A COMPARATIVE STUDY BETWEEN PRINTED MATERIALS AND VIDEO-ASSISTED INSTRUCTION IN TEACHING MATHEMATICS IN THE MODERN WORD

College of Teacher Education
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in Bachelor in Secondary Education

MA. FLOR C. BALILI
REYMART A. BASCON
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APPROVAL SHEET

This thesis entitled **"A COMPARATIVE STUDY BETWEEN PRINTED MATERIALS AND VIDEO-ASSISTED INSTRUCTION IN TEACHING MATHEMATICS IN THE MODERN WORLD"**, was prepared and submitted by Ma. Flor C. Balili, Reymart A. Bascon, Nola Mae Suello in partial fulfillment of the requirements for the degree Bachelor in Secondary Education major in Mathematics has been examined and recommended for acceptance and approval for oral defense.

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ABSTRACT

This study was conducted to compare and analyze the effectiveness of learning Mathematics in the Modern World using printed materials and video-assisted activities of the 1st year Forestry and Environmental Science students, 1st semester, academic year 2021-2022. Participants were the students taking the course Bachelor of Science in Environmental Science and Bachelor of Science in Forestry. A quasi-experimental pretest-posttest design was used in conducting the study. A self-made questionnaire was used as a tool in gathering the data. Paired Sample T-test was used to find the significant difference between the performance of the students using printed materials and video-assisted activities. Moreover, Independent Sample T-test was used to determine the difference of the post-test of the two groups. Results revealed that there is no significant difference between the performance of the students in Mathematics in the Modern World using printed materials and video-assisted activities. Based on the findings of the study, the following recommendations were given: The researchers recommend that Mathematics teachers may continue to use printed materials. They can, however, continue to employ video-assisted activities, but in shorter versions; Teachers should include the use of shorter video lessons rather than longer versions designed not only to entertain but basically to educate. It should be taken into consideration the importance of proper video content style and strategy of exposing video to students; Another research will be conducted with more respondents to be involved and on the lesson presentation; Future researchers should conduct further studies to validate the result of this study.

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THE PROBLEM AND ITS SCOPE

Rationale

Mathematics in the Modern World is about mathematics as a system of knowing or understanding our surroundings. It provides glimpses into the nature of mathematics and how it is used to understand our world. The central purpose of Mathematics in the Modern World is to explore those facets of mathematics that will strengthen one's quantitative understanding of the environment. It is one of the fields of mathematics involved with the study of set, natural numbers, and functions in general. It is one of the courses offered to first-year students at Bohol Island State University.

Traditionally, textbooks have been utilized to aid in the delivery of mathematics lessons and for students to read and review on their own. When the COVID-19 pandemic erupted, however, educational systems were among the hardest hit. Online learning has evolved as an essential educational model in today's globalizing society because of greater usage of technology in learning situations. As a result, incorporating videos into classes helps students in remote learning understand mathematics lectures better. However, studies have shown that children can better understand material in print for texts longer than a page than they do in digital texts and films (Alexander & Singer, 2017).

On the contrary, Genota (2018) stated that Generation Z learners (6-24 years old) have a higher preference for learning from YouTube and videos, compared with printed books. He went on to say that one of the benefits of video tutorial for students is that they can play and pause it as many times as they want without feeling like they're bothering someone.

Hence, online classes emerge as a new way of delivering instruction, students struggle in learning Mathematics through zoom meetings and modules. Thus, the researchers determined that the focus of this study would be to compare and analyze if students perform better using printed materials or by watching video-assisted activities in learning Mathematics in the Modern World.

Literature Background

Pursuant to Section 12 of the 1987 Constitution of Article XIV, the State shall regulate the transfer and promote the adaptation of technology from all sources for the national benefit. It shall encourage the widest participation of private groups, local governments, and community-based organizations in the generation and utilization of science and technology.

Moreover, it is embodied on CHED Memorandum Order No. 4, Series of 2020 the Guidelines on the Implementation of Flexible Learning, which states that Higher Education Institutions (HEIs) should provide learners with the most flexibility on the learning content, schedules, access, and innovative assessment, making use of digital and non-digital tools. Moreover, they shall establish means

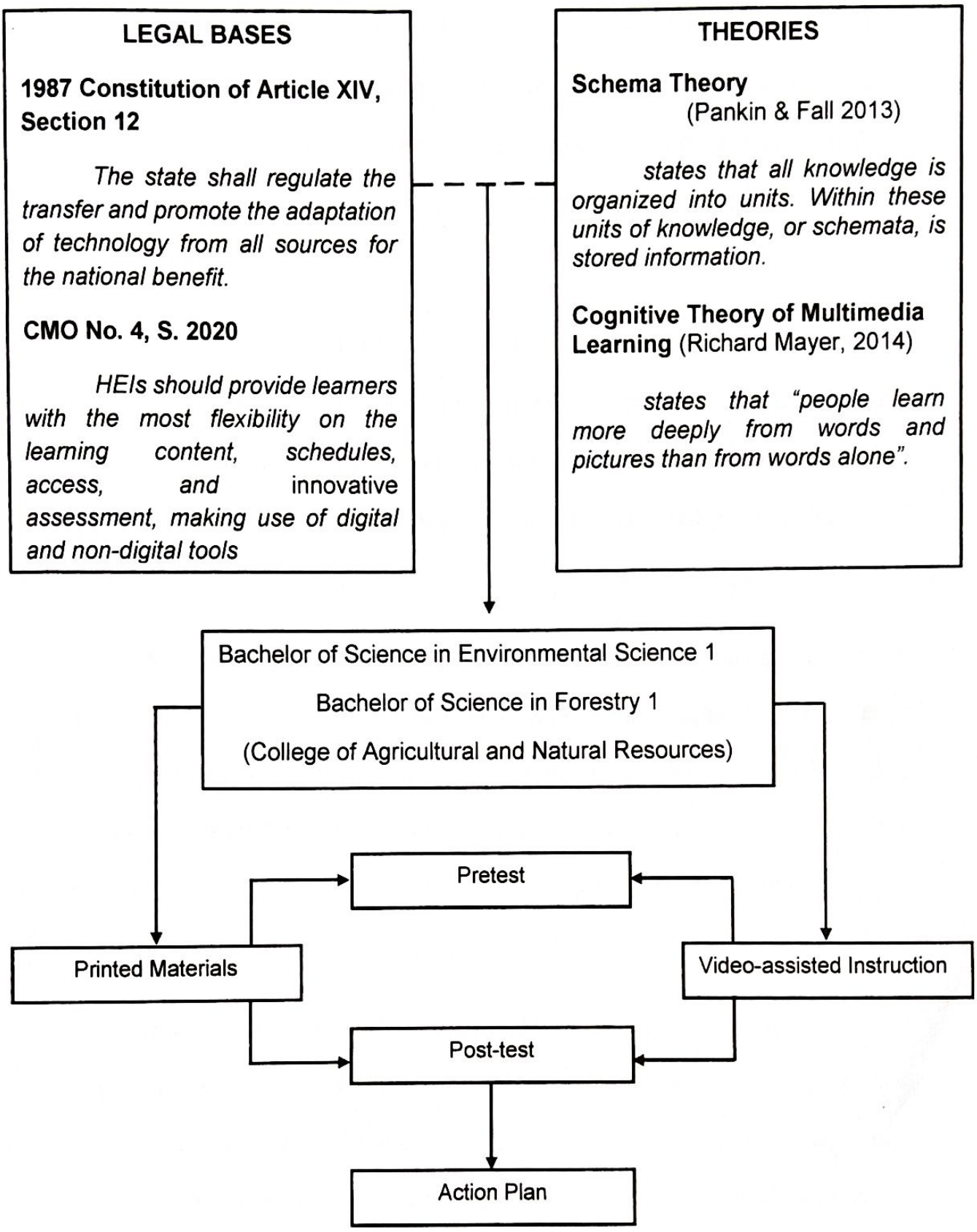

Figure 1. Theoretical and Conceptual Framework

for student and teacher engagement or communication which may include Short Message Services (SMS), electronic mail (email), online chat, instant messaging, and other means whichever is convenient, appropriate, and available in order to ensure personalized, effective, efficient, and timely monitoring and feedback mechanisms.

Schema Theory as mentioned in the study of Pankin & Fall 2013, all knowledge is organized into units. Within these units of knowledge, or schemata, is stored information. A schema, then, is a generalized description or a conceptual system for understanding knowledge - how knowledge is represented and how it is used.

Moreover, Richard Mayer's Cognitive Theory of Multimedia Learning (2014) states that "people learn more deeply from words and pictures than from words alone" (Mayer, p. 47). However, simply adding words to pictures is not an effective way to achieve multimedia learning. The goal is to utilize instructional media in the light of how human mind works. This is the basis for Mayer's cognitive theory of multimedia learning.

Today's student is no different to those of the past, but the technology that they have access to is literally at their fingertips. Students today are enabled to multitask, have constant internet access, and have become dependent on a continuous flow of information (Knight, 2015). In the past, students depended on their teachers and the textbooks they use to access knowledge. However, today "having free access to a wealth of information and content on-line is now expected:

being digitally literate today means being able to use appropriate tools to find useful, high quality information in an efficient manner" (Panto and Comas-Quinn, 2013).

Printed teaching materials may take the form of lecture material, problem solving guides, and learning guides, whereas non-printed teaching materials may take the form of audio, video/ film, or other multimedia required in the learning process (Haryanto, 2019). According to Jacobson, Degener & Gates (2003), authentic materials are printed materials that are used in classroom in similar use as they would be used in real life. Printed materials, especially in the form of textbooks, continue to be the core of the instructional materials in schools in this country (Otto & Flournoy, 2022).

Furthermore, mathematics classroom instruction is, in many cases, generally organized around and delivered through the mathematical tasks and activities found in textbooks. Learning mathematics with a textbook comprises activities such as reading explanatory texts and acquiring new content, looking through worked examples, solving tasks, etc. Valverde, Bianchi, Wolfe, Schmidt & Houang (2002) believed that the structure of mathematics textbooks is likely to have an impact on actual classroom instruction and textbooks are among the most powerful influences on school mathematics.

In addition, modular teaching is a new approach in classroom settings, for experience taking in encounters in instruction also it has been getting much consideration. The system of taking in modules has turned into a piece of all level

of instructions. Teaching through module is a self - taking in bundle managing one particular topic/ unit. It could be utilized within any setting helpful to the learner and may be finished at the learner's own particular pace (Barnett, 2004).

Based on the study conducted by Ambayon (2020), modular instruction is more operative in the teaching-learning method as equated to usual teaching approaches because in this modular approach the students learn in their own stride. It is unrestricted self-learning panache in which instantaneous reinforcement, a comment is provided to practice exercise, which stimulates the students and builds curiosity in them. Hence, this kind of learning modality increases the student-centered approach in learning. However, the implementation of modular instruction fostered various challenges to teachers, students, and parents.

Moreover, the study of Dangle & Sumaoang (2020) showed that the main challenges that emerged were lack of school funding in the production and delivery of modules, students struggle with self-studying, and parents' lack of knowledge to academically guide their child/children. Hence, it is evident that there are struggles associated with the use of modular distance learning.

However, the digital revolution has also contributed to partial predominance of online reading over traditional print reading in certain situations (but not in all situations) by providing powerful advantages such as non-linearity, immediacy of searching words in the text, immediacy of accessing information, and the convergence of text and images (Ross, 2003). In addition, learners have reported

various reasons for printing online materials: convenience, ability to highlight and write comments on the materials, avoidance problems associated with onscreen reading, etc. (Hatch, 2002; Martin & Platt, 2001).

Goldsmith (2011) found that people perceive print media as more suitable for effortful learning; whereas, the electronic media is best suited for fast and shallow reading of short texts such as news, emails, forum notes, etc.

According to Rezat & Giessen (2010), new technologies have not affected its outstanding role: "despite the obvious powers of the new technology it must be accepted that its role in the vast majority of the world's classrooms pales into insignificance when compared with that of textbooks and other written materials." In addition, a study made by Alexander & Singer (2017) showed that students were able to better comprehend information in print for texts that were more than a page in length than of that digital texts and videos. On the contrary, research shows that many students taught through the lecture method are unable to retain information and find it challenging to use what they have learned to solve new problems (Mayer, 2002).

However, rapid change in the field of technology and its easy availability for students and schools are forcing us to change our teaching and learning styles. A simple Google search will uncover numerous short instructional videos on virtually any mathematical concept. These videos are often about 5 minutes or less in length.

A study made by Girod, Bell, & Mishra (2007) showed that, with the Khan Academy, YouTube, and many other video-based solutions, videos have emerged as a potent force. Videos are considered a powerful medium for learning. In addition, online video tutorials offered outside the blended classroom and allow students to control the time, pace, frequency, and place of their learning. One study found significant gains in mathematics achievement for students using video-based instruction modules with annotations to help them identify important elements in a problem and interact with 3-D digital models before applying their understanding by building a product in the digital environment (Bottge, Rueda, & Skivington, 2006).

In the same way, when mathematics teachers use technology strategically, more students, especially those students who struggle, are given the opportunity to learn math skills effectively, close their achievement gaps, and have a better chance for a productive future. Using technology, such as the video tutorials, can improve student achievement in mathematics by providing multiple means and methods for learners to grasp traditionally difficult concepts (Darling-Hammond, Zielezinski, & Goldman, 2014).

Furthermore, Kahrmann (2016) stated that "in an effort to improve my students low mathematics achievement scores, the video tutorials tackled the goals of improving the students' self-efficacy, giving the parents resources to help their child with their math skills, differentiation of instruction delivery, access to continuous modeling by the teacher, and resources of the material missed when

students were absent". The video tutorials provide the students with resources that can build their self-confidence. The student is no longer alone trying to solve problems; they have these instructional tutorial guides to refer to and boost their belief in their capabilities.

In addition, the use of teacher made video tutorials for math also addresses Mistretta's (2013) finding where current literature suggests that parents need to be taught how to support their children at home. The videos provide the parents with just how their own child's teacher teaches the math concepts in the classroom, enabling them with the tools needed to assist and support their child at home. The video tutorials address the variable of differentiation by differentiating instruction in mathematics by giving the students another form of instruction delivery, not just classroom lecture.

Similarly, video tutorials always give the students and parents different resources available to them online. The videos give the students the opportunity to view them as many times as that particular student needs to review the videos. In the videos the teacher's modeling provides students the knowhow they need, that in turn builds their confidence in their ability to replicate the process to solve other similar mathematics problems. Lastly, the video tutorials address the problem of absenteeism by being available online any time of the day so students and parents have this resource constantly available to them which is especially useful if the student miss's classroom instruction due to being absent.

According to Denler, Wolters, & Benzon (2014), Tutorial videos are forms of modeling where much of today's learning occurs outside the classroom. In addition, Jonathan Bergmann and Aaron Sams, developers of the flipped classroom, see instructional videos as powerful tools for teachers to create content, share resources, and improve practice time for students.

Moreover, the study of Lloyd and Robertson (2012), shows that students who are taught with the screencast tutorials scored significantly better than the students taught with the traditional instructional techniques. In this study, screencast tutorials were found to be efficient tools for enhancing student learning, especially for higher order conceptual statistical knowledge. In addition, students demonstrate increased interest in the subject at hand and learning is enhanced when instruction is integrated with multimedia tools (Jaffar, 2012).

Social cognitive theories of learning (Bandura, 1986; Vygotsky, 1978) emphasized that students will learn from each other by observation, imitation, and modeling. The video tutorials considered the students' prior knowledge and were used as modeling for primary knowledge transfer and teaching of the concepts. The video tutorials in his research were forms of modeling as described by Spector (2012) for the students to retain what they observed and can reproduce the action of working the math problems out for themselves.

On the other hand, Clark & Mayer (2016) stated in their empirical testing of online learning and their research of the production of teacher-made video tutorials that what makes an effective online tutorial video include the use of shorter video

lessons rather than longer versions designed to educate and not to entertain. This goes along with Clark and Mayer's (2016) findings that the dialogue of the instructor in the tutorial videos should be more like a conversation and less like a lecture.

The theoretical and conceptual framework of this study is presented in Figure 1. The study was anchored on the theories and legal bases quoted in the diagram.

THE PROBLEM

Statement of the Problem

The main thrust of the study is to compare and analyze the effectiveness of using printed materials and video-assisted activities in teaching Mathematics in the Modern World of the 1st year Forestry and Environmental Science students, 1st semester, academic year 2021-2022.

Specifically, the study seeks to answer the following:

1. What is the profile of the students in terms of:
    1.1 sex;
    1.2 age?
2. What is the performance of the students in Mathematics in the Modern World using printed materials and video-assisted activities in terms of:
    2.1 pretest;
    2.2 posttest
3. Is there a significant difference in the pretest-posttest performance of the students in Mathematics in the Modern World using printed materials?
4. Is there a significant difference in the pretest-posttest performance of the students in Mathematics in the Modern World using video-assisted activities?
5. Is there a significant difference in the posttest's performance of the students in Mathematics in the Modern World using printed materials and video-assisted activities?

6. What action plan can be proposed in teaching and learning Mathematics in the Modern World?

Hypotheses

1. There is no significant difference in the pretest-posttest performance of the students in learning Mathematics in the Modern World using printed materials.

2. There is no significant difference in the pretest-posttest performance of the students in learning Mathematics in the Modern World using video-assisted activities.

3. There is no significant difference in the posttest's performance of the students in learning Mathematics in the Modern World using printed materials and video-assisted activities.

Significance of the Study

The results of the study would be beneficial to the following:

Students. It would enhance the knowledge and skills of the student-respondents by providing them the specific assistive learning tool.

Parents. The parents would profit from this study as they are involved about their children's education.

Teachers. The finding of the study would serve as their basis for students' better performance of the course.

School Administrators. The results of this study would serve as their basis to improve policies for school advancement.

Future Researchers. The study would serve as a reference to other researchers interested in this field.

RESEARCH METHODOLOGY

Design

To achieve the purpose of the study, the researchers employed a quasi-experimental pretest-posttest design type. The pre-test was given as basis of grouping. The difference between the post-test and pre-test will determine the progress of their test scores using printed materials and video-assisted activities of the BSF-1 and BSES-1 students of Bohol Island State University- Bilar Campus, Zamora, Bilar, Bohol in the A.Y. 2021-2022.

Environment and Participants

The study was conducted at Bohol Island State University, Bilar Campus, Zamora, Bilar, Bohol in the A.Y. 2021-2022 particularly in the College of Agricultural and Natural Resources.

The participants of the study were the freshmen students of Bachelor of Science in Forestry and Bachelor of Science in Environmental Science (32 forestry students used videos-assisted activities and 34 environmental science students used printed materials). They were chosen to be the respondents for they are

taking the course Mathematics in the Modern World in the first semester. Complete enumeration was used in the selection of the respondents in the study.

Instrument

The main tool that was utilized in gathering the data needed in the study was a self-made test. The test contained statements that determined the knowledge and understanding of the students in Mathematics in the Modern World. A table of specification was crafted as a guide in constructing the test items. To ascertain the validity and reliability of the questionnaire, a pilot test was conducted: as reflected in appendix F, it was found out that out of 40 items, only 25 are acceptable. The test made by the researchers was used as a pretest and posttest of the study.

Data Gathering Procedure

The researchers sent a letter of approval to the Thesis Adviser addressed to the Campus Director of Bohol Island State University-Bilar Campus for the conduct of the study. Upon the approval, the researchers coordinated with the dean of the College of Agricultural and Natural Resources (CANR) and the instructor of Modern Mathematics in Bohol Island State University- Bilar Campus, requesting to conduct the study to the 1st year Forestry and Environmental Science, 1st semester, A.Y. 2021-2022. Right after, the researchers conducted a pre and post-test performance of the Environmental Science students in Modern Mathematics using printed materials and the pre and post-test performance of the

Forestry students in Modern Mathematics using video-assisted activities. After which, the data was tabulated for analysis and interpretation.

Statistical Treatment

Frequency counts and percentage method was used in determining the profile of the students' according to age and sex.

$$P = \frac{f}{n} x\ 100\%$$

where:

P – percentage

f – frequency

n – total number of values

Average Weighted Mean was used to determine the pretest and posttest performances of the students in Modern Mathematics using printed materials and video-assisted activities.

$$\bar{x} = \frac{4f+3f+2f+f}{N}$$

where:

$\bar{x}$ - weighted arithmetic mean

f - frequency

Σfx - sum of all the products of *f* and *x*,

N - total number of respondents

The result of the test scores was interpreted using the following scale:

Range	Interpretation
23 – 25	Excellent
20 – 22	Very Good
17 – 19	Good
15 – 16	Poor
Below 15	Failure

Source: BISU Student Manual

Paired sample t-test was used to determine the significant difference of the pre-test and post-test performances of the Forestry and Environmental Science students of their progress using printed materials and video-assisted activities, respectively.

$$t = \frac{\overline{D} - \mu_D}{\sqrt{\frac{S}{N(N-1)}}}$$

where:

D - difference of pre- and post-test score

$\overline{D}$ - mean of the sample difference of pre- and post-test scores

μ_D - mean of the population of difference scores = 0

N - number of students

S- sum of squares of the difference of pre- and post-test scores

Independent sample t test will be used to determine the significant difference of the post-test performances of the Forestry and Environmental Science students in Modern Mathematics using printed materials and video-assisted activities, respectively.

$$t - value = \frac{\bar{x}_1 - \bar{x}_2}{\sqrt{S_P^2[\frac{1}{n_1} + \frac{1}{n_2}]}}$$

where:

$\bar{x}_1$ - computed mean from posttest scores of Environmental Science students

$\bar{x}_2$ - computed mean from posttest scores of Forestry students

S_P^2 – weighted average of the variance estimates from the posttest scores of Environmental Science and Forestry students; pooled variance

n_1 - number of Environmental Science students

n_2 - number of Forestry students

DEFINITION OF TERMS

For a better understanding of this study, the following terms are defined in the context of this research.

Generation Z learners. It refers to the students nowadays who uses technology and has a higher preference for learning from YouTube and videos.

Modeling. It refers on retaining what the students observed and can reproduce the action of working the math problems out for themselves.

Modern Mathematics. One of the subjects in Mathematics offered in Bohol Island State University to first-year students.

Online Learning. It refers to the use of technology in learning contexts.

Printed Materials. It refers to all written and printed texts that are used in teaching Mathematics in the Modern World.

Performance. It refers to the student's skills when using printed materials or video-assisted activities in Modern Mathematics.

Students' self-efficacy. It refers to student's self-confidence and their beliefs in their capabilities to solve mathematical problems.

Teacher-made video tutorials. It refers to the instructional videos which is personally made by the teachers.

Video-Assisted Activities. It is one of the resources for the students to learn mathematics given by the researchers. It refers to the delivery of mathematics lessons in which the students will watch instructional videos that is related to their lessons in Modern Mathematics given by the researchers.

Chapter 2

PRESENTATION, INTERPRETATION, AND ANALYSIS OF DATA

This chapter shows the findings, analysis, and interpretation of data. It presents the profile of the freshmen BSES and BSF students of BISU-Bilar Campus, as well as, the pretest and posttest performance of the students in Mathematics in the Modern World using printed materials and video-assisted activities. It also discusses the relationship between the pretest-posttest performance of the students in Mathematics in the Modern World using printed materials and video-assisted activities, as well as the significant difference between the performance of the students in Mathematics in the Modern World using printed materials and video-assisted activities.

Table 1

Profile of the respondents

N=66

Items	Frequency	Percent (%)
Sex		
Male	23	34.8
Female	43	65.2
Total	**66**	**100.0**
Age		
18 years old	22	33.3
19 years old	23	34.8
20 years old	9	13.6
21 years old	4	6.1
22 years old	3	4.5
23 years old	2	3.0
24 years old	3	4.5
Total	**66**	**100.0**

Table 1 shows the profile of the freshmen BSES and BSF students of BISU-Bilar Campus in terms of sex and age. As to sex, it was revealed that majority of the respondents were female. It implies that females were more interested in a Bachelors in Agriculture than males. On the other hand, as to age, most of the respondents were 18 and 19.

Table 2 presents the pretest/posttest performance of the students in Modern Mathematics. In their pretest performance, it was revealed that the controlled group performance is fair since the number of students who passed equates the number of students who failed while the experimental group has good test performance based on the result of having 22 students who passed. The test performance of the two groups implied that these students do not have strong foundation on the basic concepts of Mathematics in high school. The results of the study could be supported with Piaget's Constructivism Theory which states that prior knowledge impacts the learning process.

On the other hand, the posttest performance of the students in Mathematics in the Modern World revealed that the controlled and experimental group has a very good performance since majority of the respondents have passed. This implies that the students' performance improves after using printed materials and video-assisted activities in learning Modern Mathematics. The results support to the study of Goldsmith (2011) stated that people perceive print media as more suitable for effortful learning. Moreover, it affirms to the study of Darling-Hammond, Zielezinski, & Goldman (2014) which states that using technology, such as the

video tutorials, can improve student achievement in mathematics by providing multiple means and methods for learners to grasp traditionally difficult concepts.

Table 2

Test Score Performance of the respondents in Mathematics in the Modern World

N = 66

Range Score	Description	Controlled Group (Printed Materials)			Experimental Group (Videos-Assisted Activities)		
		Pretest	Posttest	d	Pretest	Posttest	d
23-25	Excellent	0	4	4	1	3	2
20-22	Very Good	8	13	5	10	11	1
17-19	Good	9	6	-3	11	13	2
15-16	Poor	4	5	1	2	1	-1
Below 15	Failure	13	6	-7	8	4	-4
Average Weighted Mean		15.52	17.94		17.13	18.46	
Total		**34**			**32**		

Legend: d – difference (posttest-pretest)

Table 3 illustrates the significant difference between the performances of the students in Mathematics in the Modern World. In the controlled group, the Paired Sample T-test signifies that there is a significant difference ($t= -3.040$, $p=0.005< 0.05$) between the pretest-posttest performances of the students in Mathematics in the Modern World using printed materials. It implies that students do better in Mathematics in the Modern World using printed texts. This result affirms the study of Otto & Flournoy (2022) that printed materials, especially in the form of textbooks, continue to be the core of the instructional materials in schools in this country.

Table 3

Significant difference between the performance of the students in Mathematics in the Modern World

N= 66

	Mean Difference	t-value	Df	Significance (2-tailed)	Decision	Interpretation
Controlled Group (pretest-posttest)	-2.412	-3.040	33	0.005	Reject	Significant
Experimental Group (pretest-posttest)	-1.156	-1.709	31	0.097	Accept	Insignificant
Control – Experimental Group (posttest)	-5.2757	-.460	64	.427	Accept	Insignificant

In the experimental group, the Paired Sample T-test result denotes that there is no significant difference (t= -1.709, p=0.097> 0.05) between the pretest-posttest performances of the students in Mathematics in the Modern World using video-assisted activities. This result contradicts to the study of Kahrmann (2016) that "in an effort to improve my students low Mathematics achievement scores, the video tutorials tackled the goals of improving the students' self-efficacy, giving the parents resources to help their child with their math skills, differentiation of instruction delivery, access to continuous modeling by the teacher, and resources of the material missed when students were absent".

The Independent Sample T-test result denotes that there is no significant difference (t= -0.460, p=0.647> 0.05) between the posttest's performances of the students' in Modern Mathematics using printed materials and video-assisted activities. The result indicates that using videos-assisted activities is effective but is weaker than using printed materials. According to Rezat & Giessen (2010), new technologies have not affected its outstanding role: "despite the obvious powers of the new technology, it must be accepted that its role in the vast majority of the world's classrooms pales into insignificance when compared with that of textbooks and other written materials."

Chapter 3

SUMMARY OF FINDINGS, CONCLUSIONS, AND RECOMMENDATIONS

This chapter presents the summary of findings, conclusions and recommendations drawn from the results of the study.

Summary of Findings

The study aimed to compare and analyze the effectiveness of learning Mathematics in the Modern World using printed materials and video-assisted activities of the 1st year Forestry and Environmental Science students, 1st semester, academic year 2021-2022. Specifically, it aimed to answer the profile of the students in terms of sex and age; the performance of the students in learning Mathematics in the Modern World using printed materials and video-assisted activities; and the significant difference between the performance of the students in learning Mathematics in the Modern World using printed materials and video-assisted activities.

This study utilized a pretest-posttest group design type of experimental method. It was conducted at Bohol Island State University- Bilar Campus, Zamora, Bilar, Bohol. The respondents of the study were the 1st year Forestry (32 students) exposed to video-assisted activities and Environmental Science (34 students) exposed to printed materials for the school year 2021-2022.

A self-made questionnaire was used to gather the needed data. The researchers administered the test through google forms. The data were gathered,

the responses were tallied, analyzed, and interpreted and were subjected to statistical treatment. The research statistician chooses Paired Sample T-test and Independent Sample T-test for the statistical treatment.

After a thorough analysis, the researchers came up with the following findings:

1. Profile of the respondents.

Sex. There were more females than male respondents.

Age. Most of the respondents were 19 years old.

2. Performance of the students in Mathematics in the Modern World.

Pretest. The control and experimental group have a poor and good performance respectively. This only shows that students have poor mathematical background on the basic principles of Mathematics; difficulties in retaining their knowledge in Mathematics in their high school years.

Posttest. The control and experimental group both have good performance. This shows that printed materials and video-assisted activities help improves the students' performance in Mathematics in the Modern World.

3. Significant difference between the pretest-posttest performance of the students in Mathematics in the Modern World using printed materials.

There is a significant difference between the pretest-posttest performance of the students in Mathematics in the Modern World using printed materials.

4. Significant difference between the pretest-posttest performance of the students in Mathematics in the Modern World using video-assisted activities.

There is no significant difference between the pretest-posttest performance of the students in Mathematics in the Modern World using video-assisted activities.

5. Significant difference in the posttest's performance of the students in Mathematics in the Modern World using printed materials and video-assisted activities.

There is no significant difference between the posttest's performance of the students in Mathematics in the Modern World using printed material and video-assisted activities.

6. Proposed Action Plan in teaching and learning Modern Mathematics. The researchers proposed an action plan using video lessons as supplementary material in teaching Mathematics in the Modern World.

Conclusion

Most of the respondents were females and aged 19 years old. When printed materials and video-assisted activities are employed in learning, the respondents enhance their mathematical background on basic principles of Mathematics. Students, on the other hand, exhibited no improvement in their performance while using video-assisted activities alone. In contrast, when employing printed materials, they have improved more. Students' performance in Mathematics in the

Modern World utilizing printed materials did not differ from students using video-assisted activities, according to the study. This meant that the students' test scores were unaffected by any of the instructional materials used. In addition, the researchers presented an action plan for teaching Mathematics in the Modern World using video lesson as supplementary material.

Recommendations

Based on the conclusion of the study, the following recommendations were given:

1. The researchers recommend that Mathematics teachers may continue to use printed materials. They can, however, continue to employ video-assisted activities, but in shorter versions;

2. Teachers should include the use of shorter video lessons rather than longer versions designed not only to entertain but basically to educate. It should be taken into consideration the importance of proper video content style and strategy of exposing video to students;

3. Another research will be conducted with more respondents to be involved and on the lesson presentation;

4. Future researchers should conduct further studies to validate the result of this study.

PROPOSED ACTION PLAN USING VIDEO LESSONS AS SUPPLEMENTARY MATERIAL IN TEACHING MATHEMATICS IN THE MODERN WORLD

Rationale

Online distance learning is one of the alternative delivery modes of education during this time of the pandemic. In this type of learning, students face several problems and challenges in acquiring or mastering their lessons in Mathematics in the Modern World. These include learners that are trying to understand the content of their activity via printed materials on their own. Moreover, if the students have a poor foundation in Mathematics, then learning with a printed material alone is a burden for them. For this reason, all the components of the educative process of the students shall initiate ways and means to help them realize their goal of getting better performance in Mathematics.

The findings of this study manifest the importance of tracking on which ways would be best to use for the students to have a better performance in Mathematics in the Modern World. The needs of the students should be properly addressed by the educators so that learning interventions shall be applied. In response to this situation, teachers should experiment with different strategies such as making/downloading video lessons using English as a medium of instruction or even "Taglish videos" just to supplement the printed materials. The availability of video tutorials enriched students' learning experiences and enhanced their academic performance. It is very important to provide utmost attention to the difficulties encountered by the students by supplementing ways of educating them

in this new normal regarding the fact that there is no significant difference in using printed materials and videos-assisted activities as modalities of learning.

In this connection, the researchers propose an action plan using video lessons as supplementary material in teaching Modern Mathematics to any degree programs offered by Bohol Island State University- Bilar Campus.

Objectives

After the implementation of the proposed action plan using video lessons as supplementary material in teaching Mathematics in the Modern World, the researchers aimed to achieve the following:

1. To emphasize the importance of the proper design of supplementary video content and the methodology of displaying video to students.
2. To enhance students' satisfaction and motivation in doing activities in Modern Mathematics.
3. To improve teachers' personal growth and professional development.
4. To develop a strong student-teacher relationship.
5. To establish an avenue for students to address their individual needs.

Mechanics of Implementation

The result of the research being conducted shall be presented to all Mathematics teachers for their critiquing and exchange of insights about the proposed action plan using video lessons as supplementary material in teaching

Mathematics in the Modern World. The paper shall be endorsed to the Mathematics teachers and the Dean of all Colleges of Bohol Island State University Bilar Campus for further consultation. After the consultation, the proposed action plan shall be presented to the administration for endorsement to the campus director for approval.

Schedule of Implementation

The implementation of the proposed action plan using video lessons as supplementary material in teaching Modern Mathematics will be at the start of the school year 2022-2023.

Evaluation Measures

To test the effectiveness of the proposed action plan using video lessons as supplementary material in teaching Modern Mathematics, the following measures should be undertaken:

There should be students' evaluation of their teachers in Mathematics in the Modern World at the end of every semester to find out the effective strategies and areas of improvement.

A summative test should be done at the end of the semester to assess the performance of the students in Mathematics in the Modern World.

Performance appraisal of the Mathematics teachers should be strictly observed by the immediate head of the office to determine the strength of his/her teaching as seen in the performance of the students.

Republic of the Philippines
BOHOL ISLAND STATE UNIVERSITY
Zamora, Bilar, Bohol

PROPOSED ACTION PLAN USING VIDEO LESSONS AS SUPPLEMENTARY MATERIAL IN TEACHING MATHEMATICS IN THE MODERN WORLD
A. Y. 2021-2022

AREA OF CONCERNS	OBJECTIVES	STRATEGIES	PERSONS INVOLVED	TIME FRAME	BUDGET	OUTPUT
Teaching Mathematics in the Modern World using video lessons as a supplementary material	To emphasize the importance of the proper design of supplementary video content and the methodology of displaying video to students	Multimedia presentations	Mathematics teachers, students	The implementation will be at the start of the A.Y. 2022-2023	Php. 5000	Developed competence in Mathematics in the Modern World
Students' doing activities in Modern Mathematics using video lessons as a supplementary material	To enhance students' satisfaction and motivation in doing activities in Mathematics in the Modern World	Providing video lessons/ video assisted activities	Mathematics teachers, students	Once a week	Php. 100	Improve students' performance

Student-teacher relationship	To develop a strong student-teacher relationship	A regular forum for teachers and students	Mathematics teachers, students	Once a month		A strong student-teacher relationship
>>Teachers' Personality	To improve teachers' personal growth and professional development	Attend seminars and workshops	Mathematics teachers	Every summer vacations	Php. 2000	Improved teachers' personal growth and development
	To establish an avenue for students to address their individual needs	Supplementing video lessons	Mathematics teachers, Deans, Administrators, Campus Director	Every classes		Addressed individual needs of the students

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Appendices

APPENDIX A.1

LETTERS

Republic of the Philippines
Bohol Island State University- Bilar
College of Teacher Education

October 19, 2021

MARIETTA C. MACALOLOT Ph. D.
Campus Director
Bohol Island State University- Bilar
Zamora, Bilar, Bohol

Madam:

Greetings!

The undersigned BSED IV major in Mathematics students of Bohol Island State University-Bilar, Zamora, Bilar, Bohol humbly request permission from your good office to conduct, our research through Google Forms entitled **"A Comparative Study between Printed Materials and Video-Assisted Instruction in Teaching Mathematics in the Modern World"** in partial fulfillment of the requirements for the degree of Bachelor in Secondary Education (BSEd).

May this request merit your approval, thank you.

Respectfully yours,

(Sgd) **MA. FLOR C. BALILI**

(Sgd) **REYMART A. BASCON**

(Sgd) **NOLA MAE C. SUELLO**
Student Researchers

Noted:

(Sgd) **DONNA RUTH P. TALO, MSc.**
Thesis Adviser

Recommending Approval:

(Sgd) **LIBRADA S. QUILAS, Ph.D.**
Chairperson, Department of Secondary Education

Approved:

(Sgd)**MARIETTA C. MACALOLOT Ph. D.**
Campus Director

APPENDIX A.2

LETTERS

Republic of the Philippines
Bohol Island State University- Bilar
College of Teacher Education

October 19, 2021

MA. QUIMAR Q. GAHIT Ed. D.
Dean, *College of Teacher Education*
Bohol Island State University- Bilar
Zamora, Bilar, Bohol

Madam:

Greetings!

We, the BSEd-Math IV students of Bohol Island State University – Bilar Campus, Zamora, Bilar, Bohol, are conducting our thesis entitled **"A Comparative Study between Printed Materials and Video-Assisted Instruction in Teaching Mathematics in the Modern World".**

In this connection, we humbly request permission from your good office to conduct pilot testing through Google Forms specifically among the BSEd first year students major in Mathematics.

We are hoping for your approval on this request.
Thank you and God Bless.

Respectfully yours,
(Sgd) **MA. FLOR C. BALILI**

Noted:

(Sgd) **REYMART A. BASCON**

(Sgd) **DONNA RUTH P. TALO, MSc.**
Thesis Adviser

(Sgd) **NOLA MAE C. SUELLO**
Student Researchers

Recommending Approval:

(Sgd) **LIBRADA S. QUILAS, Ph.D.**
Chairperson, Department of Secondary Education

Approved:

(Sgd)**MA. QUIMAR Q. GAHIT, Ed.D.**
Dean, College of Teacher Education

APPENDIX A.3

LETTERS

Republic of the Philippines
Bohol Island State University- Bilar
College of Teacher Education

October 19, 2021

NOEL LOMOSBOG, Ph.D.
Dean, College of Agriculture and Natural Resources
Bohol Island State University- Bilar
Zamora, Bilar, Bohol

Sir:

Greetings!

We, the BSEd-Math IV students of Bohol Island State University – Bilar Campus, Zamora, Bilar, Bohol, are conducting our thesis entitled **"A Comparative Study between Printed Materials and Video-Assisted Instruction in Teaching Mathematics in the Modern World".**

In this connection, we would like to request your permission to conduct the study in the College of Agriculture and Natural Resources through Google Forms, specifically to the BSF and BSES first year students.

We are hoping for your approval on this request.
Thank you and God Bless.

Respectfully yours,
(Sgd)**MA. FLOR C. BALILI**

(Sgd) **REYMART A. BASCON**

(Sgd) **NOLA MAE C. SUELLO**
Student Researchers

Noted:

(Sgd) **DONNA RUTH P. TALO, MSc.**
Thesis Adviser

Recommending Approval:

(Sgd) **WILBERT A. AUREO, MSc.**
Chairperson, Department of Forestry and Environmental Science

Approved:

(Sgd) **NOEL LOMOSBOG, Ph.D.**
Dean, College of Agriculture and Natural Resources

APPENDIX A.4

LETTERS

Republic of the Philippines

Bohol Island State University- Bilar

College of Teacher Education

October 19, 2021

Dear Students,

We, Ma. Flor C. Balili, Reymart A. Bascon, and Nola Mae C. Suello, BSEd Math IV students of Bohol Island State University are conducting an action research entitled **"A Comparative Study between Printed Materials and Video-Assisted Instruction in Teaching Mathematics in the Modern World".**

In view of this, we humbly request your help by answering the attached questionnaire to give us the data needed in our study. Rest assured that any information will be kept confidential.

Thank you very much for your cooperation.

Respectfully yours,

The Researchers

APPENDIX B.1

TABLE OF SPECIFICATION FOR PILOT TESTING

Republic of the Philippines
Bohol Island State University- Bilar

CONTENT AREA	OBJEC-TIVES	Time Covered (No. of minutes)	Percent % Emphasis	No. of Items	BEHAVIORAL OBJECTIVES/TARGETS					
					A	A	C	E	R	U
Counter Examples	Understand the concept of counter examples.	10 mins	12.5 %	5						1-5
Inductive and Deductive Reasoning	Identify Inductive and Deductive reasoning	40 mins	50%	20	25	16-24				6-15
Problem Solving with Patterns	Solve Problems Involving logic and patterns	30 mins	37.5%	15		37-40				26-36
TOTAL		80 mins		40	1	13				26
PERCENTAGE		**100%**			**100%**					
SUGGESTED ITEM TYPE					Multiple Choice					

R - remembering
U - understanding
A - applying
A – analyzing
E - evaluating
C - creating

APPENDIX B.2

TABLE OF SPECIFICATION

Republic of the Philippines
Bohol Island State University- Bilar

CONTENT AREA	OBJECTIVES	Time Covered (No. of minutes)	Percent % Emphasis	No. of Items	BEHAVIORAL OBJECTIVES/TARGETS					
					A	A	C	E	R	U
Counter Examples	Understand the concept of counter examples.	10 mins	16.67%	4						1-3
Inductive and Deductive Reasoning	Identify Inductive and Deductive reasoning	20 mins	33.33%	8	4-7					8-11
Problem Solving with Patterns	Solve Problems involving logic and patterns	30 mins	50%	13		12 23-25				13-22
TOTAL		60 mins		25	4	4				17
PERCENTAGE		**100%**			**100%**					
SUGGESTED ITEM TYPE					Multiple Choice					

R - remembering
U - understanding
A - applying
A – analyzing
E - evaluating
C - creating

APPENDIX C

PRE-TEST AND POST-TEST QUESTIONNAIRE

Republic of the Philippines
Bohol Island State University-Bilar Campus
Zamora, Bilar, Bohol

Vision: *A premier Science and Technology university for the formation of world class and virtuous human resource for sustainable development in Bohol and the Country.*
Mission: *BISU is committed to provide quality higher education in the arts and sciences, as well as in the professional and technological fields; undertake research and development and extension services for the sustainable development of Bohol and the country.*

Name: _____ **Yr. & Sec.**_____

Age: _____ **Sex:** _____

General Direction: Read the questions carefully. Encircle the letter that corresponds your answer.

Verify that each of the following statements is a false statement by finding a counterexample for each.

1. $\frac{x}{x} = 1$

   a. x = 0
   b. x = 1
   c. x = 2
   d. x = 3

2. If the sum of two counting numbers is an even counting number, then the product of the two counting numbers is an even counting number. Find a pair of numbers.

   a. 2 and 4
   b. 1 and 3
   c. 4 and 8
   d. 2 and 8

3. If the product of two counting numbers is an even counting number, then both of the counting numbers are even counting numbers. Find a pair of numbers.

   a. 1 and 2
   b. 2 and 4
   c. 4 and 6
   d. 6 and 8

Solve the following using inductive reasoning to predict the next number.

4. 3, 5, 9, 15, 23, 33

a. 43
b.44
c.45
d.46

5. 1, 8, 27, 64, 125

a. 130
b. 155
c. 216
d. 220

6. 2, 7, -3, 2, -8, -3, -13, -8, -18

a. -10
b. -26
c. -13
d. -15

7. 1, 5, 12, 22, 35

a. 45
b. 51
c. 39
d. 40

Use inductive reasoning to decide whether each statement is correct.

8. The product of an odd counting number and an even counting number is always an even counting number.

a. true
b. false
c. uncertain

9. The product of two odd counting numbers is always an odd counting number.

a. true
b. false
c. uncertain

10. The sum of two odd counting numbers is always an odd counting number.

a. true
b. false
c. uncertain

11. The first lipstick I pulled from my bag is red. The second lipstick I pulled from my bag is red. Therefore, all the lipsticks in my bag are red.

a. true
b. false
c. uncertain

Solve using Logic Puzzle.

12. At the local nursery school, I was chatting to my daughter's friends and noticed several things. Jessica has mousy colored hair and the girl with black hair was wearing a green dress. Lucy is not blonde, and Lauren does not have brown hair. Chloe was wearing a blue dress. The blonde girl was not wearing red and Lauren was not wearing green. I can't remember which girl was wearing a yellow dress. Can you determine the colors of the girl's dresses and their hair?

a. Jessica has black hair and wears a red dress,
Lucy has a blonde hair and wears a green dress,
Lauren is blonde and wears a yellow dress,
Chloe has mousy colored- hair and wears a blue dress.

b. Jessica has mousy colored-hair and wears a red dress,
Lucy has a black hair and wears a green dress,
Lauren is blonde and wears a yellow dress,
Chloe has brown hair and wears a blue dress.

c. Jessica has mousy colored-hair and wears a green dress,
Lucy has a black hair and wears a blue dress,
Lauren is blonde and wears a yellow dress,
Chloe has brown hair and wears a red dress.

d. Jessica has brown hair and wears a green dress,
Lucy has a black hair and wears a yellow dress,
Lauren is blonde and wears a green dress,
Chloe has black hair and wears a red dress.

Predict the next term of each sequence.

13. 1, 7, 17, 31, 49, 71, ...

a. 85
b. 91
c. 89
d. 90

14. 10, 10,12, 16, 22, 30, ...

a. 32
b. 35
c. 38
d. 40

15. -1, 4, 21, 56, 115, 204, ...

a. 329
b. 250
c. 360
d. 210

16. 0, 10, 24, 56, 112, 190, ...

a. 200
b. 240
c. 280
d. 260

17. 9, 4, 3, 12, 37, 84, ...

a. 159
b. 90
c. 100
d. 120

18. 17, 15, 25, 53, 105, 187, ...

a. 210
b. 250
c. 290
d. 305

19. 2, 7, 24, 59, 118, 207, 332, ...

a. 350
b. 390

c. 410
d. 499

20. 1, 5, 14, 30, 55, ...

a. 60
b. 91
c. 75
d. 82

21. Doves, Birds, Geese, Maids, ... (Merry Christmas)

a. Ladies
b. Lords
c. Pipers
d. Drummers

22. M, J, G, D ...

a. A
b. B
c. C
d. D

Direction: Provide what is asked in the following.

23. The ninth and tenth terms of an arithmetic sequence are, 87 and 99 respectively. What is its first term?

a. -5
b.11
c. -9
d. 9

24. The sum of the first three terms of an arithmetic sequence is 111 and the fourth term is 49. What is the first term?

a. 24
b. 13
c. 37
d. 31

25. An arithmetic sequence begins with { -9, -4, 1, 6...}. If -9 is the first term in the sequence, find the 31^{st} term.

a. 141
b. 145
c. 136
d. 151

APPENDIX D.1

Republic of the Philippines
Bohol Island State University-Bilar Campus
Zamora, Bilar, Bohol

Vision: *A premier Science and Technology university for the formation of world class and virtuous human resource for sustainable development in Bohol and the Country.*
Mission: *BISU is committed to provide quality higher education in the arts and sciences, as well as in the professional and technological fields; undertake research and development and extension services for the sustainable development of Bohol and the country.*

LESSON PLAN ON TOPIC 1 INDUCTIVE AND DEDUCTIVE REASONING

I. Objectives:

At the end of the lesson students are expected to:

1. Describe when to use inductive and deductive reasoning.
2. Learn the relationship between inductive and Deductive Reasoning.
3. Comprehend the importance of inductive and deductive reasoning in real life situation.

II. Subject Matter:

Topic: Inductive and Deductive Reasoning
Reference: Aufmann, R., Clegg, D., Epp, S., Lockwood, J. (2018) *"Mathematics in the Modern World"*. Rex Book Store Inc.
Materials: PowerPoint (multimedia presentation), laptop, projector, answer sheets

III. Procedure:

A. Preparation

- Prayer
- Checking of classroom cleanliness
- Checking of attendance

Introduce the concept

In mathematics, reasoning involves drawing logical conclusions based on evidence or stated assumptions. Reasoning and sense making are closely interrelated and are the foundation for a solid preparation in mathematics. It can develop critical thinking skills to succeed in mathematics and in life.

Define Inductive Reasoning

Inductive reasoning is the process of reaching a general conclusion by examining specific examples.

Example 1. Use inductive reasoning to predict the next number in each of the following lists.

a) 3, 6, 9, 12, 15, ?
b) 1, 3, 6, 10, 15, ?
c) 2, 5, 10, 17, 26, ?

Solution:

+3 +3 +3 +3 +3 *(add 3 to get the next term)*
a) 3 6 9 12 15 ? = 15 + 3 = **18**

+2 +3 +4 +5 +6 *(adding counting number from the given number)*
b) 1 3 6 10 15 ? = 15 + 6 = **21**

+3 +5 +7 +9 +11 *(adding odd numbers)*
c) 2 5 10 17 26 ? = 26 + 11 = **37**

Counterexamples

A statement is a true statement provided that it is true in all cases. If you can find one case for which a statement is not true, called a counterexample, then a statement is a false statement.

Example 2. Verify that each of the following statements is a false statement by finding a counterexample.

For all numbers x:

a) $|x| > 0$
b) $x^2 > x$
c) $\sqrt{x^2} = x$

Solution: A statement may have many counterexamples, but we need only find one counterexample to verify that the statement is false.

a) Let x = 0
Then |0| = 0. Because 0 is not greater than 0.

Thus, "for all numbers x, $|x| > 0$ "is a false statement.

b) For $x = 1$, we have $1^2 = 1$.
Since 1 is not greater than 1, we have found a counterexample.
Thus, "for all numbers x, $x^2 > x$" is a false statement.

c) Consider $x = -3$.
Then, $\sqrt{(-3)^2} = \sqrt{9} = 3$.
Since 3 is not equal to -3, we have found a counterexample. Thus, "for all numbers x, $\sqrt{x^2} = x$ is a false statement.

Deductive Reasoning

Deductive reasoning is the process of reading a conclusion by applying general assumptions, procedures, or principles.

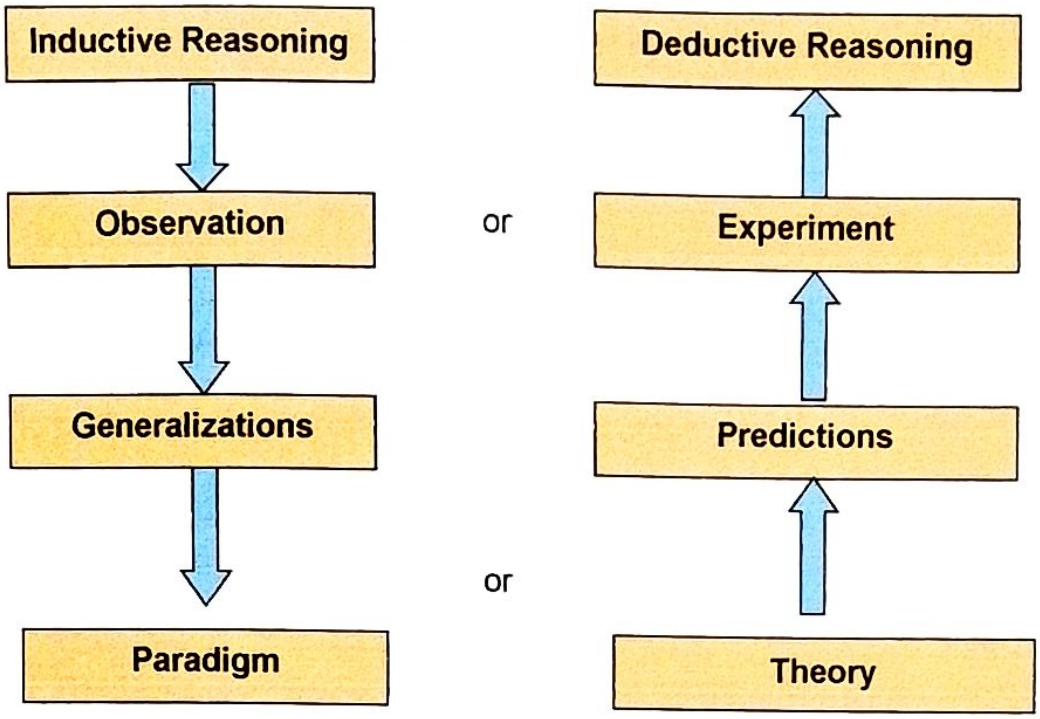
Example 3. Determine whether each of the following arguments is an example of inductive or deductive reasoning.

1) During the past 10 years, a tree has produced plums every other year. Last year the tree did not produce plums, so this year the tree will produce plums.

Solution: This argument reaches a conclusion based on specific examples, so it is an example of inductive reasoning.

2) All home improvements cost more than the estimate. The contractor estimated that my home improvement will cost P45, 000. Thus, my home improvement will cost more than P45, 000.

Solution: Because the conclusion is a specific case of a general assumption, this argument is an example of deductive reasoning.



Inductive reasoning versus deductive reasoning.

Logic Puzzles

Logic puzzles can be solved by using deductive reasoning and a chart that enables us to display the given information in a visual manner.

Example 4. Solve a Logic Puzzle

Each of four neighbors, Sean, Marie, Sarah and Bryan has a different occupation (editor, banker, chef, or dentist).
From the following clues, determine the occupation of each neighbor.

1. Maria gets home from work after the banker but before the dentist.
2. Sarah, who is the last to get home from work, is not the editor.
3. The dentist and Sarah leave from work at the same time.
4. The banker lives next door to Brian.

Solution:

From clue 1, Maria is not the banker or the dentist. In the following chart, write X1 (which stands for "ruled out by clue 1") in the banker and the Dentist columns of Maria's row.

	Editor	Banker	Chef	Dentist
Sean				
Maria		X1		X1
Sarah				
Brian				

From clue 2, Sarah is not the editor. Write X2 (ruled out by clue 2) in the Editor column of Sarah's row. We know from clue 1 that the banker is not the last to get home, and we know from clue 2 that Sarah is the last to get home; therefore, Sarah is not the banker. Write X2 in the Banker column of Sarah's row.

	Editor	Banker	Chef	Dentist
Sean				
Maria		X1		X1
Sarah	X2	X2		
Brian				

From clue 3, Sarah is not the dentist. Write X3 for this condition. There are now Xs for three of the four occupations in Sarah's row; therefore, Sarah must be the Chef. Place a √ in that box. Since Sarah is the Chef, none of the three people can be the chef. Write X3 for these conditions. There are now Xs for three of the four occupations in Maria's row; therefore, Maria must be the editor. Insert a √ to indicate that Maria is the editor and write X3 twice to indicate that neither Sean nor Brian is the editor.

	Editor	Banker	Chef	Dentist
Sean	X3		X3	
Maria	√	X1	X3	X1
Sarah	X2	X2	√	X3
Brian	X3		X3	

From clue 4, Brian is not the banker. Write X4 for this condition. Since there are three Xs in the banker column, Sean must be the banker. Place √ in that box. Thus, Sean cannot be the dentist. Write X4 in that box. Since there are three Xs in the dentist column, Brian must be the dentist. Place √ in that box.

	Editor	Banker	Chef	Dentist
Sean	X3	√	X3	X4
Maria	√	X1	X3	X1
Sarah	X2	X2	√	X3
Brian	X3	X4	X3	√

Activity.

Brianna, Ryan, Tyler and Ashley were recently elected as the new class officers (President, Vice-President, Secretary, and Treasurer) of the sophomore class at BISU-Bilar. From the following clues, determine which position each holds.

1. Ashley is younger than the president but older than the treasurer.
2. Brianna and the secretary are both the same age, and they are the youngest members of the group.
3. Tyler and the secretary are next-door neighbors.

	President	Vice-president	Secretary	Treasurer
Ryan				
Ashley		✓		X1
Tyler				
Brianna				

IV. Evaluation

Formative Test (20 minutes)

V. Assignment

Make at least 2 examples in Inductive and Deductive Reasoning.

APPENDIX D.2

Republic of the Philippines
Bohol Island State University-Bilar Campus
Zamora, Bilar, Bohol

Vision: *A premier Science and Technology university for the formation of world class and virtuous human resource for sustainable development in Bohol and the Country.*
Mission: *BISU is committed to provide quality higher education in the arts and sciences, as well as in the professional and technological fields; undertake research and development and extension services for the sustainable development of Bohol and the country.*

LESSON PLAN ON PROBLEM SOLVING WITH PATTERN

I. Objectives:

At the end of the study, students are expected to;

1. Determine whether the problem has a pattern or not
2. Solve problems involving patterns
3. Organize methods in solving problems in real life situations.

II. Subject Matter:

Topic: Problem Solving with Pattern
Reference: Aufmann, R., Clegg, D., Epp, S., Lockwood, J. (2018) *"Mathematics in the Modern World"*. Rex Book Store Inc.
Materials: PowerPoint (multimedia presentation), laptop, projector, answer Sheets.

III. Procedures

A. Preparation

- Prayer
- Checking of classroom cleanliness
- Checking of attendance

Introduce the concept

Terms of a Sequence

An ordered list of numbers such as 5, 10, 15, 20, ... is called a **sequence**.
The numbers in a sequence that are separated by commas are the **terms** of the sequence.

In the above sequence, 5 is the first term, 10 is the second term, 15 is the third term, and 20 is the fourth term. The three dots " ... " indicate that the sequence continues beyond 20, which is the last written term. It is customary to use the subscript notation a_n to designate the **nth term of a sequence**. That is,

$a_1 = 5$; a_1 represents the first term of a sequence
$a_2 = 10$; a_2 represents the second term of a sequence
... ; a_n represents the nth term of a sequence

When we examine a sequence, it is natural to ask:

- What is the next term?
- What formula or rule can be used to generate the terms?

To answer these questions, we often construct a **difference table**, which shows the differences between successive terms of the sequence. The following table is a difference table for the sequence 2, 5, 8, 11,14, ...

sequence:	2	5	8	11	14	...	
first differences:		3	3	3	3	...	(1)

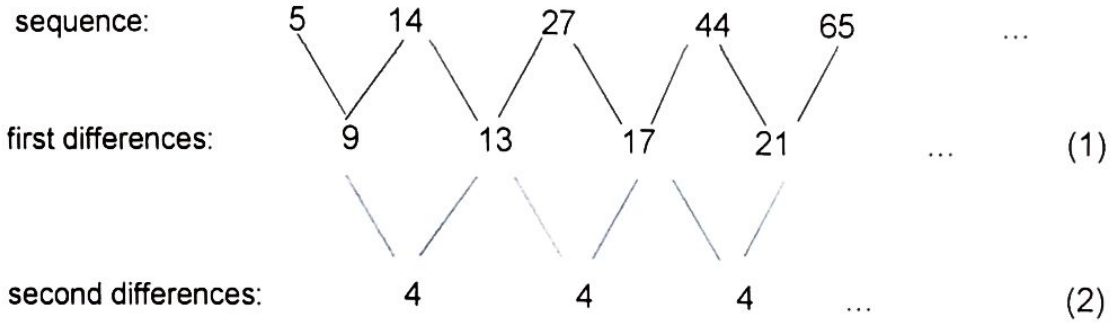
common difference = 3 (arithmetic sequence)

Each of the numbers in row (1) of the table is the difference between the two closest numbers just above it (upper right number minus upper left number). The differences in row (1) are called the **first differences** of the sequence. In this case, the first differences are all the same. Thus, of we use the above difference table to predict the next number in the sequence, we predict that 14 + 3 = 17 is the next term of the sequence. This prediction might be wrong; however, the pattern shown by the first differences seems to indicate that each successive term is 3 larger than the preceding term. The following table is a difference table for the sequence 5, 14, 27, 44, 65, ...

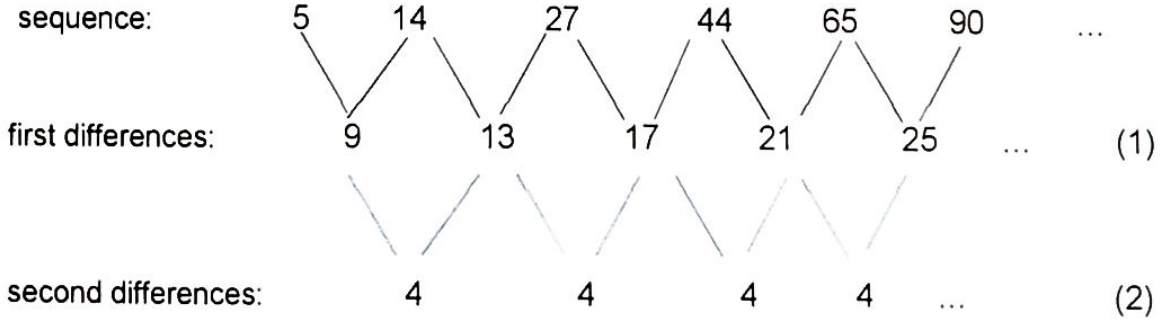
sequence:	5	14	27	44	65	...	
first differences:		9	13	17	21	...	(1)
second differences			4	4	4	...	(2)

In this table, the first differences are *not* the same. In such situation it is often helpful to compute the successive differences of the first differences. These are shown in row (2). These differences are called the **second differences.** The differences of the second differences are called the **third differences.**

To predict the next term of a sequence, we often look for a pattern in a row of differences. For instance, in the following table, the second differences shown in blue are the same constant, namely 4. If the pattern continues, then a 4 would also be the next second difference, and we can extend the table to the right as shown.



Now we work upward. That is, we add 4 to the first difference 21 to produce the next first difference 25. We then add this difference to the fifth term, 65, to predict that 90 is the next term in the sequence. This process can be repeated to predict additional terms of the sequence.



Example. Predict the next term of a sequence2, 7, 24, 59, 118, 207, 332, ?

Solution:

sequence	2	7	24	59	118	207	332	**549**
first difference		5	17	25	59	89	145	**197**
second difference			12	8	34	30	56	**52**
third difference				-4	26	-4	26	**-4** (alternate -4 and 26)

Answer: The next term of the sequence is 549.

nth- term Formula for a Sequence

In the previous examples, we used a difference table to predict the next term of a sequence. In some cases, we can use patterns to predict a formula, called an ***n*th-term formula**, that generates the terms of a sequence.

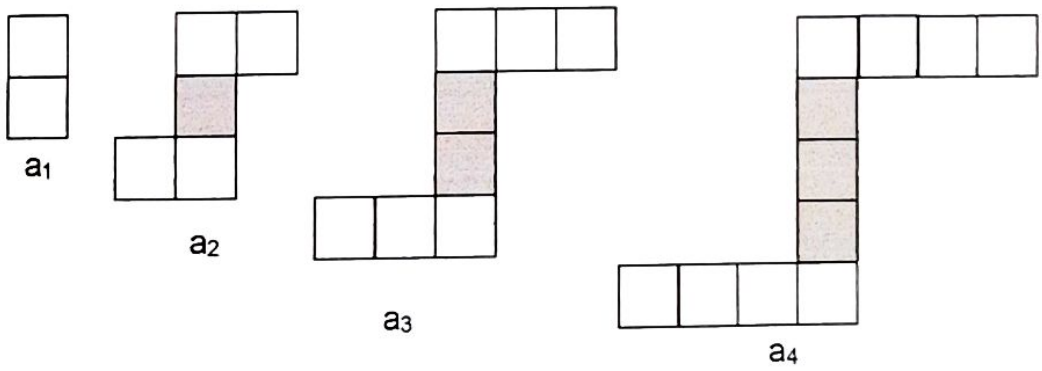
Example. Consider $a_n = 3n^2 + n$

This formula defines a sequence and provides a method for finding any term of the sequence. For instance, if we replace n with 1, 2, 3, 4, 5, and 6, then formula $a_n = 3n^2 + n$ generates the sequence 4, 14, 30, 52, 80, 114. See table below.

n	1	2	3	4	5	6
a_n	4	14	30	52	80	114

Example. Find the nth-term formula. Assume the pattern shown by the square tiles in the following figures continues.

a) What is the nth-term formula for the number of tiles in the nth figure of the sequence?
b) How many tiles are in the 8th figure of the sequence?
c) Which figure will consist of exactly 29 tiles?



Solution:

a) Examine the figures for patterns. Note that the second figure has two tiles on each of the horizontal sections and one tile between the horizontal sections. The third figure has three tiles on each horizontal section and two tiles between the horizontal sections. The fourth figure has four tiles on each horizontal section and three tiles between the horizontal sections.

Thus, the number of tiles in the nth figure is given by two groups of *n* plus a group of *n* less one. That is,

$a_n = 2n + (n - 1)$
$\underline{a_n = 3n - 1}$

b) using $a_n = 3n - 1$ where n = 8
$a_8 = 3(8) - 1$
$\underline{a_8 = 23 \text{ tiles}}$

c) using $a_n = 3n - 1$ where $a_n = 29$
$29 = 3(n) - 1$
$3n = 29 + 1$
$n = 30 / 3$
$\underline{n = 10}$

ACTIVITY. Predict the next term of a sequence M, J, G, D, _____.

IV. Evaluation

Formative Test (20 minutes)

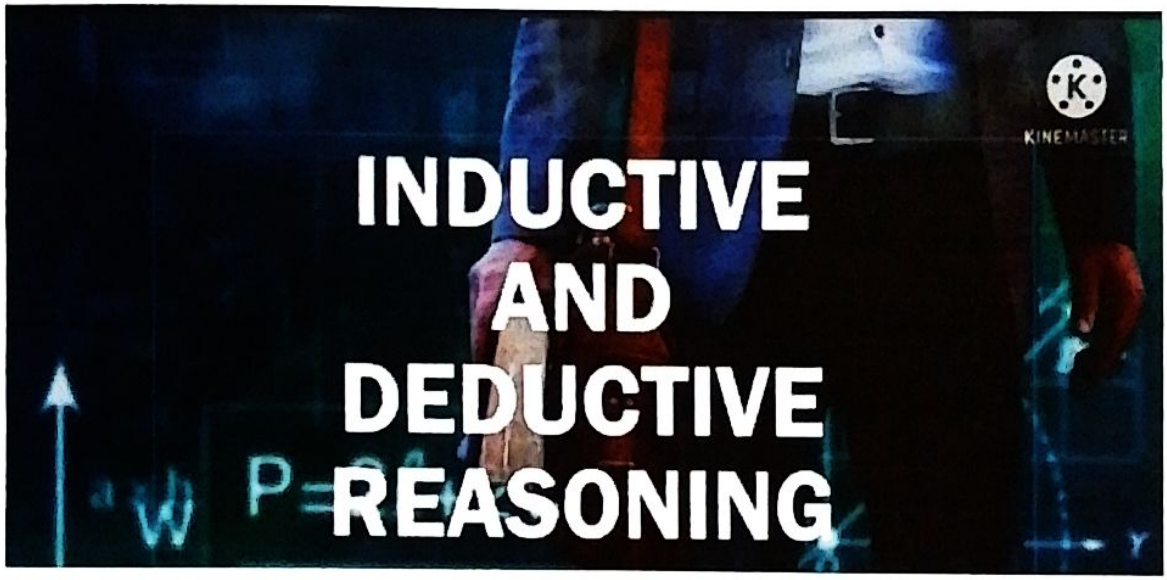
V. Assignment

Give atleast 5 examples of problem-solving involving patterns.

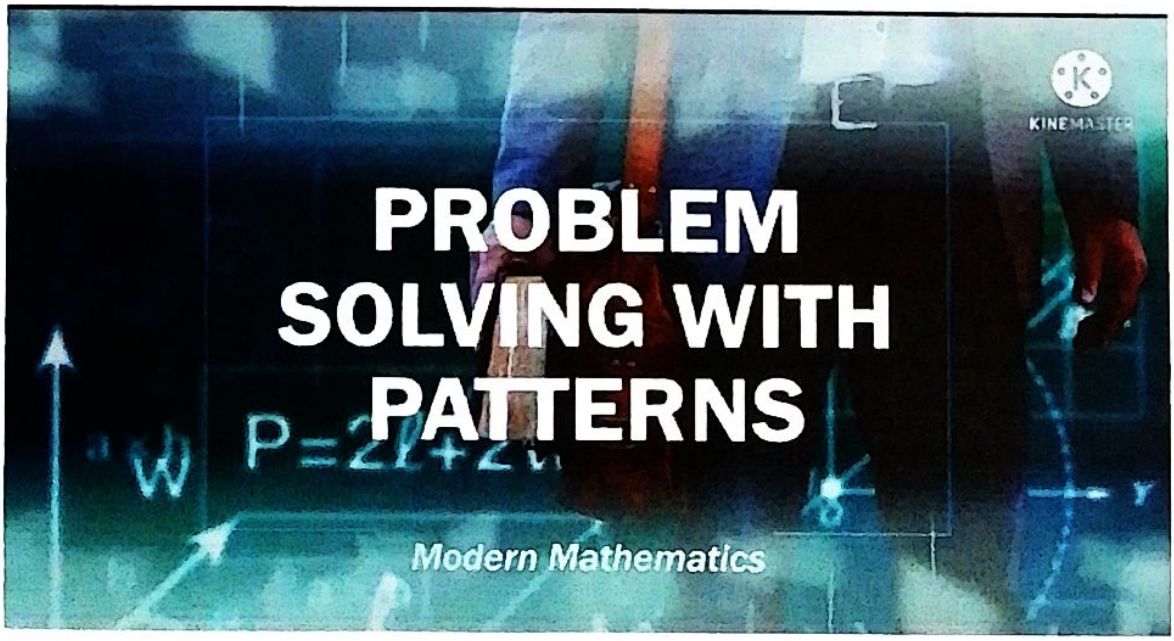
APPENDIX E

VIDEO-ASSISTED ACTIVITIES

Republic of the Philippines
Bohol Island State University- Bilar



https://drive.google.com/file/d/1l9clceSP6lh9ZT8AN85iollo3NJR7z/view?usp=drivesdk



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APPENDIX F

ITEM ANALYSIS

Republic of the Philippines
Bohol Island State University- Bilar

Formula:

ITEM DIFFICULTY

$$\frac{U + L}{N}$$

N = total number of students

ITEM DISCRIMINATION

$$\frac{U - L}{N}$$

N = half of total number of students

U = number in upper group who answered the item correctly
L = number in lower group who answered the item correctly

No.	Lower	Upper	Difficulty	Discrimination	Decision
1	1	8	0.5	0.78	Acceptable
2	2	3	0.28	0.11	Reject
3	4	1	0.28	-0.33	Reject
4	1	3	0.22	0.22	Acceptable
5	1	4	0.28	0.33	Acceptable
6	9	8	0.94	-0.11	Reject
7	9	9	1	0	Reject
8	6	9	0.83	0.33	Acceptable
9	2	9	0.61	0.78	Acceptable
10	7	9	0.89	0.22	Reject
11	7	9	0.89	0.22	Reject
12	9	9	1	0	Reject
13	8	9	0.94	0.11	Reject
14	1	9	0.56	0.89	Acceptable
15	5	9	0.78	0.44	Acceptable
16	8	9	0.94	0.11	Reject
17	4	7	0.61	0.33	Acceptable
18	2	5	0.39	0.33	Acceptable
19	6	9	0.83	0.33	Acceptable
20	4	8	0.67	0.44	Acceptable
21	7	2	0.5	-0.56	Reject
22	8	9	0.94	0.11	Reject
23	7	8	0.83	0.11	Reject

24	9	9	1	0	Reject
25	5	8	0.72	0.33	Acceptable
26	5	9	0.78	0.44	Acceptable
27	5	9	0.78	0.44	Acceptable
28	5	8	0.72	0.33	Acceptable
29	4	8	0.67	0.44	Acceptable
30	3	9	0.67	0.67	Acceptable
31	3	9	0.67	0.67	Acceptable
32	3	9	0.67	0.67	Acceptable
33	2	9	0.61	0.78	Acceptable
34	7	9	0.89	0.22	Reject
35	2	6	0.44	0.33	Acceptable
36	6	9	0.83	0.33	Acceptable
37	1	9	0.56	0.89	Acceptable
38	6	7	0.72	0.11	Reject
39	1	6	0.39	0.56	Acceptable
40	4	9	0.72	0.56	Acceptable

Legend:

Index	***Difficulty***	***Discrimination***
0.86 above	Very Easy	To be discarded
0.71 – 0.85	Easy	To be revised
0.30 – 0.70	Moderate	Very Good Items
0.15 – 0.29	Difficult	To be revised
0.14 below	Very Difficult	To be discarded

APPENDIX G.1

TEST SCORE PERFORMANCE

USING PRINTED MATERIALS

Republic of the Philippines
Bohol Island State University- Bilar

Respondents	Pretest	Posttest
1	18	16
2	10	18
3	10	17
4	17	18
5	13	22
6	13	20
7	20	20
8	18	22
9	21	23
10	20	23
11	22	19
12	21	25
13	9	15
14	11	13
15	19	15
16	16	21
17	19	21
18	14	23
19	17	17
20	15	20
21	22	20
22	17	15
23	12	14
24	17	14
25	17	22
26	7	5
27	14	21
28	8	17
29	15	9
30	22	21
31	16	21
32	9	21
33	20	16
34	9	6

APPENDIX G.2

TEST SCORE PERFORMANCE

USING VIDEO-ASSISTED ACTIVITIES

Republic of the Philippines
Bohol Island State University- Bilar

Respondents	Pretest	Posttest
1	20	22
2	14	7
3	19	18
4	14	17
5	18	18
6	21	18
7	12	21
8	22	22
9	14	16
10	19	19
11	17	24
12	23	24
13	19	22
14	22	21
15	8	4
16	17	18
17	19	19
18	7	18
19	19	18
20	16	23
21	11	19
22	6	8
23	22	20
24	17	18
25	20	18
26	16	14
27	21	22
28	21	19
29	20	21
30	19	21
31	19	20
32	22	22