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**Journal for Educators, Teachers and Trainers, Vol. 14 (2)**

<https://jett.labosfor.com/>

Date of reception: 27 Jan 2023

Date of revision: 16 Mar 2023

Date of acceptance: 17 Mar 2023

**Sheryl Irene E. Manaligod (2023). The Quality Elements of Flexible Learning: Basis for Localized Modular Development for Teachers and Students. *Journal for Educators, Teachers and Trainers*, Vol. 14(2). 510-540.**

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## **The Quality Elements of Flexible Learning: Basis for Localized Modular Development for Teachers and Students**

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### **ABSTRACT**

This study aimed to determine the quality elements of flexible learning to be used as basis for the development of a quality assured module and instructional videos in Data Management of Mathematics in the Modern World subject. It also investigated experiences in flexible learning, the quality elements, strengths, and weaknesses of the developed learning module and video recorded lectures, and the challenges encountered by mathematics teachers and students in flexible learning. This study utilized a mixed method of research design. Results showed that there are challenges and difficulties that need to be addressed because these might be the factors that hamper the attainment of quality of flexible learning beyond face-to-face learning. Further, the developed learning module and video-recorded lectures were much valid and much acceptable. However, there were identified strengths and weaknesses of the materials which were the bases in improving the materials to produce a quality assured module and instructional videos in Data Management. It is recommended that researchers study the implementation of flexible learning to the mathematics program and other programs in the curriculum and discover solutions to the challenges that might be encountered by the teachers and students in its implementation. The improvement of the quality of education through program enhancement could be achieved through this.

**Keywords:** Approaches to learning and studying, data, data management, mathematical content

### **INTRODUCTION**

Teachers in the 21<sup>st</sup> century are aware that today's students are very different from their predecessors. Due to their superior ability to learn knowledge quickly, kids nowadays are calling for changes in the classroom. We must adapt our approaches to the needs of this new generation of students if we are to build genuine connections with them. The hardest task may be deciding which technology to use and how to incorporate it into the classroom given the resources available today for use in the classroom, including interactive software, digital imagery, audio and video creation tools, on-demand video libraries, computers and LCD projectors. The learning environment is better than ever because educational technology is evolving at an exponential rate and our students can succeed with it (Joan, 2013).

The Chair of the Commission on Higher Education, Prospero de Vera, stated that moving toward flexible learning is the more workable solution in light of the coronavirus threat that employs both digital and non-digital technology during a virtual meeting of the House Committee on Higher and Technical Education on April 30, 2020. As a result, the flexible learning principles were adopted and promulgated by the Commission on Higher Education (CHED), who then put them into practice through both public and private HEIs (CHED Memo 4, Series 2020).

### **Flexible Learning, Blended Learning, Distance Learning, Online Learning, E-Learning, and Virtual Learning**

According to the study of Som, Panah, and Ghazali (2020), the factors of technology, online interaction, study management, and online learning with readiness in blended learning had a strong and significant relationship. Also, they predict students' readiness for blended learning. Further, learning flexibility and classroom learning with readiness in blended learning have no significant relationship.

Adams, Sumintono, Mohamed, and Syafika (2018), in their study revealed that students were ready for blended learning. The study also indicated that students' readiness for blended learning when grouped according to gender, age, ethnicity, the field of study, and level of education had significant differences.

The study of Birbal, Ramdass, and Harripaul (2018) indicated in their study that the most important or valued aspect of blended learning as viewed by teachers was learning flexibility and technology. Also, students' attitudes based on sex, part-time/full-time status, primary and secondary specialization, age, and year group showed significant differences. Moreover, between online learning and online interaction and technology, a significant positive correlation existed. Further, between online learning and classroom learning and the online

environment, significant negative correlations were also found. Implications and recommendations were suggested to make a better survey instrument and provide a more helpful environment for blended learning.

In the study conducted by Dziuban, Graham, Moskal, Norberg, and Sicilia (2018) entitled “Blended Learning: The New Normal and Emerging Technologies”, they contended that blended learning coalesced around access, success, and perception of the students’ learning environments because of the view of effectiveness. Face-to-face and online courses in success and withdrawal rates and their interaction for blended learning with minority status were compared. About course excellence, the perception of students was investigated and revealed that robust if-then decision rules exist for identifying the way students evaluate their experiences in education. The course modality, perceived content relevance and expected grade were self-governing rules. Although blended learning preceded modernized technologies in instruction, the authors conclude that its evolution approximating some aspects of human thought processes is inseparably bound to contemporary information communication technologies.

It was found in the study of Yulia (2016) that in the implementation of blended learning, teachers had very ready students. This could be observed from the positive attitude of students toward online aspects (learning flexibility, online learning, online interaction, and study management), as much as 83%, higher than the score of their attitude toward conventional classroom learning which is 77%. The students’ readiness should be supported by both lecturers and organizations as a foundation for the successful implementation of Blended Learning.

The study of Hasbun, Zurita, Baloian and Jerez (2015) revealed that students had to practice 21st Century Skills regarding communication, information literacy, and ICT literacy supported by a blended learning environment. Results showed a significant increase in meaningful learning by the end of the course. This study illustrated the potential that blended learning environments offer for higher education.

It was revealed in the study conducted by Gedera (2014) that most of the students preferred to have more virtual classroom activities because of the presence of physical cues and more ‘human’ interactions. It may be useful to have synchronous tools early on to both facilitate a sense of community and prepare students for later tasks assessed via such technologies. However, time zones may be an issue in this regard and if the learners are from different time zones, planning synchronous activities at a time that is suitable to all the participants can be a challenge. Generally, regarding their experiences of learning with this educational technology, students indicated their overall satisfaction.

Tang and Chaw (2013) presented three key findings in their study entitled “Readiness for Blended Learning: Understanding Attitude of University Students”. First, the use of technology in education was not a hindrance to the students. Second, blended learning adaptability, which was modelled as a second-order formative construct and formed by four first-order reflective constructs— attitude towards online learning, study management, online interaction, and learning flexibility— had a positive relationship with student readiness for blended learning. Third, attitude towards classroom learning had a negative relationship with student readiness for blended learning. An understanding of student attitude towards different learning aspects can be critical in the assessment of student readiness for blended learning, which is a prerequisite for the successful implementation of blended learning.

### **Outcomes-Based Education**

The study of a Rhaffor (2017) perceived that the lecturers work hard to ensure all students attain the course learning outcomes, which is represented by the highest weighted mean. However, briefing on OBE during orientation week obtained the least weighted mean. Serious effort should be taken to organize and make it compulsory for new students to attend OBE briefing sessions for upcoming semesters.

However, Au and Kwan (2009) showed that academic departments had not adjusted their teaching load to account for the added effort required for the migration to Outcomes-Based Teaching and Learning (OBTL). Most instructors continue to use time-saving norm-referenced assessment. Students did not seem to perform better under OBTL. With the way OBTL is being implemented, it is doubtful that the full benefits of OBTL will ever be realized.

### **Approaches to Learning and Studying Mathematics**

Nordin, Wahab, and Dahlan, (2013) found that there was a positive but low relationship between deep and strategic approaches to learning on academic performance. The findings of this study have practical implications for educators in developing a more systematic approach to academic teaching and learning.

Mattick, Dennis, and Bligh (2004) concluded that the Approaches to Learning Studying Inventory (ALSI) is valid for use among medical students and can uncover interesting relationships between approaches to studying and student characteristics. In addition, the ALSI has the potential as a tool to predict student success, both academically and beyond qualification.

The study of Campbell, Smith, Boulton-Lewis, Brownlee, Burnett, Carrington, and Purdie (2001) noted that during their interview with students with deep approaches to learning, the students established a more sophisticated understanding of the learning opportunities offered to them compared to students with surface

approaches where students' perceptions were influenced by the teaching strategies. Moreover, students with both deep approach and surface approach focused on the class aspects of student-centered teaching when teachers focused strongly on the active students' engagement and supportive environment creation. On the contrary, students with both deep approach and surface approaches focused on transmission and reproduction when teachers used exclusively teaching methods that were traditional and expository. In contrast, when traditional expository teaching methods were used exclusively, students with deep and surface approaches both focused on transmission and reproduction.

Trigwell, Prosser, and Waterhouse (1999) showed that the teachers who reported adopting more of information transmission or teacher-focused approach to teaching had students who themselves report such as this, much of the previous research from the student learning perspective on teaching and learning in higher education would be for naught.

### **Mathematics Content and Pedagogical Knowledge for Teaching**

In the study conducted by Naseer (2018), it was shown that pedagogical knowledge of teachers could be observed through teachers' lesson plans and lesson notes. Results showed that some of the algebraic concepts explained in the textbooks were incorrect. As teachers failed to detect these incorrect concepts it raised serious questions concerning algebraic content and pedagogical knowledge of sixth-grade mathematics teachers. Moreover, analysis of the textbooks showed that the focus of the textbooks was on procedural fluency rather than conceptual understanding. Last, but not least, teachers followed these textbooks word for word blindly indicating that they not only lacked content knowledge but also pedagogical knowledge to teach algebra.

Odumosu, Olisama, and Areelu (2018) indicated in their study that the quality of mathematics teachers especially at the senior secondary education level cannot be compromised. The teachers at this level must have both the message and the medium because the shallow knowledge of teachers in mathematics content especially in algebra will not give the desired results. If our goal is to encourage students to develop an interest in Algebra in particular, and Mathematics in general, this can only happen if teachers have good knowledge of content and pedagogy of mathematics (algebra) which might result in good performance of students in algebra.

Ma'rufi, Budayasa, and Juniati (2018), specified that a novice teacher's ability in analyzing the cause of students' difficulty, mistakes, and misconceptions was limited. Novice teachers tended to overcome the students' difficulty, mistakes, and misconceptions by re-explaining the procedure of question completion which was not understood by the students.

In the study of Bibi and Khan (2017), it was revealed that a different set of knowledge domains in each different episode of planning sessions gave TPACK a dynamic and content-sensitive nature.

However, it was found in the study Papanikolaou, Makri, and Roussos (2017) that the examination of pre-service teachers' perspectives through two-structured questionnaires revealed important potential of synthetic activities for teachers' TPACK development and highlight specific connections among elements of the TPACK and Community of Inquiry frameworks.

The results in the study of Jaipal-Jamani and Figg (2015) indicated that TPACK was developed through a combination of workshop experiences and immediate application of knowledge gained in the workshop into practice in the real-life teaching context.

Harr, Eichler, and Renkl, (2014) revealed in their study that the integrated condition led to greater application of pedagogical/ psychological aspects and an increase in applying both knowledge types simultaneously compared to the separated condition. Overall, the findings signified the beneficial effects of an integrated design in teacher education.

Tsafe (2013) revealed that for the teaching of mathematics to be effective within the context of pedagogy, teachers should be mindful of quite a several things; one of which has been pointed out by Abdullahi (2005) as anything a teacher uses in teaching situations to make learning easy from small stones, piece of paper, chalkboard, maps, radio, television, and computer. Such resources provide students with the opportunity to use their senses so that at the end of instruction, students can perform the teacher's stated objectives. This is one of the ways of which teachers can be said to be pedagogically sound and mathematically centered because every stage of mathematics teaching requires concretization.

The study of Lim and Guerra (2013) found that pre-service teachers displayed the highest scores for Memorized/ Factual Knowledge, followed by Conceptual Understanding, Reasoning/Problem Solving, and Pedagogical Content Knowledge. Pre-service teachers had higher Memorized/ Factual Knowledge than Pedagogical Content Knowledge. The preservice teachers' overall content knowledge was not strong, and the two lowest-performing content knowledge areas were Geometry/ Measurement and Probability/Statistics. In conclusion, the picture emerging from this study was of preservice teachers demonstrating low knowledge of content and pedagogy, thereby placing the program in the difficulty of building a pedagogical prowess upon the mathematical content.

The study conducted by Kleickmann, Richter, Kunter, Elsner, Besser, and Krauss (2013) showed that PCK and CK measurement was satisfactorily invariant across the teacher populations considered using confirmatory factor analyses. As expected, the largest differences in CK and PCK were found between the beginning and the

end of initial teacher education. Differences in the structures of teacher education were reasonably well reflected in participants' CK and PCK.

According to the findings of Turnuklu and Yesildere (2007), it was found that having a deep understanding of mathematical knowledge was necessary but not sufficient to teach mathematics. This finding emphasized the connection between knowledge of mathematics and knowledge of mathematics teaching. It is suggested that primary mathematics teacher candidates should be educated both from "mathematics knowledge" and "pedagogical content knowledge" aspects.

### **Validity, Acceptability, and Effectivity of the Instructional Materials**

According to the mixed-method study conducted by Roman (2020), the utilization of instructional module (IM) was responsive in learning topics in Statistics but fell short in Probability topics. More so, the study found the apex, pitfall, and pilot of the instructional modules (IM) using the content analysis procedure. Based on the result of the analysis, it was concluded that difficulties experienced by the students in using the instructional module (IM) can be lessened when the teacher pair it with direct instruction. Self-directed learning with the use of an instructional module (IM) among students makes them the owners and managers of their learning. However, without proper facilitation, supervision, and guidance coming from the teacher, the presumed learning may not be achieved. Hence, while using an instructional module (IM) increases the performance of the students, there is still no substitute for the presence of teachers inside the class.

The study of Columbano (2019) determined the difference between the pre-achievement and post-achievement tests of the students holding constant their attitude towards Mathematics and English 11 grades and how some experts evaluated the module according to its qualitative features. Structured in a quasi-experimental design, the study involved 18 first-year college students who got a failing mark in Basic Mathematics. Five Mathematics professors validated the modules. The instruments developed in the study were the achievement test, the 20-item questionnaire for the experts, and the 20-item attitudinal test. The statistical tools used were the analysis of covariance, t-test for correlated scores, and the KR20. The pretest mean score of the students was much lower than the posttest mean score. The students manifested a favorable attitude towards Mathematics. Correlation analysis showed that English is not related to posttest achievement of students and the posttest achievement score was significantly influenced by their attitude. On the qualitative features of the prepared modules, they were evaluated to be good and acceptable to the mathematics teachers. The modules were valid and reliable and could supplement the learning of concepts. The study concludes that the teaching of Basic Mathematics using the modular approach is an effective approach in enhancing the learning of Mathematics. Marasigan (2019) also conducted a study on material development to produce material in Analytic Geometry that is suitable to the needs of the Bachelor of Industrial Technology freshman students. This consequently will influence the students' performance and attitude towards mathematics. Specifically, it dealt with the components of the self-instructional material; the Analytic Geometry instructors' rating on the quality elements of the self-instructional material; the students' rating on the quality elements of the self-instructional material; the readability level of the material; and the significant difference between the experimental group which was exposed to the self-instructional material and the control group which was exposed to the teacher-directed method in terms of performance and attitude towards mathematics. By employing the descriptive experimental method of research, the study revealed that the developed and validated self-instructional material in this investigation seemed to yield better learning output than the usual lecture instruction since the use of the material improved the performance of the students, facilitated their interest, and developed in the students a more favorable attitude towards mathematics.

Espinar and Ballado's study (2017) evaluated the content validity and level of acceptability of a developed worktext in Basic Mathematics 2. It found a significant difference between the respondents' evaluations. Likewise, the study found a significant difference in the pretest and posttest performance between the experimental and the control group and the difference between the posttest of the experimental and control groups. The study utilized the descriptive comparative method in determining the validity and acceptability of the developed worktext and the difference between the evaluation of experts/teachers and the student respondents. A Quasi-experimental design was also used to find if the worktext is effective in teaching the course employing t-test for correlated samples and t-test for independent samples. The result showed that the content validity and acceptability were very much valid and very much acceptable. The difference in the post-test between the experimental and the control groups was significant. It is concluded that the worktext is effective to be used in teaching the course.

In the study of Torrefranca (2017), instructional modules on two content areas of Algebra taught to second-year high school students were developed and validated. Specifically, module 1 consisted of 11 lessons on Rational Expressions, and module 2 consisted of nine lessons on Variations. Findings revealed that all the evaluators strongly agreed that the instructional modules satisfied the criteria for evaluating the modules. Meanwhile, the significant change in the pretest and posttest scores of student-participants before and after they were exposed to the modules signified that the modules brought out improvement in their knowledge of Rational Expressions and Variations. Possible replication of the study to cover other topics in Intermediate Algebra was

recommended to further support the findings that emerged.

Abarro (2016) developed and validated a computer-aided instructional material in Elementary Algebra. She made use of a quasi - experimental research method utilizing a one-group pretest-posttest design. It also utilized the 100 items validated pretest/posttest developed to attain the objective of the study. The subjects of the study were the 15 randomly selected students in Elementary Algebra at Peter Pan Learning Center, Baras, Rizal, Philippines. Findings revealed that the performance pretest and posttest of the subjects in both algebraic expressions and first-degree equation and inequalities were satisfactory and very satisfactory respectively. It emphasized that the computed-aided instructional materials in Elementary Algebra brought significant gain in knowledge and skills of the students upon their exposures.

Terano's (2015) study aimed to develop a Simplified Text in Differential Calculus for engineering and determine its acceptability. The study utilized the ADDIE (Analysis, Design, Develop, Implement, and Evaluate) model in developing the IM. The acceptability of the objectives, contents, presentation, and style, and exercises in the IM was determined using a validated evaluation instrument. The instrument together with the IM was distributed to 22 engineering professors from the different academic institutions in the Bicol Region using the expert-based method of obtaining the evaluation. The weighted mean was the statistical tool used. Results showed that all text features were highly acceptable. The study is important in providing an effective IM for engineering students to improve their proficiency in higher mathematics.

Salavaria (2014) developed and validated the proposed worktext in Statistics. The study involved students from four-year degree courses and instructors from different colleges and universities in Bataan. The descriptive method of research was employed with the use of a questionnaire method that was designed to evaluate the proposed instructional materials. This study used the evaluative response of the teachers and students on the proposed Statistic worktext in terms of objectives, format, content, organization, language, and usability. Comparing the perceptions of the faculty members and the students, Mann Whitney U test was used. Findings revealed that the respondents were very satisfied with Statistics worktext specifically on usability and objectives. Also, it was evident that students were more satisfied with the Statistics worktext than the teachers. Moreover, the teachers were most satisfied with usability and format. On the other hand, they were least satisfied, though still satisfactory, on objectives. The students were most satisfied with usability, followed by content and language, and objectives. Overall, the students' mean was significantly higher compared to that of the teachers.

The study aimed to develop a quality assured module with videos in Mathematics in the Modern World subject, particularly on the Data Management for tertiary students. Given this scenario, this study investigated the strengths and weaknesses of the developed learning module and video-recorded lectures, the challenges encountered by teachers and students in flexible learning to come up with a quality assured module and instructional videos in Data Management of Mathematics in the Modern World subject.

This study looked into modalities of learning, which was also the focus of Som, Panah, and Ghazali (2020), Adams, Sumintono, Mohamed and Syafika (2018), Birbal, Ramdass, and Harripaul (2018), Dzuiban, Graham, Moskal, Norberg, and Sicilia (2018) Yulia (2016), Hasbun, Zurita, Baloian and Jerez (2015), Gedera (2014), and Tang and Chaw (2013). However, this study dealt with the development of flexible learning modalities, specifically modular learning, and video-recorded lectures. This study also focused on Outcomes-Based Education (OBE) like the study of a Rhaffor (2017), Bibi and Khan (2017), and Au and Kwan (2009) but in this study, OBE was implemented in using flexible learning modalities.

Also, this study focused on determining the level of validity and acceptability of instructional materials just like the study of Roman (2020), Columbano (2019), Marasigan (2019), Espinar, and Ballado (2017), Terrafranca (2017), Abarro (2016), Terano (2015), and Salavaria (2014). The present study differs from them because it dealt with determining the level of validity and acceptability of the developed modules and video-recorded lectures separately.

## METHODS

### Research Methods, Locale, Respondents of the Study and Statistical Treatment

There are 12 teachers and 241 students from Isabela State University participated in the study. The concurrent triangulation mixed method was used since qualitative and quantitative methods were employed to give strength to one method in areas where the other is inherently weak (Creswell, 2009). The survey instruments were used to describe the evaluation of the mathematics experts on the validity of the developed learning modules in terms of content; design, features and presentation; organization; and assessment tools, and the validity of the video-recorded lectures in terms of content; design; features and presentation; organization; assessment tools; and technical quality. Also, the learning modules and video-recorded lectures' acceptability instruments were used to describe the evaluation of the students in terms of clarity, usefulness, suitability, adequacy, timeliness, language, style and format, illustrations, and presentation. Moreover, this study was developmental research. The developmental research was applied since it involved the development of a quality assured flexible learning instructional materials, specifically learning module and instructional videos. Furthermore, this study employed a qualitative approach through the inductive method. This approach was used to determine the strengths and

weaknesses of the developed learning modules and video-recorded lectures in Data Management, and the challenges/difficulties encountered by students and teachers in flexible learning mathematics. According to the reliability test's Cronbach's alpha score, the instruments is very reliable. A computer program called Statistical Package for Social Sciences (SPSS) was used to process the information gathered and analyze the data.

### **Data Sources**

#### **CHED Mathematics in the Modern World Syllabus**

This contains the suggested objectives, learning outcomes, topics, methodologies, resources, and assessments in the Mathematics in the World subject by the CHED. This was the source in crafting the refined module in Data Management.

#### **CHED Memo on Sample or Suggested Syllabi for the New General Education (GEC) Core Courses**

This was a memorandum from the Chairperson of the CHED attached along with the CHED MMW syllabus providing information about the use of the syllabus as assistance to higher education institutions transition to the new GEC. This also informed the HEIs that public and private HEIs may adopt the sample or suggested course syllabus in the teaching and the delivery of the content of the new GEC

### **Data Gathering Procedure**

#### **Initial Phase**

During the initial phase of the study, a permit to conduct the study was sought from the President of Isabela State University. After the approval of the study, the teachers' and students' flexible learning readiness questionnaire, approaches to learning and studying mathematics questionnaire, mathematics content and pedagogical knowledge for teaching questionnaire, validity instruments for the module and video recorded lectures, and acceptability instrument had undergone the process of validation and test of reliability. Also, the instruments were tried out to non-participant students and teachers. Moreover, the instruments were finalized based on the results of the validity and reliability analyses. A consent form was given to students and teachers. They were oriented on the nature of the study, and they were given the option to stop their participation anytime without being required to explain in compliance with the Research Ethics Protocol.

#### **Data Gathering Phase for the Profile of the Participants**

In the data gathering phase, the flexible learning readiness questionnaire and approaches to learning and studying mathematics questionnaire were administered to freshman students enrolled in the subject Mathematics in the Modern World at Isabela State University Echague Campus. Also, the flexible learning readiness questionnaire was floated to all teachers of Mathematics in the Modern World at Isabela State University Echague Campus and the mathematics content and pedagogical knowledge for teaching questionnaire were administered to the Department Chairmen based on their past observation of the teachers of the Mathematics in the Modern World subject.

#### **Development and Validation of Modules and Video-Recorded Lectures Phase**

In this phase, the learning modules in Mathematics in the Modern World subject specifically in the topic Data Management were developed. After that, an in-depth validation of the developed learning modules was done. Lessons were evaluated separately. The first drafts of the learning modules were evaluated by the inter-raters. Then, the learning modules were revised based on their comments and suggestions. Afterwards, the learning materials were given back to them for their final evaluation using the validity instrument for the module. All the comments and suggestions were incorporated into the learning materials and had been finalized to be ready for use for flexible learning. After that, the panel of experts evaluated the learning module and video-recorded lectures as a whole. Also, comments and suggestions were given for the improvement of the learning materials. After the learning modules had been finalized, the video-recorded lectures were developed based on the quality assured module in Data Management.

#### **Evaluation of the Level of Acceptability of the Developed Materials**

In this phase, the evaluation of the level of acceptability of the developed materials in terms of clarity, usefulness, suitability, adequacy, timeliness, language, style and format, illustrations, and presentations were done by those students who used the developed materials, the learning modules, and video-recorded lectures, in particular.

#### **Data Analysis Phase**

After gathering the data from the participants, the researcher analyzed the results of the study. These as well as details of each participant's work were forwarded to the inter-raters for further analysis.

**RESULTS AND DISCUSSIONS**

**Quality Elements of the Developed Learning Modules and Video-Recorded Lectures**

**Table 1:Data Management Lessons with Objectives**

	Title	Objectives
Lesson 1	Data	<ul style="list-style-type: none"> <li>define what data is and identify its types;</li> <li>classify information according to their level of measurement;</li> <li>identify the most commonly used methods of data collection;</li> <li>determine the different ways of deriving a sample; and</li> <li>identify the different methods of presenting a data.</li> </ul>
Lesson 2	Measures of Central Tendency	<ul style="list-style-type: none"> <li>define what a measure of central tendency is;</li> <li>enumerate and define the three measures of central tendency; and</li> <li>solve for the mean, weighted mean, median, and mode of a given set of data.</li> </ul>
Lesson 3	Measures of Dispersion	<ul style="list-style-type: none"> <li>define measure of dispersion;</li> <li>identify the three measures of dispersion; and</li> <li>compute the range, variance, and standard deviation of a given set of data.</li> </ul>
Lesson 4	Measures of Position	<ul style="list-style-type: none"> <li>define what a measure of position or fractile is;</li> <li>identify the three measures of position or fractile; and</li> <li>compute the percentiles, deciles, and quartiles of a given set of data.</li> </ul>
Lesson 5	Probabilities and Normal Distributions	<ul style="list-style-type: none"> <li>identify the shape of the distribution;</li> <li>enumerate the properties of a normal curve; and</li> <li>compute the areas under the normal curve.</li> </ul>
Lesson 6	Linear Regression and Correlation	<ul style="list-style-type: none"> <li>determine the difference between regression and correlation;</li> <li>enumerate the steps in hypothesis testing; and</li> <li>identify the relationship between two variables.</li> </ul>
Lesson 7	Statistics using Technology (Enrichment)	<ul style="list-style-type: none"> <li>use Microsoft Excel functions or Google sheets functions in computing different tools in statistics.</li> </ul>

**Table 2:Objectives with Contents of Data Management in Mathematics in the Modern World**

Objectives in the Syllabus	Contents/Topics
1. Use a variety of statistical tools to process and manage numerical data	Data
2. Use the methods of linear progression and correlations to predict the value of a variable given certain conditions	Measures of Central Tendency Measures of Dispersion Measures of Position
3. Advocate the use of statistical data in making important decisions	Probabilities and Normal Distributions Linear Regression and Correlation Statistics using Technology (Enrichment)

**Table 3:Topics and Sub-topics of the Data Management Lessons**

Topics	Subtopics
Data	-Levels of Measurement -Methods of Collecting Data -Sampling Techniques -Methods of Presenting Data
Measures of Central Tendency	-Mean -Median -Mode
Measures of Dispersion	-Range -Population variance -Population SD
Measures of Position	-Percentiles -Deciles -Quartiles



Probabilities and Normal Distribution	-Shape of a Distribution -Normal Probability Measures -Areas under the Normal Curve
Linear Regression and Correlation	-Scatter Plot of Correlation Coefficient -Correlation and Causation
Statistics using Technology	-Descriptive Statistics -Inferential Statistics

Tables 1, 2 and 3 shows the lessons, objectives and topics of Data Management in Mathematics in the Modern World. This is the basis of the developed learning module.

**Table 3: Validity of the Developed Learning Modules as to Content**

Criteria	Phase 1						Phase 2		
	Lessons 1-6			Lesson 7			Lessons 1-7		
	Mean	SD*	QI**	Mean	SD*	QI**	Mean	SD*	QI**
1. Has clearly defined objectives in each chapter/section/unit.	4.00	0.00	SA	4.00	0.00	SA	3.67	0.47	SA
2. Is aligned to the learning objectives in the syllabus.	4.00	0.00	SA	4.00	0.00	SA	3.67	0.47	SA
3. Reflects the learning competencies of the curriculum.	4.00	0.00	SA	4.00	0.00	SA	3.33	0.47	A
4. Develops higher order thinking skills.	3.67	0.58	SA	3.67	0.58	SA	3.00	0.00	A
5. Enhances manipulative skills (if applicable).	4.00	0.00	SA	4.00	0.00	SA	3.00	0.00	A
6. Is well-organized.	4.00	0.00	SA	4.00	0.00	SA	3.00	0.00	A
7. Is gender and culture sensitive.	4.00	0.00	SA	4.00	0.00	SA	3.00	0.82	A
8. Cites references and related sources.	4.00	0.00	SA	4.00	0.00	SA	2.33	0.47	D
9. Contains complete, recent and current information.	3.67	0.58	SA	4.00	0.00	SA	2.67	0.47	A
10. Emphasizes important points using keywords, key concepts and summary points.	3.67	0.58	SA	3.67	0.58	SA	3.33	0.47	A
11. Integrates interdisciplinarity in the topics/lessons.	4.00	0.00	SA	4.00	0.00	SA	2.33	0.47	D
Mean	3.91	0.16	VMV	3.94	0.11	VMV	3.03	0.37	MV

Legend: 3.50 – 4.00 = Strongly Agree; 2.50 – 3.49 = Agree (A); 1.50 – 2.49 = Disagree (D); 1.00 – 1.49 = Strongly Disagree (SD); \* standard deviation; \*\* qualitative interpretation; 3.50 – 4.00 = Very Much Valid (VMV); 2.50 – 3.49 = Much Valid (MV); 1.50 – 2.49 = Valid (V); 1.00 – 1.49 = Less Valid (LV)

In the phase 1 evaluation, Table 3 shows that the 11 criteria for content validity of the developed learning modules are rated in the range of 3.67-4.00 which means that the inter-raters strongly agree that the content of Lessons 1-6 (mean = 3.91, SD = 0.16) and Lesson 7 (mean = 3.94, SD = 0.11) of the developed learning modules are very much valid. In the phase 2 evaluation, the table reveals that the 11 criteria for content validity of the developed learning modules are rated in the range 2.33-3.67 which means that the panel of experts agree that the content of Lessons 1-7 (mean = 3.03, SD = 0.37) of the developed learning module is much valid. Specifically, the evaluators strongly agreed that the learning modules have clearly defined objectives in each chapter/section/unit.

**Table 4: Validity of the Developed Modules as to Design, Features and Presentation**

Criteria	Phase 1						Phase 2		
	Lessons 1-6			Lesson 7			Lessons 1-7		
	Mean	SD*	QI**	Mean	SD*	QI**	Mean	SD*	QI**
1. Arranges topics in a sequential manner.	4.00	0.00	SA	4.00	0.00	SA	4.00	0.00	SA
2. Reflects layout consistency in terms of font, spacing, indentation, graphics and pagination.	4.00	0.00	SA	4.00	0.00	SA	3.33	0.47	A
3. Has simple and clear instructions	4.00	0.00	SA	4.00	0.00	SA	3.33	0.47	A

Criteria	Phase 1						Phase 2		
	Lessons 1-6			Lesson 7			Lessons 1-7		
	Mean	SD*	QI**	Mean	SD*	QI**	Mean	SD*	QI**
for teacher/s and students.									
4. Uses appropriate terms.	4.00	0.00	SA	4.00	0.00	SA	3.00	0.00	A
5. Has activities that motivate students to participate actively and master concepts and skills.	3.67	0.58	SA	4.00	0.00	SA	3.33	0.47	A
6. Has varied illustrations and examples to facilitate learning.	3.67	0.58	SA	3.67	0.58	SA	3.00	0.00	A
7. Has supplementary activities that enhance critical thinking.	3.67	0.58	SA	3.67	0.58	SA	3.00	0.00	A
8. Has lessons which may be utilized by other faculty.	4.00	0.00	SA	4.00	0.00	SA	3.33	0.47	A
Mean	3.88	0.14	VMV	3.92	0.15	VMV	3.29	0.24	MV

Legend: 3.50 – 4.00 = Strongly Agree (SA); 2.50 – 3.49 = Agree (A); 1.50 – 2.49 = Disagree (D); 1.00 – 1.49 = Strongly Disagree (SD); \* standard deviation; \*\* qualitative interpretation; 3.50 – 4.00 = Very Much Valid (VMV); 2.50 – 3.49 = Much Valid (MV); 1.50 – 2.49 = Valid (V); 1.00 – 1.49 = Less Valid (LV)

It is presented in Table 4 that in the phase 1 evaluation, the design, features and presentation of Lessons 1-6 (mean = 3.88, SD = 0.14) and Lesson 7 (mean = 3.92, SD = 0.15) of the developed learning modules are rated in the range of 3.67-4.00 which means that the inter-raters strongly agree that the developed modules are very much valid. Moreover, in the phase 2 evaluation, the table reveals that the eight criteria for design, features and presentation of the developed learning modules are rated in the range 3.00-4.00. This means that in the phase 2 evaluation, the panel of experts agree that Lessons 1-7 of the developed learning module is much valid (mean = 3.29, SD = 0.24). Specifically, they strongly agree that the topics and sub-topics of the developed learning module are organized sequentially as exposed in Table 3. Moreover, the inter-raters strongly agree and the panel of experts agree that the learning module reflects layout consistency in terms of font, spacing, indentation, graphics, and pagination.

**Table 5: Validity of the Developed Learning Modules as to Organization**

Criteria	Phase 1						Phase 2		
	Lessons 1-6			Lesson 7			Lessons 1-7		
	Mean	SD*	QI**	Mean	SD*	QI**	Mean	SD*	QI**
1. Topics and subtopics are coherent in each chapter.	4.00	0.00	SA	4.00	0.00	SA	3.50	0.50	SA
2. Observes correct grammar and usage.	4.00	0.00	SA	4.00	0.00	SA	3.00	0.00	A
3. Paragraphs are well-organized.	4.00	0.00	SA	4.00	0.00	SA	3.00	0.00	A
Mean	4.00	0.00	VMV	4.00	0.00	VMV	3.17	0.24	MV

Legend: 3.50 – 4.00 = Strongly Agree (SA); 2.50 – 3.49 = Agree (A); 1.50 – 2.49 = Disagree (D); 1.00 – 1.49 = Strongly Disagree (SD); \* standard deviation; \*\* qualitative interpretation; 3.50 – 4.00 = Very Much Valid (VMV); 2.50 – 3.49 = Much Valid (MV); 1.50 – 2.49 = Valid (V); 1.00 – 1.49 = Less Valid (LV)

The table shows that in phase 1 evaluation, all the criteria are similarly rated 4.00 in Lessons 1-6 and Lesson 7 of the developed learning modules. The inter-raters strongly agree that the developed learning modules as to organization are very much valid (mean = 4.00, SD = 0.00). On the other hand, the panel of experts agree that Lessons 1-7 in the phase 2 evaluation is much valid (mean = 3.17, SD = 0.24). Particularly, they strongly agree that the topics and subtopics are coherent in each chapter. The topics and subtopics are shown in Table 3. Moreover, the raters strongly agree, and the experts agree that developed module observes grammar and usage, and paragraphs are well-organized. The developed learning modules underwent grammar editing initially by an English teacher.

**Table 6: Validity of the Developed Learning Modules as to Assessment Tools**

Criteria	Phase 1						Phase 2		
	Lessons 1-6			Lesson 7			Lessons 1-7		
	Mean	SD*	QI**	Mean	SD*	QI**	Mean	SD*	QI**
1. Utilizes questions that help achieve the learning objectives.	4.00	0.00	SA	4.00	0.00	SA	3.00	0.00	A
2. Provides students activities that require application of what they learned.	4.00	0.00	SA	4.00	0.00	SA	3.00	0.82	A
3. Uses varied and appropriate evaluation tools (assignment, exercises, problem sets, learning checks, etc.)	3.67	0.58	SA	3.67	0.58	SA	3.00	0.00	A
4. Contains prescriptive exercises for remedial instruction.	3.67	0.58	SA	3.67	0.58	SA	2.67	0.47	A
5. Covers a project proposal for a quantitative study to be orally proposed.	4.00	0.00	SA	NA			3.33	0.47	A
6. Contains activities that works with appropriate statistical computer software.	NA			4.00	0.00	SA	3.00	0.47	A
7. Comprises a pseudo proposal defense	4.00	0.00	SA	NA			3.33	0.47	A
Mean	3.89	0.19	VMV	3.87	0.23	VMV	3.05	0.30	MV

Legend: 3.50 – 4.00 = Strongly Agree (SA); 2.50 – 3.49 = Agree (A); 1.50 – 2.49 = Disagree (D); 1.00 – 1.49 = Strongly Disagree (SD); \* standard deviation; \*\* qualitative interpretation; 3.50 – 4.00 = Very Much Valid (VMV); 2.50 – 3.49 = Much Valid (MV); 1.50 – 2.49 = Valid (V); 1.00 – 1.49 = Less Valid (LV); NA Not Applicable

As indicated in Table 6, all six criteria in terms of assessment tools in the phase 1 evaluation are rated in the range of 3.67-4.00 which means that the inter-raters strongly agree that Lessons 1-6 (mean = 3.89, SD = 0.19) and Lesson 7 (mean = 3.87, SD = 0.23) of the developed learning modules are very much valid. Besides, five criteria in the phase 2 evaluation are rated in the range 2.67-3.33 which means that the panel of experts agree that the developed module is much valid (mean = 3.05, SD = 0.30). Specifically, it is strongly agreed by the inter-raters and agree by the experts that the developed learning module utilizes questions that help achieve the learning objectives as displayed in Table 1 and 2.

**Table 7: Objectives with Sample Questions/Problems in the Learning Module**

Objectives	Sample Questions/Problems
1. Use a variety of statistical tools to process and manage numerical data	Find the mean, median, and mode of the given data set: 5, 7, 12, 5, 13, and 4.
2. Use the methods of linear progression and correlations to predict the value of a variable given certain conditions	Solve for the range, variance, and standard deviation of the number of mango production in Isabela which yielded 812, 624, 756, 867, 524, 654, 938, 892, 754,
3. Advocate the use of statistical data in making important decisions	540, 478, 880, 589, 955, and 749 trays per hectare. -Determine if there is a relationship between the two variables and the dietary supplement is effective. -Use the equation of regression line to predict the efficiency of the physical training if the standard athletes' weight is 65, and determine how many variations of the athletes' weight are due to the variations of the physical training.

The inter-raters strongly agree and the panel of experts agree that the developed learning modules provide students activities that require application of what they learned as shown in a sample activity from the module given to the students after each lesson or topic given in Figure 1.

**== ACTIVITY 2.1 ==**

Name: \_\_\_\_\_ Year and Section: \_\_\_\_\_  
Date Accomplished: \_\_\_\_\_ Time Started: \_\_\_\_\_ Time Finished: \_\_\_\_\_

A. Find the mean, median, and mode(s) of the following data sets:

- 5, 7, 12, 5, 13, 4  

Mean:	Median:	Mode:
-------	---------	-------
- 5, 0, 4, -3, 6, -7, 0  

Mean:	Median:	Mode:
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- 135, 124, 124, 135, 112, 134, 128, 127, 142  

Mean:	Median:	Mode:
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B. Illustrate or explain how you solve the following data set problems.  
For numbers 1-3, examine the table below which explicitly shows the four-game scores of DJ, Nicole, Anjeli, and Zeus in bowling.

Name	Scores			
	Game 1	Game 2	Game 3	Game 4
DJ	140	160	140	170
Nicole	160	140	140	160
Anjeli	170	115	165	130
Zeus	125	130	160	120

- Who has the greatest median score for four games?  
\_\_\_\_\_
- What is the mean score of all the games?  
\_\_\_\_\_
- After Zeus bowled two more games, his mean score for six games became 140. What could have been his scores in the last two games he bowled?  
\_\_\_\_\_
- Five numbers have a mean of 12. When one number is removed, the mean becomes 11. What is the value of the omitted number?  
\_\_\_\_\_
- Use the following clues to find the age of each family member of a family of five. The median is 12. The mean is 21. The mode is 41. The age of one of the family members is the median divided by 3.  
\_\_\_\_\_
- Rodrigo took a trip. He filled his tank with 20 liters of gasoline for P48.90 per liter and bought an additional 12 liters for a price of P50.10 per liter. On his way home, he refilled

**Figure 1: Sample activity that requires application of what the students learned**

Moreover, the raters strongly agree, and the panel of experts agree that the module uses varied and appropriate evaluation tools (assignment, exercises, problem sets, learning checks, etc). The developed learning module has target practices in each sub-topics and activity in each topic. Additionally, the inter-raters strongly agree, and the panel of experts agree that the learning module contains prescriptive exercises for remedial instruction.

**Table 8: Data Management Topics with Number of Exercises and Activities**

Topic	Number of Exercises	Activity
Data	4 sets	1 set
Measures of Central Tendency	3 sets	1 set
Measures of Dispersion	3 sets	1 set
Measures of Position	1 set	1 set
Probabilities and Normal Distribution	1 set	1 set
Linear Regression and Correlation	1 set	1 set
Statistics using Technology	5 sets	1 set

Moreover, the raters strongly agree, and the panel of experts agree that the learning modules cover a project proposal for a quantitative study to be orally proposed and a pseudo proposal defense as indicated in the Figures 2 and 3.

**- GROUP ACTIVITY 1 (OPTIONAL) -**

**A Project Proposal for a Quantitative Study to be Orally Proposed.**

A. Directions:

- This group work will consist of five (5) members per group.
- Each group will make a project proposal comprise of:
  - one paragraph rationale or reason for choosing the topic, importance in your field, and who will benefit from it;
  - the target population and samples;
  - sampling and data gathering techniques to be used.
- Format

(Title)	_____
Rationale	_____ _____ _____
Population and Sample	_____ _____
Sampling and Data Gathering Techniques	_____ _____
Submitted by:	_____ _____ _____
Date: _____	SV: _____

B. Rubrics for Checking:

	1-2 points	3-4 points	5 points
The title and the rationale for choosing the topic	Title is irrelevant, rationale for choosing the topic is not so clearly stated, not beneficiary of the research identified.	Title is so common, rationale for choosing the topic is not so clearly stated, only one beneficiary of the research is identified.	The title is timely and relevant, rationale for choosing the topic is clearly stated, at least two beneficiaries are identified.
Target population and Samples	The target population is not appropriate in the problem; the sample obtained cannot represent the identified population.	Appropriate target population but the sample identified cannot represent the population.	Target population is appropriate and can be represented by sample identified.
Sampling and Data Gathering Techniques	Sampling and data gathering is not appropriate to the topic and not clearly explained.	Sampling and data gathering techniques are appropriate to the topic but not clearly explained.	Sampling and data gathering techniques are appropriate to the topic and clearly explained.
Format	Format is not followed with at least three parts missing.	Format is not strictly followed, with at most two parts are missing.	Format is strictly followed.
Promptness	The group submits the output one week or later after the deadline.	The group submits the output following meeting after the deadline.	The group submits the output on time.
<b>Total Points: 35</b>			

Figure 2: An optional activity for a project proposal to be orally proposed

**- GROUP ACTIVITY 2 (OPTIONAL) -**

**A Pseudo Proposal Defense**

Direction: Prepare a power-point presentation for your project proposal and get ready for your defense.

Rubrics for the Pseudo Proposal Defense:

Attribute	1-5 points	6-10 points
Overall presentation quality	Poorly organized; poor presentation; poor communication skills; slides and handouts difficult to read; presentation reveals critical weaknesses in depth of knowledge in subject matter	Clearly organized; clear presentation; good communication skills; slides and handouts clear; presentation demonstrates depth of knowledge in subject matter.
Quality of response to questions/critical thinking skills	Responses were incomplete; respondent exhibited lack of knowledge in subject area; presentation does not reflect well developed critical thinking skills	Responses were complete; respondent exhibit adequate knowledge in subject area; presentation demonstrates critical thinking skills.
<b>Total points: 20</b>		

Figure 3: An optional activity for the pseudo proposal defense.

Generally, the two activities presented in Figures 2 and 3 are optional in the final draft evaluated by the inter-raters. Additionally, they strongly agree and the panel of experts agree that the learning modules contain activities that work with appropriate statistical computer software as exposed in Figure 4.

**- TARGET PRACTICE -**

*Solve the following problems got from different disciplines using Google sheets functions:*

- Politics:** The ages of 13 official candidates for the senatorial election in a certain party list are as follows: 40, 38, 51, 36, 29, 47, 50, 47, 39, 45, 38, 47, and 38. Find the 45<sup>th</sup> percentile, 8<sup>th</sup> decile, and 3<sup>rd</sup> quartile.
- Education:** The following scores were garnered by 10 students in Statistics quiz: 89, 78, 88, 86, 79, 92, 81, 37, 95, and 96. Find the 36<sup>th</sup> percentile, 7<sup>th</sup> decile, and 3<sup>rd</sup> quartile.
- Health:** The two Math major students weigh 60 kilos, five weigh 58 kilos, seven weigh 64 kilos, four weigh 59 kilos, six weigh 63 kilos and one weigh 68 kilos. What is the  $P_{90}$ ,  $D_9$ , and  $Q_3$ ?

Figure 4: Sample activity that works with appropriate computer statistical software

**Table 9: Summary of the Means, Standard Deviations, and Qualitative Interpretations of the Validity of the Developed Learning Modules**

Criteria	Phase 1									Phase 2		
	Lessons 1-6			Lesson 7			Overall			Lessons 1-7		
	Mean	SD*	QI**	Mean	SD*	QI**	Mean	SD*	QI**	Mean	SD*	QI**
Content	3.91	0.17	VMV	3.94	0.11	VMV	3.93	0.14	VMV	3.03	0.37	MV
Design, Features and Presentation	3.88	0.14	VMV	3.92	0.15	VMV	3.90	0.15	VMV	3.29	0.24	MV
Organization	4.00	0.00	VMV	4.00	0.00	VMV	4.00	0.00	VMV	3.17	0.24	MV
Assessment Tools	3.89	0.19	VMV	3.87	0.23	VMV	3.88	0.21	VMV	3.05	0.30	MV
Mean	3.92	0.13	VMV	3.93	0.12	VMV	3.93	0.13	VMV	3.14	0.29	MV

Legend: 3.50 – 4.00 = Very Much Valid (VMV); 2.50 – 3.49 = Much Valid (MV); 1.50 – 2.49 = Valid (V); 1.00 – 1.49 = Less Valid (LV); \* standard deviation; \*\* qualitative interpretation

As shown in Table 9, Lessons 1-6 (mean = 3.92, SD = 0.13) and Lesson 7 (mean = 3.93, SD = 0.12) of the developed learning modules as to their content, design, features and presentation, organization, and assessment tools are very much valid in the phase 1 evaluation. Overall, the developed learning module is very much valid (mean = 3.93, SD = 0.13). Further, the table reveals that the content, design, features and presentation, organization, and assessment tools of Lessons 1-7 of the developed learning module in the phase 2 evaluation is much valid (mean = 3.14, SD = 0.29). This could indicate that the developed learning module is ready to use for flexible learning.

#### Acceptability of the Developed Learning Modules

**Table 10: Level of Acceptability of the Developed Learning Modules along with Clarity as Assessed by the Students**

Criteria	Lessons 1-6			Lesson 7		
	Mean	SD*	QI**	Mean	SD*	QI**
1. The modules' information is clear and simple.	3.34	0.68	MA	3.73	0.50	VMA
2. The modules' language used is clear and easy to understand.	3.20	0.73	MA	3.71	0.51	VMA
3. The modules' concepts for each activity are arranged logically.	3.23	0.67	MA	3.78	0.47	VMA
4. The modules' information suits the students' level of comprehension.	3.16	0.73	MA	3.76	0.43	VMA
Mean	3.23	0.70	MA	3.75	0.48	VMA

Legend: 3.50 – 4.00 = Very Much Acceptable (VMA); 2.50 – 3.49 = Much Acceptable (MA); 1.50 – 2.49 = Acceptable (A); 1.00 – 1.49 = Less Acceptable (LA); \* standard deviation; \*\* qualitative interpretation

Table 10 shows that in Lesson 1-6, all the criteria are rated in the range of 2.50-3.49 by the students, which means that these criteria on clarity are much acceptable (mean = 3.23, SD = 0.70). Hence, Lessons 1 to 6 of the learning modules have much acceptable information that are clear, simple, and easy to understand. Also, the information that is suited on the level of comprehension of students and the logically arranged concepts for each activity are much acceptable. Additionally, all the criteria on clarity are rated by the students in the range of 3.50-4.00 indicating that Lesson 7 of the developed learning modules is very much acceptable (mean = 3.75, SD = 0.48). This further implies that the developed learning modules have clear and simple information, clear and easy to understand language, and logically arranged concepts for each activity. The information contained in the module is suited to the students' level of comprehension. All of these criteria are very much acceptable.

**Table 11: Level of Acceptability of the Developed Learning Modules in Terms of Usefulness as Assessed by the Students**

Criteria	Lessons 1-6			Lesson 7		
	Mean	SD*	QI**	Mean	SD*	QI**
1. The module prepares the students to think logically and critically.	3.27	0.69	MA	3.69	0.51	VMA
2. The module is simple and comprehensible.	3.16	0.74	MA	3.78	0.42	VMA

Criteria	Lessons 1-6			Lesson 7		
	Mean	SD*	QI**	Mean	SD*	QI**
3. The module has contents that increase the students' knowledge, understanding, and proficiency/skills.	3.29	0.72	MA	3.76	0.48	VMA
4. The module provides opportunities for the development/enhancement of mathematical skills.	3.25	0.74	MA	3.76	0.53	VMA
5. The module has learning contents that provide adequate information on the topics presented.	3.27	0.69	MA	3.67	0.60	VMA
6. The module encourages the students to become actively involved in the learning activities.	3.22	0.71	MA	3.67	0.56	VMA
7. The module stimulates the learners' analytical thinking skills.	3.23	0.70	MA	3.73	0.54	VMA
8. The module presents activities that seek to relate new concepts from previous.	3.21	0.69	MA	3.69	0.56	VMA
Mean	3.23	0.71	MA	3.72	0.53	VMA

Legend: 3.50 – 4.00 = Very Much Acceptable (VMA); 2.50 – 3.49 = Much Acceptable (MA); 1.50 – 2.49 = Acceptable (A); 1.00 – 1.49 = Less Acceptable (LA); \* standard deviation; \*\* qualitative interpretation

It can be seen from Table 11 that all the criteria on usefulness are rated by the students from 2.50-3.49 in Lessons 1 to 6. This means that the developed learning modules are much acceptable (mean = 3.23, SD = 0.71) in terms of usefulness. The students much accept that the contents of the developed learning modules are simple and comprehensible; that the contents allow students think logically and critically; and that the students' knowledge, understanding, and proficiency/skills can be increased by the modules. Also, the provided opportunities for the development/enhancement of mathematical skills and adequate information on the topics presented, the encouragement to the students to become actively involved in the learning activities, the stimulation of the learners' analytical thinking skills, and activities that were related to the new concepts from previous are much acceptable. Additionally, a very much acceptable learning module in Lesson 7 of Data Management of the Mathematics in the Modern World subject in terms of usefulness is revealed in the students' ratings which range from 3.50-4.00 (mean = 3.72, SD = 0.53). The students very much accept that the contents of the developed learning modules are simple and comprehensible; that their knowledge, understanding, and proficiency/skills can be improved; that the modules provide opportunities for the development/enhancement of mathematical skills and adequate information on the topics presented; that they are encouraged to become actively involved in the learning activities; that the modules stimulate their analytical thinking skills; and that the activities are related to the new concepts from the previous.

**Table 12: Level of Acceptability of the Developed Learning Modules on Suitability as Assessed by the Students**

Criteria	Lessons 1-6			Lesson 7		
	Mean	SD*	QI**	Mean	SD*	QI**
1. The modules' activities take into consideration the varying attitudes and capabilities of the learner.	3.09	0.70	MA	3.67	0.60	VMA
2. The modules' activities are suitable for the topic.	3.29	0.71	MA	3.78	0.47	VMA
3. The modules' activities are relevant, interesting, and self-motivating.	3.20	0.74	MA	3.69	0.56	VMA
4. The modules' enrichment activities are adaptable to classes with a large number of students.	3.19	0.70	MA	3.76	0.48	VMA
Mean	3.19	0.71	MA	3.73	0.53	VMA

Legend: 3.50 – 4.00 = Very Much Acceptable (VMA); 2.50 – 3.49 = Much Acceptable (MA); 1.50 – 2.49 = Acceptable (A); 1.00 – 1.49 = Less Acceptable (LA); \* standard deviation; \*\* qualitative interpretation

It can be gleaned from Table 12 that the students rate Lessons 1-6 from 2.50-3.49 which means that the criteria on the suitability of the developed learning module are much acceptable (mean = 3.19, SD = 0.71). This result shows that the developed learning modules have much acceptable activities that are relevant, interesting, self-

motivating, and appropriate for the topic taking into consideration the varying attitudes and capabilities of the learner and are adaptable to a large number of classes. On the other hand, along with the suitability of Lesson 7, all the criteria are evaluated by the students as very much acceptable (mean = 3.73, SD = 0.53). This implies that the students very much accept that the activities are right for the topic and adaptable to classes with a large number of students. Also, the modules have a very much acceptable relevant, interesting, and self-motivating activities taking into consideration the changing attitudes and aptitudes of the learner.

**Table 13:Level of Acceptability of the Developed Learning Modules on Adequacy as Assessed by the Students**

Criteria	Lessons 1-6			Lesson 7		
	Mean	SD*	QI**	Mean	SD*	QI**
1. The module covers all the topics in the course syllabus.	3.14	0.69	MA	3.69	0.51	VMA
2. The module provides sufficient information on each topic.	3.18	0.72	MA	3.69	0.56	VMA
3. The module provides expected learning.	3.15	0.70	MA	3.73	0.50	VMA
4. The module defines important terms for reinforcement.	3.21	0.70	MA	3.71	0.55	VMA
5. The module provides enough activities to increase students' knowledge, skills and attitudes.	3.30	0.74	MA	3.78	0.47	VMA
6. The module explains and applies concepts and principles.	3.28	0.71	MA	3.69	0.56	VMA
Mean	3.21	0.71	MA	3.72	0.53	VMA

Legend: 3.50 – 4.00 = Very Much Acceptable (VMA); 2.50 – 3.49 = Much Acceptable (MA); 1.50 – 2.49 = Acceptable (A); 1.00 – 1.49 = Less Acceptable (LA); \* standard deviation; \*\* qualitative interpretation  
Table 13 reveals that in Lessons 1-6, all criteria are rated much acceptable by the students (mean = 3.21, SD = 0.71). This could mean that the developed modules cover all the topics in the syllabus, provide expected learning, provide sufficient information on each topic and enough activities to increase students' knowledge, skills and attitudes, define important terms for reinforcement, and explain and apply concepts and principles. Also, the table shows that Lesson 7 is very much acceptable (mean = 3.72, SD = 0.53). This manifests that the following criteria: modules provide expected learning, sufficient information on each topic, and enough activities to increase students' knowledge, skills and attitudes; the modules cover all the topics in the course syllabus, define important terms for reinforcement, and explain and apply concepts and principles, are very much acceptable to the students.

**Table 14:Level of Acceptability of the Developed Learning Modules on Timeliness as Assessed by the Students**

Criteria	Lessons 1-6			Lesson 7		
	Mean	SD*	QI**	Mean	SD*	QI**
1. The validation and use of the module are timely because it is one of the tools for quality learning.	3.24	0.70	MA	3.62	0.53	VMA
2. The validation and use of the module are timely because teachers are encouraged to produce instructional materials to make learning effective.	3.27	0.70	MA	3.76	0.48	VMA
3. The validation and use of the module are timely because students need instructional materials where they could apply what had been discussed in the classroom.	3.28	0.70	MA	3.71	0.51	VMA
Mean	3.26	0.70	MA	3.70	0.51	VMA

Legend: 3.50 – 4.00 = Very Much Acceptable (VMA); 2.50 – 3.49 = Much Acceptable (MA); 1.50 – 2.49 = Acceptable (A); 1.00 – 1.49 = Less Acceptable (LA); \* standard deviation; \*\* qualitative interpretation  
As indicated in Table 14, all criteria in Lessons 1-6 are rated much acceptable (overall mean = 3.26, SD = 0.70) by the students. The students accept that the validation and use of the modules are timely because they are tools for quality learning; teachers are encouraged to produce instructional materials to make learning effective; and students need instructional materials where they could apply what had been discussed in the classroom.



Further, Lesson 7 of the developed learning modules is very much acceptable in terms of timeliness (mean = 3.70, SD = 0.51).

**Table 15: Level of Acceptability of the Developed Learning Modules on Language, Style, and Format as Assessed by the Students**

Criteria	Lessons 1-6			Lesson 7		
	Mean	SD*	QI**	Mean	SD*	QI**
1. The format and style of the module warrants appropriate use of illustrations.	3.28	0.62	MA	3.71	0.51	VMA
2. The format and style of the module warrants proper spacing of items.	3.18	0.67	MA	3.67	0.48	VMA
3. The format and style of the module warrants use of optimum print size.	3.13	0.73	MA	3.71	0.46	VMA
4. The format and style of the module warrants variation in the positioning of response sections.	3.15	0.70	MA	3.62	0.53	VMA
5. The format and style of the module warrants the observation of correct grammar.	3.20	0.73	MA	3.69	0.51	VMA
6. The format and style of the module warrants clear and comprehensive language in terms of vocabulary.	3.24	0.70	MA	3.69	0.51	VMA
7. The format and style of the module warrants sufficient familiar vocabulary to ensure learning.	3.21	0.70	MA	3.62	0.58	VMA
8. The format and style of the module warrants appropriate structure, style, and format to the target level.	3.29	0.63	MA	3.67	0.52	VMA
Mean	3.21	0.68	MA	3.67	0.51	VMA

Legend: 3.50 – 4.00 = Very Much Acceptable (VMA); 2.50 – 3.49 = Much Acceptable (MA); 1.50 – 2.49 = Acceptable (A); 1.00 – 1.49 = Less Acceptable (LA); \* standard deviation; \*\* qualitative interpretation  
As presented in Table 15, Lesson 1-6 is rated much acceptable by the students in terms of the criteria on language, style, and format. The students consider that the format and style of the modules warrant appropriate use of illustrations, proper spacing of items, use of optimum print size, variation in the positioning of response sections, the observation of correct grammar, clear and comprehensive language in terms of vocabulary, sufficient familiar vocabulary to ensure learning, and appropriate structure, style, and format to the target level are much acceptable. Further, it is also revealed that based on the criteria on language, format, and style, Lesson 7 of the developed learning modules is very much acceptable (mean = 3.67, SD = 0.51). This exhibits a very much acceptable learning module since it warrants appropriate use of illustrations, proper spacing of items, use of optimum print size, variation in the positioning of response sections, observes correct grammar, clear and comprehensive language in terms of vocabulary, sufficient familiar vocabulary to ensure learning, and appropriate structure, style, and format to the target level.

**Table 16: Level of Acceptability of the Developed Learning Modules in terms of Illustrations as Assessed by the Students**

Criteria	Lessons 1-6			Lesson 7		
	Mean	SD*	QI**	Mean	SD*	QI**
1. The illustrations used are clear and simple.	3.31	0.67	MA	3.78	0.52	VMA
2. The illustrations used arouse students' interest, making learning effective and enjoyable.	3.22	0.67	MA	3.69	0.56	VMA
3. The illustrations used provide concrete visual clues	3.23	0.67	MA	3.69	0.60	VMA
4. The illustrations used guides students to follow directions	3.38	0.67	MA	3.62	0.61	VMA
5. The illustrations used relevant to the topic	3.37	0.62	MA	3.71	0.51	VMA
Mean	3.30	0.66	MA	3.70	0.56	VMA

Legend: 3.50 – 4.00 = Very Much Acceptable (VMA); 2.50 – 3.49 = Much Acceptable (MA); 1.50 – 2.49 = Acceptable (A); 1.00 – 1.49 = Less Acceptable (LA); \* standard deviation; \*\* qualitative interpretation

Table 16 shows that Lessons 1-6 of the developed learning modules are much acceptable in terms of illustrations (mean = 3.30, SD = 0.66). Thus, using clear and simple illustrations that arouse students' interest, making learning effective and enjoyable, providing concrete visual clues, guiding students to follow directions, and relevant to the topic are much acceptable to the students. The table also reveals that all the criteria in terms of illustration are evaluated by the students as very much acceptable (mean = 3.70, SD = 0.56).

**Table 17:Level of Acceptability of the Developed Learning Modules in terms of Presentation as Assessed by the Students**

Criteria	Lessons 1-6			Lesson 7		
	Mean	SD*	QI**	Mean	SD*	QI**
1. The presentation of topics is logical and orderly sequenced.	3.33	0.67	MA	3.71	0.51	VMA
2. The presentation of directions is concise, readable, and easy to follow.	3.38	0.65	MA	3.69	0.51	VMA
3. The presentation of topics fit the sequence of the course.	3.35	0.67	MA	3.71	0.51	VMA
Mean	3.35	0.66	MA	3.70	0.51	VMA

Legend: 3.50 – 4.00 = Very Much Acceptable (VMA); 2.50 – 3.49 = Much Acceptable (MA); 1.50 – 2.49 = Acceptable (A); 1.00 – 1.49 = Less Acceptable (LA); \* standard deviation; \*\* qualitative interpretation

It can be seen from Table 17 that all the criteria on the presentation of Lessons 1-6 are much acceptable by the students with the overall mean of 3.35 (SD = 0.66). This means that the logically and orderly sequenced topics, concise, readable, and easy to follow directions, and properly sequenced topics of the course in the modules are much acceptable. Also, all the criteria in terms of presentation are rated very much acceptable (mean = 3.70, SD = 0.51) by the students. This means that Lesson 7 of the developed learning modules has very much acceptable presentation because of the logical and orderly sequencing of course topics, and the concise, readable, and easy to follow the directions.

**Summary of the Level of Acceptability of the Developed Learning Modules as Assessed by the Students**

**Table 18:Level of Acceptability of the Developed Learning Modules as Assessed by the Students**

Criteria	Lessons 1-6			Lesson 7			Overall		
	Mean	SD*	QI**	Mean	SD*	QI**	Mean	SD*	QI**
Clarity	3.23	0.70	MA	3.73	0.50	VMA	3.48	0.60	MA
Usefulness	3.23	0.71	MA	3.72	0.53	VMA	3.48	0.62	MA
Suitability	3.19	0.71	MA	3.73	0.53	VMA	3.46	0.62	MA
Adequacy	3.21	0.71	MA	3.72	0.53	VMA	3.47	0.62	MA
Timeliness	3.26	0.70	MA	3.70	0.51	VMA	3.48	0.61	MA
Language, Style and Format	3.21	0.68	MA	3.67	0.51	VMA	3.44	0.60	MA
Illustrations	3.30	0.66	MA	3.70	0.56	VMA	3.50	0.61	VMA
Presentation	3.35	0.66	MA	3.70	0.51	VMA	3.53	0.59	VMA
MEAN	3.24	0.69	MA	3.71	0.52	VMA	3.48	0.61	MA

Legend: 3.50 – 4.00 = Very Much Acceptable (VMA); 2.50 – 3.49 = Much Acceptable (MA); 1.50 – 2.49 = Acceptable (A); 1.00 – 1.49 = Less Acceptable (LA); \* standard deviation; \*\* qualitative interpretation

As shown in Table 18, the level of acceptability for Lessons 1-6 of the developed learning modules is much acceptable (mean = 3.24, SD = 0.69) and very much acceptable for Lesson 7 (mean = 3.71, SD = 0.52). In general, the developed learning modules are much acceptable (mean = 3.48, SD = 0.61). In particular, the modules are very much acceptable in terms of illustrations and presentation, and much acceptable in terms of clarity, usefulness, suitability, adequacy, timeliness, and language, style and format.

Developed Video-Recorded Lectures

Table 19: Developed Video-Recorded Lectures as to Content

Criteria	Phase 1						Phase 2		
	Lessons 1-6			Lesson 7			Lessons 1-7		
	Mean	SD*	QI**	Mean	SD*	QI**	Mean	SD*	QI**
1. Has clearly defined objectives in each chapter/section/unit.	4.00	0.00	SA	4.00	0.00	SA	3.67	0.47	SA
2. Is aligned to the learning objectives in the syllabus.	3.67	0.58	SA	4.00	0.00	SA	3.67	0.47	SA
3. Reflects the learning competencies of the curriculum.	4.00	0.00	SA	4.00	0.00	SA	3.33	0.47	A
4. Develops higher order thinking skills.	3.67	0.58	SA	3.67	0.58	SA	3.00	0.00	A
5. Enhances manipulative skills (if applicable).	4.00	0.00	SA	4.00	0.00	SA	3.00	0.00	A
6. Is well-organized.	4.00	0.00	SA	4.00	0.00	SA	3.00	0.00	A
7. Is gender and culture sensitive.	4.00	0.00	SA	4.00	0.00	SA	3.00	0.82	A
2. Cites references and related sources.	4.00	0.00	SA	4.00	0.00	SA	2.67	0.47	A
3. Contains complete, recent and current information.	3.67	0.58	SA	3.67	0.58	SA	2.33	0.47	D
4. Emphasizes important points using keywords, key concepts and summary points.	4.00	0.00	SA	4.00	0.00	SA	3.00	0.82	A
5. Integrates interdisciplinarity in the topics/lessons.	4.00	0.00	SA	4.00	0.00	SA	2.33	0.47	D
Mean	3.91	0.16	VMV	3.94	0.11	VMV	3.00	0.41	MV

Legend: 3.50 – 4.00 = Strongly Agree (SA); 2.50 – 3.49 = Agree (A); 1.50 – 2.49 = Disagree (D); 1.00 – 1.49 = Strongly Disagree (SD); \* standard deviation; \*\* qualitative interpretation; 3.50 – 4.00 = Very Much Valid (VMV); 2.50 – 3.49 = Much Valid (MV); 1.50 – 2.49 = Valid (V); 1.00 – 1.49 = Less Valid (LV)

As shown in Table 19, all criteria in the phase 1 evaluation are rated in the range of 3.67-4.00 which means that the inter-raters strongly agree that the developed video-recorded lectures of Lessons 1-6 (mean = 3.91, SD = 0.16) and Lesson 7 (mean = 3.94, SD = 0.11) are very much valid in terms of content. Further, the panel of experts agree that the video-recorded lectures of Lessons 1-7 in the phase 2 evaluation are much valid (mean = 3.00, SD = 0.41). Particularly, they strongly agree that the video-recorded lectures have clearly defined objectives in each chapter/section/unit. Also, it is strongly agreed that the content of the video-recorded lectures is aligned with the objectives in the syllabus. Additionally, the raters strongly agree, and the panel of experts agree that the video lectures reflect the learning competencies of the curriculum. Further, the raters strongly agree, and the panel of experts agree that the learning videos develop higher order thinking skills and enhances manipulative skills. Also, the raters strongly agree, and the panel of experts agree that the video-recorded lectures are well-organized. The raters strongly agree, and the panel of experts agree that the learning videos are gender and culture sensitive. Additionally, it is strongly agreed by the raters and disagreed by the panel of experts that the video-recorded lectures cite references and related sources, and contain complete, recent and current information. Moreover, the developed learning videos emphasize important points using keywords, key concepts and summary points. Also, the raters strongly agree and the panel of experts disagree that the video-recorded lectures integrate interdisciplinarity in the topics/lessons.

**Table 20: Validity of the Developed Video-Recorded Lectures as to Design, Features and Presentation**

Criteria	Phase 1						Phase 2		
	Lessons 1-6			Lesson 7			Lessons 1-7		
	Mean	SD*	QI**	Mean	SD*	QI**	Mean	SD*	QI**
1. Arranges topics in a sequential manner.	4.00	0.00	SA	4.00	0.00	SA	4.00	0.00	SA
2. Reflects layout consistency in terms of font, spacing, indentation, graphics and pagination.	4.00	0.00	SA	4.00	0.00	SA	3.00	0.82	A
3. Has simple and clear instructions for teacher/s and students.	4.00	0.00	SA	4.00	0.00	SA	3.33	0.47	A
4. Uses appropriate terms.	4.00	0.00	SA	4.00	0.00	SA	3.00	0.00	A
5. Has activities that motivate students to participate actively and master concepts and skills.	4.00	0.00	SA	4.00	0.00	SA	3.33	0.00	A
6. Has varied illustrations and examples to facilitate learning.	4.00	0.00	SA	4.00	0.00	SA	3.00	0.00	A
7. Has supplementary activities that enhance critical thinking.	4.00	0.00	SA	4.00	0.00	SA	3.00	0.00	A
8. Has lessons which may be utilized by other faculty.	4.00	0.00	SA	4.00	0.00	SA	3.00	0.00	A
Mean	4.00	0.00	VMV	4.00	0.00	VMV	3.21	0.22	MV

Legend: 3.50 – 4.00 = Strongly Agree (SA); 2.50 – 3.49 = Agree (A); 1.50 – 2.49 = Disagree (D); 1.00 – 1.49 = Strongly Disagree (SD); \* standard deviation; \*\* qualitative interpretation; 3.50 – 4.00 = Very Much Valid (VMV); 2.50 – 3.49 = Much Valid (MV); 1.50 – 2.49 = Valid (V); 1.00 – 1.49 = Less Valid (LV)

As can be gleaned from Table 20, all the criteria in terms of design, features, and presentation in Lessons 1-6 and Lesson 7 in the phase 1 evaluation are rated 4.00 which means that the inter-raters strongly agree that the developed video-recorded lectures are very much valid (mean = 4.00, SD = 0.00). Moreover, the panel of evaluators rated the video-recorded lectures from 3.00-4.00 which signifies their agreement that the video-recorded lectures for Lessons 1-7 are much valid (mean = 3.21, SD = 0.22). in terms of the design, features, and presentation during the phase 2 evaluation. Particularly, they strongly agree that the topics and sub-topics of the developed learning videos are organized sequentially. Moreover, the raters strongly agree, and the panel of experts agree that the video-recorded lectures reflect layout consistency in terms of font, spacing, indentation, graphics and pagination. Also, the raters strongly agree, and the panel of experts agree that the video lectures use appropriate terms and simple and clear instructions for the teacher/s and students. Further, the raters strongly agree, and the panel of experts agree that the videos have activities that motivate students to participate actively and master concepts and skills. Besides, the raters strongly agree that the learning videos have varied illustrations and examples to facilitate learning. Further, the raters strongly agree, and the panel of experts agree that the video-recorded lectures contain supplementary activities that enhance critical thinking. It is strongly agreed by the raters and agreed by the panel of experts that the learning videos consist of lessons which may be utilized by other faculty.

**Table 20: Validity of the Developed Video-Recorded Lectures as to Organization**

Criteria	Phase 1						Phase 2		
	Lessons 1-6			Lesson 7			Lessons 1-7		
	Mean	SD*	QI**	Mean	SD*	QI**	Mean	SD*	QI**
1. Topics and sub-topics are coherent in each chapter.	4.00	0.00	SA	4.00	0.00	SA	3.50	0.50	SA
2. Observes correct grammar and usage.	4.00	0.00	SA	4.00	0.00	SA	3.00	0.00	A
3. Paragraphs are well-organized.	4.00	0.00	SA	4.00	0.00	SA	3.00	0.00	A
Mean	4.00	0.00	VMV	4.00	0.00	VMV	3.17	0.17	MV

Legend: 3.50 – 4.00 = Strongly Agree (SA); 2.50 – 3.49 = Agree (A); 1.50 – 2.49 = Disagree (D); 1.00 – 1.49 = Strongly Disagree (SD); \* standard deviation; \*\* qualitative interpretation; 3.50 – 4.00 = Very Much Valid (VMV); 2.50 – 3.49 = Much Valid (MV); 1.50 – 2.49 = Valid (V); 1.00 – 1.49 = Less Valid (LV)

Table 20 shows that the inter-raters evaluate Lessons 1-6 and Lesson 7 of the developed video-recorded lectures as very much valid (mean = 4.00, SD = 0.00) in terms of organization in the phase 1 evaluation. Additionally, the learning video-recorded lectures for Lessons 1-7 are considered much valid (mean = 3.17, SD = 0.17) by the inter-raters in the phase 2 evaluation. Specifically, they strongly agree that the topics and subtopics are coherent in each chapter. Also, the raters strongly agree, and the panel of experts agree that developed learning videos observe grammar and usage, and paragraphs are well-organized since the learning materials underwent grammar editing by experts in the field.

**Table 21: Validity of the Developed Video-Recorded Lectures as to Assessment Tools**

Criteria	Phase 1						Phase 2		
	Lessons 1-6			Lesson 7			Lessons 1-7		
	Mean	SD*	QI**	Mean	SD*	QI**	Mean	SD*	QI**
1. Utilizes questions that help achieve the learning objectives.	3.67	0.58	SA	4.00	0.00	SA	3.00	0.00	A
2. Provides students activities that require application of what they learned.	4.00	0.00	SA	4.00	0.00	SA	3.00	0.00	A
3. Uses varied and appropriate evaluation tools (assignment, exercises, problem sets, learning checks, etc.)	3.67	0.58	SA	3.67	0.58	SA	2.33	0.47	D
4. Contains prescriptive exercises for remedial instruction.	3.67	0.58	SA	3.67	0.58	SA	2.00	0.00	D
5. Covers a project proposal for a quantitative study to be orally proposed.	4.00	0.00	SA	NA			3.00	0.82	A
6. Contains activities that works with appropriate statistical computer software.	NA			4.00	0.00	SA	3.00	0.00	A
7. Comprises a pseudo proposal defense.	4.00	0.00	SA	NA			2.67	0.47	A
Mean	3.84	0.29	VMV	3.87	0.23	VMV	2.71	0.25	MV

Legend: 3.50 – 4.00 = Strongly Agree (SA); 2.50 – 3.49 = Agree (A); 1.50 – 2.49 = Disagree (D); 1.00 – 1.49 = Strongly Disagree (SD); \* standard deviation; \*\* qualitative interpretation; 3.50 – 4.00 = Very Much Valid (VMV); 2.50 – 3.49 = Much Valid (MV); 1.50 – 2.49 = Valid (V); 1.00 – 1.49 = Less Valid (LV); NA Not Applicable

Table 21 reveals that in the phase 1 evaluation of Lessons 1-6 and Lesson 7 of the video-recorded lectures, all criteria are rated from 3.67-4.00 indicating that the inter-raters strongly agree that the assessment tools in Lessons 1-6 (mean = 3.84, SD = 0.29) and Lesson 7 (mean = 3.87, SD = 0.23) are very much valid. Further, the panel of experts rate the assessment tools of Lessons 1-7 of the developed video-recorded lectures as much valid (mean = 2.71, SD = 0.25) in the phase 2 evaluation. Specifically, it is strongly agreed by the raters and agreed by the panel of experts that the developed video-recorded lectures utilize questions that help achieve the learning objectives. Also, the raters strongly agree, and the panel of experts agree that the developed learning videos provide students activities that require application of what they learned. Moreover, the raters strongly agree, and the panel of experts disagree that the videos use varied and appropriate evaluation tools (assignment, exercises, problem sets, learning checks, etc). The developed learning videos contain target practices in each sub-topic and activity in each topic. In addition, they strongly agree, and the panel of experts disagree that the learning videos contain prescriptive exercises for remedial instruction. Moreover, the raters strongly agree, and the panel of experts agree that the learning videos cover a project proposal for a quantitative study to be orally proposed and a pseudo proposal defense. Further, the raters strongly agree, and the panel of experts agree that the video-recorded lectures contain activities that works with appropriate statistical computer software.

**Table 22: Validity of the Developed Video-Recorded Lectures as to Technical Quality**

Criteria	Phase 1						Phase 2		
	Lessons 1-6			Lesson 7			Lessons 1-7		
	Mean	SD*	QI**	Mean	SD*	QI**	Mean	SD*	QI**
1. Audio enhances understanding of the concept.	4.00	0.00	SA	4.00	0.00	SA	3.67	0.47	SA
2. Speech and narration (correct pacing, intonation, and pronunciation) is clear and can be easily understood.	4.00	0.00	SA	4.00	0.00	SA	3.67	0.47	SA
3. There is complete synchronization of audio and visuals, if any.	3.67	0.58	SA	4.00	0.00	SA	3.67	0.47	SA
4. Music and sound effects are appropriate and effective for instructional purposes.	4.00	0.00	SA	4.00	0.00	SA	3.00	0.82	A
5. Screen displays (text) are uncluttered, easy to read, and aesthetically pleasing.	3.67	0.58	SA	3.67	0.58	SA	2.67	0.47	A
6. Visual presentations (non-text) are clear and easy to interpret.	3.67	0.58	SA	3.67	0.58	SA	3.33	0.47	A
7. Visuals sustain interest and do not distract user's attention.	3.67	0.58	SA	3.67	0.58	SA	2.67	0.47	A
8. Visuals provide accurate representation of the concept discussed.	4.00	0.00	SA	4.00	0.00	SA	3.00	0.00	A
9. The user support materials (if any) are effective.	4.00	0.00	SA	4.00	0.00	SA	2.67	0.47	A
10. The design allows the target user to navigate freely through the material	3.67	0.58	SA	3.67	0.58	SA	2.67	0.47	A
11. The material can easily and independently be used.	4.00	0.00	SA	4.00	0.00	SA	3.00	0.00	A
Mean	3.85	0.21	VMV	3.88	0.21	VMV	3.09	0.42	MV

Legend: 3.50 – 4.00 = Strongly Agree (SA); 2.50 – 3.49 = Agree (A); 1.50 – 2.49 = Disagree (D); 1.00 – 1.49 = Strongly Disagree (SD); \* standard deviation; \*\* qualitative interpretation; 3.50 – 4.00 = Very Much Valid (VMV); 2.50 – 3.49 = Much Valid (MV); 1.50 – 2.49 = Valid (V); 1.00 – 1.49 = Less Valid (LV)

As shown in Table 22, the developed video-recorded lectures for Lessons 1-6 and are rated from 3.67-4.00 which means that raters strongly agree that the lessons of the learning videos in terms of technical quality are very much valid in the phase 1 evaluation. Moreover, the developed video-recorded lectures for Lessons 1-7 are rated from 2.67-3.67 in the phase 2 evaluation which means that the panel of experts agree that the developed learning videos are much valid.

**Table 23: Summary of the Validity of the Developed Video-Recorded Lectures**

Criteria	Phase 1									Phase 2		
	Lessons 1-6			Lesson 7			Overall			Lessons 1-7		
	Mean	SD*	QI**	Mean	SD*	QI**	Mean	SD*	QI**	Mean	SD*	QI**
Content	3.91	0.16	VMV	3.94	0.11	VMV	3.92	0.15	VMV	3.00	0.41	MV
Design, Features and Presentation	4.00	0.00	VMV	4.00	0.00	VMV	4.00	0.00	VMV	3.21	0.22	MV
Organization	4.00	0.00	VMV	4.00	0.00	VMV	4.00	0.00	VMV	3.17	0.17	MV
Assessment Tools	3.84	0.29	VMV	3.87	0.23	VMV	3.86	0.26	VMV	2.71	0.25	MV
Technical Quality	3.85	0.26	VMV	3.88	0.21	VMV	3.87	0.24	VMV	3.09	0.42	MV
MEAN	3.92	0.14	VMV	3.94	0.11	VMV	3.93	0.13	VMV	3.04	0.30	MV

Legend: 3.50 – 4.00 = Very Much Valid (VMV); 2.50 – 3.49 = Much Valid (MV); 1.50 – 2.49 = Valid (V); 1.00 – 1.49 = Less Valid (LV); \* standard deviation; \*\* qualitative interpretation

As shown in Table 23, the developed video-recorded lectures for Lessons 1-6 (mean = 3.92, SD = 0.14) and Lesson 7 (mean = 3.94, SD = 0.11) in the phase 1 evaluation are very much valid in terms of content, design, features and presentation, organization, assessment tools, and technical quality. Overall, the developed learning videos are very much valid (mean = 3.93, SD = 0.13). Additionally, the table indicates that the content, design, features and presentation, organization, assessment tools, and technical quality of the video-recorded lectures for Lessons 1-7 are much valid (mean = 3.04, SD = 0.30) in the phase 2 evaluation. This could indicate that the video-recorded materials are ready for use for flexible learning.

**Acceptability of the Video Recorded Lectures**

**Table 24: Level of Acceptability of the Developed Video-Recorded Lectures on Clarity as Assessed by the Students**

Criteria	Lessons 1-6			Lesson 7		
	Mean	SD*	QI**	Mean	SD*	QI**
1. The video-recorded lectures' information is clear and simple.	3.41	0.64	MA	3.72	0.46	VMA
2. The video-recorded lectures' language used is clear and easy to understand.	3.27	0.67	MA	3.59	0.50	VMA
3. The video-recorded lectures' concepts for each activity are arranged logically.	3.31	0.65	MA	3.59	0.61	VMA
4. The video-recorded lectures' information suits the students' level of comprehension.	3.19	0.74	MA	3.50	0.67	VMA
Mean	3.29	0.67	MA	3.60	0.56	VMA

Legend: 3.50 – 4.00 = Very Much Acceptable (VMA); 2.50 – 3.49 = Much Acceptable (MA); 1.50 – 2.49 = Acceptable (A); 1.00 – 1.49 = Less Acceptable (LA); \* standard deviation; \*\* qualitative interpretation

Table 24 reveals that all criteria for clarity are rated by the students from 2.50-3.49 which means that the video-recorded lectures for Lessons 1-6 are much acceptable (mean = 3.29, SD = 0.67). The result implies that the clear and simple information suits the comprehension level of the students, that the use of language is clear and easy-to-understand, and that the concepts for each activity are logically arranged. In Lesson 7, it is shown that all the criteria for clarity are rated from 3.50-4.00 by the students which means they are very much acceptable. The video-recorded lectures are very much acceptable because information is clear and simple, the use of language is clear and easy to understand, the concepts for each activity are organized logically, and the information ensembles the students' level of comprehension.

**Table 25:Level of Acceptability of the Developed Video-Recorded Lectures as to Usefulness as Assessed by the Students**

Criteria	Lesson 1-6			Lesson 7		
	Mean	SD*	QI**	Mean	SD*	QI**
1. The video-recorded lecture prepares the students to think logically and critically.	3.31	0.65	MA	3.63	0.49	VMA
2. The video-recorded lecture is simple and comprehensible.	3.27	0.66	MA	3.50	0.67	VMA
3. The video-recorded lecture has contents that increase the students' knowledge, understanding, and proficiency/skills.	3.39	0.69	MA	3.63	0.55	VMA
4. The video-recorded lecture provides opportunities for the development/enhancement of mathematical skills.	3.37	0.66	MA	3.63	0.55	VMA
5. The video-recorded lecture has learning contents that provide adequate information on the topics presented.	3.38	0.67	MA	3.50	0.72	VMA
6. The video-recorded lecture encourages the students to become actively involved in the learning activities.	3.30	0.66	MA	3.59	0.50	VMA
7. The video-recorded lecture stimulates the learners' analytical thinking skills.	3.31	0.67	MA	3.53	0.62	VMA
8. The video-recorded lecture presents activities that seek to relate new concepts from previous.	3.25	0.72	MA	3.50	0.62	VMA
Mean	3.32	0.67	MA	3.56	0.59	VMA

Legend: 3.50 – 4.00 = Very Much Acceptable (VMA); 2.50 – 3.49 = Much Acceptable (MA); 1.50 – 2.49 = Acceptable (A); 1.00 – 1.49 = Less Acceptable (LA); \* standard deviation; \*\* qualitative interpretation  
As presented in Table 24 all criteria for usefulness are rated from 2.50-3.49 by the students which means that the developed video-recorded lectures for Lessons 1-6 are much acceptable (mean = 3.32, SD = 0.67). Therefore, the learning contents of the video-recorded lectures can increase the knowledge, understanding and proficiency skills of students, and can provide adequate information on the presented topics. Also, the simple and comprehensible lectures can present activities that seek to relate new concepts from previous, provide opportunities for the development/ enhancement of mathematical skills of the students, stimulate the learners' analytical thinking skills, and are prepared for the students to think logically and critically and encourage them to become actively involved in the learning activities. Similarly, for Lesson 7, it can be viewed in the table that the learning video-recorded lectures are very much acceptable in terms of usefulness (mean = 3.56, SD = 0.59).

**Table 25:Level of Acceptability of the Developed Video-Recorded Lectures on Suitability as Assessed by the Students**

Criteria	Lessons 1-6			Lesson 7		
	Mean	SD*	QI**	Mean	SD*	QI**
1. The video-recorded lectures' activities take into consideration the varying attitudes and capabilities of the learner.	3.13	0.68	MA	3.69	0.54	VMA
2. The video-recorded lectures' activities are suitable for the topic.	3.36	0.68	MA	3.59	0.61	VMA
3. The video-recorded lectures' activities are relevant, interesting, and self-motivating.	3.26	0.71	MA	3.59	0.61	VMA
4. The video-recorded lectures' enrichment activities are adaptable to classes with a large number of students.	3.31	0.67	MA	3.59	0.61	VMA
Mean	3.26	0.68	MA	3.62	0.59	VMA

Legend: 3.50 – 4.00 = Very Much Acceptable (VMA); 2.50 – 3.49 = Much Acceptable (MA); 1.50 – 2.49 = Acceptable (A); 1.00 – 1.49 = Less Acceptable (LA); \* standard deviation; \*\* qualitative interpretation  
Table 25 shows that all the criteria on the suitability of the video-recorded lectures for Lessons 1-6 are rated by the students from 2.50-3.49 which means that they are much acceptable (mean =3.26, SD = 0.68). Hence, the activities in the video-recorded lectures that are suitable for the topic, the enrichment activities that are



adaptable to classes with a large number of students, and the relevant, interesting, and self-motivating activities that take into consideration the learners' varying attitudes and capabilities are much acceptable. Additionally, the video-recorded lectures for Lesson 7 are rated by the students from 3.50-4.00 which indicates that the inter-raters strongly agree that they are valid in terms of suitability. Hence, they very much accept that the activities in the videos are relevant, interesting, self-motivating, suited for the topic, and adaptable to classes with a large number of students taking into consideration the learners' different attitudes and capabilities.

**Table 26: Level of Acceptability of the Developed Video-Recorded Lectures on Adequacy as Assessed by the Students**

Criteria	Lessons 1-6			Lesson 7		
	Mean	SD*	QI**	Mean	SD*	QI**
1. The video-recorded lecture covers all the topics in the course syllabus.	3.24	0.73	MA	3.53	0.62	VMA
2. The video-recorded lecture provides sufficient information on each topic.	3.20	0.70	MA	3.56	0.56	VMA
3. The video-recorded lecture provides expected learning.	3.23	0.71	MA	3.53	0.57	VMA
4. The video-recorded lecture defines important terms for reinforcement.	3.30	0.66	MA	3.53	0.51	VMA
5. The video-recorded lecture provides enough activities to increase students' knowledge, skills and attitudes.	3.41	0.71	MA	3.56	0.62	VMA
6. The video-recorded lecture explains and applies concepts and principles.	3.32	0.67	MA	3.63	0.55	VMA
Mean	3.28	0.69	MA	3.56	0.57	VMA

Legend: 3.50 – 4.00 = Very Much Acceptable (VMA); 2.50 – 3.49 = Much Acceptable (MA); 1.50 – 2.49 = Acceptable (A); 1.00 – 1.49 = Less Acceptable (LA); \* standard deviation; \*\* qualitative interpretation

As shown in the table, all the criteria on the adequacy of the recorded videos for Lessons 1-6 are rated from 2.50-3.49 by the students which indicates that the developed video-recorded lectures are much acceptable (mean = 3.28, SD = 0.69). Hence, the students much accept that the video-recorded lectures provide enough activities to increase students' knowledge, skills, and attitudes; that they explain and apply concepts and principles; that they define important terms for reinforcement; that they cover all the topics in the syllabus; and that they provide expected learning and sufficient information on each topic were much acceptable. Moreover, the video-recorded lectures for Lesson 7 are rated from 3.50-4.00 by the students which indicates that the lectures are very much acceptable (mean = 3.56, SD = 0.57) in terms of adequacy. Therefore, students strongly believe that the video-recorded lectures provide enough activities to increase students' knowledge, skills, and attitudes; explain and apply concepts and principles; define important terms for reinforcement; cover all the topics in the syllabus; and provide expected learning and sufficient information on each topic.

**Table 27: Level of Acceptability of the Developed Video-Recorded Lectures on Timeliness as Assessed by the Students**

Criteria	Lessons 1-6			Lesson 7		
	Mean	SD*	QI**	Mean	SD*	QI**
1. The validation and use of the video-recorded lecture is timely because it is one of the tools for quality learning.	3.37	0.68	MA	3.50	0.57	VMA
2. The validation and use of the video-recorded lecture is timely because teachers are encouraged to produce instructional materials to make learning effective.	3.46	0.64	MA	3.66	0.55	VMA
3. The validation and use of the video-recorded lecture is timely because students need instructional materials where they could apply what had been discussed in the classroom.	3.39	0.69	MA	3.59	0.67	VMA
Mean	3.40	0.67	MA	3.58	0.60	VMA

Legend: 3.50 – 4.00 = Very Much Acceptable (VMA); 2.50 – 3.49 = Much Acceptable (MA); 1.50 – 2.49 = Acceptable (A); 1.00 – 1.49 = Less Acceptable (LA); \* standard deviation; \*\* qualitative interpretation

As can be gleaned from Table 27, all criteria on the timeliness of the video-recorded lectures for Lessons 1-6 have the mean rating of 2.50-3.49 which shows that they are much acceptable (mean = 3.40, SD = 0.67). Hence, the timeliness of the video-recorded lectures is much acceptable because the students believe that they are used as tools for quality learning; that they make learning effective, and that students need instructional materials where they could apply what had been discussed in the classroom. Further, the video-recorded lectures for Lesson 7 are very much acceptable in terms of timeliness (mean = 3.50, SD = 0.60).

**Table 28: Level of Acceptability of the Developed Video-Recorded Lectures on Language, Style, and Format as Assessed by the Students**

Criteria	Lesson 1-6			Lesson 7		
	Mean	SD*	QI**	Mean	SD*	QI**
1. The format and style of the video-recorded lecture warrants appropriate use of illustrations.	3.32	0.62	MA	3.57	0.67	VMA
2. The format and style of the video-recorded lecture warrants proper spacing of items.	3.24	0.68	MA	3.53	0.62	VMA
3. The format and style of the video-recorded lecture warrants use of optimum print size.	3.17	0.75	MA	3.50	0.67	VMA
4. The format and style of the video-recorded lecture warrants variation in the positioning of response sections.	3.24	0.68	MA	3.56	0.50	VMA
5. The format and style of the video-recorded lecture warrants the observation of correct grammar.	3.26	0.74	MA	3.56	0.62	VMA
6. The format and style of the video-recorded lecture warrants clear and comprehensive language in terms of vocabulary.	3.32	0.71	MA	3.66	0.60	VMA
7. The format and style of the video-recorded lecture warrants sufficient familiar vocabulary to ensure learning.	3.31	0.72	MA	3.63	0.55	VMA
8. The format and style of the video-recorded lecture warrants appropriate structure, style, and format to the target level.	3.39	0.59	MA	3.59	0.56	VMA
Mean	3.28	0.68	MA	3.58	0.60	VMA

Legend: 3.50 – 4.00 = Very Much Acceptable (VMA); 2.50 – 3.49 = Much Acceptable (MA); 1.50 – 2.49 = Acceptable (A); 1.00 – 1.49 = Less Acceptable (LA); \* standard deviation; \*\* qualitative interpretation

As indicated in Table 28, the criteria on language, format, and style of the video-recorded lectures for Lessons 1-6 have a mean of 3,28 (SD=0.68). This indicates that the students much accept that the format and style of the video-recorded lectures warrant appropriate use of illustrations, structure, style and format to the target level; that they use clear and comprehensive language in terms of sufficient familiar vocabulary to ensure learning; that correctness of grammar, proper spacing of items, variation in the positioning of response sections, and the use of optimum print size are observed. Moreover, it is also revealed in the same table that the video-recorded lessons for Lesson 7 are very much acceptable (mean = 3.58, SD = 0.60). All the criteria on language, style, and format are very much acceptable for the students.

**Table 28: Level of Acceptability of the Developed Video-Recorded Lectures in Terms of Illustrations as Assessed by the Students**

Criteria	Lessons 1-6			Lesson 7		
	Mean	SD*	QI**	Mean	SD*	QI**
1. The illustrations used are clear and simple.	3.37	0.59	MA	3.59	0.67	VMA

2. The illustrations used arouse students' interest, making learning effective and enjoyable.	3.26	0.67	MA	3.59	0.56	VMA
3. The illustrations used provide concrete visual clues	3.23	0.69	MA	3.66	0.55	VMA
4. The illustrations used guides students to follow directions	3.40	0.63	MA	3.75	0.57	VMA
5. The illustrations used are relevant to the topic	3.37	0.68	MA	3.72	0.58	VMA
Mean	3.32	0.65	MA	3.67	0.59	VMA

Legend: 3.50 – 4.00 = Very Much Acceptable (VMA); 2.50 – 3.49 = Much Acceptable (MA); 1.50 – 2.49 = Acceptable (A); 1.00 – 1.49 = Less Acceptable (LA); \* standard deviation; \*\* qualitative interpretation

As can be gleaned from Table 28, all criteria in terms of illustration are rated from 2.50-3.49 which shows that the video-recorded lectures for Lessons 1-6 are much acceptable (mean 3.32, SD = 0.65). This indicates that the students believe that the clear and simple illustrations used are relevant to the topic; guide the students to follow directions; arouse students' interest making learning effective and enjoyable; and they provide concrete and visual clues was much acceptable. Similarly, the video-recorded lectures for Lesson 7 are rated much acceptable (mean = 3.67, SD = 0.59) by the students.

**Table 29:Level of Acceptability of the Developed Video-Recorded Lectures in Terms of Presentation as Assessed by the Students**

Criteria	Lessons 1-6			Lesson 7		
	Mean	SD*	QI**	Mean	SD*	QI**
1. The presentation of topics is logical and orderly sequenced.	3.40	0.67	MA	3.59	0.61	VMA
2. The presentation of directions is concise, readable, and easy to follow.	3.39	0.63	MA	3.59	0.56	VMA
3. The presentation of topics fit the sequence of the course.	3.44	0.66	MA	3.66	0.55	VMA
Mean	3.41	0.65	MA	3.61	0.57	VMA

Legend: 3.50 – 4.00 = Very Much Acceptable (VMA); 2.50 – 3.49 = Much Acceptable (MA); 1.50 – 2.49 = Acceptable (A); 1.00 – 1.49 = Less Acceptable (LA); \* standard deviation; \*\* qualitative interpretation

Table 29 illustrates that all the criteria on presentation are rated from 2.50-3.49 by the students which imply that the developed video-recorded lectures for Lesson 1-6 are much acceptable (mean 3.41, SD = 0.65). With this rating, the students signify that the topics in the video-recorded lectures are logically and orderly sequenced and that they fit the course; and the directions are concise, readable, and easy to follow. On the other hand, the video-recorded lectures for Lesson 7 are very much acceptable (mean = 3.61, SD = 0.57) in terms of presentation as assessed by the students.

**Summary of the Level of Acceptability of the Developed Video-Recorded Lectures as Assessed by the Students**

**Table 30:Summary of Means, Standard Deviations, and Qualitative Interpretations of the Level of Acceptability of the Developed Video-Recorded Lectures as Assessed by the Students**

Criteria	Lessons 1-6			Lesson 7			Overall		
	Mean	SD*	QI**	Mean	SD*	QI**	Mean	SD*	QI**
Clarity	3.29	0.67	MA	3.60	0.56	VMA	3.45	0.62	MA
Usefulness	3.32	0.67	MA	3.56	0.59	VMA	3.44	0.63	MA
Suitability	3.26	0.68	MA	3.62	0.59	VMA	3.44	0.64	MA
Adequacy	3.28	0.69	MA	3.56	0.57	VMA	3.42	0.63	MA
Timeliness	3.40	0.67	MA	3.58	0.60	VMA	3.49	0.64	MA
Language, Style and Format	3.28	0.68	MA	3.58	0.60	VMA	3.43	0.64	MA
Illustrations	3.32	0.65	MA	3.67	0.59	VMA	3.50	0.62	VMA
Presentation	3.41	0.65	MA	3.61	0.57	VMA	3.51	0.61	VMA
MEAN	3.32	0.67	MA	3.60	0.58	VMA	3.46	0.63	MA

Legend: 3.50 – 4.00 = Very Much Acceptable (VMA); 2.50 – 3.49 = Much Acceptable (MA); 1.50 – 2.49 = Acceptable (A); 1.00 – 1.49 = Less Acceptable (LA); \* standard deviation; \*\* qualitative interpretation

As shown in Table 30, the level of acceptability of the video-recorded lectures for Lessons 1-6 is much acceptable (mean = 3.32, SD = 0.67) and very much acceptable for Lesson 7 (mean = 3.60, SD = 0.58). In general, the video recorded lectures in all the lessons are much acceptable (mean = 3.46, SD = 0.63). In particular, the video lectures exhibit very much acceptability in terms of illustrations and presentation, and much acceptability in terms of clarity, usefulness, suitability, adequacy, timeliness, and language, style, and format.

### **Strengths and Weaknesses of the Developed Learning Module and Video-Recorded Lectures**

Based on the evaluation of the panel of experts, the developed learning modules and video-recorded lectures had strengths particularly on their content, design, features and presentation, organization, and assessment tools. Moreover, the panel of experts also identified weaknesses specifically on their content, language, assessment, format and technical specification, intellectual property rights, and learning competency.

### **Challenges encountered by Mathematics Teachers and Freshmen in Flexible Learning**

In relation to the lessons on Data Management, the most pressing challenge/difficulty encountered by mathematics teachers and freshman students was unstable internet/mobile connection.

### **Quality assured module and instructional videos in Data Management of Mathematics in the Modern World**

Due to this worldwide pandemic, several institutions have adopted more flexible, alternative, and equity-based learning approaches that address the characteristics of the learner, such as their interests, needs, experiences, abilities, culture and learning styles, and current situations which is a crucial strategy to bring education within the reach of every learner. These include approaches like the use of the learning module that has undergone quality assurance from different experts in the field. To come up with the quality-assured module and instructional in Data Management, the initial drafts of the developed learning module were revised based on the two phases of evaluation. Moreover, based on the second phase evaluation, the evaluators considered the alignment of the learning module in the recommended CHED syllabus. The missing lessons in the initial drafts were included compliant with the syllabus. Further, the quality-assured module in Data Management became the basis of the finalized instructional videos in Data Management.

## **CONCLUSIONS AND RECOMMENDATIONS**

### **Conclusions**

Based on the findings, the developed learning module and video-recorded lectures are much valid and much acceptable. Hence, the developed materials are ready for use in flexible learning. When it comes to the strengths and weaknesses of the developed learning module and video-recorded lectures, the developed learning module and video-recorded lectures have strengths and weaknesses that need to be addressed to produce quality assurance flexible learning materials. When it comes to the challenges encountered by mathematics teachers and freshman students in flexible learning, the mathematics teachers and freshman students have encountered challenges that need to be addressed because these might be the factors that hamper the attainment of quality of flexible learning beyond face-to-face learning. Considering all the results of validations and evaluations conducted of this study, the quality assured module and instructional videos in Data Management of Mathematics in the Modern World is ready to use for flexible learning.

### **Recommendations**

Based on the findings, the following are recommended:

1. The mathematics teachers should consider developing additional quality assured instructional materials that could be ready to use for flexible learning as a response to the urgent call of these challenging times.
2. Teachers should develop learning materials that will undergo series of evaluations, particularly in their content.
3. Professional development activities for teachers should be considered to enhance their strategies specifically in addressing the challenges brought about by the innovative mathematics program.
4. Researchers should consider testing the effectiveness of the quality-assured module and instructional videos in Data Management among freshman students.
5. Researchers are encouraged to study the implementation of flexible learning in the mathematics program and other programs in the curriculum and to discover solutions to challenges/difficulties that might be faced by the teachers and students in its implementation. The improvement of the quality of education through program enhancement could be achieved through this.

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