencies, and as an intervention for students with difficulties in Mathematics.

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