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**DEVELOPMENT AND VALIDATION OF AN
ACHIEVEMENT TEST IN STATISTICS
FOR COLLEGE STUDENTS**

A Dissertation
Presented to the Faculty
Of the Graduate School
Bicol University
Legazpi City

In Partial Fulfillment
Of the Requirements for the Degree
Doctor of Philosophy in Mathematics Education

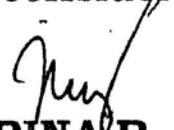
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April 2003

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RECOMMENDATION FOR ORAL DEFENSE

This dissertation hereto attached entitled **Development and Validation of an Achievement Test in Statistics for College Students** prepared and submitted by **Myrna A. Santelices**, in partial fulfillment of the requirements for the degree **Doctor of Philosophy**, is hereby submitted to the dissertation committee for consideration.


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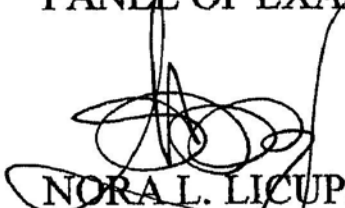
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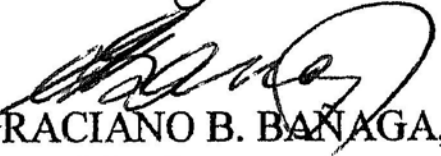
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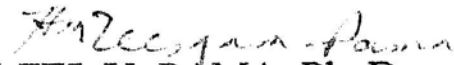
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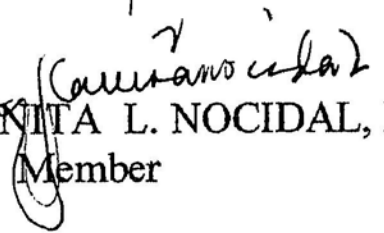
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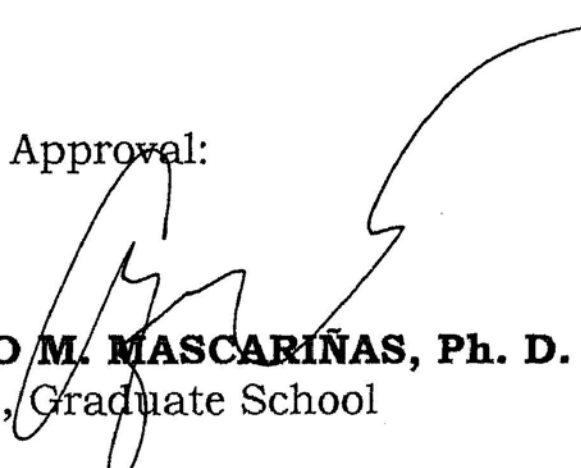
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APPROVAL SHEET

Upon the recommendation of the Oral Examination Committee, this dissertation entitled "DEVELOPMENT AND VALIDATION OF AN ACHIEVEMENT TEST IN STATISTICS FOR COLLEGE STUDENTS", is hereby approved in partial fulfillment of the requirements for the degree, Doctor of Philosophy major in Mathematics Education

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ACKNOWLEDGEMENT

The researcher expresses her great appreciation and heartfelt gratitude to the following who without hesitation extended their hands, personal resources, expertise and prayers to realize the fruit of this study:

Dr. Adolfo S. Bagadiong, President, Catanduanes State Colleges for giving the permission to collect the needed data;

Dr. Rafael D. Doma, Dean, Bicol University Graduate School for facilitating all papers necessary in the conduct of the study;

Dr. Nora L. Licup, Dr. Hazel B. Vergara, Dr. Graciano B. Bañaga, Dr. Leonila Barbacena and Dr. Elenita Nocidal, members of the dissertation committee for sharing their expertise and comments which contributed a lot in the development of the study;

Dr. Norina R. Sy, the researcher's adviser, for giving her valuable time and immeasurable assistance which gave the researcher the eagerness to pursue this study;

Dr. Hermelita Antivola for her unselfish support and encouragement when the research was in rough sailing;

Dr. Asuncion V. Asetre, Professor Carmen C. Francisco and Engr. Emmanuel Bernal for their constructive criticisms which contributed a lot to the development of the achievement test;

Department Chairmen of the Catanduanes State College for giving the researcher a wholehearted support and cooperation in data gathering;

Faculty members for sharing their time and patience as they accomplish the questionnaire and to the student respondents who willingly answered the achievement test;

Colleagues for being very supportive;

For those who assisted me throughout the research work but have been forgotten to mention here, more so my profound thanks;

Her beloved husband and sons, daughter-in-laws and grandchildren serving as her ultimate inspiration; and

To the Almighty GOD who gave her strength, knowledge and guidance throughout the course of the study.

M. A. S.

ABSTRACT

TITLE	DEVELOPMENT AND VALIDATION OF AN ACHIEVEMENT TEST IN STATISTICS FOR COLLEGE STUDENTS
AUTHOR	SANTELICES, MYRNA A.
TYPE OF DOCUMENT	Unpublished Doctoral Dissertation

Summary

This descriptive-correlational study aimed to develop and validate an achievement test for college students at the Catanduanes State Colleges, during the school year 2000-2001. Specifically, it sought answers to the following sub-problems:

1. What are the characteristics of the achievement test developed?
2. What topics and test items do the students find easy? difficult?
3. How do the students compare in the achievement test in Statistics across colleges?
4. Which of the following student variables significantly correlate with achievement test in Statistics, in terms of:
 - a. Attitude towards Statistics

b. English proficiency

5. What are the characteristics of the teachers in Statistics?

Theories of Piaget on cognitive development, Kohler on insight and understanding, Lewin on internal and external forces, Bruner on learning process, Fehr on learning mathematics and Hammond on evaluation were pooled together in order to advance the theory of this study which states that "Learning in Statistics can be evaluated in terms of subject content and cognitive skills and it is influenced by some variables".

The instruments used were Achievement Test, Attitude Towards Statistics Questionnaire and Questionnaire for Teachers.

The study tested the following hypotheses: 1) There is a significant difference in the level of achievement of students across colleges, and 2) There is a significant relationship between student variables and the achievement test in statistics for college students.

The respondents were the faculty members teaching Statistics, freshmen and sophomore college students.

Findings

1. Characteristics of the Test

Results of an item analysis in achievement test in Statistics revealed that the test has content validity, easy to administer and score. The reliability coefficient of 0.63 showed the test is highly reliable.

2. Topics / Test Items Found Easy and Difficult.

Four topics found easy were Introduction, Measures of Central Tendency, Contingency Tables and Analysis of Variance. Eight topics found difficult were: Collection of Data, Presentation of Data, Measures of Variation, Permutation and Combination, Simple Correlation, Tests for Goodness of Fit, Probability and Hypothesis Testing.

Two test items taken on the topic Contingency Tables were found easiest whereas ten test items were found difficult by the students.

3. Comparison of Students Achievement Test Across Colleges.

The computed F-value equals 3.9954 was greater than the tabular value of 2.65 at 0.05 level of significance. This means that there is a significant difference in the achievement test in Statistics of

students across colleges. The Tukey test of difference revealed that the students from the College of Nursing and School of Midwifery and the College of Agriculture and Fisheries had a significantly higher achievement test result than those students from the College of Industrial Technology.

4. Correlation Between Student Variables and Achievement Tests.

The computed grand mean of 2.14 indicated that the students had a neutral attitude towards Statistics. In English proficiency, 61 percent of the students got a rating ranging from 2.1-2.5 described to be in the satisfactory level. A significant relationship existed between attitude towards Statistics. ($t = 6.3560$; $r = 0.4303$) and English proficiency ($t = 4.9758$; $r = 0.3493$) and achievement test.

5. Characteristics of Faculty Members

Majority of the faculty members are holders of Bachelor of Science in Education (BSE) and all are occupying permanent positions. Some teachers have been teaching Statistics from 8 to 15 years, while others for 1, 2, and 3 years. Some have attended seminars or workshops for several times while others have not been given a chance.

Conclusions

The following conclusions were drawn from the foregoing findings:

1. The test was valid and reliable, easy to administer and score.
2. Four (4) topics found easy were: Introduction, Measures of Central Tendency, Contingency Tables and Analysis of Variance.

Eight (8) topics found difficult were: Collection of Data, Presentation of Data, Measures of Variation, Permutation and Combination, Simple Correlation, Tests for Goodness of Fit, Probability and Hypothesis Testing. An overall index of difficulty = 0.49 indicated that the topics were difficult for college students.

Two test items and ten test items were found easiest and difficult by the students, respectively.

3. In terms of achievement test in Statistics, it showed that the students from the Colleges of Agriculture and Fisheries and Nursing and School of Midwifery were significantly better than those from the College of Industrial Technology.

4. Attitude towards Statistics and English proficiency are significantly related to the achievement of students in Statistics.

5. A typical professor in Statistics has not earned any degree in Statistics, has taught the subject for an average of 10 years, permanent in status and has attended few seminars in Statistics.

Recommendations

Based from the conclusions the following recommendations are herein presented:

1. The achievement test may be useful in several ways:
 - a. The test may be used as a final examination in Statistics for college students.
 - b. The predictive validity of the test may be established.
 - c. The test may be standardized using appropriate methods.
2. There is a need for students to develop better understanding especially for difficult topics in Statistics by introducing innovative teaching strategies and by creating instructional materials.
3. The teacher having two groups of students, the low achievers and high achievers must on decide on the content and selecting cognitive processes and skills appropriate for both groups. Students repertoires of skills and strategies can be modified substantially, by effective instructional conditions and methods. This is true not only

for high achieving and older students but also for low achievers and younger students.

4. Aside from correlating achievement test and student variables considered in this study, other criteria can be explored such as awards received in contests in Statistics, membership or hold positions in organization relevant in Statistics and success on the job or placement in related scientific fields and others.

5. Characteristics of the faculty members teaching Statistics need further improvement for effective teaching delivery. If a new faculty member is being hired or assigned to teach Statistics subjects proper screening procedures should be followed to ensure competency and efficiency in teaching.

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