A STUDY TO DETERMINE THE EFFECTS OF COURSE LENGTH ON THE ACHIEVEMENT OF COLLEGE ACCOUNTING STUDENTS AT CAMERON UNIVERSITY

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PREFACE

The purpose of this study was to contribute some research evidence to show the effects of class length on the achievement of college students enrolled in principles of accounting at Cameron University.

My sincere appreciation is extended to Dr. Dennis L. Mott, who served as my graduate committee chairman. His interest, encouragement, and prompt and knowledgeable guidance were very helpful to me. Gratitude is also extended to the other members of my graduate committee: Dr. William B. Adrian, Dr. Hal W. Ellis, and Dr. Herbert Jelley. I also wish to thank Dr. Jimmy G. Koeninger for his cooperation during the proposal state of this study.

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CHAPTER I

INTRODUCTION

Like many other colleges and universities throughout the country, Cameron University has experienced considerable growth during the past decade. The institution has seen continuous change in its curriculum as it developed from a junior college to a four year college.

Today, there are still decisions to be made concerning the future of the higher education curriculum at Cameron University. A college or university that does not change its curriculum to meet the changing demands of today's world and today's students will soon stagnate or find itself replaced by an institution that does fulfill the changing demands. There are historical precedents for this. A prime example occurred in the first half of the nineteenth century. The private liberal arts colleges of that time refused to significantly alter or update their courses in order to allow for a more practical or vocationally oriented curriculum. The result was the rise of the technical institute and state supported universities which soon were larger than the private liberal arts colleges.

Background of the Problem

A curriculum change made at Cameron University during the late 1960's was a reduction in the length of the night school courses in accounting from the traditional 16 weeks of study to an eight-week

duration. The 16-week classes normally met for two hours and 40 minutes once a week. The revised eight-week courses meet twice a week for the same length of time as the previously mentioned 16-week classes. The total number of hours spent in the classroom by the student has remained constant under the new program.

This revision of the departmental policy was made in response to the demand by night students for shorter length of evening course design. A portion of the student body felt that the traditional evening program of 16 weeks was too long a duration for courses designed to serve a mobile society subject to transfer by employers on very short notice.

Need for the Study

In today's rapidly changing world, there is a need for some systematic method of determing the important areas of the curriculum and the revisions that need to be made in these areas. It is also important for an educational institution to be able to readily determine its strengths and weaknesses so that it may attempt to correct them.

Currently, the department of business at Cameron University has no systematic method for revising its curriculum. Revisions may be made impulsively, as a result of someone's looking at changes that other colleges have made and implemented. The final outcome of revision to the important areas of the curriculum cannot be measured without documented research. Arthur W. Chickering, a respected authority in the area of higher education, has addressed himself to this problem with the following statement:

> Innovation, experimentation, and research designed specifically to test and to study some of the general propositions is needed if curriculum procedures are to become more effective and if

educational policies and practices are to derive less from myth and more from evidence and concrete experience.[1]

Purpose of the Study

The purpose of the study was to provide research evidence to either support or deny the hypothesis that the study of accounting for a period of 16 weeks results in the same achievement in accounting as a similar course of study for an eight-week duration. This research will aid instructors and administrators of accounting programs in determining the affects of course length in instructional design on student achievement. The study should also aid counselors in the area of student advisement in course selection.

The Statement of the Problem

In general, the problem was to determine if there are significant differences in achievement between principles of Accounting II students of three distinct levels of intelligence who study a course for eight weeks as compared to a similar group of students who study a course for a 16-week duration.

Specifically, the problem was to procure answers to the following questions:

1. Is there a significant difference in accounting achievement between all students in the experimental group (students who are enrolled in an eight-week course) and all students in the control group (students who are enrolled in a 16-week course)?

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[1]Arthur W. Chickering, Education and Identity (San Francisco, 1969), p. 219.

2. Is there a significant difference in accounting achievement among the three ACT score groups of all students combined (both experimental and control)?
3. Is there significant interaction of accounting achievement between student membership in both independent variable groups? (Basically, interaction tests whether one method of course length is uniformly superior or inferior regardless of which ACT level of student is assigned to the course.)
4. Is there a significant difference in accounting achievement between the low ACT score experimental group and the low ACT score control group?
5. Is there a significant difference in accounting achievement between the medium ACT score experimental group and the medium ACT score control group?
6. Is there a significant difference in accounting achievement between the high ACT score experimental group and the high ACT score control group?

Limitations of the Study

This study was limited to all of the Accounting II classes taught at Cameron University during the fall semester of 1979. Any inferences drawn from this study were, therefore, limited to the population and are applicable only to the particular school in question.

Due to the time of the offerings and the prearranged schedules of classes at Cameron University, it was impossible for the accounting instructors and the administrator of the business program to cater completely to the desires of this investigator regarding the manipulation

of students and instructors for research purposes. Therefore, it was necessary to deal with "intact" student groups for the purpose of this study. The random assignment of students and instructors to the experimental and control groups was unattainable. An ex post facto research design was used to compare the levels of aptitude identified and explained in Chapter III.

Other uncontrolled personal variables might include the amount of study time each person had, the number of semester credit hours in which each was enrolled, their previous exposure to bookkeeping and/or accounting. Additional uncontrolled variables are the time of day of the class, length of the class period and the number of times each class meets per week and the number of students enrolled in each class section.

Assumptions

The study includes the following basic assumptions:

1. The students ability as measured by the ACT math scores is homogeneous and normally distributed between the experimental and control groups in this study.
2. The desire of individual students to enroll in a specific section was not influenced by previous knowledge of the instructor of the class. (The instructors' names were omitted and substituted with the notation staff on the fall schedule of Accounting II classes.)
3. The scores attained by the students on the American College Test reflect the level of ability of the students for the purpose of this study.

Terminology

ACT Score: the score earned by entering freshmen on the American College Testing Program battery of tests. Students transferring to Cameron University from other institutions and some older students did not have these scores on file at Cameron University.

Achievement: the gain in accounting knowledge in the Principles of Accounting II class which was defined as the difference between the pre-test and the posttest scores as measured by the American Institute of Certified Public Accountants Achievement Test, Level I.

High ACT Score Group: the students whose math ACT scores are rated as 22 or higher.

Medium ACT Score Group: the students whose math ACT scores are rated between 17 and 21, inclusively.

Low ACT Score Group: the students whose math ACT scores are rated as 16 or below.

Control Group: the Principles of Accounting II classes which were scheduled for a duration of 16 weeks.

Experimental Group: the Principles of Accounting II classes which were scheduled for a duration of eight weeks.

Principles of Accounting II: defined by the Cameron University Catalog 1978-1979, on page 149 as "Continuation of theory presented in Principles of Accounting I, with special emphasis on partnerships, corporations, bonds, sinking funds, reserve depreciation and problems of valuation."

Research Design

The investigator utilized all of the Principles of Accounting II

classes offered at Cameron University during the fall of 1979 to conduct the research. The classes were taught by various instructors assigned to each class without students having prior knowledge of which instructor was teaching a specific class. The notation staff was substituted for each Principles of Accounting II instructors' name that would normally appear on the student's enrollment schedule for the fall of 1979 listing of courses being offered at Cameron University. Student variables are assumed to be normally distributed through the process of allowing students to enroll in the class of their choice without the knowledge that an experiment was being conducted or who was instructing the class being offered.

Data Collection

All of the accounting students in both the experimental and control groups were administered a pretest during the first week of the semester. The pretest is the achievement test developed by the American Institute of Certified Public Accountants. The test covers elementary financial accounting concepts as well as managerial accounting topics such as elementary systems and cost analysis. The AICPA Achievement Examination, Level I, Form E-S, is an examination specifically designed to measure student knowledge of accounting principles when administered at the completion of the second course in accounting principles. The examination contains 45 multiple-choice questions and is structured for a 50-minute time limit. The test is divided into four parts. Part I is composed of 22 questions emphasizing vocabulary and financial accounting concepts. Part II is composed of nine questions emphasizing elementary cost accounting and system concepts. Part III contains six questions that pertain to

cost-volume-profit relationship. Part IV consists of eight questions emphasizing account classifications. The same test was given to the students in the experimental and control groups at the end of the semester as a posttest. The difference in scores for each student between the pre- and the posttest was considered to be the gain in achievement in accounting which resulted from the student's participation in their course of study.

Statisticial Analysis

For purposes of analysis, both the control and experimental groups were further divided into three sub-groups based on the American College Test Scores. A determination of the three divisions within each group was made on the basis of the students' composite score provided by the ACT records in the admissions office at Cameron University. The three divisions were established after consulting information published by the American College Testing Program.[2] The high ACT score range was defined as all scores of 22 and above. Medium ACT scores ranged between 17 and 21 inclusively, and the low ACT score range was limited to scores below 17. The analysis of covariance was applied to determine if there was a significant difference in achievement among the several classifications of students. The covariates (control variables) were the scores attained on the first administration of the AICPA Achievement Examination, Level I, Form E-S, and the ACT math scores. These control factors were shown to be effective covariates by previous research studies. Popham indicates that many situations in educational research require

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[2]American College Testing Program, College Student Profile Norms for the ACT Assessment (Iowa City, Iowa, 1966), p. 161.

the use of intact student groups.[3] He further indicates that analysis of covariance can be employed as the statistical tool to equate those groups with respect to possible confounding relevant variables.

> This technique allows the researcher to statistically equate independent variables groups with respect to one or more variables which are relevant to the dependent variable.[4]

Kerlinger further describes the statistic when he says:

> Analysis of covariance is a form of analysis of variance that tests the significance of the differences between means of final experimental data by taking into account and adjusting initial differences in the data. That is, the analysis of covariance analyzes the differences between experimental groups on Y after taking into account either initial differences in the Y measures or differences in some pertinent independent variable.[5]

If significant differences were found where three or more groups had been compared through the use of the analysis of covariance, Duncan's multiple-range test was applied to determine which of the groups differ significantly.[6]

The dependent variable in this instance was student achievement as measured by the American Institute of Certified Public Accountants Achievement Test, Level I. The two independent variables were: (1) the length of the accounting class enrolled, and (2) the student's ability level as measured by the American College Test.

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[3]W. James Popham, Educational Statistics: Use and Interpretation (New York, 1967), p. 221.

[4]Ibid.

[5]Fred N. Kerlinger, Foundations of Behavioral Research (New York, 1964), p. 360.

[6]Robert G. D. Steel and James H. Torrie, Principles and Procedures of Statistics (New York, 1960), p. 107.

CHAPTER II

REVIEW OF THE LITERATURE

The literature review of this study was conducted within the following areas of considerations: (1) factors of time and its affect on the learning process, and (2) methods of predicting the success of accounting students. The literature was first reviewed with the above categories searched only in the area of accounting. When sufficient data was not found related to accounting studies, other areas of research were referenced for studies developed outside the area of accounting.

Factors of Time and the Learning Process

Factors of time and its affect on the learning process was reviewed both within and outside the field of accounting. Although some of the authors in accounting did not directly deal with the time factor in the reviewed research, this element was derived from some studies as a noticeable part of the research results. Singer devised a study to measure the achievement of accounting students based on individual differences and the time necessary to attain a stated educational objective.[1]

The students involved in the study were mostly sophomores at the University of Massachusetts. The students were enrolled for the first

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[1]Frank A. Singer, "A Primitive Individualization of Time and Method in a Beginning Accounting Course," Paper presented at the Annual Meeting of the National Society for Performance and Instruction (Miami Beach, Florida, April, 1974).

course in accounting. Students were selected for the experiment by computer. There were 60 students so-assigned that participated in the study. Three adjacent rooms were regularly available for the use of instructors and students involved in the experiment. On each day of class the investigator posted a notice of the activity planned for each of the three rooms. One room was always scheduled for a conventional lecture-discussion activity in which students could ask questions, check their success with homework problem assignments and/or witness a demonstration or review. The other two rooms were used for the taking of progress quizzes and/or for consultation with the instructors or simply for study with such help as the student requested.

All students were provided with two types of assignment sheets; one relating to the textbook, and one relating to the teacher-authored programmed materials. All students were advised to assess their study efforts by taking the self-quizzes at the end of the programmed lessons. Both solutions and suggested mastery criteria were provided for this formative evaluation. A student who did not achieve mastery on the self-quiz was advised to review or to study the alternative assignment material.

The two sets of assignments were not mutually exclusive. On occasion, when a portion of the programmed lesson was judged to have no textbook counterpart, it was assigned along with the text. Students were advised that if they could succeed on the basis of the textbook presentation they would probably save time. The commitment was not, of course, exclusively to either set of assignments. If a student did not achieve a level of mastery learning on a unit of study, they could drop back and assume a slower pace of progress.

The results of the experimental group on the final exam was compared with student achievement in regular accounting classes. Testing the hypothesis that the scores of the experimental group were not significantly different from those earned by regular accounting students, using the analysis of variance the author obtained an F of 19.2 which far exceeded the F of 11.0 which indicated that a result would occur by chance once-in-a-thousand times. The author rejected the null hypothesis.

The author also performed a treatment-interaction analysis, using g.p.a. as the independent variable. A regression line was computed relating test scores to g.p.a. for the experimental group and the control group. When graphed, these lines were very nearly parallel. Students of comparable aptitude, as roughly measured by g.p.a., tended to have uniformly higher scores in the experimental group. The conclusions of this study as stated by the author are,

> . . . that an academic year is a minimum time over which to permit students to spread a study effort to achieve competence. The measurements taken in the experiment here reported do indicate that providing more time does increase the number of students who achieve a worthwhile level of mastery.[2]

An earlier study by House found that there was no significant relationship between the amount of time spent in home study and the test scores secured in bookkeeping.[3] Twenty-two students were interviewed in depth and were asked to keep daily records of the time spent completing the homework was determined to be as follows: 75 to 100 percentile

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[2]Ibid, p. 14

[3]Forrest Wayne House, "Factors Affecting Student Achievement in Beginning Bookkeeping in the High School" (unpub. doctoral dissertation, Ohio State University, 1951).

range, 47 minutes; 50 to 75 percentile range, 43 minutes; 25 to 50 percentile range, 48 minutes; and 1 to 25 percentile range, 56 minutes. The poorer students spent more time successfully completing the homework assignments than did the better students. In a later article, House concluded from these and other related findings that "the time required for the satisfactory completion of assignments affects to a great extent your students' achievement in bookkeeping."[4]

A much earlier statement by Douglas criticized the amount of time utilized for the presentation of bookkeeping as a vocational training course. Douglas stated:

> As a vocational training course, however, elementary bookkeeping is a failure. Vocational objectives are not justifiable for the vast majority of bookkeeping students who study the typical one-year course offered in most of our high schools. This course in elementary bookkeeping should be a "try out" course offered for possible future vocational specialization. With the possible elimination of laboratory sets and problems designed to develop actual recording technique, the desired objectives could be attained in a one-semester course.[5]

During this same time period Colvin advocated a one-year course in bookkeeping.[6] He further stated that those interested in bookkeeping and accounting as a field of specialization would take the course in vocational bookkeeping in the twelfth year.

Nanassy states that evening work for students not interested in completing a high school program of training should be organized into

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[4]Forrest Wayne House, "Length of Assignments as it Relates to Success in Bookkeeping," Business Education Forum, XX, No. 6 (March, 1966), p. 21.

[5]Lloyd V. Douglas, "A One-Semester Course in Nonvocational Bookkeeping," Business Education World, XVIII, No. 5 (January, 1938), p. 41.

[6]A. O. Colvin, "A One-Year Course in Bookkeeping," Business Education World, XVIII, No. 5 (April, 1938), p. 39.

short unit courses given once, twice, or three times a week for a period of not more than eight weeks.[7] Longer courses might be organized for the few who desire them.

Bloom developed a study using an analysis of standardized test norms at the elementary school level to test the effect of time on mastery learning.[8] The results of this experiment revealed that a criterion level of achievement attained by the highest 20 percent of the students on a given standardized test was attained by about 50 percent of the students a year later, and by about 80 percent of the students two years later. That is, four-fifths of the students eventually reached a criterion of achievement that one-fifth of the students attained two years earlier.

A study originated by Carroll illustrates a model for school learning.[9] The basic thesis is that time is a central variable in school learning and that students differ in the amount of time they need to learn a given unit of learning set to some criterion. Carroll defined aptitude as the amount of time needed by a student to reach the criterion, and he stated that the amount of time needed by each student could be predicted by an appropriate aptitude test. He contended that if the student were given the amount of time necessary to grasp the learning task, he would reach the criterion level of achievement.

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[7]Louis C. Nanassy, Dean R. Malsbary, and Herbert A. Tonne, Principles and Trends in Business Education (Indianapolis, Indiana, 1977), p. 127.

[8]B. S. Bloom, "Recent Development in Mastery Learning," Educational Psychologist, X (1973), pp. 204-221.

[9]J. B. Carroll, "A Model of School Learning," Teachers College Record, LXIV (1963), pp. 723-233.

Carroll further stated,

> . . . the quality of instruction and the student's ability to understand the instruction would, when both were optimal, make the time needed minimal for each student. If these conditions were less than optimal, the amount of time needed would be increased for each student.[10]

In setting time as the central variable in school learning, Bloom[11] refers to producing a major shift in the thinking about education and educational research. Within this concept, teachers and curriculum makers must define an appropriate criterion for learning. If time is the central variable and the necessary time is provided, then the attainment of the criterion is possible for all students who can be movtivated to use the time they need.

In an earlier statement, Tonne comments,

> . . . no valid studies have been made, and indeed, it is difficult to see how such studies could be organized to determine, for example, how much time is needed for instruction in junior business training. There is no doubt that some teachers tend to spend an undue amount of time upon the teaching of given body of subject matter without fruitful results. On the other hand, many teachers tend to cover subject matter so rapidly that students do not really learn.[12]

Several studies have been carried out to gain knowledge of student attitudes toward the amount of time necessary to complete accounting assignments. House concluded that the time required for the satisfactory completion of assignments affects to a great extent the students' achievements in bookkeeping.[13] In general, the poorer student spends more time

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[10]Ibid., p. 726.

[11]Ibid., p. 686.

[12]Herbert A. Tonne, Principles of Business Education (New York, 1947), pp. 249-250.

[13]Ibid., p. 26.

on assignments than what they think is reasonable. House further concluded that it is highly probable that the assignments by accounting instructors are too long. A later study by Amyx was developed to test the attitude of students toward the length of accounting homework assignments.[14] As a result of the study, Amyx concluded that since homework problems in the study were of contrasting lengths but covered the same concepts, that the coverage of concepts in homework problems is of more importance than the length of each individual problem. He further recommended that authors of accounting textbooks should include problems of varying lengths, and should insure that both the longer and shorter problems include all the important concepts, to allow instructors to choose the length of problem which complements their teaching methods.

In an earlier article House reported that many students do not or cannot find time to finish their homework in bookkeeping.[15] The learners were asked whether they actually spent enough time on their assignments to complete them satisfactorily. Most of the students in the top fourth indicated yes, they did spend the time required by the assignemtns. The ratio of "yes" answers diminishes rapidly, while that of "no" answers increases--which is especially interesting in view of the fact that the students at the bottom actually spent much more time on their homework than did the top fourth students.

Altogether, nearly a fifth of the students--some in each fourth, but proportionately more in the lower quarters--reported that they did not,

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[14] Jack Fred Amyx, "An Experiment to Determine the Effects of the Length of Homework Problems on the Achievement and Attitudes of College Accounting Students" (unpub. doctoral dissertation, Oklahoma State University, 1973).

[15] Ibid.

or could not, give their assignments enough time to do them adequately.

Mertes conducted a study at Chabot College, a community college located in Hayward, California, to identify the attitudes and performances of junior college students during the period of transition from a semester to a quarter system.[16]

The population tested consisted of 233 continuing, sophomore, full-time day students, 173 enrolled in the transfer program and 60 enrolled in the two-year program. All students had completed two years of higher education at Chabot College, one year under the semester system followed by one year under the quarter system.

Student attitudes were determined by a questionnaire that was administered to all students participating in the study. From this total population of students, a random sample participated in individual interview sessions.

Grade point averages were used to determine the changes in the academic performance of the students during the period of transition from the semester to the quarter system. Although it was expected that the transfer and the two-year students would differ in their responses to the questionnaire, they appeared to be not independent in their choices; transfer students and two year students see this transition from a semester to a quarter system essentially in the same way.

Both groups stated that they prefer the quarter system to the semester system in a proportion of two to one. However, this student preference is highly qualified, and a recognition of these qualifications is

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[16]Barbara Fracisco Mertes, "Attitudes and Performances of Junior College Students During the Transition from a Semester to a Quarter System" (unpub. doctoral dissertation, University of California, Berkeley, 1968).

necessary if an accurate understanding of the student attitudes is to be achieved. In summary, these qualifications are as follows:

1. Students were not especially concerned with the terms quarter or semester, but viewed these terms as abstractions that had little meaning for them. Students were concerned with the specific experiences that they would encounter under one or the other system.
2. There is nearly a unanimous feeling among students that the quarter system places them in an environment that involves considerable pressure accompanied by a feeling of being rushed and hurried in comparison to their experiences under the semester system. Students emphasized repeatedly that every attempt should be made to reduce the number of courses a student takes under the quarter system and thus permit an opportunity to perform indepth exploration and study in each course.
3. A significant number of students reported that under the quarter system, as compared with the semester system, the following problems are more prevalent for the student: (1) less time for adequate use of the library, (2) less faculty contact, (3) increased problems with registration procedures, (4) increased difficulty in arranging counseling appointments, and (5) a decreasing opportunity to take elective courses.
4. Students pointed out that in their view that academically oriented transfer student succeeds better under the quarter system, while the poorer academic student and the student in the two-year pre-occupational program appear to have more problems with success under the quarter system.

These student qualifications of their preference for the quarter system can be categorized essentially in two ways; one, that many of the problems experienced by students under the quarter system are directly related to the fact that they are taking too many courses, in most cases--five courses, in the given period of time; and, two, that many of the problems for the student are related to administrative procedures, that to the student, seem better adapted to the semester system than they do to the quarter system.

The data on performance indicate that the student over-all grade point average rose from 2.44 earned under the semester to 2.56 earned under the quarter system. Whether this increase is related in a meaningful way to student learning was not determined by this study.

Mangham, in a similar study of junior college students, recommended that, "the fearful concern among some educators that low ability junior college students will not fare as well under the quarter system as they will under the semester system is unwarranted."[17] The evidence from the results of this study is that low ability students can perform as well or better under the quarter system as they can under the semester system.

The Mangham study was made of the relationship between student academic ability and student performance under the quarter and semester systems at Merritt College, a junior college in Oakland, California. Three hypotheses were tested:

1. As a group, high ability students will show better academic

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[17]Clarence Walter Mangham, "A Study of the Relationship between Student Academic Ability and Student Performance under the Quarter and Semester Systems in a Junior College" (unpub. doctoral dissertation, University of California, Berkeley, 1970).

performance under the quarter system than they showed under the semester system.

2. As a group, high ability students will show better academic performance under the quarter system than they showed under the semester system.
3. As a group, high ability students will show greater persistence and fewer withdrawals than the group of low ability students will show over the same attendance periods.

To test the hypotheses, an investigation was made of the attitudes and the performance patterns of the same high ability students and the same low ability students who had attended college under both the semester system and quarter system. By selecting a junior college which had recently made the change from the semester to the quarter system, it was possible to investigate the performances of the two groups under both systems while attending the same institutions.

Students scoring at the 80th percentile or above on the School and College Ability Test were placed in the high ability group and those scoring at the 9th percentile or below were placed in the low ability group. There were 254 high ability students and 291 low ability students used in the study.

As a means of ascertaining the students' feelings about the semester and quarter systems as these systems related to their academic performances, structured telephone interviews were held with a 20 percent random sample of those persons who had attended Merritt for at least one semester and at least two quarters. To determine the students' performance and attendance patterns, an investigation was made of their grade point averages, persistence patterns and withdrawal rates.

Prior to the study of the attitudes and performances of high ability and low ability students, an exploratory study was made of the attitudes and performances of the general student population and of the attitudes of instructors, department chairmen, counselors and administrators. The purpose of the exploratory study was to obtain information which would be valuable in interpreting the results of the study of high ability and low ability students.

Each of the three hypotheses which were tested in this study was rejected. The study revealed that neither the high ability group nor the low ability group showed a significant difference in its academic performance under the semester and quarter systems. In addition the study revealed that the persistence patterns and withdrawal rates of both groups were essentially the same.

Although there was no evidence that either high ability or low ability students learned more under the quarter system than they learned under the semester system, there was evidence that the majority of students in each group preferred the quarter system. It appears that they favored the quarter system because they like the increased pace and greater pressure which they experienced under this system. Apparently, it seemed less drawn out and less boring.

Methods of Predicting the Success of Accounting Students

Numerous studies have been conducted in the field of education trying to find positive predictors to be utilized by instructors and counselors to forecast the success of college students in the area of academic achievement. Positive correlation has been developed using

group norms on standardized tests. The most widely used test for predicting the success of college freshmen are the ACT, American College Testing, and SAT, Scholastic Aptitude Test. When investigators try to forecast individual success in a single course, the probability of successful prediction appears to diminish from the group norms. This literature review revealed several studies designed to measure and predict the success of college students in accounting.

Amyx utilized ACT composite scores as one independent variable in an attempt to measure achievement and attitudes of students in accounting.[18] This experiment was designed to correlate three levels of ACT scores and the independent variables of short versus long homework problems in the study of accounting. The findings by Amyx indicated no significant difference existed in accounting achievement between all students who were assigned short homework problems and all students who were assigned long homework problems. Amyx concluded that since the length of accounting problems is not significant, the instructors should not choose problems for assignments based only on their length, but should use some other criteria, such as the concepts covered. He furthur found that a significant difference in accounting achievement existed among the three ACT score groups. In addition, Amyx recommended that a similar experiment should be conducted using subjects grouped by means other than ACT composite level scores.

A study by Swink further suggests that standardized tests can be used to predict the success of beginning accounting students.[19] One

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[18] Ibid.

[19] Hugh Steve Swink, "Success Correlates in First-Quarter Accounting" (unpub. doctoral dissertation, Georgia State University, 1972).

purpose of this study was to determine the relationship of selected factors to the successful completion of first-quarter accounting classes at Georgia State University represented the sample in the study. To determine the relationship between first-quarter accounting and 11 factors, simple and intercorrelation coefficients were computed. Chi-square was used to test the significance of the relationship between grades in accounting and two discrete variables, remedial math and reading. Multiple stepwise regression was applied to determine the regression coefficients necessary to project accounting grades. Projection tables were then constructed using these coefficients.

Swink's findings indicate that factors which reflect mathematical ability correlate higher with grades earned in accounting than does any type of factor. In addition, the use of any one variable does not differentiate between successful and unsuccessful performance in first-quarter accounting. By using seven variables, approximately 15.9 percent of all accounting can be predicted with perfect accuracy, 40.0 percent within $\pm$ .5 grade points, 66.9 percent within $\pm$ 1.0 grade points, 85.5 percent within $\pm$ 1.5 grade points, and 92.8 percent within $\pm$ 2.0 grade points. The regression equation more accurately projects successful achievement than it projects unsuccessful achievement. According to this investigator SAT math score, grade in college mathematics, and completion of remedial basic mathematics are the best indicators of a student's probable achievement in first-quarter accounting. Course load, hours employed, and remedial reading-study skills status are of little value in projecting accounting achievement.

Several writers support Swink's contention that success in mathematics is a positive indicator of a student's probable achievement

in first year accounting. Pour conducted a study to determine those factors which might account for any differences between the successful and the unsuccessful student of accounting.[20] Significant differences were found between the successful and the unsuccessful student on the following characteristics: (1) grade earned in first-semester accounting, (2) grade earned in college mathematics, (3) grade earned in business mathematics, (4) cumulative gradepoint average in business subjects, and (5) several other lesser characteristics. An inference was drawn that intelligence and mathematical background would be the strongest factors in the achievement of the successful group.

Slater reported in studying accounting practices in teacher training institutions in Illinois that a combination of teacher demonstration and supervised laboratories should be used in presenting subject matter to elementary accounting students.[21] This investigator further reported that business mathematics assisted the demonstration and laboratory techniques in producing the best results from students.

George in a similar study of colleges and universities of 12 midwestern states, recommended that both business mathematics and some course in college mathematics should be required for business administration majors, especially the students who leaned toward accounting as

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[20]Frederick Albert Pour, "The Similarities and Differences in the Successful and Unsuccessful Second-Semester Accounting Students at Northern Illinois University" (unpub. Ph.D. dissertation, University of Minnesota, 1962), Dissertation Abstracts, p. 2381.

[21]Robert M. Slater, "A Study of the Practices in Teaching First Year Accounting in the Teacher-Training Institutions of Illinois," The National Business Education Quarterly, XX, No. 3 (March, 1954), pp. 5-10.

a major field of study.[22]

In 1973, Bryan conducted a study to determine certain factors that could be used as predictors for student success in Intermediate Accounting.[23] Accounting Principles I and II grades, high school grades reported by the ACT Program, ACT scores, and first and second semester freshmen grade point averages were used as intelligence factors in developing regresssion equations. In his analysis, Bryan determined that the best predictors of achievement in Intermediate Accounting were the grades earned in Accounting Principles. The ACT mathematics score, and the ACT composite score were also strong predictive measures for achievement in Intermediate Accounting.

A significant relationship between high school bookkeeping, as measured by standardized tests, and predicting success in the first course of elementary accounting was reported by Webb.[24] This investigator also concluded that intelligence, reading, listening, writing, and quantitative ability in mathematics were factors that could influence the degree of success attained in studying the elementary course of accounting. A later study developed by Stumbaugh was concerned with the effects of college algebra and high school bookkeeping on achievement in

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[22]Stephen L. George, "Practices in the Teaching of Collegiate Elementary Accounting," The National Business Education Quarterly, XXXVII, No. 3 (March, 1958), pp. 6-10.

[23]James Alvin Bryan, "A Study of Selected Factors Related to Student Achievement in Intermediate Accounting" (unpub. Ed.D. dissertation, Oklahoma State University, 1973), p. 76.

[24]Harold Quentin Webb, "The Prognostic Potential of Selected Factors for Predicting Achievement in the Study of Highschool Bookkeeping and Accounting" (unpub. Ph.D. dissertation, The Ohio State University, 1971). Dissertation Abstracts, p. 3645.

the second course of elementary accounting.[25] Ten prime-time sections of this course were selected from the offerings of eight Oklahoma colleges and universities. Four hundred twenty-two students composed the population of the selected sections. Two hundred sixty-five students completed the accounting courses and supplied information for inclusion in the sample. One hundred fifty-seven students did not complete the course.

The 265 students in the sample were grouped according to their backgrounds in college algebra and high school bookkeeping. As a result of this separation, Groups I through IV were termed from the intact classroom situations. To equate students in terms of intelligence and prior accounting knowledge, three covariates were employed. The AICPA Orientation Test, Form E, and the AICPA Achievement Test, Level 1, Form E-S--two of the covariates--were administered to the subjects during the first few days of the semester. The ACT composite scores, the third covariate, were obtained from student records. The AICPA Achievement Test, Level 1, Form E-S, were readministered to the students completing the accounting course.

The score obtained on the second administration of the Achievement test was the dependent variable. College algebra and high school bookkeeping were the two independent variables.

These data were subjected to analysis of covariance to produce the F ratios used to test the hypotheses of the study. A Chi-square analysis was made of the 157 students who did not complete the accounting

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[25]Charles C. Stumbaugh, "The Effect of College Albegra and High School Bookkeeping on Achievement in the Second Course of Elementary Accounting" (unpub. doctoral dissertation, University of Oklahoma, 1975).

course.

The investigator formulated the following conclusions from the results of the research project:

1. Completing a course in college algebra tends to accompany success in Accounting Principles II.
2. Completing a course in high school bookkeeping tends to accompany success in Accounting Principles II.
3. As a group, the students who have obtained backgrounds in both college algebra and high school bookkeeping attain the highest level of success in Accounting Principles II.
4. As a group, the students who have obtained only a background in college algebra achieve at a higher level in Accounting Principles II, than those students who, as a group, have obtained only a high school bookkeeping background.
5. As a group, students with neither a college algebra nor a high school bookkeeping background achieve at a lower level than those students who, as a group, have at least one of the background areas.
6. For the students who did not complete the accounting course, the analysis yielded no differential trends.

Summary

A review of the research and literature indicated varying degrees of agreement within the two areas of bookkeeping and accounting surveyed.

The findings of researchers and conclusions of writers indicate that there are seemingly mixed results concerning the time required to

conduct a course in bookkeeping or accounting. Several writers stated that what could be more important than the factor of time is that the objectives of a course are reasonable for the time that can be utilized to present the subject matter.

Several authors have attempted to use various methods for the prediction of success for beginning bookkeeping and accounting students. The findings of researchers indicate that the standardize tests, ACT and SAT, are useful instruments for the prediction of accounting success. The successful completion of a college mathematics course also seems to provide a positive indicator for determining the success of students in Principles of Accounting.

CHAPTER III

PROCEDURES OF THE STUDY

The purpose of this study was to provide research evidence to either support or deny the hypothesis that the study of accounting for a period of 16 weeks results in the same achievement in accounting as a similar course of study for an eight-week duration. A further consideration was to determine whether interaction existed between the independent variables of (1) the length of the accounting course, and (2) the student's ability level as measured by the American College Test.

Population

The population for this study was all the accounting students enrolled in Principles of Accounting II at Cameron University, Lawton, Oklahoma, during the fall semester of 1979. Tables I and II indicate the number of second-course elementary accounting sections, instructors, scheduled time of day for each class, the length of the class, the number of times the class meets per week, the total class time measured in clock hours for instructional purposes, the length of the class in weeks, the total number of students that enrolled in each section and the number that completed each course and met the criteria for the purpose of this study.

TABLE I

PRINCIPLES OF ACCOUNTING II CLASS SCHEDULING INFORMATION
CAMERON UNIVERSITY, FALL 1979

Section	Instructor	Time Scheduled	Class Length	Number of Meetings Per Week	Clock Hours Per Semester*	Course Length
1	1	8:00 A.M.	50 Min.	5	40	8 Weeks
2	2	9:30 A.M.	75 Min.	2	40	16 Weeks
3	1	11:30 A.M.	50 Min.	3	40	16 Weeks
4	3	5:30 P.M.	160 Min.	1	40	16 Weeks
5	4	7:00 P.M.	160 Min.	2	40	8 Weeks
6	5	8:15 P.M.	160 Min.	2	40	8 Weeks

*Amount of actual instructional time available in the classroom.

TABLE II

PRINCIPLES OF ACCOUNTING II STUDENT INFORMATION
CAMERON UNIVERSITY, FALL 1979

Section	Total Students Enrolled	Students Not Meeting Criteria*	Students Meeting Criteria*
1	34	18	16
2	27	15	12
3	37	18	19
4	30	16	14
5	33	18	15
6	13	9	4
	174	94	80

*Each student's records must contain the following: ACT composite score, ACT math score, AICPA pretest and the AICPA posttest.

Design of the Study

The primary purpose of this study was to determine if a significant relationship existed between the length of the accounting course and student achievement in accounting. To establish a problem design whereby collection of information concerning the effects of the class length on the students could be assimilated, an experimental group of accounting students was designated to comprise the classes in which the course was of an eight-week duration. Furthermore, a control group of accounting students was designated to comprise the classes in which the regular 16-week classes were assigned. Since conjecture among writers in the field of education has intimated that perhaps students with different ability might achieve differently or have different attitudes when exposed to the same treatment, both the control and experimental groups were further subdivided into three groups each.

Determination of the three divisions within each group was made on the basis of the students' American College Composite Scores, after consulting information published by the American College Testing Program.[1] The high ACT score range was defined as all scores of 22 and above. Medium ACT scores ranged between 17 and 21 inclusively, and the low ACT score range was limited to scores 16 and below.

With the division of students into a control and an experimental group and the consequent further subdivision within each group, an experimental design became plausible whereby it was possible to study the results in relation to one dependent variable and two independent

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[1]Charles C. Stumbaugh, "The Effect of College Algebra and High School Bookkeeping on Achievement in the Second Course of Elementary Accounting" (unpub. doctoral dissertation, University of Oklahoma, 1975).

variables for the purpose in this study. For the purpose of comparing achievement among the accounting students, the one dependent variable was the achievement on the accounting test and the two independent variables were (1) the length of the accounting class, and (2) the ACT score level of the students.

Results and conclusions derived from any study are only as valid as the design of that study. The independent variables in this study were established before the subjects' enrollment in the second course of elementary accounting and were used to separate the students into levels of aptitude by the length of the class in which they had enrolled, as shown in Table II.

Because the independent variables had already occurred, an ex post facto research design was used to compare the three levels of aptitude in Groups I through VI in Table II. Kerlinger defines ex post facto research as:

> . . . that research in which the independent variable or variables have already occurred and in which the researcher starts with the observation of a dependent variable or variables. He then studies the independent variables in retrospect for their possible relations to, and effects on, the dependent variable or variables.[2]

The gain scores achieved by the six groups of students on the AICPA Achievement Test, Level I, Form E-S, when administered as the pretest and the posttest, were defined as the dependent variable.

Kerlinger contends that the most important educational research problems do not lend themselves to experimentation, although they do lend themselves to controlled inquiry of the ex post facto kind.[3] He

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[2]Ibid., p. 360.

[3]Ibid., p. 373.

also states that ex post facto research has these three major weaknesses: (1) the inability to manipulate independent variables, (2) the lack of power to randomize, and (3) the risk of improper interpretation. However, Kerlinger believes that the contributions of ex post facto research vastly outweigh its weaknesses when carefully constructed hypotheses and proper statistical tools are employed in the research project.

Campbell and Stanley further discuss the rationale on which this investigator has based this study:

> The true experiment differs from the correlational setting just because the process of randomization disrupts and lawful relationships between the character or antecedents of the students and their exposure to X. Where we have pretests and where clearcut determination of who were exposed and who were not is available, then designs . . . may be convincing even without the randomization.[4]

Due to the time of the offerings and the prearranged schedules of accounting classes at Cameron University, it was impossible for the accounting instructors and the administrator of the business program to cater completely to the desires of this investigator regarding the manipulation of students for experimental purposes. Therefore, it was necessary to deal with "intact" student groups in this study. Popham indicates that many situations in educational research require the use of intact student groups.[5] He further indicates that analysis of covariance can be employed as the statistical tool to equate those groups with respect to possible confounding relevant variables.

> This technique allows the researcher to statistically equate independent variables groups with respect to one or

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[4]Donald T. Campbell and Julian C. Stanley, Experimental and Quasi-Experimental Designs for Research (Chicago, 1968), p. 65.

[5]Ibid.

more variables which are relevant to the dependent variable.[6]

The basic objective of this study was to test the effects of the length of a course of study on the success of students completing the second course of elementary accounting. A secondary objective for the study was to test for interaction which could exist between the two independent variables. As previously stated, the independent variables were the length of the course and the student's ability level as measured by the American College Test. The dependent variable was the gain score calculated from the results of the AICPA Achievement Examination, Level I, Form E-S, which was administered as a pretest/posttest for this study. The covariates (control variables) were the scores attained on the first administration of the AICPA Achievement Examination, Level I, Form E-S, and the ACT math scores. From a review of previous research studies related to achievement, these control factors were shown to be effective covariates.

Evaluative Instrument

A review of standardized testing materials developed to measure student knowledge of the first two courses in elementary accounting revealed three sources, the United States Armed Forces Institute, the Educational Testing Service, and the American Institute of Certified Public Accountants.

A written response from the Test Administration Branch, United States Armed Forces Institute, Madison, Wisconsin, 53713, notified this investigator that this division of the Armed Forces Institute was closed by an Act of Congress in the spring of 1976. The material

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[6]Ibid., p. 223.

utilized in their testing procedure for principles of accounting students was no longer available for research purposes.

The Educational Testing Service has the College-Level Examination Program, frequently referred to as CLEP tests. CLEP also has an examination designed to measure elementary accounting knowledge, but this test requires more time than the normal 50-minute class period.

The American Institute of Certified Public Accountants publishes an examination designed to measure elementary accounting knowledge at the completion of the second course of elementary accounting. The instrument requires a 50-minute testing period and has an established national norm.

Two of the class sections illustrated in Table I utilized a class period of 50 minutes. For this reason, the AICPA Achievement Examination, Level I, Form E-S, was determined to be acceptable for administration to all sections of students in this study. The AICPA Testing Project Office was contacted and permission was granted to this investigator for the use of the AICPA Achievement Examination as the evaluative instrument for this study. The usage agreement was subject to the provision that no part of the examination would be reproduced in this study. The initial test booklets and score sheets were then ordered.

The AICPA Achievement Examination, Level I, Form E-S, is an examination specifically designed to measure student knowledge of accounting principles when administered at the completion of the second course in accounting principles. The examination contains 45 multiple-choice questions and is structured for a 50-minute time limit. The test is divided into four parts. Part I is composed of 22 questions emphasizing vocabulary and financial accounting concepts. Part II is composed of

nine questions emphasizing elementary cost accounting and system concepts. Part III contains six questions pertaining to cost-volume-profit relationship. Part IV consists of eight questions emphasizing account classification.

During the spring of 1969 and the fall of 1970, the American Institute of Certified Public Accountants selected several colleges and universities throughout the United States and requested their cooperation in the AICPA Testing Program. A total of 10,306 students completing the second course of elementary accounting was administered the Achievement Examination. The Institute utilized the results of these examinations to develop percentile rank norms for Level I of the Achievement Examination.

The AICPA gives no published validity or reliability data for Level I of the Achievement Examination. The Institute does, however, make available an item analysis for the examination revealing a discrimination index and difficulty level for each question. This data is based on 450 students tests in January, 1966, and is reproduced as Appendix A.

The scoring and reporting services, provided by the AICPA Testing Project Office, are composed of a list of each student examined, his raw score, and corresponding percentile ranking.

Validity

Osgood, Suci, and Tannenbaum state that an instrument is said to be valid when "it measures what it is supposed to measure."[7] Further, Thorndike and Hagen state that a test is not generally valid, but is

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[7]Charles F. Osgood, George J. Suci, and Percy H. Tannenbaum, The Measurement of Meaning (Indianapolis, Indiana, 1957), p. 76.

valid for "a particular curriculum or a particular job."[8]

Williams defines validity as the degree to which the researcher measures what he claims to measure.[9] Content, construct, and criterion validity represent three general types of validity used in gathering validity information. This writer was concerned with content validity as it is the type normally associated with achievement tests. Downie and Heath refer to content validity as:

> A nonstatistical type of validity that is usually associated with achievement tests. When a test is so constructed that it adequately covers both the content and the objectives of a course or part of a course of learning, it is said to have content validity.[10]

Four instructors from Cameron University were requested to evaluate the AICPA Achievement Examination, Level I, Form E-S, for content. On the basis of affirmative reactions, the achievement examination was determined to have content validity for measuring concepts presented in the first two courses of elementary accounting.

Stumbaugh also concluded that the AICPA Achievement Examination, Level I, Form E-S, contained content validity upon receipt of positive affirmation from seven college and university instructors at various institutions in the State of Oklahoma.[11]

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[8]Robert L. Thorndike and Elizabeth Hagen, Measurement and Evaluation in Psychology and Education (New York, 1961), p. 181.

[9]Thomas Howard Williams, "An Investigation of the Mathematical Dimensions of Accountancy" (unpub. Ph.D. dissertation, University of Illinois at Urbana-Champaign, 1961), p. 22.

[10]N. M. Downie and R. W. Heath, Basic Statistical Methods (New York, 1965), p. 223.

[11]Ibid., p. 48.

Reliability

Kerlinger states that "reliability is the accuracy or precision of a measuring instrument."[12] A similar definition by Wert, Neidt, and Ahmann defines reliability as the degree of consistency with which a test measures whatever it does measure, or the degree to which all compensating errors are absent.[13] The AICPA reports no reliability estimates for the achievement examination.

The AICPA Achievement Examination, Level I, Form D-S, was used as the testing instrument to measure elementary accounting knowledge retained by students entering into the study of Intermediate Accounting, by Krull.[14] That investigator reported a Hoyt reliability coefficient of .80 and a standard error of measurement of 2.85 based on all items of the AICPA Achievement Examination.

A study similar to that made by Krull was completed by Beavers in 1974.[15] The AICPA Achievement Examination, Level I, Form E-S, a revision of Form D-S, was employed as part of the investigation. Using the Kuder-Richardson Formula 21, Beavers reported a reliability coefficient of .82 and a standard error of measurement of 3.04 for all items of the

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[12] Ibid., p. 430.

[13] James E. Wert, Charles O. Neidt, and J. Stanley Ahmann, Statistical Methods in Educational and Psychological Research (New York, 1954), p. 329.

[14] George William Krull, Jr., "A Study of Two-Year College Transfer Students' Elementary Accounting Achievement" (unpub. Ph.D. dissertation, Michigan State University, 1971), p. 100.

[15] Lorren Hays Beavers, "A Study of the Elementary Accounting Achievement of Junior College Transfer Students in Selected Institutions of Higher Education in Oklahoma" (unpub. Ed.D. dissertation, University of Oklahoma, 1974), p. 61.

achievement examination. The studies by Krull and Beavers established that the achievement examination was reliable for their investigations.

Stumbaugh utilized the Kuder-Richardson Formula 21 to estimate the reliability coefficient for his study.[16] The reliability coefficient for the Stumbaugh study was calculated to be .836 which compares favorably with the coefficients previously reported for Form D-S and Form E-S of the achievement examination.

Since there were no published reliability coefficients for the achievement test, other than the coefficients established by the three preceding studies, it was necessary to estimate a reliability coefficient for the achievement test as employed in this study. Thorndike and Hagen state that an examination which has a known mean and standard deviation may provide a reliability coefficient by using the Kuder-Richardson Formula 21.[17] The mean for the 80 students taking the post-test was 17.49 and the standard deviations was 7.276. Using the established mean and standard deviation, the following Kuder-Richardson Formula 21 was employed to estimate the reliability coefficient:

$$r_{11} = \frac{n}{n-1}\left[1 - \frac{M_t(1-M_t)}{s_t^2}\right]$$

where r_{11} is the estimate of reliability

n is the number of items on the test

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[16]Ibid, p. 50.

[17]Ibid.

s_t is the standard deviation of the test

M_t is the mean score of the student group

The reliability coeffficient for this test was calculated to be .8993 which compares favorably with the coefficients previously reported for Form D-S and Form E-S of the achievement examination.

Data Collection Procedures for Testing Hypotheses

During the spring of 1979, the Chairman of the Department of Business at Cameron University was contacted and permission was granted for this investigator to test the students enrolled in all sections of Principles of Accounting II during the fall of 1979. In addition, the Chairman concurred with the request of this investigator that the names of the instructors be omitted from the Principles of Accounting II classes that were to appear on the fall schedule of Accounting II classes being offered at Cameron University. The administrator and instructors further agreed to the assigning of instructors at random for the Principles of Accounting II classes to be taught in the fall of 1979.

The Testing Projects Office of the AICPA was contacted during the spring of 1979 and permission was secured by this investigator to utilize the AICPA Achievement Examination, Level I, Form E-S, in this investigation. The test booklets and answer sheets were received in June of 1979.

The AICPA Testing Projects Office provided instruction manuals for each instructor administering the tests. The instruction manuals specified procedure and time allotment for each section of the tests. Instructors were requested to follow the testing instructions carefully

in order to produce uniformity in the administration of the examination. The instruction manual, achievement examination, and answer sheets were distributed to each instructor prior to the start of the fall semester.

During the first week of class, the AICPA Achievement Examination was given by each instructor. The completed test answer sheets were collected and mailed to the Testing Projects Office for scoring and ranking. During the final week of the fall semester, the AICPA Achievement Examination, Level I, Form E-S, was readministered to those students completing the course in Principles of Accounting II. All examinations and answer sheets were then collected from the instructors and mailed to the Testing Projects Office for scoring and ranking.

After all necessary data for the study was obtained, the students were grouped on the basis of their aptitude level as determined by the ACT Composite Score and the length of the course completed during the study of Principles of Accounting II. IBM cards were then punched with all applicable data for each subject. The coding of the data and the order in which the data was punched on the cards are presented in Appendix B. Appendix C presents the entire list of data used for this study.

Procedures for Testing Hypotheses

The 80 students comprising the population of this study were separated into six groups. Group classification was based on the level of aptitude of the student and the length of the class enrolled. Six groups were then employed to form a 2 X 3 factorial design.

The 2 X 3 factorial design was used to test the hypotheses. The gain score calculated from the pretest/posttest was the dependent

variable in each hypothesis.

The factorial experiment permits an investigator to evaluate the combined effects of two or more treatments in a single experiment. This is accomplished by combining block designs so that one level from each of two or more treatments is presented simultaneously according to Kirk.[18] The 2 X 3 factorial design provides this study with a test of hypotheses about effects of the students' aptitude level, effects of the length of the class, and a test for interaction.

Table III presents the 2 X 3 factorial design employed in this study. The cells in the model indicate the number of subjects in the study classified by aptitude level and the length of the class enrolled.

Six hypotheses were pertinent to this investigation:

Ho_1 There will be no significant difference in accounting achievement between all the students in the experimental group (students who are assigned to the eight-week course) and all the students in the control group (students who are assigned to the 16-week course) when tested at the .05 level of significance.

Ho_2 There will be no significant difference in accounting achievement among the three ACT score groups (high versus average versus low) of all students combined (both experimental and control) when tested at the .05 level of significance.

Ho_3 There will be no significant interaction between student membership in both independent variable groups and their accounting achievement scores. (Basically, interaction tests whether one method of course length is uniformly superior or inferior regardless of which ACT level of students are assigned to the class.)

Ho_4 There will be no significant difference in accounting achievement between the students in the low ACT score experimental group and the students in the low ACT score control group when tested at the .05 level of significance.

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[18] Roger E. Kirk, Experimental Design: Procedures for the Behavioral Sciences (Belmont, California, 1968), p. 18.

TABLE III

2 X 3 FACTORIAL MODEL SHOWING NUMBER OF STUDENTS WITH AICPA ACHIEVEMENT TEST SCORES (GAIN SCORES)

		Length of Course	
		8 week	16 week
Aptitude Level as Measured by the ACT Math Score	High (22 & above)	Group 1 N = 8	Group 4 N = 9
	Medium (17-21)	Group 2 N = 15	Group 5 N = 19
	Low (16 & below)	Group 3 N = 10	Group 6 N = 19

Ho_5 There will be no significant difference in accounting achievement between the students in the medium ACT score experimental group and the students in the medium ACT score control group when tested at the .05 level of significane.

Ho_6 There will be no significant difference in accounting achievement between the students in the high ACT score experimental group and the students in the high ACT score control group when tested at the .05 level of significance.

The SAS 76 Computer Program was employed to perform the statistical functions of analysis of covariance. Release 79.3 is a computer program designed to calculate multiple classification analysis of covariance when the design cells are of unequal size.[19]

The use of multiple classification analysis of covariance with a 2 X 3 factorial design produces three F ratios. The first F ratio tests for differences in achievement between students who have enrolled in an eight-week course as compared with those who have enrolled in a 16-week course. The second F ratio tests for differences in achievement between students according to their level of aptitude as measured by their ACT Composite Score. Since the length of the course of study and the level of aptitude were defined as the two independent variables, the first two F ratios are termed "main effect" ratios. Consequently, the first two F ratios test for the individual effect of each independent variable. The third F ratio tests for interaction which may take place between the two main effects.

The research was organized to meet the criteria outlined for the multiple-classification analysis of variance and the analysis of covariance. An ability to assign the students at random to the control

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[19]Anthony J. Barr, James H. Goodnight, John P. Sall, and Jane T. Helwig, SAS 76: A User's Guide (Raleigh, North Carolina, 1976), pp. 127-138.

and experimental group was impossible within the framework of the current study. The students enrolling in the classes did not have prior knowledge that an experiment was being conducted or who was instructing the class. Both the experimental and control groups were each further subdivided into three groups for statistical analysis based on the ACT Composite Scores of the students.

The analysis of covariance was applied to the gain scores obtained to determine any significant differences in accounting achievement scores. However, a significant F score will not indicate specifically which of the several subgroups are significantly different. The statistic chosen for further analysis of the significant F scores was Duncan's multiple-range test.

Steel and Torrie reported that in 1951, Duncan developed "a multiple comparisons test to compare each treatment mean with every other treatment mean."[20] Duncan's multiple-range test was applied to those scores where a significant F value was found, which allowed for an exact determination of which groups were significantly different. The complete results of the application of the statistics can be seen in Chapter IV.

Summary

Chapter III has presented the composition of the population for this study, the data collection procedures, and the method employed to group the subjects. The research design was presented along with justification for utilizing the AICPA Achievement Examination as the

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[20]Robert G. D. Steel and James H. Torrie, Principles and Procedures of Statistics (New York, 1960), p. 107.

instrument to measure student achievement. Content validity and reliability coefficient estimates were established for the evaluation instrument.

A description of the statistical techniques for testing the hypotheses was presented. The SAS 76 computer program employed to calculate the F ratios which were used to accept or reject the hypotheses was described. Duncan's multiple range test, the statistic chosen for further analysis of any significant F scores was also discussed.

CHAPTER IV

FINDINGS

The purpose of this study was to secure statistical evidence to determine if there is a significant difference in achievement between accounting students who enroll in a course of study for a period of 16 weeks and accounting students who enroll in a course of study for a period of eight weeks. A review of the current literature revealed writers believe that students at one academic level may achieve differently than students at another academic level, this study was structured to test and compare achievement at three levels of academic ability, as determined by the ACT scores of the students utilized in the study.

The analysis of covariance was the primary statistic applied to the data in the study. This statistic made comparisons between all the students in the control group and all the students in the experimental group; among all the low ACT score students, all the medium ACT score students, and all the high ACT score students; and among the ACT level groups for interaction. Interaction determined whether or not one type of class in which the students were enrolled was uniformly superior or inferior over the entire ACT score range.

Description of Data

Student success in this study was measured through the administration of an achievement examination with established national norms. The

achievement examination was specifically designed to measure knowledge of accounting principles retained by students at the completion of the second course of Principles of Accounting. AICPA Achievement Examination, Level I, Form E-S, was the test of achievement employed in this study. The test was administered to six sections of the second-course accounting principles students at Cameron University during the fall semester of 1979.

One hundred and seventy-four students enrolled in the six sections of the second course of elementary accounting at Cameron University in the fall of 1979. Ninety-four of the students were enrolled in the 16-week classes while the remaining 80 consisted of the students enrolled in the eight-week classes. From this population, 80 students provided the information that was utilized in this study. Of the total enrollment, 118 students completed the course of study. Fifty-six students withdrew from their classes prior to the end of the semester. Thirty-eight students were eliminated because of a lack of ACT scores being available in their files at the business office. Of those 56 students that withdrew from their classes, 23 were enrolled in the 16-week classes and 33 were enrolled in the eight-week classes. On a percentage basis the withdrawal rate for the eight-week classes was 16.75% higher than the withdrawal rate for the 16-week classes. No other analysis or inferences were made in regards to the students that withdrew from the classes.

Variance Homogeneity

After the accounting achievement scores were properly categorized, the group variances were checked for homogeneity. Popham states that

the test for homogeneity is performed by securing the individual group variances of the two independent variables by dividing the smallest variance into the largest variance.[1] The resulting F value is then analyzed for significant differences. If the variances are not significantly different, the investigator may then continue with his analysis of the data.

The variances of the two independent variables, the length of the class and the ACT level of the students, are shown in Table IV. In both cases, the resulting F values indicate that all variances are homogeneous. Therefore, the statistical analysis of the achievement scores was continued by applying the analysis of covariance to the data.

Enumeration of Findings

The raw accounting achievement scores for all students in the study are listed in Appendix C. The pretest and posttest scores are given in Tables X and XI with the achievement scores shown in Table XII. A summation of the achievement scores, however, is shown in Table V.

The scores shown in Table V were analyzed for significant differences through the application of the analysis of covariance on the appropriate accounting achievement data.

Due to the time of the offerings and the prearranged schedules of accounting classes at Cameron University, it was impossible for the accounting instructors and the administrator of the business program to cater completely to the desires of this investigator regarding the

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[1] Robert G. D. Steel and James H. Torrie, Prinicples and Procedures of Statistics (New York, 1960), p. 206.

TABLE IV

VARIANCE HOMOGENEITY RESULTS FOR THE ACCOUNTING ACHIEVEMENT SCORES OF 80 STUDENTS CLASSIFIED ACCORDING TO ACT LEVEL AND LENGTH OF THE CLASS THE STUDENT ENROLLED

Group	Variance	F-Value	Significance
Sixteen week classes	74.826	1.616	Not Sig.
Eight week classes	46.313		
Low ACT Level	24.821		
Medium ACT Level	26.485	1.692	Not Sig.
High ACT Level	42.000		

TABLE V

ACCOUNTING ACHIEVEMENT SCORES: TOTAL GROUP SCORES OF 80 STUDENTS CLASSIFIED BY ACT LEVEL AND LENGTH OF CLASS STUDENT ENROLLED

Length of Class	Low ACT (n)	Medium ACT (n)	High ACT (n)	Total
Sixteen week (control)	121 (9)	156 (19)	106 (19)	383 (47)
Eight week (experimental)	35 (8)	66 (15)	55 (10)	156 (33)
TOTAL	156 (17)	222 (34)	161 (29)	539 (80)

manipulation of students for experimental purposes. Therefore, it was necessary to deal with "intact" student groups in this study. Intact groups are normally unequal with regard to intelligence; therefore, two control variables were used as covariates to equate student performance. The control variables were: (1) the ACT Math Score, and (2) the AICPA Achievement Examination, Level I, Form E-S (administered as a pretest). These data were obtained at the beginning of the semester. The means and standard deviations for the control variables are shown in Table VI.

The mean scores indicated in Table VI are synonymous with the arithmetic average scores attained by each group on the two tests included in this study. One standard deviation, above and below the mean, would normally include approximately 68 percent of the subjects' scores on each test.

The importance of an effective covariate cannot be overlooked. Therefore, Pearson r's were calculated among the two covariates and the dependent variable. The intercorrelation coefficients for these three variables are shown in Table VII.

The correlation between the ACT Math Score and the AICPA Achievement Pretest is .318, a moderately low correlation. The ACT Math Score and the AICPA Achievement Posttest produced a correlation of .363, also moderately low. The AICPA Achievement Pretest and the AICPA Posttest correlation is .702 which is moderately high.

However all three correlation coefficients are significant at a probability level less than .05. The correlation coefficients can be interpreted as follows:

1. The moderately high positive correlation indicates that those students who did well on the AICPA Achievement Pretest also

TABLE VI

MEANS AND STANDARD DEVIATIONS OF THE TWO CONTROL VARIABLES AND THE DEPENDENT VARIABLE

Group	n		Control Variables: ACT Score	Control Variables: AICPA Pretest	Dependent Variable: AICPA Posttest
Sixteen week (Control)	47	mean	15.92	9.21	17.36
		S.D.	5.34	5.31	6.70
Eight week (Experimental)	33	mean	16.60	12.94	17.67
		S.D.	5.50	6.81	7.76
TOTAL	80	mean	16.30	10.75	17.49
		S.D.	5.41	5.93	7.18

TABLE VII

INTERCORRELATION BETWEEN THE TWO COVARIATES AND THE DEPENDENT VARIABLE FOR THE COMBINED SAMPLE

	ACT Math Score	AICPA Achievement Pretest	AICPA Achievement Posttest
ACT Math Score	1.00000	0.31838	0.36131
AICPA Achievement Pretest	0.31838	1.00000	0.70201
AICPA Achievement Posttest	0.36131	0.70201	1.00000

P < .05

had higher scores on the AICPA Achievement Posttest.

2. The moderately low correlation between the ACT Math Score and the AICPA Pretest and Posttest indicates that the ACT Math Score is only a moderate indicator of successful achievement as measured by this study.

In other words, one covariate (AICPA Achievement Pretest) would have produced results equally as significant as those results obtained by using two covariates.

The statistitical technique, analysis of covariance, was used to make comparisons of the six student groups. Analysis of covariance permits scores made by groups to be adjusted for relevant factors believed to have influencing effect on performance. Adjustments are made, through the use of covariates (control variables), to equate groups in terms of stated objectives. The means and adjusted means of Groups I through VI are revealed in Table VIII.

Table VIII clearly reveals the adjusting effect of the covariates. Groups I, IV, and VI have adjusted means which are lower than the means calculated from only the raw data, while Groups II, III, and V have adjusted means which are higher than their raw score means.

The decision to use analysis of covariance appeared to be sound because of the substantial correlation between the covariates and the dependent variable. Specifically, Meyers states that: ". . . analysis of covariance is more precise than the treatment x blocks design when the true correlation between x and y is greater than .60.[2]

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[2]Jerome L. Myers, Fundamentals of Experimental Design (Boston, 1966), pp. 323-324.

TABLE VIII

MEANS, ADJUSTED MEANS, AND STANDARD ERROR FOR POSTTEST

Group	Mean	Adjusted Mean	Standard Error
I	25.00	21.48	.80
II	14.11	17.31	.358
III	17.00	18.77	.206
IV	26.88	16.81	.556
V	7.80	16.35	.593
VI	17.00	14.81	.349

Hypotheses Tested

A SAS 76 computer program, designed for multi-classification analysis of covariance and unequal cell size, was used to calculate the F ratios associated with the 2 X 3 factorial design established for this study. The results from computation of the analysis of covariance are presented in Table IX.

Table IX reveals the sums of squares, degrees of freedom, mean squares, and the F ratios calculated for each source of variation. The table indicates that the F ratios for the interaction (A X B) and the (A) variable were not significant when measured at the .05 level of significance. The F ratio for the (B) variable was significant beyond the .05 level. These three F ratios were used to test the hypotheses.

The first hypothesis was structured to compare achievement on the accounting change score of the control group with that of the experimental group of students. To test for differences, the null hypothesis was stated as follows:

> Ho_1 There will be no significant difference in accounting achievement between all the students in the experimental group (students who are assigned to the eight-week course) and all the students in the control group (students who are assigned to the 16-week course) when tested at the .05 level of significance.

The achievement scores of all students in the experimental group were compared to the achievement scores of all students in the control group (Table II). The experimental group score of 156 (n=33) and the control group score of 383 (n=47) results in an F value of 6.62 which is significant at the .05 level (Table VI). This finding indicates that when the achievement of all students in the control group is compared to the achievement of all students in the experimental group,

TABLE IX

ANALYSIS OF COVARIANCE OF THE ACHIEVEMENT OF 80 STUDENTS ON THE ACCOUNTING TEST, CLASSIFIED BY ACT SCORE AND LENGTH OF CLASS THE STUDENT ENROLLED

Source of Variance		Sum of Squares	Degrees of Freedom	Mean Squares	F
(A)	ACT LEVEL (High, Medium or Low)	39.722	2	19.861	.80
(B)	Length of Class (Experimental vs Control)	159.023	1	150.023	6.62*
(A X B)	Interaction (ACT X Length of Class)	42.366	2	21.183	.85
	ERROR	1784.412	72	24.784	

*$P < 0.05$

there is a significant difference at the .05 level of confidence. The null hypothesis Ho_1 was rejected.

The remaining null hypotheses Ho_2 through Ho_6 as listed on page 40 of Chapter III were structured to make comparisons between ACT levels of achievement and interaction of variables A X B. As previously mentioned, Table VI reflects that variable (A) ACT level and (A X B) Interaction were found to be not significant by the analysis of covariance in this study. The null hypotheses Ho_2 through Ho_6 were accepted as listed in Chapter III.

When a significant interaction does exist, length of the class enrolled cannot be spoken of unless comments are also made which concern ACT math scores of the students. The same is true when attempting to speak only of ACT math scores. In other words, a significant interaction would mean that a confounding effect would be produced by one independent variable upon another independent variable. Since the F ratio for interaction was not statistically significant, the independent variables may be commented on separately.

The lack of a statistically significant interaction may be shown by plotting the adjusted means of Group I through VI in graphic form.

An analysis of Figure 1 indicates that the 16-week groups attained a higher mean achievement level on the final achievement test than the eight-week groups. To determine the significance of this difference, the F ratio for interaction (A X B) must be reviewed. An F ratio of 0.85 calculated at the .05 level of significance falls far below the 2.83 value required for significance at the .05 level with one and 72 degrees of freedom. Thus, the graph of Figure 1 and the F ratio for interaction agree.

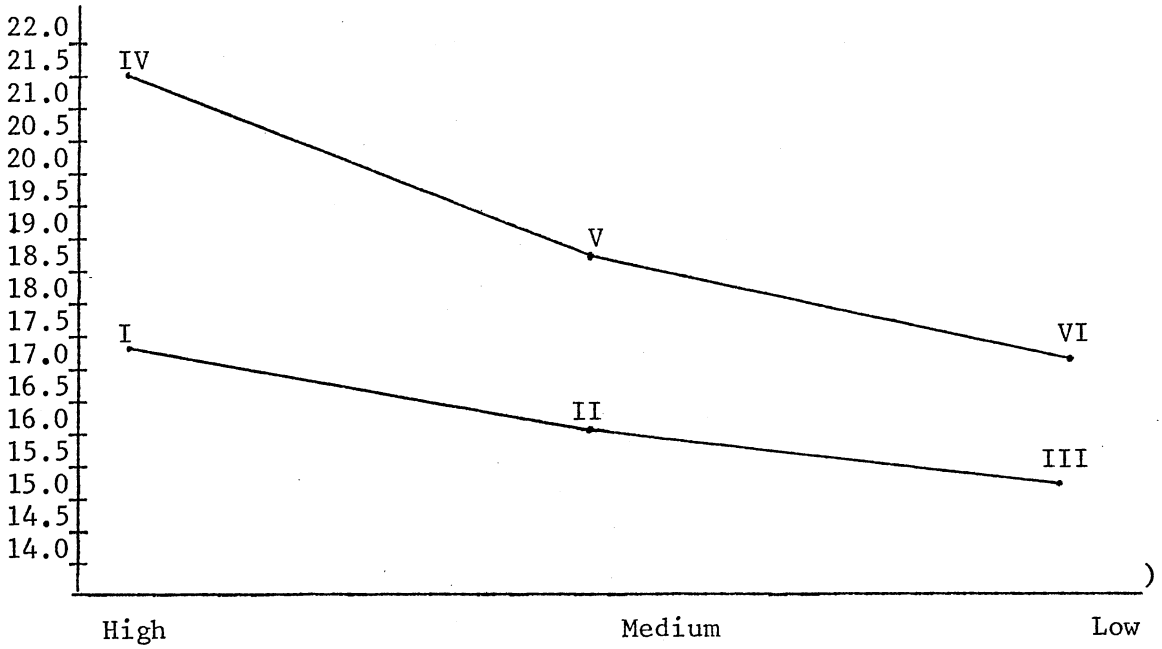

Figure 1. Adjusted Means of Class Enrolled and ACT Scores

Summary

Chapter IV has presented the statistical analyses, the testing of the hypotheses, and the interpretations of the data pertaining to the research study. In the second course of elementary accounting, students who study accounting for a period of 16 weeks have a higher level of achievement than students who study accounting for a duration of eight weeks regardless of their aptitude level as measured by the students ACT scores. However, there was no interaction between the length of the course of study and the level of ACT score.

Chapter V presents a summary of the research study, conclusions drawn from the interpretation of the results of the data, and recommendations for further study.

CHAPTER V

SUMMARY, CONCLUSIONS, AND RECOMMENDATIONS

The content of this chapter is divided into three sections. The first part summarizes the purposes, procedures, and findings of the study. The second part discusses the conclusions drawn from the findings of the previous chapter. Part three contains a listing of recommendations of suggested practices and future studies.

Summary

The purpose of this study was to determine if the study of accounting for a period of 16 weeks as opposed to eight weeks would result in a significant difference in accounting achievement for students enrolled in a college principles of accounting class.

Accounting achievement was defined as the difference between the pre- and posttest scores on the AICPA Achievement Examination, Level I, Form E-S, developed by the American Institute of Certified Public Accountants.

Six classes in Principles of Accounting II at Cameron University, Lawton, Oklahoma, were used in the study conducted during the fall semester of 1979. The data for 80 accounting students were used in the study. The data for both the control and the experimental groups were divided into three subgroups based on the ACT score level of the student involved. Thus, there were two independent variables, the ACT score of the student

and the length of class the student was enrolled.

The multiple-classification analysis of covariance was the statistic used to analyze the data for student achievement. The results of the statistical analysis of the student's accounting achievement indicate the only significant difference in achievement exist between the experimental group and the control group. The remaining comparisons between student groups indicate no significant differences for student accounting achievement.

Conclusions

The conclusions are based on the findings from Chapter IV and are listed to basically correspond with the findings, the questions asked the null hypotheses presented in Chapter III. Additionally, general conclusions which may relate to any one specific hypothesis or finding are also listed:

1. The findings indicate that a significant difference exists in accounting achievement between all students who study accounting for a period of eight weeks. Therefore, the investigator concludes that the null hypothesis stating that there will be no significant difference in accounting achievement between all the students in the experimental group and all the students in the control group can be rejected. Furthermore, the investigator concludes that since the length of a class is significant for the study of principles of accounting at Cameron University, curriculum developers should consider this as an important variable to consider in the design of course offerings.

2. The findings show that no significant difference in accounting achievement exists among the three ACT score groups. Therefore, the

investigator concludes that the null hypothesis stating that there will be no significant difference in accounting achievement among the three ACT score groups (high versus medium versus low) of all students combined (both experimental and control) is accepted.

3. The results of the study show no interaction concerning student acounting achievement. Therefore, the investigator concludes that the null hypothesis stating that there will be significant interaction between student membership in both independent variable groups and their accounting achievement scores cannot be rejected. Each class (16-week or eight-week) has the same relative effect on student achievement when compared to the other class at all three ACT score levels.

4. The test scores indicate no significant differences exist between the two low ACT score groups. The investigator concludes, therefore, that the null hypothesis stating that there will be no significant difference in accounting achievement between the students in the low ACT score experimental group and the students in the low ACT score control group cannot be rejected. The length of the class offering has no significant effect on accounting achievement for the low ACT score student.

5. The investigator finds that no significant difference in accounting achievement is evident between the two medium ACT score groups. The investigator concludes, therefore, that the null hypothesis stating that there will be no significant difference in accounting achievement between the students in the medium ACT score experimental group and the students in the medium ACT score control group cannot be rejected. The length of the class offering has no specific effect on accounting achievement for the medium ACT score student.

6. The findings indicate no significant difference in achievement exists between the two high ACT score groups. Thus, the investigator concludes tht the null hypothesis that there will be no significant difference in accounting achievement between the students in the high ACT score experimental group and the students in the high ACT score control group cannot be rejected. The length of class offering has no significant effect on accounting achievement for the high ACT score student.

General Conclusions

There were other uncontrolled factors operating in the experiment in addition to the two independent variables being considered. These uncontrolled variables were discussed on page five of Chapter I.

Table XIII, Appendix C, provides the mean score data of the 80 students classified by the experimental group and the control group. The mean AICPA pretest score is higher for the experimental group than the control group, Table XIII. This could be explained by the time span between the different length of classes. The 16-week classes will normally have a break between the classes of four to 12 weeks. Students enrolling in eight-week classes normally will take Accounting I and then immediately enroll in Accounting II with only a one week delay in the second class. The mean AICPA Posttest for the two groups are compariable. The larger change score by the 16-week classes does not appear to be higher achievement, but rather a reinforcement of prior knowledge. This observation should be carefully considered in regards to the significant findings as related to Ho_1.

Recommendations

1. A broader study should be conducted to determine a more exact picture of student achievement at the college level.

2. Accounting advisers and instructors should be made aware that the length of a class in accounting can effect the achievement of all students regardless of their aptitude level.

3. A study should be conducted to contrast the attitudes and frustration levels of students enrolled in various lengths of courses.

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APPENDICES

APPENDIX A

ITEM ANALYSIS FOR AICPA TEST

ITEM ANALYSIS[1]

Achievement Test, Level I, Form E-S

Item	Difficulty*	Discrimination Index**	Item	Difficulty*	Discrimination Index**
Pt. I			Pt. II		
1.	91	51	23.	89	41
2.	88	43	24.	77	39
3.	73	53	25.	73	46
4.	73	50	26.	60	39
5.	72	43	27.	52	25
6.	72	35	28.	46	41
7.	70	24	29.	40	40
8.	64	32	30.	37	40
9.	59	32	31.	29	35
10.	55	43			
11.	49	41	Pt. III		
12.	48	40	32.	77	68
13.	47	29	33.	80	52
14.	46	37	34.	34	54
15.	45	21	35.	86	56
16.	42	42	36.	83	65
17.	40	37	37.	71	51
18.	37	50			
19.	36	42	Pt. IV		
20.	34	26	38.	42	41
21.	31	40	39.	18	27
			40.	47	42
			41.	78	39
			42.	93	36
			43.	34	28
			44.	30	37
			45.	58	39

*Decimal points omitted

**Correlation between item and total scores ("Flanagan r"); decimal points omitted.

Note: Item analysis is based on a group of 450 students tested in January, 1966, by the following nine colleges: University of Arizona, C.C.N.Y., Hofstra, University of Minnesota, University of North Carolina, Oklahoma State University, University of Rochester, San Jose State, University of Texas.

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[1]The Item Analysis was reproduced by permission from the Testing Project Office of the American Institute of Certified Public Accountants.

APPENDIX B

CARD CODING SYSTEM

CODE INFORMATION

STUDENT DATA

Order of Data on Cards

Card Column	
1	Input Group 1 Experimental 2 Control
3	ACT Group 1 High 2 Medium 3 Low
5-6	Group Identification Number 1 Group I 2 Group II 3 Group III 4 Group IV 5 Group V 6 Group VI
8-9	Math ACT Scores
11-12	ACT Composite Scores
14-15	AICPA Pretest Achievement Scores
17-18	AICPA Posttest Achievement Scores
20-22	Change scores as measured by the difference between Pretest and Posttest scores.

APPENDIX C

STUDENT ACHIEVEMENT DATA

TABLE X

DATA FOR ACHIEVEMENT IN ACCOUNTING ATTAINED BY THE CONTROL GROUP

Student Number	ACT Composite	Math ACT Score	AICPA Pretest	AICPA Posttest	Change Score
1.	26	22	20	36	16
2.	25	22	04	16	12
3.	25	20	16	33	17
4.	24	23	19	25	06
5.	24	19	15	32	17
6.	23	18	10	20	10
7.	22	20	16	24	08
8.	22	17	13	17	04
9.	22	24	06	22	16
10.	20	26	05	13	08
11.	20	16	12	17	05
12.	19	20	09	18	09
13.	19	20	01	24	23
14	19	17	09	14	05
15.	19	17	10	16	06
16.	19	16	14	20	06
17.	19	16	13	17	04
18.	19	15	02	13	11
19.	18	19	12	17	05
20	18	16	02	16	14
21.	18	14	08	24	16
22.	17	25	09	14	05
23.	17	23	06	20	14
24.	17	22	12	25	13
25.	17	15	01	16	15
26.	17	14	12	14	02
27.	17	14	14	14	00
28.	17	07	17	13	- 04
29.	16	23	06	18	12
30.	16	20	02	12	10
31.	16	18	04	15	11
32.	16	11	12	21	09
33.	15	19	19	21	02
34.	15	18	12	21	09
35.	15	17	13	17	04

TABLE X (Continued)

Student Number	ACT Composite	Math ACT Score	AICPA Pretest	AICPA Posttest	Change Score
36.	15	17	13	17	04
37.	15	10	05	18	13
38.	14	15	09	09	00
39.	13	13	05	05	00
40.	12	12	06	02	- 04
41.	12	10	04	08	04
42.	12	06	04	12	08
43.	11	11	09	14	05
44.	11	09	15	30	15
45.	11	07	04	06	02
46.	11	07	04	12	08
47.	10	07	01	10	09

TABLE XI

DATA FOR ACHIEVEMENT IN ACCOUNTING ATTAINED BY THE EXPERIMENTAL GROUP

Student Number	ACT Composite	Math ACT Score	AICPA Pretest	AICPA Posttest	Change Score
1.	27	23	17	24	07
2.	25	22	30	34	04
3.	25	21	15	25	10
4.	24	20	17	24	07
5.	23	25	28	30	02
6.	23	18	17	32	15
7.	22	21	20	24	04
8.	22	18	16	22	06
9.	21	22	12	22	10
10.	21	14	14	18	04
11.	20	23	20	25	05
12.	20	23	18	25	07
13.	20	17	13	18	05
14.	19	22	21	24	03
15.	19	16	12	17	05
16.	19	14	14	17	03
17.	18	24	09	13	04
18.	18	17	10	09	- 01
19.	18	16	05	12	07
20.	18	15	09	10	01
21.	18	13	04	13	09
22.	17	19	12	14	02
23.	17	12	16	18	02
24.	16	19	13	20	07
25.	16	18	06	06	00
26.	15	17	13	18	05
27.	15	14	12	14	02
28.	15	07	07	12	05
29.	14	17	09	06	- 03
30.	13	15	04	13	09
31.	12	03	14	16	02
32.	11	09	00	04	04
33.	11	06	00	04	04

TABLE XII

ACCOUNTING ACHIEVEMENT TEST SCORES: SCORES OF 80 STUDENTS CLASSIFIED ACCORDING TO AICPA TEST SCORE AND LENGTH OF CLASS STUDENT ENROLLED

Length of the Class Enrolled	High ACT X	High ACT X^2	Medium ACT X	Medium ACT X^2	Low ACT X	Low ACT X^2	TOTAL X	TOTAL X^2
	07	49	10	100	07	49		
	04	16	04	16	00	00		
	10	100	05	25	05	25		
	07	49	07	49	02	04		
	02	04	05	25	05	25		
Eight	15	225	03	09	- 03	09		
Week	04	16	05	25	09	81		
Classes	06	36	03	09	02	04		
			04	16	04	16		
			- 01	01	04	16		
			07	49				
			01	01				
			09	81				
			02	04				
			02	04				
	55	495	66	414	35	229	156	1138
	16	256	08	64	12	144		
	12	144	05	25	10	100		
	17	289	09	81	11	121		
	06	36	23	529	09	81		
	17	289	05	25	02	04		
Sixteen	10	100	05	25	09	81		
Week	08	64	06	36	04	16		
Classes	04	16	04	16	04	16		
	16	256	11	121	13	169		
			05	25	00	00		
			14	169	00	00		
			16	256	- 04	16		
			05	25	04	16		
			14	196	08	64		
			13	169	05	25		
			15	225	15	225		
			02	04	02	04		
			00	00	08	64		
			- 04	16	09	81		
	106	1450	156	2034	121	1227	383	4711
TOTALS	161	1945	222	2448	156	1456	539	5849

TABLE XIII

MEAN SCORE DATA OF THE 80 STUDENTS CLASSIFIED BY THE EXPERIMENTAL GROUP AND THE CONTROL GROUP

Group	(N)	ACT Composite	Mean Math ACT Score	Mean AICPA Pretest	Mean AICPA Posttest	Mean Change Score
Experimental						
1	(9)	23.87	21.00	20.00	26.87	6.87
2	(19)	18.20	17.80	12.60	17.00	4.40
3	(19)	13.80	12.50	7.80	11.30	3.50
Control						
4	(8)	23.67	20.56	13.22	25.00	11.78
5	(15)	18.21	17.47	8.84	17.11	8.27
6	(10)	13.47	13.16	7.74	14.11	6.37

VITA

James William Chester

Candidate for the Degree of

Doctor of Education

Thesis: A STUDY TO DETERMINE THE EFFECTS OF COURSE LENGTH ON THE ACHIEVEMENT OF COLLEGE ACCOUNTING STUDENTS AT CAMERON UNIVERSITY

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Biographical:

Personal Data: Born August 1, 1943, at Lawton, Oklahoma, the son of Leonard and Leona Chester.

Education: Attended elementary and secondary schools in southwest Oklahoma, graduated from Frederick High School in May, 1961; received the Associate of Arts degree from Cameron Junior College in May, 1967; received the Bachelor of Science degree from the University of Science and Arts of Oklahoma in December, 1968; received the Masters of Business Administration degree from Western New England Collge in May, 1973; enrolled in the doctoral program at the Oklahoma State University in June 1976, and completed requirements for the Doctor of Education degree in December, 1980.

Professional Experience: Employed by the following companies in various managerial positions: The Army and Air Force Exchange Service, 1969-1972; Lew Wenzel Company, 1973-1974; and the Distron Corporation, 1974-1976; worked for the State Department of Vocational Education, 1978-1979, as a half-time graduate student; and taught in the Department of Business, Cameron University, as an instructor and assistant professor, 1976-1980.

Professional Organizations: Member of Delta Pi Epsilon, American Management Association, Oklahoma Accounting Educator's Association, and Higher Education Alumni Council.