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DEVELOPMENT AND EVALUATION OF MODULES ON SELECTED TOPICS IN STATISTICS

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CHAPTER V

SUMMARY, CONCLUSIONS, AND RECOMMENDATIONS

SUMMARY

At the start of this study, the following questions were posed:

1. Assessment of the modules

    1.1 Is the discussion of the lesson logical, properly sequenced, relevant, simple, clear and easily comprehensive?

    1.2 Are the basic statistical concepts accurately defined, clearly discussed and fully explained?

    1.3 Are the examples, illustrations and activities simple, clear, interesting and directly related to the lesson being discussed?

    1.4 Is the module readable for second year high school students?

    1.5 Do the questions in the mastery tests reflect the specified behavioral objectives? Are they reliable?

2. Assessment of the modules on the achievement of the students.

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2.1 Is there a significant difference in the achievement of the subjects belonging to both the control and experimental groups at the end of the experimental period.

The main objective of this study was to develop and evaluate self-instructional materials called modules for second year high school students of San Beda College. These modules were on measures of averages, measures of variability, areas under a normal curve and correlation.

The study consisted of two phases, the first of which was the development and the evaluation of the prepared modules. On the other hand, the second phase was concerned with determining whether there was a significant difference in the achievement of the subjects, and hence test the effectivity of the modular approach in studying these same topics in Statistics.

For the first phase, four topics in Statistics were selected in agreement and compliance to the Department of Education, Culture and Sports mathematics requirement for second year high school

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level. Of the four topics, the first two topics mentioned earlier were part of the syllabus for the second year high school level while the last two topics were enrichment materials. After choosing these topics, the respective modules were written. All in all, there were four modules prepared. For each module, a readiness test was prepared prior to the module proper to test the student's strengths and weaknesses. Each readiness test was accompanied by a correction key. Through with the readiness test, the concept was written to summarize the pivotal thought of the whole module. Then the desired behavioral objectives were enumerated, each carefully identified in terms of the performance goals to be achieved. This was followed by the writing of the module proper, which included writing the text, explaining the basic concepts, giving examples, asking guide questions and choosing the appropriate learning activities. For the guide questions, an accompanying study guide was included containing all the answers to the questions asked.

For every module, a self-test and a corresponding

correction key were prepared to test the student's comprehension of the lesson just previously discussed. A minimum cut-off score which was not more than three errors was set. Finally, a mastery test with a corresponding correction key was also prepared.

Once through with writing all the four modules, they were tested, out of the five second year high school classes, on one intact class of forty students of San Beda College. Unfamiliar with this new method of instruction, the writer who conducted herself the experiment, explained to the students the rationale, contents and procedures of the module approach. The students then studied all the four modules including taking the different types of test, answering the guide questions and doing the prescribed learning activities.

Having studied and completed the four modules, each of the forty students was given a module evaluation questionnaire to assess the prepared modules in term of organization and presentation, language, readability and writing style, learning aids, test questions and finally, the modules in their entirety. The questionnaire consisted of 20 statements, and a

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scale from one to five was used. For every statement, the weighted average mean was computed.

Simultaneously while the students were studying and evaluating the modules, these modules were likewise given to six mathematics teachers of San Beda College who had been teaching mathematics both in high school and college for the last many years. Module evaluation questionnaires were also given to them to assess the modules in terms of scope and subject matter content, language, writing style, readability. learning aids, test questions and the modules as a whole. Again the questionnaire consisted of twenty statements and a scale from one to five was used. The weighted average mean for each statement was also computed. The results of the teachers' evaluation of the modules served as a test for the content validity of these modules.

With the modules evaluated by both students and teachers, a test on the readability of the modules was done. Two methods were used in this test. They were the use of the Flesch Formula and the Fry Procedure. In both tests, random sample pages were used. For the Flesch Formula, twelve random sample pages were drawn

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and the number of words, number of syllables and the number of sentences within a 100-word limit were counted to find the reading ease score. For the human interest score, the number of personal words and the number of personal sentences were counted also within a 100-word limit. Both the reading ease score and the human interest score were then substituted in the Flesch Formula to determine the readability of the modules.

On the other hand, the Fry Procedure required drawing only three sample pages one near the beginning, middle and end of the modules. The average number of syllables and the average number of sentences with a 100-word limit were computed, and the readability of the modules was gauged using a readability graph.

Having tested the readability of the modules, the reliability of all the mastery tests was tested. For each module, the number of test items, the variance, the proportion of correct answers, the proportion of wrong answers, and the product of the proportions of correct and wrong answers were determined. The values of theses variables were then substituted in the Kuder-

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Richardson 20 Formula and the individual reliability coefficients were computed for.

Based on the students and teachers' evaluations and suggestions plus the results of the mastery tests, the necessary revisions were made.

The second phase in this experiment consisted in determining whether there was a significance difference in the achievement of the subjects, and hence test whether the use of modules could be considered an effective method of instruction. Using the class of forty second year high school students of San Beda College who studied the modules as the experimental group, another intact class of forty second year high school students from the same school was used as the control group. For the control group, the same topics in Statistics were taught but this time using the traditional lecture method.

However, to be able to conduct the experiment, there was a need to statistically determine whether the two groups were significantly different or not in terms of mathematical abilities. To both groups the mathematics aptitude test was given, the results of

which were computed and compared. Having established the fact that the two groups were not significantly different, the experiment was conducted. Simultaneously while the experimental group was taught the four topics in Statistics using the prepared modules, the control group was likewise taught these very same topics using the traditional lecture method. In both classes, it was the researcher herself who conducted the experiment.

With all the topics thoroughly discussed, a summary post-test was given to both groups. However, to use this summary post-test, there was a need to validate it. To validate the summary post-test, another group of forty students from an intact third year high school class of the same school was chosen. These students had taken Statistics a year before when they were in second year high school. The summary post-test consisted of forty statements.

Given the summary post-test to each of these forty third year high school students, the results were checked and the reliability of this summary post-test was determined. In computing for the reliability

coefficient, the Kuder-Richardson 20 Formula was used.

Furthermore, each of the test items had to be item analyzed by finding both the discrimination index and the index for difficulty level. The index for the difficulty level for each item was detrmined by getting the proportion of correct answers. For the discrimination index, there was a need first to get the 27% of the high top group of the class and the 27% of the low bottom group of the class. Twenty-seven per cent of forty students was eleven. Then the proportions of their correct answers were determined (H and L) respectively and their differences (H-L) gave the individual discrimation indices (DI).

After the summary post-test was validated and tested for relaibility, it was given to each of the students from both the experimental group and the control group. The results of the summary post-test from the two groups were compared to determine whether there was a significant difference in the achievement of the two groups.

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Findings

Since this study was two-phased, the discussion of the findings will be in terms of these two parts.

In relation to the assessment of the modules, the following findings were arrived at:

a) Based on the evaluation of the six mathematics teachers in the module evaluation questionnaire, the results gave weighted average ratings of 4.40 for scope and subject matter content, 4.09 for language, writing style and readability, 4.52 for learning aids, 4.67 for the prepared test questions and 4.42 for their evaluation of the modules as a whole. These values ranged from 4.09 to 4.67 and were considered highly favorable in a scale from one to five.

b) Based on the evaluation of the forty second year high school students who studied the prepared modules, the results from the module evaluation questionnaire gave weighted average ratings of 4.02 for organization and

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presentation, 4.01 for language, readability and writing style, 3.96 for learning aids, 3.84 for the prepared test questions and 4.03 for their evaluation of the modules as a whole. These values ranged from 3.84 to 4.03 and were considered favorable in a scale from one to five.

c) Using the Flesch Formula to test the readability of the modules, the reading ease score scale formulated by Flesch showed that the reading ease score, RES, 60.958 was within the standard range and therefore implied that the prepared modules were read by the experimental group in a relaxed stance. The human interest score scale was considered interesting.

d) Using the Fry Procedure to test the readability of the modules, the average number of syllables which was 141 and the average number of sentences which was 5.67 were plotted in a readability graph. Referring to this graph, the "Approximate Grade Level" was

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8 which in terms of the Filipino level was for second year high school level.

e) Based on the reliability coefficients of each of the four mastery tests, the following values were arrived at using the Kuder-Richardson 20 Formula. They were $r_{kr1} = 0.77$, $r_{kr2} = 0.80$, $r_{kr3} = 0.72$ and $r_{kr4} = 0.82$. These values implied a relatively high degree of consistency within the test items and therefore, the mastery tests were considered reliable.

In relation to the assessment of the modules on the achievement of the subjects, the following findings were arrived at:

a) Based on the mathematics aptitude tests given to both the experimental group and control group, the means of the test scores were 38.7 and 40.7 respectively, and the standard deviations of the test scores were 9.11 and 7.32 respectively. Using a 5% significance level and comparing the two means using the z-test, z = -0.758. This z-value was found

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within the acceptance region. Thus, the null hypothesis stating that no significant difference existed between the two groups in terms of mathematical aptitudes was not rejected.

b) Based on the summary post-test given to both the experimental group and the control group, the means of the test scores were 28.13 and 24.12 respectively, and the standard deviations of the test scores were 8.92 and 8.34 respectively. Using a 5% significance level and comparing the two means using the z-test, z = 2.077. This z-value was found outside the acceptance region. Thus the null hypothesis stating that no significant difference existed in the achievement of the subjects was rejected.

c) Based on the validation of the summary post-test where each test item was analyzed, both the individual discrimination indices and indices for difficulty level per item were determined. For the discrimination indices,

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the values ranged from 0.46 to 0.18. About four values were lower than 0.20. Otherwise out of the forty items, thirty-six of them were quite satisfactory. For the indices for difficulty level, the values ranged from 0.80 to 0.18. In short, the levels of difficulty ranged from easy, desirable to difficult, and so the recommended action was to retain all.

d) Based on the relaibility of the summary post-test where the Kuder-Richardson 20 Formula was used, the reliability coefficient was r_{kr} 0.662.

Other Findings are as follows:

a) At first, the students were wary about the modular approach since it was something novel. However, as they studied the other modules, they became more relaxed and at eased with these modules.

b) Not all topics lent easily to the modular approach like the modules on areas under a normal curve.

c) The students felt a sense of responsibility in studying the modules since they realized that they were now on their own. Absences were minimized, not wanting to be left behind.

d) The students learned to read and study on their own. In fact, some went to the library for added references.

e) The organization and presentation of the lesson was clear, logical and relevant.

f) The concepts were accurately defined and clearly discussed.

g) There was active student involvement in all the learning activities.

h) The behavioral objectives were compatible to the questions in the mastery tests.

CONCLUSIONS

The findings of this study led me to make the following conclusions:

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1. In assessing the modules, the results of all the evaluations done conclude that

1.1 The prepared modules possess a highly favorable degree of content validity

1.2 The prepared modules are readable.

1.3 The mastery tests are reliable.

2. In assessing the modules on the achievement of the students, there is a significant difference in the achievement of the students belonging to both the experimental group and control group. In other words, the use of the modular approach is more effective than the traditional lecture method.

Hence, we can conclude that the prepared modules in this study are valid, readable and effective for second year high school students of San Beda College.

Recommendations

The observations and findings of the study led the researcher to give the following recommendations:

1. Further modules in Statistics may be prepared

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only on topics that lend easily to the modular approach.

2. Further modules in Statistics may be developed in the tertiary and even graduate level.

3. Further study may be made on student retention of concepts and skills learned through the use of modules.

4. The summary post-test may be further validated.

5. Other methods of measuring the readability of a module may be introduced.

6. A standardized statistic achievement test may be developed for future instrument validity comparisons.

7. A study on the rate of learning of the students may be made.

8. In order to ascertain the effect of time schedules, a similar study can be made using different time schedules.