



# Effectiveness of Modular Instruction on Reasoning in Mathematics Among K to 12 First Year BSS Students

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## Abstract

The study aimed to determine whether the modular approach to teaching was more effective than the traditional lecture approach. Thirty students divided into two groups of 15 each, were tested in the pretest and posttests in a two-group quasi-experimental design. The results revealed that the modular and traditional method was found to be equally effective based on the not-significant result of the independent sample t-test result. It was recommended that the module materials be used as a supplemental resource in the absence of the teacher in the class, and useful for distance offline learning mode, and module material could be used as a tool for both enrichment and for studying advanced lessons of the students.

**Keywords:** Modular approach, Reasoning, Effectiveness, K to 12

## I. Introduction

This research is centered on the effectiveness of the Modular style in teaching Reasoning in Mathematics. This is a Quasi-Experimental design to study using a comparison of two approaches in Samar State University under the k – 12 curriculums leading to the degree of Bachelor of Science in statistics. The respondents of this study involve all enrolled first- year college BS statistics students since the enrollees were only limited to one section at the Department of a college of Arts and Sciences, Samar State University-Main Campus. The half students comprised the control group and the other half students for the experimental groups. It used the pretest which was given to both the control and experimental group before the experimentation and the posttest after the experimentation.

One of the roles of the teachers is to increase knowledge of the current innovation in the use of instructional materials and teaching strategies. One of these strategies is called the modular approach.

“Every child is unique because of individual differences”

As a teacher, we need to know different approaches, and strategies in teaching for the learners learned, because of individual differences, most often not all learners learn arithmetic simultaneously in the same style. Hence, no identical students can learn the same concepts at the same speed and in the same way around.

Johnson (2006) online) Conducted research on developing a mentorship program on non-traditional teaching and learning strategies. According to them, in the late 1980s national attention has begun to focus on the quality and outcomes of university classroom teaching. Paralleling this emphasis has been a growing body of pedagogy centered on non-traditional teaching and learning techniques. These techniques include an active learning approach in teaching, collaborative learning, cooperative learning, problem-based learning, and small group teaching. Collectively these teaching techniques emphasize self-directed student learning, teachers as facilitators or guides, cooperative learning in student small groups, and acquisition of critical thinking, writing, and speaking skills. The body of research and evaluation investigating these teaching methods has revealed higher achievement and productivity relative to traditional teaching models of lecture-based individualistic learning.

Ornstein (1990: 217) suggested some basic guidelines for using instructional aids and guides for selecting and using instructional materials.



According to him, there must be a purpose for using instructional materials. Specific objectives are essential for planning the lesson, and selecting and using instructional materials. The material should be flexible. It should be able to satisfy many different purposes. It should cater to the needs of the students such as age, ability, and interest of the student's reaction to the instructional material.

The literature of Ornstein gave the researcher important insights as to the content of the active learning material that was used in the experimentation. Objectives are very essential in developing the materials for the active learning approach.

Oringo (2018), "Module in linear Equation: Addressing learning difficulties". His findings concluded that process skills in modeling, transforming, inferring, and communicating specifically in linear equation topics were not given attention before entering college; students are not familiar with some terminologies and there is a significant improvement in the knowledge acquired by the results of the evaluation. The module can address their difficulty.

Lim (2016 online) Researched Effectiveness of Modular Instruction in Word Problem Solving of BEED Students. The study used a Quasi-experimental Design to determine the effects of modular instruction on third-year BEED students of Eastern Samar State University (ESSU) who were exposed to lecture methods and modular instruction in teaching word problem-solving. Based on his research findings; (1) The pretest mean scores of the subjects are the same (2) the post-test mean scores of the subjects are significantly different; and (3) there is a significant difference in the mean gain scores of the two groups of respondents from experimental and control groups. The experimental group that was taught by modular instruction is higher than the performance of the control group who were taught using the traditional lecture method. Thus, it is concluded that modular instruction in teaching Math specifically word problem solving, is the best approach to teaching.

On the other hand, Gonzales (2015) conducted a study to find out the effectiveness of the modular approach using a decision tree in teaching integration techniques in Calculus. The study sought an answer to the question: Is there a significant difference between the mean scores of two groups of students in their quizzes on (1) integration by parts and (2) integration by trigonometric transformation? The study utilized a quasi-experimental research design of two groups using a modular versus traditional approach to teaching.

The research instruments used were two twenty-item multiple-choice-type quizzes. The statistical treatment used the mean, standard deviation, Shapiro-Wilk test for normality, two-tailed t-test for independent samples, and Mann-Whitney U-test. The findings brought to the result that both modular and traditional instructions were similarly powerful and effective in teaching the learning of integration by parts, while the other result indicated that the modular approach utilizing a decision tree in teaching integration by trigonometric transformation was more powerful than the traditional method.

The study of Devesh and AL Nasser (2014), aimed to know the effectiveness of the Mathematics Module in the Foundation Programme at Majan College. This study utilized a Cross-sectional survey design, on a sample of two hundred and seventy-five students taken from a population of level 1 and level 2 undergraduate students of Majan College. A convenience sampling technique was used to select the samples from the population. The exclusive criteria were students who have not undergone the foundation program at Majan College. The questionnaire consists of students' feedback regarding the mathematics module in the foundation program and its usefulness in their pathway to higher education. The survey result showed that the students consider the course contents of the Math module in the foundation program offered in Majan College was more effective. A similar study can be recommended on students to increase their effectiveness by adopting various strategies for teaching and learning mathematics.

Zamir (2014) in his study "Effectiveness of Modular Approach in Teaching at University Level" the study used an experimental type method, and an equivalent group study design was used. The findings of the study supported the application of a modular teaching approach. This study recommended that the modular approach should be widely used at various levels of education.

Religioso (1995:67) added that the main feature of individualized instruction is that is presented with learning materials that have been designed to meet their own needs, interests, and abilities. It becomes a very effective teaching method when it is used in conjunction with other methods of teaching that enhance sharing and cooperation among students like team learning, peer tutoring, and discussion. One of the advantages of individualized instruction is its flexibility. It allows more student choices and more independent work. It helps in the development of self-discipline individual and a sense of personal achievement. The teacher plays a less dominant role. After developing



the materials, he/she devotes more time to giving encouraging feedback to the individual students.

Lockwood (1998) differentiated the characteristic of textbook and modules and pointed out the advantages of the latter, to wit: modules arouse interest, are written for learner use; give an estimate of study time; are designed for a particular audience; always gives aims and objectives, may have many ways through it; are structured according to the needs of the learners; primarily emphasize self-assessment; can be alert to potential difficulties; always offer summaries; are personal in style; are content unpacked; have more open layout; always conduct learners' evaluation; provide study skills advice; require an active response, and aimed at successful teaching.

Salandanan (2009), pointed out that learning pocket materials are those which are described to be self-contained and the manner of presentation is such that the learning activities can be undertaken individually or in small groups. These materials are most effectively used in individualized instruction programs. The learning pocket module helps in providing remedial instruction for slow learners and enrichment materials for quick learners. Topics can best be presented through these learning pocket materials. With the use of one, the student has enough time and support to complete the prescribed learning activity at their own pace. The lessons will certainly be fun and the experiences gained will be satisfying.

Moreover, Race (1989). Said that whatever self-teaching materials it is, most likely it is an interaction-centered rather than content-centered. These are written to enhance the learner or get the learner interested and acquainted. Self-teaching materials build students' and boost their self-confidence. This is possible because the students are given a manifestation to conceptualize their ideas. It is even more important that the students get credit for the newly acquired knowledge. Most self-teaching materials are designed with a specific purpose in mind and are structured to meet the needs of learners. Race further emphasized that the main principle underlying the use of self-teaching materials is to make learning reactive, interesting, successful, and humane.

According to Checkering and Gamson (1987), that modular instruction is one of the active learning approaches where students themselves are the main focus of attention while the role of the teacher is more on guiding and facilitating the learning process. This approach encourages the students to be active learners. And it is one approach that is proven to be effective in the learning process

of the students. Modules were given to the learners in which they need to read the concept and perform the given activity either in or out of the classroom. They do this at their own pace and learn in their style. The instructor facilitates learning through consultations. This considers the individual's capacity to learn, interests, and background knowledge.

Moya (2008) "Development and Validation of Modules on Matter in materials Chemistry 101," concluded that the experimental groups had more or less the same level of entry behavior based on their age, sex, and scholastic performance in high school average family income and pretest scores. Both the control and the experimental groups had a favorable interest level in chemistry. This shows that the two methods of teaching, the traditional lecture-discussion, and the active learning approach are equally effective.

Maniabile (2009), "The Development and evaluation of instructional modules in Electricity for High School students". The researcher found out that the result of the two groups is significantly different. The experimental group performed very well than the control group. The results showed that the use of a module is more effective than the traditional approach.

The literature and studies reviewed the similarities and differences which became sources of important information for this study. Most of the researcher's studies stated that the modular approach is effective teaching, and most of them used the experimental research method. But they differ in the number of respondents, variables, findings, and conclusions. The present study uses also a similar experimental research method. Yet, none of them studied the effectiveness of Module in Math I for k - 12 first-year BS Statistics students in terms of the PPT approach as a traditional teaching method. Thus, these were the gaps the presented study bridged.

### 1.1 Objective of the Study

The main objective of this study is to determine:

1. The significant difference between the pretest mean scores of the experimental group and the control group?
2. The significant difference between the pretest and the posttest mean scores of the control group and the experimental group?
3. The significant difference between the posttest mean scores of the experimental group and the control group?

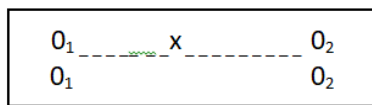


4. Is there a significant difference between the mean gain scores between the control group and the experimental group??

## II. Methodology

### 2.1 Design of the Study

To find the effectiveness of this study, A quasi-experimental research design was used, using two groups of respondents who will undergo a pretest and post-test. The subjects were not grouped by randomization. The diagram of this design is shown below:



The "X" stands for the treatment of the study, which is the modules. The "O1" stands for the experimental pre-test and the "O2" represents the post-test of both experimental and control groups. The broken line between the two groups suggests that there had been no randomization done to the respondents. This design involved the use of two groups namely; the experimental and control groups. The experimental group was taught using the individualized instructional modules while the control group was taught using the PPT lecture-discussion method.

### 2.2 Sampling Procedure

The researcher will use intact groups of students since they belong only to one section with Less than 30 respondents.

### 2.3 Instrumentation

The instruments utilized in this study were the following:

a) Diagnostic test. The researcher constructed a multiple choice test to establish the concepts/skills that were found too difficult by the students. The test was administered to the BSS second-year college students who had already taken this subject. Then answer sheet was collected, tallied, and followed by an item analysis and factor analysis for

facility and discrimination indices. The result of the diagnostic test served as the input for the researcher in the preparation of developing lessons.

b) Pretest/posttest. This is a 40-item multiple choices test that will be given to both experimental and control groups before and after the experimentation. However, before the test was administered it was shown first to the mathematics expert of Samar State University for comments and suggestions for improvement and refinement of the test.

c) Modules. Instructional materials made by the researcher.

### 2.4 Data Gathering.

The researcher provided an instruction to the two groups about the arrangement of conducting the pretest down to the posttest. Two sets of tests were given to both groups; control and experimental groups. The pretest was given some time recently the experimentation started and the posttest was given after the instruction was conducted.

### 2.5 Statistical treatment

The statistical tools by the researcher in this study were the mean, standard Deviation-test for dependent and independent samples, and Flesch Formula.

As a statistical measure, this will be used to determine the mean scores of the experimental group both in the pretest and the posttest. Standard Deviation will be used to measure the extent of variation that existed in each group. T-test for Independent Samples. The statistical tool was applied to test the hypothesis of the study. This tool was used to find out the significant difference between the mean scores of the experimental and control groups both in the pretest and posttest (Walpole, 1982: 311). T-test for Dependent Samples was the statistical tool used to test whether there was learning or none in each group. (Freund & Simon, 1992:327). Flesch Formula was used to determine the readability level of the constructed module. To measure the Reading Ease Score (RES) and the Human Interest Score (HIS) of the module (Lacambra, 1985:29).

## III. Results

**Table 1. Test of Difference Between Modular and Traditional Methods**

|    |                                | Modular | Traditional | T value | P-value |
|----|--------------------------------|---------|-------------|---------|---------|
| 1) | <i>Comparison of Pretests</i>  |         |             |         |         |
|    | Mean                           | 15      | 18.36       | -2.686  | 0.023*  |
|    | SD                             | 2.52    | 2.94        |         |         |
| 2) | <i>Comparison of Posttests</i> |         |             |         |         |



|      |       |       |       |       |         |
|------|-------|-------|-------|-------|---------|
| Mean | 28.82 | 27.64 | 1.097 | 0.298 | Not Sig |
| SD   | 2.31  | 2.76  |       |       |         |

There is a significant difference in the means scores pretest between modular and traditional methods of instructions, where the traditional method scores higher (18.36) than the modular (15); while in the posttests, no significant difference is registered

**Table 2. Test of Difference between Pretests and Posttests of Modular and Traditional Methods**

|    |                           |         |          |         |         |
|----|---------------------------|---------|----------|---------|---------|
| 3) | <i>Modular Method</i>     |         |          |         |         |
|    |                           | Pretest | Posttest |         |         |
|    | Mean                      | 15      | 28.82    | -16.448 | .000**  |
|    | SD                        | 2.52    | 2.31     |         |         |
| 4) | <i>Traditional Method</i> |         |          |         |         |
|    |                           | Trad    |          | T value | P-value |
|    |                           | Pretest | Posttest |         |         |
|    | Mean                      | 18.36   | 27.64    | -7.052  | .000**  |
|    | SD                        | 2.94    | 2.76     |         |         |

Both the pretest and posttest scores in either the modular and traditional approaches, respectively, showed significant differences.

#### IV. Discussion and Conclusion

The main goal of this study is to determine whether the modular approach is more effective than the traditional method of teaching and since the findings are no significant difference between the modular and traditional approaches, it can be concluded that the modular approach and the traditional method is equally effective as a method in teaching reasoning in Mathematics among K to 12 first year BSS students at the Samar State University. This study is contrary to the other related studies mentioned above because they found out that the modular approach was superior to the other.

This study recommends that the module material maybe be used for distance offline learning, It is also an alternative to a face-to-face teaching method, or required of the students whenever the teacher is absent or goes on leave, and the students can have ample time studying the materials as to enrich their knowledge of past lessons or to do advance study.

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