**International Journal of Professional Development, Learners and Learning**
2023, 5(1), ep2306
ISSN 2754-0618 (Online)
https://www.ijpdll.com/

**Research Article**

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# Messenger lectures and video lessons as mathematics interventions for modular distance learning

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**Citation:** Insorio, A. O., & Insorio, J. E. (2023). Messenger lectures and video lessons as mathematics interventions for modular distance learning. *International Journal of Professional Development, Learners and Learning*, 5(1), ep2306. https://doi.org/10.30935/ijpdll/13008

**ABSTRACT**

Providing self-learning modules and other printed materials under modular distance learning in the Philippines does not guarantee the acquisition of learning competencies, particularly in mathematics, wherein explanation and illustration of concepts, principles, and procedures demand the teacher's clarification. To address this, Facebook Messenger was used as a platform to communicate with the students and deliver interventions like lectures through posting slides with voice clips and video lessons. This study aimed to establish the effectiveness of the said interventions for grade 7 mathematics using practical action research. Test material, questionnaire, and interview guide were the instruments used in collecting data validated by a master teacher and two head teachers in mathematics education. Quantitative data were analyzed using SPSS version 23 and qualitative data were analyzed using thematic analysis. Based on the findings, lectures and video lessons through Facebook Messenger helped students understand the mathematical concepts and procedures for solving mathematical problems. It means that the said interventions via Facebook Messenger were adequate for the students to cope with the learning challenges in mathematics brought by modular distance learning. However, the students suggested that sustain the interventions for a longer time.

**Keywords:** Facebook Messenger, lecture, mathematics intervention, modular distance learning, video lesson

Received: 19 Aug. 2022 ◆ Accepted: 23 Feb. 2023

## INTRODUCTION

Modular distance learning, the most carried out learning modality in the Philippines (Trinidad et al., 2022), causes learning difficulties among students. In this modality, self-learning modules were given to the students quarterly to do self-paced learning with less assistance from the teacher (DepEd Order No. 012, s. 2020). However, teachers must monitor the student's learning progress using any means such as text messaging, phone calls, online platforms, or home visitation. The teachers are responsible for finding means of reaching and helping the students cope with the challenges in the said modality.

In modular distance learning, self-paced learning is expected through the provision of printed modules and other learning materials. The implementation of this modality causes burden on the student's learning and how the curriculum is taught (Castroverde & Acala, 2021). Students work independently studying the content in the modules, but they may ask the teacher to clarify their misconceptions through the online platform or phone text and call. However, this cannot be done immediately because the teacher must follow the set class schedule and entertain students' queries in a limited time. Hence, the teacher's responses are not always on time, so the students need to wait for the response anytime. Also, mathematical lessons in the modules are not easy to understand, and limited illustrative examples are found in every lesson.

On the other hand, Pacita Complex National High school is a public school in San Pedro, Laguna, implementing modular distance learning since the school year 2020-2021. Under this modality, students receive printed learning materials and modules every two weeks to continue learning at home autonomously. The teachers' instruction regarding what activities and performance tasks need to accomplish every week is done through group chat in Facebook Messenger. The utilization of printed learning materials and modules is not enough for the students to understand the content of mathematics lessons, leading to poor development of the target competencies, as seen in the submitted outputs. They need the teacher's explanation of the mathematical concepts, principles, and procedures than reading the module content. It has been observed from the outputs submitted that students struggle to answer the learning activities and perform the tasks. Most of their submitted outputs are incomplete and have many incorrect answers, which calls the attention of a mathematics teacher to implement interventions via Facebook Messenger so that the students develop the target competencies properly. It is a teacher's responsibility to plan and formulate interventions to facilitate meaningful distance learning.

Learning mathematics in the new normal through distance education is challenging since face-to-face interaction is still prohibited. Making the students responsible for their learning means pushing them into a burden. So, mathematics teachers must help them how to cope with the challenges, which benefits the entire school system. If the teachers implement effective interventions, these produce better academic performance, yielding better school performance. It means no one must be left behind despite the limited resources and present situation. Mathematics teachers' primary duty is to develop learning competencies for every student to ensure the continuity of learning and cultivate the passion and love for mathematics learning.

## Literature Review

Dangle and Sumaoang (2020) revealed that students struggled in learning the content of the self-learning modules, and parents are not capable of helping their children to answer the activities and do the performance tasks. So, learning difficulties arise, particularly in mathematics subjects at the secondary level, where the lessons come from different branches of mathematics. Mathematical concepts could not be explained by the modules and develop students' competencies (Trinidad et al., 2022). However, an online platform like Facebook Messenger can be used for communication and delivering interventions since this is the most accessible to teachers and students. Facebook Messenger can be used easily by teachers and students since it is connected to Facebook's system.

On the other side, Facebook Messenger, or simply Messenger as a messaging application is convenient to use and many students use this compared with mobile calls (Tananuraksakul, 2018). It can create a group chat, send a text message with a voice clip and make video or audio calls (Gangneux, 2020). Hence, this is an excellent platform for an online discussion of school lessons to help students perform better in examinations (Farhan, 2019). So, it is convenient to use Facebook Messenger since most students use this platform for instant messaging, which does not require a strong internet connection.

Tananuraksakul (2018) found that Facebook Messenger can be used as a platform for academic learning conveniently, efficiently, and confidentially. They concluded that the students look forward to using Facebook Messenger as the medium of academic interaction since students nowadays are digital natives. The statement supports the present study's claim that Facebook Messenger can be used as a platform to deliver instruction conveniently, efficiently, and safely to help students cope with the challenges of modular distance learning. Hence, Facebook Messenger can be a teaching tool (Samani & Noordin, 2020).

One of the responsibilities of mathematics teachers is to design the learning materials and activities appropriate to the student's understanding, making the learning experience meaningful, relevant, and accessible. They must pay attention to students' immediate concerns to avoid losing interest in learning the subject. This can be done by providing interventions accessible to all, like utilizing Facebook Messenger as a platform to bring lectures and video lessons. Since students prefer to watch videos rather than read materials (Jungić et al., 2015), it is better to make teacher-made video lessons to guide the students to learn mathematics lessons better (Amstelveen, 2018).

Teacher-made videos improve students' learning via online platforms (Ou et al., 2019). However, it needs to investigate an online platform that facilitates active learning (Anggoro & Rueangrong, 2020). Baer & Vargas (2021) claimed that utilizing videos in teaching mathematics improves students' academic performance effectively. The teacher should prepare and utilize videos to encourage the students to learn more. It means the teacher should be the one who makes the video rather than downloading it from online sources. However, few studies have been done regarding the effectiveness of video and how viewers learn from watching it (Hansch et al., 2015; Ou et al., 2019).

On the other hand, Bullo (2021) found that using video lessons is more effective than self-learning modules in the new normal education. Video lessons empower the students to comprehend the mathematics lessons with less teacher assistance. But he suggested studying the perceived effect of using video lessons on the students. However, Lipomi (2020) claimed that video utilization for students above 12 years old is effective for knowledge acquisition. Students can comprehend mathematics concepts, master problem-solving skills, perceived mathematical ideas, and achieve better academically (Huang et al., 2020). Hence, learning through videos improves the students' mathematics learning outcomes (Rahmadani et al., 2019). The statements above support the use of videos in delivering mathematics lessons. However, the present study believes that the use of short videos delivers a good mathematics lesson.

Integrating video lessons into modular learning increases students' performance effectively (Maningo, 2021). Video lessons improve the student's learning experience and empower them to have learning control. Hence, if the students find incomprehensible information about the lesson, they can review the video lessons anytime to master the learning competencies (Abdullaeva et al., 2022). Video lessons as mathematics intervention materials in modular distance learning improve students' academic performance (Trinidad et al., 2022). Students gain confidence in doing the learning activities in the modules.

The literature review above supports the claim that Facebook Messenger must be utilized as a platform to bring mathematics interventions like lectures and video lessons. Also, video lessons can be used to improve students' mathematics learning. However, few studies in the past regarding the utilization of video lessons in mathematics education have been done (Trinidad et al., 2022). Hence, most video lessons are used for science, technology, engineering, and mathematics (STEM) students for the secondary level (Wagner et al., 2020), not students under the regular Basic Education Curriculum. However, video lessons for the new normal education need further investigation (Brezovnik & Lipovec, 2021; Bullo, 2021). It is very timely to study the effectiveness of video lessons and lectures via Facebook Messenger since many students still struggle with modular distance learning, particularly in mathematics subjects. Hence, limited studies have been conducted on utilizing Facebook Messenger to deliver intervention under modular distance learning.

## Theoretical and Conceptual Framework

The study leaned on the cognitive theory of multimedia learning, which posits that combining words and pictures in videos with sounds produces deep learning compared to words only (Rudolph, 2017). In producing video lessons and lectures, necessary words from the presentation and images are organized coherently so that the students can easily integrate them into their prior knowledge. A careful and systematic selection of words and images must be placed in video lessons and lectures via Facebook Messenger. Hence, the teacher needs to utilize the local context appropriate to the student's level of understanding to ensure that the said interventions take effect and produce desirable learning outcomes.

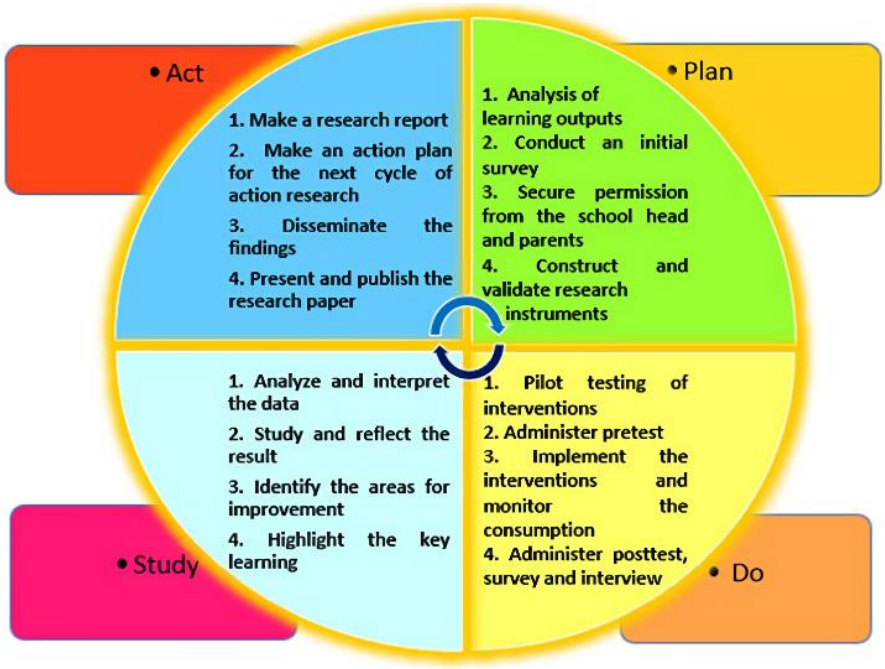


**Figure 1.** Conceptual paradigm (Source: Authors)

**Figure 1** presents the study flow under the plan-do-study-act (PDSA) model originating from the work of Edward Deming and Walter Shewhart (Taylor et al., 2014). The plan stage started with analyzing the students' submitted activities and performance tasks from the first grading period. Based on the result, students struggled to accomplish the module activities and tasks, so the teacher conducted an initial survey to disclose the root causes. It has been revealed that self-paced learning using self-learning modules does not guarantee the development of mathematical competencies. Many students work alone in answering the module activities. Students have misconceptions and misunderstandings of mathematics concepts, principles, and procedures. So, the teacher formulated interventions such as lectures and video lessons via Facebook Messenger since these were the most requested methods for the students to understand better the mathematics lesson based on the initial survey. Permission from the school head was secured, and informed consent was sent to the parents as part of the protocol. Then, research instruments such as test material, survey questionnaire, and interview guide were made and permitted by the three experts in mathematics education.

Under the do stage, two weeks of the pilot implementation of the interventions to non-participants to determine the areas of improvement was done. Data collected from the pilot implementation through a simple poll survey serve as the basis for refining the interventions. Then, a hardcopy pre-test was administered during module distribution to the target participants to measure their prior knowledge, and the result was set aside for future comparison. The implementation of interventions lasts two months during the third grading period, with regular consumption monitoring and consultations with the participants. After that, the post-test was administered via Facebook Messenger and a hard copy during module distribution, wherein the students wrote the answer on a sheet of paper and submitted it in school. Hence, the student-teacher conducted surveys and interviews to avoid biases in data collection.

In the study stage, quantitative and qualitative data analyses were done immediately to arrive at the results of the interventions. Then, the researcher reflected on the results to identify what went well and what did not go well. Hence, areas for improvement were highlighted, and key learning was formulated as the basis for the following action research cycle. In the act stage, a research report was written immediately, and an action plan was constructed to guide future research. Dissemination of findings was performed through faculty meetings, conferences, and forums. Hopefully, the research paper will be published in an international journal.

### Research Questions

This study aimed to establish the effectiveness of Facebook Messenger to deliver lectures and video lessons as grade 7 mathematics interventions for modular distance learning.

Specifically, it answered the following questions:

1. Are the scores of the experimental group statistically different from the scores of the control group?
2. Are the mean scores in the pre- and post-test examinations of the control and experimental groups statistically different?
3. What is the perceived effect of Facebook Messenger lectures and video lessons on the academic performance of grade 7 students?
4. What are the suggestions from the students to improve the Facebook Messenger lectures and video lessons?

## METHODOLOGY

### Research Design

The study utilized a practical action research design implementing Facebook Messenger to deliver lectures and video lessons as interventions for grade 7 mathematics under a modular distance learning modality. Practical action research was the most appropriate design for this study because the study's main objective was to address the student's learning difficulties through interventions. The said

design aims to solve a specific problem by improving practices using available resources suited to those who experienced the problem within the locality (Stowell & Kramarova, 2022). Practices were improved by putting theory into practice and action into reflection in the current condition, leading to better results (Dreyer-Gibney et al., 2022).

### Participants of the Study

The participants were two sections of grade 7 students under Basic Education Curriculum (BEC) at Pacita Complex National High School for 2021-2022 who struggled in modular distance learning. One section was assigned randomly to the control group, while the other was to the experimental group. Forty-three participants per group voluntarily participated and completed their participation. The students were struggling to learn mathematics due to modular distance learning, wherein self-learning modules and printed materials were distributed to the students to do self-paced learning, which seemed ineffective for grade 7 students. So, purposive sampling was employed to select the target participants based on the results of the first grading summative test and performance tasks. Students who got low scores in summative tests and performance tasks were considered struggling students. Hence, informed consent and assent forms were given to the participants' parents to ensure voluntary participation. However, the participants were given the right to refuse or withdraw at any time upon request.

### Research Instrument

The study used test materials, a survey questionnaire, and an interview guide as research instruments validated by a master teacher and two head teachers in the mathematics department to establish face and content validity. Before utilization, the test materials underwent content validation, which is the first requirement for instrument development (Halek et al., 2017). Content validation was performed by expert judgment of the subject matter thinking about each item within the research instrument (Ismail & Zubairi, 2022). The judgment of subject matter experts confirms the accuracy, accountancy, and appropriateness of each item found in the test material.

Kendall's coefficient of concordance was employed to determine the agreement of the three experts regarding the validity of the instruments. The computed value of .98 revealed that the three raters agreed on the face and content validity of the said instruments. The 30-item pre- and post-test materials were used to elicit quantitative data as a result of intervention implementation. The reliability indices of the test materials using Kuder-Richardson formula 20 were .80 and .84, respectively since quantitative data were derived from the test result (Nugroho et al., 2019).

Item analysis was done to establish the quality of test materials (Sharma, 2021). In the final version of the pre-test material, four items with 0.20-0.39 difficulty index, ten items with 0.40-0.59 difficulty index, and sixteen items with 0.60-0.79 difficulty index. For the discrimination index, five items were found between 0.30-0.39, while twenty-five items were more than 0.40. Hence, there were ten items with 66.66% and twenty with 100% for distractor efficiency. On the other hand, the post-test material was a modified version of the pre-test material has five items found between 0.20-0.39 difficulty index, eight items with 0.40-0.59 difficulty index, and seventeen items with 0.60-0.79 difficulty index. However, eight items were found between 0.30-0.39 discrimination index, while twenty-two items were more than 0.40. Similarly, it has nine items with 66.66% and twenty-one with 100% for distractor efficiency.

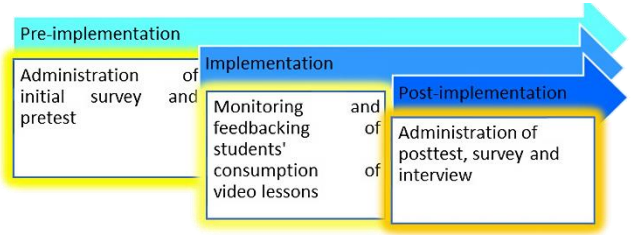


**Figure 2.** Flow chart of data gathering procedure (Source: Authors)

Hence, a 10-item survey questionnaire was constructed based on related literature from Alqurashi (2018) and Kuo et al. (2014) to determine the perceived effect of the interventions. Permission was secured for the authors to adapt the questionnaire. Then, it went through content validation by a group of experts in mathematics education. Suggestions from the validators were carefully followed in the revision, such as having a Filipino version of each item, simplicity of direction, and correctness of grammar. But the survey questionnaire has a reliability index of .81 using Cronbach's alpha. Also, five-item interview guide questions were used to gather qualitative data.

### Data Gathering

**Figure 2** presents the methodological processes of data collection. After securing permission from the school head, an initial survey via Facebook Messenger was conducted to reveal the challenges in modular distance learning as a basis for crafting the interventions appropriate to the student's needs and interests. Also, technological capabilities were elicited via a poll and were considered in making interventions. Students were asked how they better understood the mathematics lessons besides printed modules and other learning materials. As a result, most preferred video lessons or lectures from the teacher via Facebook Messenger. So, the teacher crafted lectures using PowerPoint slides with voice clips and video lessons as interventions. Hence, a pre-test was administered during the distribution of modules.

The study utilized Facebook Messenger as a platform to deliver lectures using slides with voice clips and video lessons as interventions for grade 7 mathematics under modular distance learning. The lectures last for a maximum of 15 minutes per weekly lesson, wherein in each slide, a voice-over comes explaining the slide's content intended for the students with low internet bandwidth. Also, slides containing the lesson's content were posted one by one, accompanied by a voice clip explaining the content using the local language. On the other hand, links to teacher-made video lessons are posted via Facebook Messenger and last from 10-15 minutes for those capable of a strong internet connection. Video lessons are made short so that the student's attention will not lose (Ou et al., 2019). Also, the student's eyes must take away from the screen every twenty minutes based on the recommendation of the American Optometric Association (DM-CI-2020-00162, 2020).

The teacher discussed the lesson title, content, and illustrative examples in the video lesson. Ou et al. (2019) claimed that video is the best medium to demonstrate illustrative examples with visual, animation, and audio recording. So video lesson is the best way to show the mathematical procedures and computation explained by the teacher in the local language. So, the local language (Filipino) was used to explain the lesson's content in the video.

The teacher implemented the interventions for the third grading period. Formal assessments were done through summative tests and performance tasks aside from the research instruments to ensure that the students consumed the interventions. Hence, the number of students who see the interventions was monitored weekly and reminded students to answer the summative tests and do the performance tasks. Also, the teacher conducted poll surveys every two weeks to determine if they consumed and understood the interventions.

After two months of implementation, the post-test was administered via Facebook Messenger and hardcopy during module distribution. Then, the pre-test result was compared with the post-test for a significant difference. Hence, the survey was conducted to elicit quantitative data about the perceived effect of interventions. Also, semi-structured interviews were conducted by the student-teacher to know how those interventions helped the students better understand the mathematics lessons and get suggestions to improve the interventions via phone calls.

For positionality, the first researcher was an outsider responsible for data analysis and research report, while the second researcher was the teacher who determined the interventions' effectiveness via Facebook Messenger based on her students' responses. She bracketed her ideas on how the students responded and removed biases over the data collection. The second researcher was the one who administered the initial survey, pre-test, and post-test materials. However, the student-teacher administered the survey questionnaire and interviews to avoid influencing students' responses. Hence, member checking was also done by the student-teacher.

### Ethical Considerations

Ethical issues such as the right of human participants, safeguarding against discrimination, respecting autonomy, the confidentiality of data, respect for the local authority, and proper dissemination of findings must be appropriately followed in any part of the research process (Ventura et al., 2021). The school head's permission was secured through a formal letter, and informed consent for the parent and assent forms for the participants were secured. Utmost confidentiality was considered with the data, and the participants' identities were kept anonymous using pseudonyms to replace their names. Data were placed in the researcher's computer for two years; then, all data was deleted. Hence, the study was disseminated only in the faculty meeting, professional conferences, fora, and journal publications so that other practitioners could get benchmarking insights.

### Data Analysis

Quantitative data were cleaned by removing the missing data entries and outliers from the pre-analysis. From 86 total participants, it was trimmed down to 80 due to data cleaning. Hence, data were treated with statistical package for the social sciences (SPSS) version 23 for descriptive statistics such as median, normality of data using the Shapiro-Wilk test before doing statistical analysis (Cui et al., 2022) and homogeneity of variances using Levene's test (Estrella, 2022). Also, the hypothesis was tested at a .05 level of significance using paired sample t-test for significant differences before and after the interventions. A t-test for two independent samples between the scores of the control and experimental groups, Cohen's d, and percentage change were used to compute the significant difference and effect size in response to the first two research questions.

**Table 1.** Normality test & homogeneity of variance test of scores in pre- & post-test

| Test | Shapiro-Wilk test | | Levene's test | |
|---|---|---|---|---|
| | Statistic | p-value | Statistic | p-value |
| Pre-test of experimental | .967 | .288 | 1.744 | .183 |
| Post-test of experimental | .951 | .082 | 1.523 | .224 |
| Pre-test of control | .961 | .187 | 1.484 | .231 |
| Post-test of control | .966 | .260 | 2.364 | .132 |

For qualitative data analysis, manual coding was used by reading and rereading the transcripts from the interview in MS Excel spreadsheets. Codes were assigned in a small set of responses to represent the participants' ideas. Codes were categorized to form concepts regarding how the interventions helped the students and their suggestions for improvement. Then, each category was regrouped to form themes. So, a reflective thematic analysis was used to arrive at various themes extracted from the categories (Janis, 2022). Member checking was done to establish the credibility of qualitative data by returning the transcripts and data analysis to the participants and seeking their agreement if the actual responses and experiences reflected in the data. Busetto et al. (2020) claimed that member checking or respondent validation is a way of establishing the credibility of qualitative data by returning the responses to the participants.

**Table 1** shows the normality test of the pre- and post-test results for two groups using a Shapiro-Wilk, and the homogeneity test of variance using Levene's test as the prerequisites for using the parametric test of difference. As gleaned from **Table 1**, the scores of the two groups were normally distributed since the p-values are more than a .05 level of significance. Hence, the variances are homogenous since the p-values of Levene's test are more than .05 alpha. It means that the parametric tests of difference are appropriate to use to test if a significant difference exists, particularly the t-test.

## RESULTS

**Table 2** depicts the descriptive and inferential analysis of the scores. The scores of the experimental group in the pre-test ranged from 5 to 15, while the control group ranged from five to 17. However, the post-test scores of the experimental group ranged from 17 to 27, while the control group ranged from 11 to 20. Hence, the experimental group's post-test mean score (22.70) is significantly higher than the control group's (15.15). It implies that the Facebook Messenger lectures, and video lessons helped the students to perform well academically. It connotes that Facebook Messenger can be an excellent platform for delivering interventions similar to the findings of Farhan (2019) and Wang et al. (2011). Facebook Messenger is more convenient for communication and delivery of learning materials preferred by most students. Also, Facebook Messenger can be used as an excellent platform to deliver teacher-made interventions (Anggoro & Rueangrong, 2020).

Moreover, **Table 2** shows the result of the t-test for two independent samples. It signifies that the scores in the pre-test of the two groups–experimental and control are not statistically significant since the p-value (.410) is more than the .05 significance level. The two groups possessed the same mathematical ability before the intervention implementation. However, the post-test scores were statistically significant since the p-value (.000) is less than the significance level of

**Table 2.** Descriptive statistics and independent sample t-test for significant difference between the two groups

| Group | Test | Minimum score | Maximum score | Mean | Standard deviation | df | t-value | p-value |
|---|---|---|---|---|---|---|---|---|
| Experimental | Pre-test | 5 | 15 | 8.93 | 2.39 | 78 | -.828 | .410 |
| Control | Pre-test | 5 | 17 | 9.60 | 2.97 | | | |
| Experimental | Post-test | 17 | 27 | 22.70 | 2.64 | 78 | 13.994 | .000 |
| Control | Post-test | 11 | 20 | 15.15 | 2.11 | | | |

**Table 3.** Paired samples t-test for significant difference and effect size for practical significance

| Group | Paired differences | | | t | df | Sig. (2-tailed) | Cohen's d | Percentage change |
|---|---|---|---|---|---|---|---|---|
| | Mean | Standard deviation | Standard error mean | | | | | |
| Experimental pre-/post-test | -13.773 | 3.333 | .502 | -27.409 | 39 | .000 | 5.468 | 154.199 |
| Control pre-/post-test | -5.550 | 2.952 | .467 | -11.890 | 39 | .000 | 2.154 | 57.813 |

**Table 4.** Perceived effect of Facebook Messenger lectures and video lessons on the academic performance of grade 7 students

| Statement | Median | Interpretation |
|---|---|---|
| 1. Facebook Messenger lectures and video lessons improve my learning in a self-paced manner. | 3 | Agree |
| 2. Facebook Messenger lectures and video lessons help me learn the content of mathematics lessons & develop my competencies. | 3 | Agree |
| 3. Facebook Messenger lectures and video lessons help me develop my confidence in dealing with mathematics lessons. | 3 | Agree |
| 4. Facebook Messenger lectures and video lessons motivate me to perform my activities and tasks actively. | 3 | Agree |
| 5. Facebook Messenger lectures and video lessons make my learning easy because the lessons are well-explained. | 3 | Agree |
| 6. I can better answer the module's activities alone after watching Facebook Messenger lectures and video lessons. | 3 | Agree |
| 7. I can understand mathematics lessons better due to Facebook Messenger lectures and video lessons. | 3 | Agree |
| 8. I can do my performance task alone & answer my summative test correctly due to Facebook Messenger lectures & video lessons. | 3 | Agree |
| 9. Mathematical concepts, principles, and procedures become clear to me due to Facebook Messenger lectures & video lessons. | 3 | Agree |
| 10. I am interested to learn more about mathematics through Facebook Messenger lectures and video lessons. | 3 | Agree |

.05 alpha. It implies that the interventions such as Facebook Messenger lectures and video lessons influence the academic performance of the experimental group.

**Table 3** depicts the paired samples t-test to establish the significant difference between the pre- and post-test scores. Having a p-value of .000 (t=-27.409 & t=-11.890) signifies a significant difference between the scores of the pre- and post-test examinations. It implies that there are increments in the scores of the two groups. However, considering the mean differences, the experimental group obtained higher scores than the control group. Considering Cohen's d and percentage change as the most commonly used effect size measures (Raykov et al., 2022), the interventions via Facebook Messenger improve the students' learning outcomes. The interventions produced better learning compared with pure printed modules. It implies that Facebook Messenger lectures and video lessons equipped the students with the mathematical competencies needed. The effect size signifies that the interventions are effective and must be utilized again (Dankel et al., 2017). Students improved their learning by watching the video lessons or listening to the teacher's lectures via Facebook Messenger. The teacher explained the lesson contents using the local language, which makes the lesson understandable.

**Table 4** shows the effect of Facebook Messenger lectures and video lessons on academic students' performance as perceived by the grade 7 students using the median since the Likert scale was used to measure the responses. The Facebook Messenger lectures and video lessons made mathematics learning easy and understandable because their teacher was the one who explained the lessons. The video lesson contents made the students understand the content better, similar to the finding of Kuo et al. (2014). The mathematical computation, principles, and procedures became straightforward to follow. Hence, students were motivated to accomplish the learning task in the modules alone since they were equipped with mathematical competencies. Also, they were confident enough to do the activities and performance tasks assigned to them. They were interested in learning more about mathematics lessons, implying that the teacher must find ways to make interventions appropriate to the student's level of understanding by utilizing the most available means.

Moreover, the teachers explained the lessons so the students knew what mathematical principles or concepts could be used for the module learning task. Students were equipped with competencies in facing the performance tasks given by the teachers since they could watch the video lessons repeatedly or listen to the lectures conveniently. To sum up, Facebook Messenger lectures and video lessons improve the self-paced learning of the students under modular distance learning despite the challenges faced. Video lessons and audio recordings are some of the teacher's interventions for the students under modular distance learning (Dargo & Dimas, 2021). It connotes that the said interventions effectively develop the students' mathematical competencies since Facebook Messenger is a platform instance that facilitates communication and interaction among users (Nieborg & Helmond, 2019).

**Figure 3** shows the themes based on the transcripts from the interview. Students suggested regularly posting lectures and video lessons so that they expected to have teacher-made interventions explaining the lesson. Also, they asked for more examples and explanations of the lessons so that they grasp the lesson quickly. Hence, they requested that the teacher speak slowly and have a clear voice to comprehend every word easily.

The words of the students support the findings above.

> "Always send us Facebook Messenger lectures and video lessons so that I understand the lesson better" (Participant 13).

> "My suggestion is to post the lecture regularly so that I can see what I will do immediately" (Participant 15).

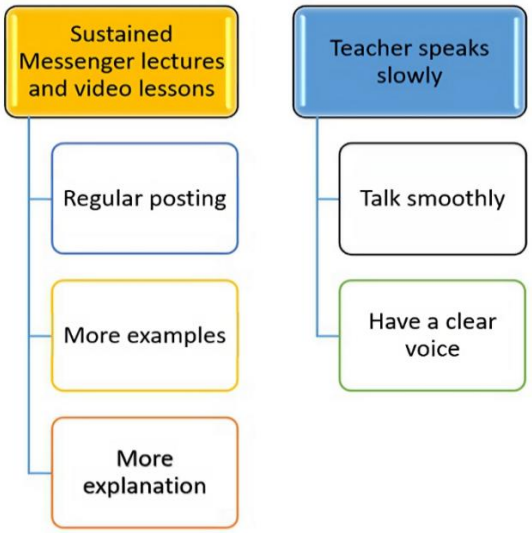


**Figure 3.** Suggestions to improve Facebook Messenger lectures & video lessons (Source: Authors)

> "If I have something to answer, I can answer it by myself, and I will listen again to the Facebook Messenger lectures so that I can remember them easily" (Participant 19).

## DISCUSSIONS

The study aimed to establish the effectiveness of Facebook Messenger to deliver lectures and video lessons based on pre- and post-test scores and the perceived effect on academic performance. As a result, both the experimental and control groups produced statistical significance from the pre-test to post-test examinations but considering the mean scores, the experimental group performed better in the post-test. Hence, the post-test scores of the experimental group are statistically different from the control group, as shown by paired sample t-test. It means the experimental group performed better due to the consumption of teacher-made interventions. The Facebook Messenger lectures and video lessons guided the students to understand the mathematics lessons comfortably by repeatedly watching until the students developed confidence in answering the module activities and performing the tasks given by the teachers. Hence, the teachers constantly monitored the interventions' consumption to ensure that the students watched and understood the content. Facebook Messenger is used by the teacher to contact students, share learning resources like videos, and instruct the students to do activities (Le et al., 2022).

The students perceived that their consumption of the Facebook Messenger lectures and video lessons helped them understand the mathematics lesson better, making learning easy. Mathematical concepts, principles, and procedures become more precise, and the target mathematical competencies are developed. Teacher-made video lessons assist students in learning mathematics lessons better (Amstelveen, 2018). Students are more confident in answering the module activities and performing the assigned tasks in a self-paced manner. However, the teacher-made video lessons and the printed modules produced better learning outcomes (Bullo, 2021) and enhanced students' understanding of the lesson (Trinidad et al., 2022). These empower the students to learn more in a self-paced manner. Baer & Vargas (2021) and Trinidad et al. (2022) believed that teacher-made videos effectively improve students' academic performance, which supports the study's claim.

Considering the lens of the cognitive theory of multimedia learning, a teacher carefully selects the words and pictures included in the lectures and video lessons so that the students can quickly grasp the concepts and principles presented in the materials. However, students suggested uploading the lectures and video lessons with more examples frequently and detailed explanations, especially the computational part. Also, they have requested the teacher to speak slowly so that every word is clear. Moreover, all students' suggestions are considered in revising the intervention implementation for the next research cycle.

Based on the findings, the teacher reflects on the practices that she needs to conduct a random interview for every lesson with the student to verify if the student develops the target competencies in the next action research cycle. She needs to communicate with the parents to assist their children in answering the module's activities after consuming the interventions. Also, she needs to add more illustrative examples, explain the lesson content further, and speak slowly to clarify her words.

## CONCLUSIONS AND RECOMMENDATIONS

The pre-test scores of the two groups did not show any statistical significance, but the post-test scores did. The experimental group performed academically better than the control group after receiving the Facebook Messenger lectures and video lessons for two months of implementation. Hence, the pre-test scores were statistically different from the post-test scores. The said interventions helped the students academically and equipped them with mathematical competencies in answering the modules' activities and performance tasks. Lectures and video lessons via Facebook Messenger as interventions positively affect students' academic performance in mathematics for modular distance learning. Since the teachers explained the lessons, the students became more confident, competent, and interested in answering the module activities. However, they suggested continuing to post lectures and video lessons, with more examples and detailed explanations of each lesson. Also, they requested the teacher to talk slowly and smoothly so that the voice would become evident.

The study was restricted to two sections since it was action research focusing on the solution to the immediate classroom problem. Also, two months of implementation were carried out to facilitate the pre-implementation and post-implementation stages to complete the entire research cycle. So, it is suggested to have action research implemented for an extended period in different schools so that the effectiveness of Facebook Messenger lectures and video lessons can be investigated further. Moreover, the future researcher may conduct a true experimental design to verify the effectiveness of the said interventions. Hence, the teacher must always ask for immediate feedback from the students for every intervention implemented to make necessary adjustments promptly.

**Author contributions: AOI:** data analysis & research report & **JEI:** proposal, implementation, & data collection. All authors approve final version of the article.

**Funding:** The authors received no financial support for the research and/or authorship of this article.

**Acknowledgments:** The authors would like to thank all people who contributed a lot to the completion of this paper. To the school head of Pacita Complex National High School, Sonia J. Alvero, for her approval to conduct this study, head teacher II of the mathematics department Erwin S. Corpuz for the support and encouragement to continue learning, master teacher II Irma Estella Marie L. Esteban for words of encouragement and technical assistance and head teacher VI of San Pedro Relocation Center National High School-Main Campus Marites M. Urcia for validating the research instruments. Also, to all grade 7 students who participated voluntarily, your learning needs derive us from thinking beyond usual and inspiring us to improve our practices. Above all, Almighty God and Lord Jesus are the sources of Divine wisdom, courage, and prosperity. May the researchers be served as stewards of peace, wisdom, transformation, and faith.

**Ethics declaration:** Authors declared that the study had no ethics committee approval because it was action research implemented in one school with the approval of the school head.

**Declaration of interest:** Authors declare no competing interest.

**Data availability:** Data generated or analyzed during this study are available from the authors on request.

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