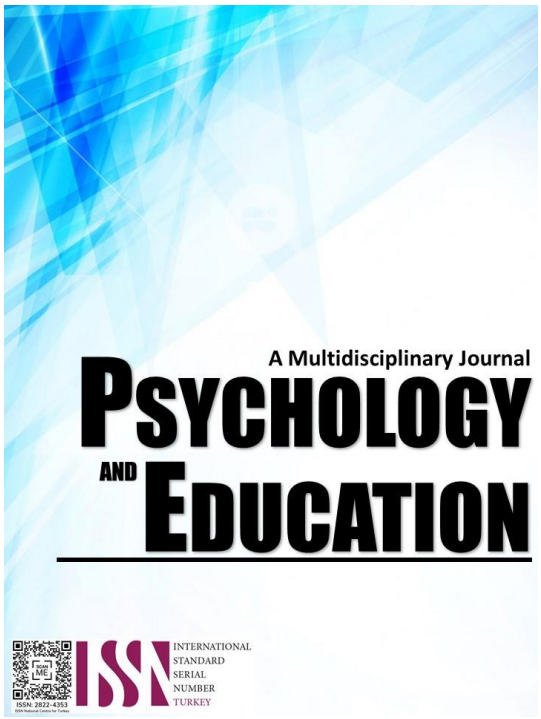
# DEVELOPMENT AND EVALUATION OF MULTIMEDIA LEARNING MODULES FOR MATHEMATICS 10

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Research Article

# Development and Evaluation of Multimedia Learning Modules for Mathematics 10

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**Abstract**

This study attempted to develop and evaluate Multimedia Learning Modules for Mathematics 10 of Schools Division of Antipolo City during the school year 2022 – 2023. A descriptive method of research was used in this study. The developed Multimedia Learning Modules for Mathematics 10 were evaluated by fifteen (15) mathematics teachers and fifteen (15) experts from different public schools in Antipolo City. The statistical tools used to treat the data were the weighted mean, and independent-samples t test. To determine the evaluations of the respondent's, weighted mean was utilized; and to examine the difference between the evaluations of the two groups of respondents, independent-samples t test was used. The researcher crafted a learning module based on the results of the second quarterly examination in Mathematics as reflected in the mean percentage score. The Mathematics teachers and expert respondents evaluated the developed Multimedia Learning Modules for Mathematics 10 in terms of Clarity, Comprehensibility, Appropriateness, Usefulness, and Technical and Instructional Design with the grand weighted mean ratings of 3.88 and 3.79, respectively, verbally interpreted as Strongly Agree (SA). It was also shown that there was no significant difference between the evaluations of the two groups of respondents. Comments and suggestions of both teachers and expert respondents to further improve the developed Multimedia Learning Modules for Mathematics 10 were given.

**Keywords:** *multimedia, learning modules, mathematics*

## Introduction

The massive school closures to stop the spread of COVID-19 as part of public health efforts have put the education sector around the world in a unique bind. It altered education for children of all ages, and this disruption in education affected over a billion students worldwide. Additionally, the disruption of the pedagogic learning process has a significant impact on the advancement of higher education both economically and politically as well as on the circumstances surrounding the protection of students' right to an education. Additionally, the challenges in the educational system caused a current demand for the development and advancement of different methods to teaching. To ensure continuity in curriculum-based study and learning for all, governments and nations around the world are working to quickly deliver remote education at scale (UNESCO 2020).

In response to the basic education issues brought on by the global pandemic, the Department of Education (DepEd) created DepEd Order No. 12 series 2020 or the Basic Learning Continuity Plan (BE-LCP). The integration of the K–12 Curriculum into the Most Essential Learning Competencies (MELCs) and allowing for various learning delivery modalities, such as distance learning and blended learning, either on top of or in place of face–to–face learning, are key components of the learning strategies that will operationalize the BE–LCP.

The DepEd Memorandum CI-2020-00162 was developed as the Department of Education used distance learning delivery modalities (DLDM) as their mode of instruction while dealing with the global pandemic. It includes descriptions and considerations for each DLDM, a map of learning resources for each DLDM, and suggested actions to address potential challenges in implementing DLDM. The matrix of specifications for the delivery methods for distance learning is enclosed. Any of the following delivery methods, including TV-Video/RBI, blended distance learning, online distance learning, and modular distance learning, may be used to deliver distance learning.However, on the policy guidelines on the implementation of learning delivery modalities for the formal education and in response to the need of the learners, most public schools and institutions used Modular Distance Learning (MDL) when the pandemic happened. A learner may adopt either Digital Modular Distance Learning (DMDL) or Printed Modular Distance Learning (PMDL).

In connection with this, DepEd Order No. 034 series of 2022 or the School Calendar and Activities for School Year 2022-2023, recognizing the COVID-19 pandemic in relation to the need resume to 5 days in-person classes gave schools enough time to slowly implement the transitioning or classes by choosing the following options: 5 days of in-person classes, blended

learning, and full distance learning.The researcher believes that learning is an active process, thus, students must be actively engaged in discussions and activities to construct knowledge. It can be in a form of educational videos, interactive modules, video lesson and such. It is not possible for students to take on a passive role and retain information.

This seems applicable to early distance learning classes that lacked complex technology and instead relies upon constant communication such as correspondence through the mail or video and audio recordings. Current distance learning classes compete with face-to-face classes in that student-teacher communication is often instantaneous. Quick technological growth in the field of distance learning supported by interactive and innovations, and real-time performance calls into question the importance of an objectivist framework. As the technology that supports distance learning has evolved, the reinforcing learning theories should be re-examined and re-evaluated to recognize the success of the learning modality. In support, online courses for distance learning have been the most widely recognized and useful learning method as the teachers are no longer confined to the traditional face-to-face delivery of lessons. Distance learning could significantly increase the standards for effective educational experiences in virtual settings (Leontyeva, 2018).

Additionally, the use of multimedia in the distance learning set up has been shown to enhance learning and boost student-teacher engagement. By integrating multimedia into the lesson, teachers can make it more interesting. Instead of writing key information on the chalkboard, multimedia can draw attention to them. (Crisologo et al., 2019).With these, the researcher believes that crafting a multimedia learning module will help the learners to be actively ready during the in-person classes since it engages students, aids them in knowledge retention, as well as motivates them to learn the subject, and they can develop their full potential while learning the subject.

Multimedia Learning Module (MLM) is designed to cater to the needs of the students. It provides time for mastery and sufficient practice to ensure that the targeted Most Essential Learning Competencies (MELC) are achieved. In teaching Mathematics, MLM can be helpful in different activities and strategies that can be used to gain the attention of the learners. It can be used as their alternative materials to cope up to the lessons. As technology plays an important role in the teaching and learning of mathematics in this new normal, the initiative of the teachers to craft and create an instructional material should be suited to the needs of the learners and the community. Mathematics teachers must learn to use and manage technological tools and resources well. Development of Multimedia Learning Modules can be a great help to cope up to this new normal situation. Not only that, but teachers may also use these instructional materials as their other way of teaching even when they are not around the classroom because of different circumstances. This can also be one of the different interventions and innovations of the school in the new normal.

**Research Questions**

This study aimed to develop and evaluate Multimedia Learning Modules for Mathematics 10 of Schools Division of Antipolo City for the school year 2022 – 2023. More specifically, it sought answers to the following questions:

1. Which quarter has the lowest mean percentage score (MPS) of Mathematics 10 based on the quarterly exam result of Mayamot National High School for the school year 2021 – 2022 as basis for crafting the Multimedia Learning Modules?
2. What is the evaluation of experts and Mathematics teacher respondents on the developed Multimedia Learning Modules for Mathematics 10 of schools in Division of Antipolo City with respect to the following criteria?
   2.1 Clarity
   2.2 Comprehensibility
   2.3 Appropriateness
   2.4 Usefulness
   2.5 Technical and Instructional Design
3. Is there a significant difference between the evaluations of the two groups of respondents on the Multimedia Learning Modules for Mathematics 10 based on the above-mentioned criteria?
4. What are comments and suggestions of Mathematics teachers and experts to improve the developed Multimedia Learning Modules for Mathematics 10?

## Literature Review

Modular instruction aims to individualize learning by requiring learners to master one unit of information before advancing on to a following lesson (Torrefranca, 2017). It is a self-instructional resource used as an additional resource to support students in mastering the lesson and managing the lessons. It specifically aims to shift the emphasis of the classroom from what it is to what the students can do.

Saad (2017) elaborates that students who were taught using instructional materials outperformed learners who were taught without them. The use of instructional materials in secondary school teaching and learning has been identified as having a positive effect on students' academic achievement. There is broad consensus that instructional materials improve teaching and learning and improve academic achievement among students. Through it, he supported, among other things, the idea that instructional resources should be employed in secondary school teaching and learning as it improves the students' academic achievement. Cempron (2021) explained that all forms of teaching and learning need the use of instructional materials to ensure that the objectives are met, and that the delivery is effective. The selection of proper instructional resources is of vital importance to take into consciousness due to the fact the subject matter has a reputation for being profoundly factual and conceptual.

On the other hand, the necessity for innovative concepts has grown as technology has evolved greatly, as Sadeghi (2019) explained. The modalities in which education is delivered are expanding, and this has changed both teaching and learning. Distance education differs greatly from regular schooling in this regard.

With that, Swart, et al., (2021) explained the transactional distance as barriers to a student's engagement with their learning experience. These obstacles result from interactions between students and teachers, from interactions amongst students themselves, from subject matter content, and from the usage of instructional technology. It demonstrates that, from the perspective of student involvement and outcomes, the investment in pricey high-tech classrooms is not justified—a beneficial finding during times when school funds are already at their absolute maximum.

The Multimedia Learning Theory appears to build on a few earlier theories and employ best practice methods that help design effective instructional messages. As explained by Ramlatchan (2019), all learners can themselves process auditory and visual information, have limited working memory resources, and need cognitive resources to process new information and learn, which forms the basis for diversity of application. Relative to that, Yahya, R. et al. (2019) cited that using Multi-frames Video Recorded Experiments (MFVREs) as self-learning materials showed the positive perceptions towards the achievement of control and experimental group. It also showed that MFVREs are effective as self-learning materials to improve students' achievements in learning the subject.

Meanwhile, Tupaz (2021) asserts that the effective teaching in mathematics requires an understanding of what the students need to know, to learn, and to support them to learn it better. To be effective, teachers must have a thorough understanding of and commitment to their learners as well as be competent at selecting and utilizing a variety of pedagogical techniques and learning resources. One of the innovative ideas that has the potential to enhance education and give students in all subject areas a meaningful learning experience is the implementation of a distinct teaching approach. Because they can work directly in their books, further contextualizing the mathematics worktext helps pupils absorb the information more quickly. No matter the students' level of conceptual understanding contextualized modular worktext and Department of Education learning materials can be employed as a teaching strategy.

One of the reviewed studies was conducted by Andres (2021) which aimed to create a self-learning package that helped the students. This self-learning package aid and guide Mathematics teachers in their efforts to teach various mathematical concepts to their students. It was revealed that the developed self-learning package for Grade 8 Mathematics was acceptable in terms of usefulness, suitability, cohesiveness, and quality. Also, it could establish a self-directed learning environment that encourages students to think critically, learn effectively, and understand and apply mathematical principles in their daily lives.Another reviewed study by Lopez (2021) attempted to develop and validate a self – paced instructional material in Mathematics 9 based on the Restricted Basic Education Curriculum. This self – paced instructional material enhanced the performance of Grade 9 student in Mathematics. The study revealed that there is a significant difference between the students' pre- test and post- test scores as there is an increase in the computed mean.

Meanwhile, Vallespin's study (2021) aimed to develop and evaluate supplementary digital learning worksheets as a learning material in Mathematics 10 for Junior High School students in OLOPSC, Marikina City. Findings revealed it to be effective to the students and encouraged the teachers and instructors to develop other enrichment materials such as worksheets, activity sheets, and the like on topics and make it digitalize so as students make learning easier

and more enjoyable. This supplementary digital learning worksheets in Mathematics 10 were found accepted by both teachers and experts in terms of appropriacy, automaticity, authenticity, clarity, comprehensibility, meaningfulness, and technicality.

Relative to that, Navalta's study (2020) aimed to evaluate and utilize ICT-Based Instructional Materials for Mathematics 9. Findings revealed that the utilization of the learning materials was more effective than the use of traditional method in teaching Geometry and improving the level of performance of Grade 9 students in San Roque National High School. It was also revealed in her study that Grade 9 students performed better in Geometry when using both traditional methods and ICT-based instructional materials.

In addition, Salaguste's (2021) main goal in her study was to describe and evaluate the developed supplementary digital learning kit in Mathematics. The students' performance slightly improved after using the developed supplementary Digital Learning Kit because it was able to assist and direct them during their distance learning under the new normal.Additionally, Garcia's study (2021) which aimed to develop and evaluate Self-Learning Module in Mathematics for the grade 10 students at Antipolo National High School, District I of City Schools Division Office of Antipolo for the third quarter of the school year 2021 – 2022 revealed that there is no significant difference between the evaluations of the mathematics teachers and expert respondents in terms of content and pedagogy. Additionally, those with experience in the development of teaching aids praised it highly.Lastly, Gonzales (2021) revealed in his study that the evaluation of the two groups of respondents on the developed instructional materials in Mathematics 9 do not vary. The development and evaluation of computer-assisted instructional materials for Mathematics 9 during the academic year 2020–2021 were the focus of his study. The developed materials for instruction are practical for Grade 9 students to use in the real world.

## Methodology

This study utilized the descriptive method to achieve its main objective which is to develop and evaluate the Multimedia Learning Modules for Mathematics 10. According to McCombes (2019), descriptive research aims to describe a population, situation, or phenomenon accurately and systematically. It can answer what, where, when and how questions, but not why questions. A descriptive research design can use a wide variety of research methods to investigate one or more variables.This method was used in this study because its main concern is to describe and evaluate the developed Multimedia Learning Modules for Mathematics 10 based on Clarity, Comprehensibility, Appropriateness, Usefulness, and Technical and Instructional Design.

**Participants of the Study**

The sources of the data are fifteen (15) experts and fifteen (15) Grade 10 Mathematics teachers as reflected in Table 1. The respondents were chosen based on purposive sampling. Purposive sampling, for Cohen, et al. (2016), includes respondents who were selected as those who have specific attributes needed in the study and by the researcher.

The main instruments applied in this study to gather data was the survey questionnaire. The questionnaire was for the evaluation of the developed Multimedia Learning Modules for Mathematics 10 as to the following criteria: Clarity, Comprehensibility, Appropriateness, Usefulness, and Technical and Instructional Design. It was adapted from the study of Edejer (2021) entitled E-module in Trigonometry as Teaching Materials for Mathematics 9 and from the study of Arce (2020) entitled Development and Evaluation of Educational Videos in Media and Information Literacy for Senior High School Students.

**Procedure**

A permission to conduct this research study was first secured from the Division Office of Antipolo. Communication letter was submitted to the Division Office of Antipolo. After having sought their permission, the researcher designed and developed the Multimedia Learning Modules for Mathematics 10. The format used in designing the instructional material was based on the PIVOT 4A Teaching-Learning Process, the Introduction, Development, Engagement, and Assimilation.

Following the developed Multimedia Learning Modules for Mathematics 10, the evaluation by the two groups of respondents – experts and teachers was done. The questionnaires for the evaluation of the developed Multimedia Learning Modules for Mathematics 10 were accomplished by the respondents and retrieved by the researcher through Google Forms. The respondents' names were not used in this study. To ensure compliance with copyright laws, proper document sourcing or referencing of materials were

performed.

**Ethical Considerations**

The researcher himself explained and gave the informed consent to each participant before the conduct of the study. He ensured them that the information would be used with utmost confidentiality and within the purpose of the study only.

## Results and Discussion

This section presents the findings according to the study's research questions.

Lowest Mean Percentage Score (MPS) of Mathematics 10 Based on the Quarterly Exam Result of Mayamot National High School for the School Year 2021 – 2022

Table 1. *Mean Percentage Results of School Year 2021 – 2022*

| *Subject* | *Percentage per Quarter* | | | |
|---|---|---|---|---|
| | *First* | *Second* | *Third* | *Fourth* |
| Mathematics | 41.60 | 37.35 | 45.58 | 50.25 |

Based on the table, the quarter that has the lowest mean percentage results for school year 2021-2022 was the second quarter. This implies that these quarter must be prioritized and be given emphasis in the blended distance learning modality.

Through this, the prioritized learning competencies based on the Regional Order No. 10 series of 2020, Regional Memorandum No. 306, s. 2020 and Division Memorandum No. 725, s. 2022 are as follows: (1) Illustrates polynomial functions; (2) Understands, describes, and interprets graphs polynomial functions; (3) Solves problems involving polynomial functions; (4) Derives inductively the relations among chords, arcs, central angles, and inscribed angles; (5) Illustrates secants, tangents, segments, and sectors of a circle; (6) Solves problems on circles; (7) Applies the distance formula to prove some geometric properties; (8) Illustrates the center-radius form of the equation of a circle; (9) Determines the center and radius of a circle given its equation and vice versa; and (10) Graphs a circle and other geometric figures on the coordinate plane.

Evaluations of Mathematics Teachers and Expert Respondents on the Developed Multimedia Learning Modules for Mathematics 10.

Table 2. *Respondents' Evaluations on the Developed Multimedia Learning Modules as Regards Clarity*

| *Indicators* | *Respondents* | | | |
|---|---|---|---|---|
| | *Teachers* | | *Experts* | |
| | *WM* | *VI* | *WM* | *VI* |
| The *introduction phase* gives the students a clear overview about the lesson to be learned. | 3.80 | SA | 3.87 | SA |
| The learning contents in the *development phase* is stated in a simple and clear language. | 3.87 | SA | 3.80 | SA |
| The various activities given in *engagement phase* were clear and precise to the lesson. | 3.93 | SA | 3.80 | SA |
| The *assimilation phase* gives the learners clear concepts of the lesson. | 3.93 | SA | 3.87 | SA |
| Overall Weighted Mean | 3.88 | SA | 3.83 | SA |
| Standard Deviation | 0.25 | | 0.28 | |

It can be seen in the table that both the teachers and the expert respondents Strongly Agree (SA) on the clarity of the developed Multimedia learning modules as evidenced by the overall weighted mean ratings of 3.88 and 3.83, and standard deviations of 0.25 and 0.28, respectively.

More specifically, indicator 3 and 4 obtained the highest weighted mean ratings which means that the various activities given in engagement phase were clear and precise to the lesson and the assimilation phase gives the learners clear concepts of the lesson. This signifies that the developed Multimedia Learning Modules is clear as evaluated by the two groups of respondents based on the overview about the lesson to be learned, language, activities, and concepts of the lesson.

As presented in the table, both teachers and expert respondents Strongly Agree (SA) on the comprehensibility of the developed Multimedia learning modules with the overall weighted mean ratings of 3.85 and 3.67, and standard deviations of 0.32 and 0.40, respectively.

More specifically, indicator 1 obtained the highest weighted mean ratings from the two groups of respondents which means that the introduction phase expounds the previous experiences and core knowledge of the learners which can be easily understood by the students. This further implies that the developed Multimedia Learning Modules can be easily understood by the learners.

Table 3. *Respondents' Evaluations on the Developed Multimedia Learning Modules as Regards Comprehensibility*

| *Indicators* | *Respondents* | | | |
|---|---|---|---|---|
| | *Teachers* | | *Experts* | |
| | *WM* | *VI* | *WM* | *VI* |
| The *introduction phase* expounds the previous experiences and core knowledge of the learners which can be easily understood by the students. | 3.93 | SA | 3.87 | SA |
| The *development phase* includes learning contents which presented in a manner which could be easily grasped by the students. | 3.87 | SA | 3.73 | SA |
| The *engagement phase* includes various tasks which could easily be understood. | 3.80 | SA | 3.53 | SA |
| The *assimilation phase* gives the learners deeper understanding to the topic and are easy to follow. | 3.80 | SA | 3.53 | SA |
| Overall Weighted Mean | 3.85 | SA | 3.67 | SA |
| Standard Deviation | 0.32 | | 0.40 | |

Table 4. *Respondents' Evaluations on the Developed Multimedia Learning Modules as Regards Appropriateness*

| *Indicators* | *Respondents* | | | |
|---|---|---|---|---|
| | *Teachers* | | *Experts* | |
| | *WM* | *VI* | *WM* | *VI* |
| The *introduction phase* includes activities which appropriate to the level of understanding of the learners. | 3.87 | SA | 3.87 | SA |
| The learning contents in the *development phase* are appropriate to the maturity level of the students. | 3.93 | SA | 3.87 | SA |
| Various activities in the *engagement phase* are appropriate to the content of the learning materials. | 3.87 | SA | 3.67 | SA |
| The *assimilation phase* creates conceptual structures among learners which appropriate to the learning contents. | 3.93 | SA | 3.87 | SA |
| Overall Weighted Mean | 3.90 | SA | 3.82 | SA |
| Standard Deviation | 0.26 | | 0.35 | |

As presented in the table, both teachers and expert respondents Strongly Agree (SA) on the appropriateness of the developed Multimedia learning modules with the overall weighted mean ratings of 3.85 and 3.67, and standard deviations of 0.32 and 0.40, respectively.

More specifically, indicators 2 and 4 obtained the highest weighted mean ratings which means the learning contents in the development phase are appropriate to the maturity level of the students and the assimilation phase creates conceptual structures among learners which appropriate to the learning contents. It also shows that the developed Multimedia Learning Modules is appropriate to the level of maturity and understanding of the learners.

Table 5. *Respondents' Evaluations on the Developed Multimedia Learning Modules as Regards Usefulness*

| *Indicators* | *Respondents* | | | |
|---|---|---|---|---|
| | *Teachers* | | *Experts* | |
| | *WM* | *VI* | *WM* | *VI* |
| The *introduction phase* gives useful background to the learning contents. | 3.80 | SA | 3.53 | SA |
| The learning contents in the *development phase* include useful information. | 4.00 | SA | 4.00 | SA |
| Various activities in the *engagement phase* guides the students well. | 3.87 | SA | 3.67 | SA |
| The *assimilation phase* guides the learners to familiarize the skill. | 3.93 | SA | 3.87 | SA |
| Overall Weighted Mean | 3.90 | SA | 3.77 | SA |
| Standard Deviation | 0.23 | | 0.29 | |

It can be gleaned in the table that both teachers and expert respondents Strongly Agree (SA) on the usefulness of the developed Multimedia learning modules as evidenced by the overall weighted mean ratings of 3.90 and 3.77, and standard deviations of 0.23 and 0.29, respectively.

More specifically, indicator 2 obtained the highest weighted mean ratings which may mean that the learning contents in the development phase include useful information. It implies that the developed Multimedia Learning Modules is useful as evaluated by the two groups of respondents which provide directions as to what they are expected, give background to the learning content, and include information which guides the learners to fully utilize their skills.

It can be seen in the table that both teachers and expert respondents Strongly Agree (SA) on the technical and instructional design of the developed Multimedia learning modules with the overall weighted mean ratings of 3.87 and 3.73, and standard deviations of 0.30 and 0.30, respectively.

More specifically, indicator 2 obtained the highest weighted mean ratings which means the videos include authentic, relevant, and useful contents which promotes active learning. This suggests that the developed Multimedia Learning Modules provides authentic, relevant, and useful contents to promotes to the learner and promotes active learning.

Table 6. *Respondents' Evaluations on the Developed Multimedia Learning Modules as Regards Technical and Instructional Design*

| *Indicators* | *Respondents* | | | |
|---|---|---|---|---|
| | *Teachers* | | *Experts* | |
| | *WM* | *VI* | *WM* | *VI* |
| The videos introduce varied and simplified tasks allowing the learners to establish meaningful learning. | 3.87 | SA | 3.87 | SA |
| The videos include authentic, relevant, and useful contents to promotes to the learner and promotes active learning. | 3.93 | SA | 3.87 | SA |
| The background is appropriate for the subject and content and compliments the color and design of the production. | 3.87 | SA | 3.67 | SA |
| Narration and audio level of the video is consistently audible throughout the videos without any significant high or low incidents. | 3.80 | SA | 3.53 | SA |
| Overall Weighted Mean | 3.87 | SA | 3.73 | SA |
| Standard Deviation | 0.30 | | 0.30 | |

Table 7. *Summary of the Respondents' Evaluations on the Developed Multimedia Learning Modules for Mathematics 10*

| *Criteria* | *Respondents* | | | | | |
|---|---|---|---|---|---|---|
| | *Teachers* | | | *Experts* | | |
| | *OWM* | *s* | *VI* | *OWM* | *s* | *VI* |
| Clarity | 3.88 | 0.25 | SA | 3.83 | 0.28 | SA |
| Comprehensibility | 3.85 | 0.32 | SA | 3.67 | 0.40 | SA |
| Appropriateness | 3.90 | 0.26 | SA | 3.82 | 0.35 | SA |
| Usefulness | 3.90 | 0.23 | SA | 3.77 | 0.29 | SA |
| Technical and Instruction Design | 3.87 | 0.30 | SA | 3.85 | 0.30 | SA |
| Grand Weighted Mean | 3.88 | | SA | 3.79 | | SA |

As manifested in the table, the teachers and expert respondents evaluated the Multimedia learning modules in terms of clarity, comprehensibility, appropriateness, usefulness, and technical and instructional design with grand weighted mean ratings of 3.88 and 3.79, respectively, verbally interpreted as Strong Agree (SA).

More specifically, appropriateness and usefulness obtained the highest weighted mean ratings which means the developed multimedia learning modules were appropriate and useful to the two groups of respondents.Test of Significant Difference Between the Evaluations of the Two Groups of Respondents on the Developed Multimedia Learning Modules for Mathematics 10

Table 8. *Test of Significant Difference Between the Evaluations of the Two Groups of Respondents on the Developed Multimedia Learning Modules for Mathematics 10 as to Clarity*

| *Respondents* | *n* | *OWM* | *s* | *Computed t Value* | *Critical t value* | *Decision* | *Interpretation* |
|---|---|---|---|---|---|---|---|
| Teachers | 15 | 3.88 | 0.25 | 0.52 | 2.05 | Fail to reject the $H_0$ | Not Significant |
| Experts | 15 | 3.83 | 0.28 | | | | |

As noticed in the table, the computed t value of 0.52 is smaller than the critical t value of 2.05 with 28 degrees of freedom. Therefore, at 5% level of significance, the statistical decision is not to reject the null hypothesis. This indicates that there is no significant difference between the evaluations of the two groups of respondents on the developed Multimedia learning modules as learning materials for Mathematics 10 as regards clarity.

This signifies that the respondents share the same view that the developed Multimedia learning modules give the learners clear concepts of the content and arouses the attention of the learners to fully understand the lesson.

Table 9. *Test of Significant Difference Between the Evaluations of the Two Groups of Respondents on the Developed Multimedia Learning Modules for Mathematics 10 as to Comprehensibility*

| *Respondents* | *n* | *OWM* | *s* | *Computed t Value* | *Critical t value* | *Decision* | *Interpretation* |
|---|---|---|---|---|---|---|---|
| Teachers | 15 | 3.85 | 0.32 | 1.38 | 2.05 | Fail to reject the $H_0$ | Not Significant |
| Experts | 15 | 3.67 | 0.40 | | | | |

As reflected in the table, the computed t value of 1.38 is lower than the critical t value of 2.05. Consequently, the statistical decision is not to reject the null hypothesis at a 5% significance level. This shows that there is no significant difference in the evaluation of the two groups of respondents on the developed Multimedia learning modules as learning materials for Mathematics 10 as regards comprehensibility.

This means that the two group of respondents agree that the developed materials is easily understood by the students. The learners can expound the previous experiences and core knowledge that includes learning contents and various activities which are presented in a manner which can easily be understood.

Table 10. *Test of Significant Difference Between the Evaluations of the Two Groups of Respondents on the Developed Multimedia Learning Modules forMathematics 10 as to Appropriateness*

| *Respondents* | *n* | *OWM* | *s* | *Computed t Value* | *Critical t value* | *Decision* | *Interpretation* |
|---|---|---|---|---|---|---|---|
| Teachers | 15 | 3.90 | 0.26 | 0.74 | 2.05 | Fail to reject the $H_0$ | Not Significant |
| Experts | 15 | 3.82 | 0.35 | | | | |

Based on the table, the computed t value of 0.74 is smaller than the critical t value of 2.05. At 5% significance level, this means that the null hypothesis cannot be rejected. Thus, there is no significant difference between the evaluations of the two groups of respondents on the developed Multimedia learning modules as learning materials for Mathematics 10 as regards appropriateness.

This implies that the two groups of respondents have similar preview that the developed Multimedia Learning Modules is appropriate for the students and meet the challenging expectations of the K to 12 curricula for Mathematics 10 students. The learning content and various activities create conceptual structures among learners which are appropriate to their maturity level.

Table 11. *Test of Significant Difference Between the Evaluations of the Two Groups of Respondents on the Developed Multimedia Learning Modules for Mathematics 10 as to Usefulness*

| *Respondents* | *n* | *OWM* | *s* | *Computed t Value* | *Critical t value* | *Decision* | *Interpretation* |
|---|---|---|---|---|---|---|---|
| Teachers | 15 | 3.90 | 0.23 | 1.40 | 2.05 | Fail to reject the $H_0$ | Not Significant |
| Experts | 15 | 3.77 | 0.29 | | | | |

As depicted in the table, the computed t value of 1.40 is below the critical t value of 2.05. Thus, the statistical decision is to fail to reject the null hypothesis. At a 5% level of significance, this suggests that there is no significant difference between the evaluations of the two groups of respondents on the developed Multimedia learning modules for Mathematics 10 as regards usefulness.

This means that the two groups of respondents have the same views that the developed Multimedia learning modules for Mathematics 10 provide directions to the students as to what they are expected. The learning contents and various activities include information that guides the learners to be familiarized with the skill.

Table 12. *Test of Significant Difference Between the Evaluations of the Two Groups of Respondents on the Developed Multimedia Learning Modules for Mathematics 10 as to Technical and Instructional Design*

| *Respondents* | *n* | *OWM* | *s* | *Computed t Value* | *Critical t value* | *Decision* | *Interpretation* |
|---|---|---|---|---|---|---|---|
| Teachers | 15 | 3.87 | 0.30 | 0.15 | 2.05 | Fail to reject the $H_0$ | Not Significant |
| Experts | 15 | 3.85 | 0.30 | | | | |

It can be observed in the table that the computed t value of 0.15 is less than the critical t value of 2.05. This means that at 5% level of significance, the statistical decision is not to reject the null hypothesis. Hence, there is no significant difference in the evaluation of the two groups of respondents on the developed Multimedia learning modules for Mathematics 10 as regards technical and instructional design.

This means that the two groups of respondents agree that the technical and instructional design of the Multimedia learning modules for Mathematics 10 introduce varied and simplified tasks allowing the learners to establish meaningful learning through videos which includes full narration. The audio level of the video was consistently audible without any significant high or low incidents.

Table 13. *Summary of the Test of Significant Difference Between the Evaluations of the Two Groups of Respondents on the Developed Multimedia Learning Modules for Mathematics 10*

| *Criteria* | *Teachers* | | *Experts* | | $t_{computed}$ *Value* | *Decision* | *Interpretation* |
|---|---|---|---|---|---|---|---|
| | *OWM* | *S* | *OWM* | *s* | | | |
| Clarity | 3.88 | 0.25 | 3.83 | 0.28 | 0.52 | Fail to reject the $H_0$ | Not Significant |
| Comprehensibility | 3.85 | 0.32 | 3.67 | 0.40 | 1.38 | Fail to reject the $H_0$ | Not Significant |
| Appropriateness | 3.90 | 0.26 | 3.82 | 0.35 | 0.74 | Fail to reject the $H_0$ | Not Significant |
| Usefulness | 3.90 | 0.23 | 3.77 | 0.29 | 1.40 | Fail to reject the $H_0$ | Not Significant |
| Technical and Instructional Design | 3.87 | 0.30 | 3.85 | 0.30 | 0.15 | Fail to reject the $H_0$ | Not Significant |

As portrayed in the table, the evaluations of experts and grade 10 teachers' respondents on the developed Multimedia Learning Modules for Mathematics 10 regarding clarity, comprehensibility, appropriateness, usefulness, and technical and instructional design do not show significant difference as presented by the

respective computed t values which are smaller than the critical t value. This means that the respondents' evaluations are the same. This indicates that the two groups of respondents strongly agreed that the developed Multimedia Learning Modules for Mathematics 10 are clear, comprehensive, appropriate, useful, and has very acceptable technical and instructional quality.Comments and Suggestions of the Respondents for Further Improvement of the Multimedia Learning Modules for Mathematics 10

The respondents remarked that the developed modules will help students practice and enhance their performance in mathematics, particularly for those who are unable to attend their sessions in person. They also recognized the way the activities were organized and the clarity and thoroughness of the explanation.The respondents suggested that all students should be able to access the material which means that offering an offline option for accessing the content would be beneficial. They also suggested that it would be more effective to introduce concepts one at a time. Additionally, they advised making the video interactive by giving the students option to click their responses on-screen. They also suggested that the layout of the information be improved and explanation at the bottom be included. Using clear, easy-to-read fonts, keeping the layout easy to understand and making use of the right animations and transitions are the other suggestions the respondents offered.

## Conclusion

Based on the findings of this study, the following conclusion were drawn:

(1) Multimedia Learning Module for Mathematics 10 could be developed based on the quarter with the lowest mean percentage score. (2) The developed Multimedia Learning Modules for Mathematics 10 are clear, comprehensive, appropriate, useful, and has very acceptable technical and instructional quality.

Based on the findings and conclusions drawn, the following are recommended:

(1) The developed Multimedia-Mediated Learning Modules may be utilized by the students to determine its effectiveness. (2) Other teachers in other levels may be encouraged to developed other learning materials in Mathematics. (3) Other researchers may use the findings of this study as baseline data in conducting parallel studies.

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