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E-Module in Teaching Statistical Methods: An Asynchronous and Synchronous Delivery Mode Under the New Normal

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Abstract. The study entitled E-module in teaching statistical methods: an asynchronous and synchronous delivery mode under new normal focused on the development and assessment of the e-module created using office mix. The e-module was developed with powerpoint presentation for each of the eight (8) lessons in statistics having audio or video explanation of the topics per slide exported as video presentation were shared by the researcher to the mathematics experts, IT experts and students for evaluation. The research adopted the ADDIE model from the analysis of the students that led in realizing the study up to the implementation and evaluation. Each of the lessons in the e-module was designed and developed based on the needs of the students.

The research findings of the mathematics experts, IT experts, and students favored the e-module as it was proven very acceptable and therefore highly recommended for use. In terms of the objectives, content, motivational or review activities, delivery of instruction, and formative assessment exercises evaluated by the mathematics experts, the grand mean was 3.62 indicating the e-module was really having acceptable standards. While the evaluation of the ICT experts revealed a grand mean of 3.77 indicating that the content, layout, design, usability and quality of the e-module are very acceptable and highly recommended for use. The students' evaluation obtained a grand mean of 3.74 numerical description and interpretation that the content, layout, delivery of instruction, instructional use, and formative assessment exercises are also very acceptable and highly recommended for use. The evaluation of the students also resulted to the positive feedback while exploring and using the e-module that provided them with notable experiences about the office mix.

Keywords: Office Mix; E-module; Statistics; Asynchronous; Synchronous;

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1. Introduction

Mathematics and logic are the pillars on which statistics stand, focusing on the basics of statistics combined with a fair amount of practice that will for sure make a student do better at it (Jain, 2020). Nowadays, acquiring data is a vital asset. Jain (2020), also noted that many companies pour millions of dollars collecting and analyzing their customer data. Data served as the footprint on the internet. According to Noraidah & Hairulliza (2011), statistics is a structural method to solve a problem and frequently used in various fields including information and communication technology. Many aspects in education, health, and economics especially in business rely on the gathered information or data for decision-making. And because of the importance of data in today's world, statistics is taught right from the schooldays (Jain, 2020). The subject has been an important part in the present system of education from the basic to the higher level of education. This is a vital course in pursuing graduate studies since it is useful in research.

Mathematics would be incomplete without highlighting the enormous progress witnessed in a seemingly parallel and yet overlapping field termed as statistics. Statistics, almost as ancient as mathematics itself, has its roots firmly entrenched in numbers and their operations Sheynin (2012). Considered as essential part of mathematics, statistics has now grown into a full-fledged subject in its own right (Parashar, 2014). Statistics is included in the Most Essential Learning Competencies (MELCs) in the Basic Education Mathematics 7-10. It is also a specific subject taken by Senior High School students in the academic track as part of the implemented curriculum. In pursuing a graduate course, students are also required to pass the statictics subject as a pre-requisite subject in taking research.

In most cases, statistics is a bit difficult to handle for students, and they seem overwhelmed by a lot of terms and problems related to it. Statistics is challenging for students because it is taught out of context. Most students do not really learn and apply statistics until they start analyzing data in their own researches. Students who do not like math or do not have strong mathematical foundation may struggle with statistics (Jain, 2020). Students who perceive math as difficult subject may also tend to dislike statistics for it is normally dealt on using numbers. Most students may have not realized that statistics is useful and practical especially in analyzing and making insightful decision based on a given situation. But it is learnt more when one is not intimidated. It is essential that

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each concept must be realized and how it can be related to another concept or even better when applied to personal and real-life situation so that it will become more meaningful. Jain (2020), further said that concepts taught in statistics should not look like they are coming out of nowhere, instead, they should be related to fundamental concepts followed by real-life examples. Since statistics is a branch of math, one should have good mathematical skills and knowledge to get a good understanding of it. Furthermore, statistics should be taught clearly and understandably to students sfor them to grasp the essence where statistics can be applied to make learning more meaningful. But this challenge especially in the current situation people are now aggravated by pandemic causing normal face-to-face classes to become limited.

The Commission on Higher Education issued new policies and guidelines on implementing flexible learning (CHED Memo Order s. 2020) to ensure the continuity of learning at the tertiary level (De Vera, 2020). The Higher Education Institutions are advised to prepare necessary adjustments from face-to-face instruction to flexible learning situations. Pursuant to this memorandum, NEUST has made an effort in the continuity of education that includes preparation of work plans with specific learning delivery mode of instruction using readily available online platforms.

In July 2020, The Commission on Higher Education (CHED) Chairman Prospero de Vera III said that schools were ready to open classes in August 2020 even if the country is still dealing with the corona virus pandemic. According to De Vera (2020), flexible learning, is not new. He further said that HEIs are ready because top universities have been doing flexible learning even before COVID. Other universities have shifted to flexible learning during the quarantine and are moving ahead for the opening of classes as De Vera explained (2020).

However, the decision made by the Commision to open the classes then was criticized. Some people showed on social media sites about the students climbing on trees just to get good internet connection signals, while other students and parents were calling for academic freeze as they could afford to have access on computer and internet connection. But the Commission on Higher Education insisted the use of flexible learning to continue the education process.

According to CHED, flexible learning involves a combination of digital and non-digital technology, which does not require connection to the internet. The said flexible learning ensures the continuity of inclusive and accessible education when the use of traditional modes of teaching is not feasible, as in the occurrence

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of national emergencies (Magsambol, 2020). De Vera (2020) said that universities and colleges had the freedom to choose what mode would be effective for them. Some could use pure online, pure modular, while others would have a combination of the two, De Vera further explained.

Based on CHED Memorandum Order (CMO) No. 04, series 2020, colleges and universities were encouraged to maximize the use of technology to support learning and teaching, by: (1) determining the level of technology to be used for teaching based on connectivity, level of digital literacy, and available devices; (2) establishing a multi-media or learning resource centers to provide technical support to faculty members in the (3) developing instructional materials; (4) providing access to online libraries; (5) utilizing Learning Management System; (6) implementing/exploring grants and/or supporting capacity-building programs for administrators, faculty, and staff; (7) ensuring to follow health and safety protocols; and (8) ensuring to be guided by the principles of outcomes based education for quality of teaching and learning (Necio, 2020). Thus, the higher education insitutions adapted flexible learning pursuant to this call for the continuity of education.

Therefore, it is so timely to consider providing audio and video explanations of the lessons through the Microsoft Office Mix computer add-on application as additional or supplementary materials for students guided by their parents that aid their needs of better comprehension and retention of the lessons.

Graduate students particularly Master of Arts in Teaching and Master in Education Management do not only prepare themselves as students, but also prepare the welfare of their own children as students. They play both roles of being a student and a teacher, having to attend to their students and their academic work (Krieger, 2020). She further said that graduate students across the countries are already struggling with pay and overextended labor, and this situation adds to their stressful life. They are fully aware of the difficulties the students are facing right now as they feel the same struggles. Graduate students playing the role of a teacher to their students, should prepare an instructional material to deliver instruction effectively. They know the struggle of students especially in mathematics subjects like statistics. Likewise, as they play the role of the graduate student that requires advanced and higher learning, they also need an instructional material that would be best used as they faced challenges in managing their time pursuing the requirements of the course.

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This has been the main factor considered by the researcher that such an undertaking can help other educators through the e-module in teaching statistical methods with the aid of the Microsoft office mix to develop a material that is of great help also to students who are having hard time adjusting to the situation. It is envisioned to provide a better grasp of the lessons with the audio or video explanation of each slide where students can repeatedly play, pause, and forward until fully understood which cannot be possible when face-to-face classes are held or even during the online class because such classes can only be held once. Through the recorded audio and video explanation, lessons can be done again and again for better comprehension and reiteration of ideas.

The e-module was also realized by the researcher to elicit inspiration to the educators especially the graduate school students who are also teachers by profession to develop teaching materials for their students. Teachers and other educators faced another challenge in preparing learning modules and other self-learning kits for the benefits of the students. Considering learners' diversity, the said materials must be carefully planned and prepared in addressing the learners' needs, interests and learning preferences. They must be parents-friendly since they are now accepted in facilitating their children's progress at home. Aside from these considerations, the chosen modality should also set proper guidelines in the different learning modes to ensure quality instruction. However, the learning modalities mentioned are not guarantee having 100% assurance that students would learn just because they had fully answered the questions in the printed materials. Students differ in learning styles. Experts suggest that learners retain different training types best through different delivery modes, so providing multiple modalities will be most effective for learning retention (DuVernet, 2019).

In response to the abovementioned instances, educational institutions from the basic to higher education initiated necessary action in scrutinizing the learning materials for better quality. This is to create and develop alternative of delivering asynchronous and synchronous instruction and preserving the credibility and integrity of teachers known as having the noblest profession. Educators must be adaptive enough to realize the implications of the said pandemic on curriculum and other related factors and consider reframing education for the new normal. The researcher proposed to use the Microsoft Office Mix as a tool in producing supplemental learning guides for the students who cannot afford to engage in the online mode of instruction or who are slow learners and challenged to cope with a modular approach. This would also help

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the parents who were not fully able to finish their studies due to some financial reasons thus were not capable of teaching the lesson to their children. The instructional material is also envisioned to provide a long term influence on the teaching-learning process. It is planned to be implemented to achieve and attain the objectives set in every lesson indicated in the module, even in the absence of face-to-face instruction. The developed material might be used for this generation and the next generation as an intervention whenever unavoidable circumstance happens. It could also be best used when the teacher is sick and cannot conduct actual instruction or must attend equally important seminars or workshops for his/her professional development. It can also be used when the student is absent, or the student cannot cope with the lesson as what others could do.

2. Methodology

The study used the descriptive developmental method of research. Gillaco (2014), discussed that descriptive method seeks the real facts in relation to a current situation. Furthermore, this method works primarily on the description, comparison, analysis and interpretation of data. This study described the results from the gathered facts in relation to the assessment made by the respondents towards the developed e-module in teaching statistical methods. Meanwhile, Beb (n.d.) defined developmental method as a body of research literature that pertains directly to instructional development, which means an output is developed in conducting any research. In other words, descriptive developmental method is the systematic study of putting into design, development and careful evaluation of instructional programs, processes and products that must meet the criteria.

2.1. Sampling Procedure

The purposive sampling technique was used in selecting the participants for this study. They are the group of students enrolled in Statistical Methods during the Second Semester of A.Y. 2020-2021 where the e-module was purposively designed. The mathematics experts were determined based on their expertise as they are Doctor of Philosophy in Mathematics Education graduates with remarkable experience in the field. They reviewed and assessed the content of the e-module and other factors like the objectives, delivery of instruction, motivational activities and formative assessments. On the other hand, the

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computer experts checked and evaluated the content, design, layout, usability, and quality. The mathematics teachers and computer experts had been teaching or handling mathematics subjects for at least five years.

2.2. Respondents

The participants were the Master of Arts in Teaching students major in Mathematics, Science, Vocational-Tecnological Education, Master of Arts in English and Master in Education Management, who were having the Statistical Methods subject for the first semester of AY 2020-2021. Those students are also the primary recipients and beneficiaries of this study. Students who will take the statistics subject as well as the teachers who will teach the subject will also be benefited by the result of the study. Mathematics teachers and experts, with ICT experts, acted as the evaluators of the e-module developed by the researcher.

2.2.1 Research Site

This study was conducted at Nueva Ecija University of Science and Technology (NEUST), General Tinio Street campus in Cabanatuan City.

Table 1. Distribution of Participants of the Study

PARTICIPANTS	FREQUENCY
MATHEMATICS EXPERTS	3
ICT EXPERTS	3
MAT – MATH STUDENTS	3
MAT – SCIENCE STUDENTS	2
MEM STUDENTS	11
MAE – APPLIED LINGUISTICS	6
MAT – VTE	4

The table shows the participants of the study who evaluated the e-module in teaching statistical methods using office mix.

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3. Results and Discussion

The researcher developed an e-module focused on teaching statistical methods using office mix. It was developed as an asynchronous and synchormous delivery mode of instruction under the new normal not only to deliver instruction but also to provide and create another strategy of presenting and teaching statistics and other fields of mathematics. This idea was realized by the researcher after analyzing the performance of the students in the subject for the past semesters.

The development of the e-module adapted the ADDIE model serving to analyze the students' performance. Design was then carefully planned to address the needs of the students in coping with the subject due to some considerable reasons. The design was executed through the development of the e-module containing the lessons indicated in the course syllabus of instruction for the subject. After developing the module with corresponding e-module created with a powerpoint presentation provided with an exported video of lessons made through the office mix, it was implemented and then assessed by the mathematics experts, ICT experts, and students.

The significant results of the evaluation are summarized as follows:

1.There is considerable number of students noted to be challenged as they had experienced having "no grade" or "incomplete grade" in the course due to the difficulties they had. During the first semester of Academic Year 2019-2020, there were two (2) or 6% of the students from MEM program that got "incomplete grade" while five (5) or 11% got "no grade". In the MAT-VTE program, there were eight (8) students or 17% who had "incomplete grade" while two (2) or 4% got "no grade". For the second semester, six (6) or 18% of students from the MAE program had "no grade". These data were considered by the researcher as the challenges encounterd by the students.

2.The e-module was described based on the ADDIE model for objectives set in for each lesson, content of the lesson being discussed, motivational activites or review exercises, delivery of instruction, and formative assessment exercises provided to test students'understanding.

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3.The results of the evaluation of the mathematics experts reached the grand mean of 4.0 for the objectives, 3.84 in terms of the content, 3.33 for the delivery of instruction, and 3.67 for the formative assessment which was interpretd as very acceptable and highly recommended for use. It resulted to 3.25 for the motivational activities and review exercises that were interpreted as acceptable and recommended for use. The overall rating of the e-module is 3.62 which means the material is very acceptable and highly recommended for use.

4.The evaluation of the ICt experts resulted to the grand mean of 3.75 in the content, 3.67 for the layout, 3.58 for the design, 4.0 for the usability, and 3.83 for the quality. These grand mean were interpreted as very acceptable and highly recommended for use. The overall rating of the e-module is 3.77 which means the material is very acceptable and highly recommended for use.

5. The evaluation conducted by the students obtained high results. These include 3.75 grand mean for content, 3.67 for the layout, 3.70 for the delivery of the lesson, 3.81 for the usability, and 3.77 for the quality. These results were all interpreted as very acceptable and highly recommended for use. The overall rating of the e-module is 3.74 which means the material is very acceptable and highly recommended for use.

The qualitative evaluation of the students proved that the e-module is an effective way to deliver instruction both for synchronous and asynchronous modes of learning.

4. Conclusions

Based on the results of the study, the following conclusions were drawn. The students are diversed wherein there are some students who find difficult time coping with statistics, a mathematics subject. The developed e-module in teaching statistical methods was designed to address the needs of the students as it was proven to be helpful for them. The mathematics experts proved the e-module very acceptable and highly recommended for use in terms of its objectives, content, motivational activities and review exercises, delivery of instruction, and formative assessment activities provided. The ICT experts also proved the e-module very acceptable and highly recommended for use in terms of its content, layout, design, usability and quality. The e-module is another ICT

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related instructional material suitable in the teaching statistics. The e-module is a recommendable asynchronous and synchronous material for students' use to help them address their learning difficulties in statistics.T he students perceived that the e-module is way far better than the other alternative modes of delivering instruction for them. The e-module can contribute to the solution to problems and challenges faced by the students in dealing with statistical methods. The e-module could serve as the basis in creating and developing similar instructional material that aids in teaching and learning difficulties.

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