

APTITUDE, PAST ACHIEVEMENT, ATTITUDE AND  
MOTIVATION AS COURSE GRADE PREDICTORS  
IN INDIVIDUALIZED INSTRUCTION

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Bachelor of Science

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1970

Submitted to the Faculty of the Graduate College  
of the Oklahoma State University  
in partial fulfillment of the requirements  
for the Degree of  
MASTER OF SCIENCE  
July, 1978

Thesis  
1978  
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## PREFACE

This study is concerned with the relationship of aptitude, past achievement, attitude, motivation and a combination of these factors to academic achievement in a course using an individualized method of instruction. The objectives of the study entailed making predictions of final grades in the course and testing the validity of those predictions. A multiple linear regression was used to formulate the prediction equation, and a chi-square procedure was used to test the validity of the predictions.

The writer expresses sincere appreciation to Dr. Grovalynn Sisler, Head of the Department of Clothing, Textiles and Merchandising, for her encouragement and guidance during the course of this study. Appreciation is also extended to Dr. Kathryn Greenwood and to Dr. Lora Cacy for their support and counsel during this study and the preparation of this thesis.

Grateful acknowledgement is extended to Iris McPherson, systems analyst at the University Computer Center, for her assistance, patience and encouragement in developing the computer programs used in this study. Appreciation is also extended to Dr. William Warde and Dr. P. L. Claypool for their advice and assistance in interpreting the statistical procedures.

Special appreciation is extended to the writer's parents, Mr. and Mrs. C. R. Millard, for their encouragement and assistance during the preparation of this thesis.

Special gratitude is expressed to my husband, Curtis W. Richardson, for his encouragement and assistance with proofreading during the preparation of this manuscript and for his family-management expertise during the course of study. A special debt of appreciation is owed to our children, Sharon, Charley, Beth and Stephenie, who have assisted with the home duties, as well as being understanding during the writing of this thesis.

Finally, appreciation is expressed to Dr. Sisler and the Department of Clothing, Textiles and Merchandising for making available the research assistantship which made this study possible.

## TABLE OF CONTENTS

Chapter	Page
I. INTRODUCTION . . . . .	1
Objectives of the Study . . . . .	3
Limitations of the Study . . . . .	3
Definition of Terms . . . . .	3
II. REVIEW OF LITERATURE . . . . .	5
Individualized Method of Instruction . . . . .	6
Aptitude in the Subject Area as a Predictor . . . . .	8
Past Achievement as a Predictor . . . . .	10
Attitude and Motivation as Predictors . . . . .	14
Self-Predicted Grades . . . . .	18
Combinations of Predictive Factors . . . . .	25
Summary . . . . .	27
III. PROCEDURE . . . . .	29
Participants in the Study . . . . .	29
Evaluative Measures Used . . . . .	29
Aptitude in the Subject Area . . . . .	30
Past Achievement . . . . .	30
Attitude . . . . .	30
Motivation . . . . .	31
Predictive Method Used . . . . .	31
Statistical Analysis Used . . . . .	32
IV. RESULTS OF THE STUDY . . . . .	33
Aptitude in the Subject Area . . . . .	33
Past Achievement . . . . .	35
Attitude . . . . .	38
Motivation . . . . .	39
Combination of Factors . . . . .	40
Conclusions . . . . .	41
Aptitude in the Subject Area . . . . .	41
Past Achievement . . . . .	42
Attitude . . . . .	42
Motivation . . . . .	43
Combination of Factors . . . . .	43

Chapter	Page
V. SUMMARY AND RECOMMENDATIONS . . . . .	44
Recommendations . . . . .	45
A SELECTED BIBLIOGRAPHY . . . . .	47
APPENDIXES . . . . .	50
APPENDIX A - SELF-DIRECTEDNESS SKILLS RATING SCALE . . . . .	51
APPENDIX B - RAW DATA AND PREDICTOR VARIABLES . . . . .	53

LIST OF TABLES

Table	Page
I. Contingency Table Showing Relationship of Grades Predicted by BMR With Actual 1978 Final Grades Achieved in CTM 4553 . . . . .	34
II. Contingency Table Showing Relationship of Grades Predicted by GPA With Actual 1978 Final Grades Achieved in CTM 4553 . . . . .	35
III. Contingency Table Showing Relationship of Grades Predicted by ACT With Actual 1978 Final Grades Achieved in CTM 4553 . . . . .	36
IV. Contingency Table Showing Relationship of Grades Predicted by GPA+ACT With Actual 1978 Final Grades Achieved in CTM 4553 . . . . .	37
V. Contingency Table Showing Relationship of Grades Predicted by SDS With Actual 1978 Final Grades Achieved in CTM 4553 . . . . .	38
VI. Contingency Table Showing Relationship of Grades Predicted by SPG With Actual 1978 Final Grades Achieved in CTM 4553 . . . . .	39
VII. Contingency Table Showing Relationship of Grades Predicted by Combined Variables (BMR+GPA+ACT+SDS) With Actual 1978 Final Grades Achieved in CTM 4553 . . . . .	40
VIII. Raw Data Including BMR, GPA, ACT, SDS, SPG and Final Course Grade in CTM 4553 . . . . .	54
IX. Predicted Final Grades for all Predictor Variables (SDS, GPA, ACT, BMR, GPA+ACT, SDS+GPA+ACT+BMR, SPG) and Final Grades Achieved in CTM 4553 for Spring, 1978 . .	57



## CHAPTER I

### INTRODUCTION

For some time educators have argued that students do not learn at a uniform pace, nor in a uniform manner. Various methods of instruction have been developed for use with, or in place of, the traditional lecture method. Individualized instruction and independent study have been presented recently as the cure-all for education's ills.

According to Ruskin and Ruskin (1977, p. 5), there has been a drastic change in the characteristics of college students because of the broader admissions policies of most universities. "As a result, students now entering universities possess widely varying skills and abilities, presenting new and complex problems for our educational system."

An offering of various methods of instruction might permit each student to learn by the method which would allow for his or her maximum achievement. This creates the problem of determining the best method of instruction for each student. If accurate predictions could be made of a student's potential for achievement under various types of instruction, solving the problem of choice of instructional method would be made easier (Misanchuk, 1977; Pascarella, 1977).

Additionally, the use of accurate predictors might identify students who will need extra help or counseling during course work (Misanchuk, 1977). Such identification could be especially useful for the student who might not seek such help on his own until it was too late.

Finally, accurate predictors of academic achievement could be useful for counseling students as to major fields of study. Morris (1954) stated,

It is almost an unpardonable waste of human effort and financial resources to allow a student to continue in a program in which he has little or no chance of success without making him aware of those chances, so that he may if he wishes transfer into a field where there is a greater probability of satisfactory experience (p. 5).

Thus efforts have been made to discover better ways to preassess academic achievement of students. Previous researchers (Khan, 1970; Lehrer and Hieronymous, 1977; Misanchuk, 1977; Sheehan and Hambleton, 1977) have attempted to identify predictors of academic achievement based on the following factors, among others:

1. Aptitude in the subject area,
2. Past achievement,
3. Attitude and motivation,
4. Various combinations of the above factors.

The merchandising curriculum in the Clothing, Textiles and Merchandising Department at Oklahoma State University requires one mathematics course, Profitable Merchandising Analysis (CTM 4553). This course is usually taken during the senior year. The course is taught through individualized instruction. A few of the students fail to satisfactorily complete the course and, thus, graduation is delayed for those students. If the students who are most likely to encounter difficulty in the course could be identified before their final semesters, they could be more appropriately counseled.

The purpose of the study was to determine the relationship of each of the above-mentioned predictor factors to academic achievement in CTM 4553 which is taught by an individualized method of instruction.

### Objectives of the Study

Objectives of the study were to predict academic achievement based on (1) aptitude in the subject area using scores on the Basic Math Review (BMR), already incorporated into the course format as a pre-test, (2) past achievement using cumulative college grade point average (GPA) and American College Testing Program (ACT) composite scores, when available, (3) attitude using the Self-Directedness Skills (SDS) rating scale, developed by Wood and McCurdy (1975), (4) motivation using the students' self-predicted grades (SPG), and (5) a combination of subject area aptitude, past achievement, attitude and motivation; and to test the validity of the predictions by comparing the predictions with the final grades actually achieved in the course.

### Limitations of the Study

The study was limited to predicting academic success in one individualized course, Profitable Merchandising Analysis (CTM 4553) at Oklahoma State University. The sample for the study was limited to the 59 students enrolled in CTM 4553 for the spring semester of 1978. The majority of the students were females in their fourth year of university course work.

### Definition of Terms

Academic achievement -- in this case, measured by final grade in the Profitable Merchandising Analysis course (CTM 4553).

Accurate predictor -- a factor or combination of factors showing a significant statistical relationship (.05 level of confidence or better) with academic achievement.

ACT -- a standardized battery of tests developed by the American College Testing Program "to assess each student's general educational development and ability to complete college level work" (Using ACT on the Campus, 1975, p. 2). ACT cautions college counselors that "ACT tests do not reflect innate ability" (p. 12). The composite ACT score was used in this study as a measure of past academic achievement.

BMR -- Basic Math Review test, a pretest incorporated into the format of the course CTM 4553; used in the study as an indication of aptitude in the subject area.

GPA -- grade point average. In this study, cumulative college grade point average was used as a measure of past achievement.

SDS -- Self-Directedness Skills. Wood and McCurdy (1975) developed a scale by which students rate themselves on each of eight such skills. In this study, SDS total score was used as a measure of attitude.

Validity -- frequency of correct predictions.

## CHAPTER II

### REVIEW OF LITERATURE

One of the unsolved problems of education is accurate prediction of student academic achievement. In spite of the many attempts by investigators, such accurate predictions remain elusive. Accurate predictions of student achievement would certainly be helpful for those involved in counseling and decision making in the area of college entrance and retention (Keefer, 1969). Performance prediction would be equally useful for placing each individual student into courses using the most effective instructional methods for him or her and for identifying those students who need help in some areas (Khan, 1970; Misanchuk, 1977; Moen and Doyle, 1977).

Mayhew (1965, p. 42) stated that "research on the relationship between all sorts of variables and academic achievement should be continued as important in understanding students." He noted, however, that predicting achievement for the purpose of college admission had come to a stand-still because the varied problems of different institutions prevent generalization, and he urged the continued approach to the problem on an institutional rather than on a national basis.

Misanchuk (1977) and Pascarella (1977) found that recent efforts in predicting academic performance have included studies of high school achievement, motivational and non-motivational personality variables, previous experience with the subject matter, high school attended and

high school quarter in which graduation occurred. "However, there does not appear to be any systematic underlying theory or rationale to guide the selection of the various predictors," Misanchuk added (1977, p. 30). Morris noted (1954, p. 13), "If the problem is to be solved, continuous study must be made of all factors, intellectual and others, which are suspected of bearing a relationship to academic success in any curriculum area."

#### Individualized Method of Instruction

Early studies of personalized, individualized and/or independent methods of instruction indicated that those methods were at least as effective as the traditional lecture methods. Finally, within this decade, educators have begun to realize that college student learning or academic achievement might actually be improved by the use of these innovative techniques, sometimes called behavioral systems (Kulik and Jaksa, 1977).

Perhaps the most widely known of the individualized study methods is Keller's Personalized System of Instruction (PSI) which was made public in 1968. However, Kulik and Jaksa (1977, p. 17) pointed out that many educators have developed similar systems of study and, although the methods have variations, "each of them embodied such concepts as clear communication of learning objectives, learner performance of desired responses, and reinforcement of these responses."

Kulik and Jaksa (1977) reviewed many studies of Keller's behavioral system of instruction in order to determine its effectiveness in the following three areas: end of course achievement, retention and transfer of knowledge, and time required to complete the learning. The

conclusions reached in the study were as follows: Students in PSI courses performed better on final examinations in various courses than did students in similar courses taught by conventional methods; PSI students had higher learning retention scores than did students in conventional courses; although the first PSI courses required more time to complete than did conventional courses, improved methods have cut the time required to a level consistent with that for conventional courses.

Kulik and Jaksa (1977) found that many of the consistently effective behavioral systems of instruction had the following factors in common:

the over-all novelty of these teaching methods; their reliance on educational technology; and their use of specific instructional features, such as proctorial assistance, freedom of student pacing and mastery quizzes (p. 17).

The authors also concluded that neither innovation nor technology itself insures that the instruction will be effective.

PSI appears to be a fascinating subject of research as indicated by the great number of articles published or presented on the topic. According to Ruskin (1977) more than 1,000 such articles are documented in the Journal of Personalized Instruction, available from Georgetown University. Ruskin and Ruskin (1977) suggested that the increased popularity of PSI courses may be due, in large part, to the great increase in number and variety of college students.

The open availability of a college education has, in effect, drastically changed student characteristics. Universities are no longer able, or indeed willing, to limit the benefits of a higher education to a small number of highly selected students, as was traditionally the case. As a result, students now entering universities possess widely varying skills and abilities, presenting new and complex problems for our educational systems. Compounding these problems is the rising cost of a college education and consequent concerns about instructor accountability (p. 5).

An important by-product of the move toward behavioral systems of instruction was the measurement and evaluation of the variables which contribute to or hinder learning by students (Ruskin and Ruskin, 1977). Sherman (1977) stated that a more substantial instructional technology has emerged from the last ten years of work with PSI systems, and a systematic analysis of education with improvements in teaching and learning now seems possible.

#### Aptitude in the Subject Area as a Predictor

Sheehan and Hambleton (1977) attempted to determine the best combination of variables with which to predict final grades in a ninth-grade individualized science course. The researchers expected IQ to be the variable correlating highest with final grade in the science course. To their surprise, they found the highest correlating variable to be the Science Research Associates' Achievement Series total arithmetic score. Another variable with high correlation was the Letter Sets Test Score from the Kit of Reference Tests for Cognitive Factors. The Letter Sets Test measures induction which is the forming and trying out of hypotheses, an important part of scientific reasoning.

In a longitudinal study of four years with high school students, Khan (1970) found that predictions of achievement based on aptitude remain stable over a long period of time. His predictions based on scores from tests given in ninth grade held valid for achievement in 12th grade. According to Mayhew (1965) academic aptitude has proven significance as a predictor of academic success, although it allows a wide variance.

The use of standardized aptitude tests presented a problem in a study conducted by Eastman and Behr (1977). They found that correlations



among several test scores differed among experimental populations. One recommendation of the researchers was that consideration be given to the use of non-standard aptitude measures in further studies.

Morris (1954) investigated the relationship of selected variables with academic success in algebra and calculus classes and the validity of two of the variables as predictors of academic success in calculus. The study was conducted at Oklahoma State University (then Oklahoma Agricultural and Mechanical College) and involved 160 students enrolled in calculus. The criterion variables for the study were the final grades achieved in college algebra courses and in the college calculus classes. The independent variables used in the first section of the study were as follows:

1. Mathematical aptitude as measured by The American Council on Education (ACE) Psychological Examination quantitative test score (Q-score), The Guilford Zimmerman Test of General Reasoning, The ACE Cooperative Algebra Test;
2. Past achievement in mathematics as measured by high school grade point average in mathematics courses, and final grade in college algebra (in relation to final grade in calculus only);
3. Attitude and motivation as measured by the number of semesters of mathematics completed in high school;
4. Language aptitude as measured by the ACE L-score;
5. Reading ability as measured by the Nelson Denny Reading Test.

The results of the study indicated that each of the variables except number of semesters of school mathematics completed had a significant correlation with final grade achieved in college algebra. Only two variables, ACE Q-score and final grade in college algebra, were

found to be significantly related to final grade in the college calculus courses.

The second part of the study involved predicting final grades in the college calculus courses. This was accomplished by means of a regression equation based on ACE Q-scores and college algebra final grades obtained from the students enrolled in the courses during two previous years. The grade predictions of AB, C and DF were found to be significant at the .01 level.

Johnson (1975) investigated the relationship between selected evidences of aptitude and achievement in the academic program at Oklahoma State University and job satisfaction of former Clothing, Textiles and Merchandising students. She found that aptitude, as measured by the General Clerical Test (GCT), had a higher correlation with job satisfaction than did achievement, as measured by overall grade point average (GPA). She also found the intercorrelation between GCT and GPA to be significant at the .05 level.

#### Past Achievement as a Predictor

Mayhew stated (1965, p. 42), "Past academic performance . . . has proved to be the most important single evidence upon which to base a prediction of future academic success" although it allows a wide variance in prediction.

Several years ago Holland and Astin (1962) conducted a study on prediction of the academic, artistic, scientific and social achievement of undergraduates of superior scholastic aptitude as part of a research program of the National Merit Scholarship Corporation. The predictor variables investigated were scholastic aptitude, personality,

originality, interest, parental attitude and background information. The four criterion variables were measures of creative performance in the arts, creative performance in the sciences, high freshman grades in college and leadership. The researchers found that ". . . the best single predictor of each of the four kinds of undergraduate achievement is similar achievement in high school" (Holland and Astin, 1962, p. 142).

Mann (1971, p. 37) corroborated that opinion and suggested that "past academic performance is indicative of future academic performance." Mann investigated the relationship of selected academic and interest variables to academic achievement in the college of Engineering at Oklahoma State University. The purpose of the study was to determine whether factors other than a specific GPA are more indicative of academic success in upper class engineering work.

The sample consisted of 196 sophomore students enrolled in the College of Engineering in the spring semester of 1967. The sample was divided into two groups, 103 students who had completed the requirements for a Bachelor of Science in Engineering and 93 students who had failed to successfully complete those requirements.

The following scores were obtained for each of the students: ACT English, mathematics, social studies, natural science and composite; Cooperative Algebra Test (CAT), form 2; Nelson Denny Reading Test (NDRT); Kuder Preference Record (KPR); high school GPA; GPA in mathematics, chemistry, physics, social science and humanities at the end of the sophomore year; and total GPA at the end of the sophomore year. The above-mentioned scores were used as predictor variables. The criterion variables consisted of the following: upper division GPA; cumulative GPA; and successful completion of the engineering program.

Multiple correlation and step-wise linear regression statistical analyses were performed by use of a computer program. The results revealed correlations that were significant at the .01 level between the predictor variables sophomore GPA, mathematics GPA, chemistry GPA, physics GPA, social science GPA, humanities GPA and the first criterion variable, upper division GPA. The step-wise procedure accepted the following predictor variables for the regression equation: sophomore GPA, chemistry GPA, NDRT comprehension, KPR musical, KPR outdoor and KPR artistic. The multiple R was found to be 0.645 which implies that the above six predictors combined accounted for about 42 percent of the variability in upper division GPA. However, the standard error of the estimate was too large for predictions based on the equation to be meaningful.

Significant correlations were found between the second criterion variable, cumulative GPA, and the following 13 predictor variables: sophomore GPA, mathematics GPA, chemistry GPA, physics GPA, social science GPA, humanities GPA, high school GPA, CAT, NDRT vocabulary, NDRT total, ACT mathematics, KPR persuasive, and KPR social science.

The multiple step-wise regression procedure was again employed to determine the best combination of variables for predicting cumulative GPA. Only sophomore GPA was retained by the procedure since no other predictors were found to be capable of making a significant contribution to the predictive efficiency of sophomore GPA. The standard error of the estimate was relatively small, which would indicate that the regression equation using sophomore GPA as a predictor was useful for the selection of students for the upper division engineering program.

The third criterion, successful completion of the engineering program, was found to be significantly related to the following 12 predictors: mathematics GPA, sophomore GPA, physics GPA, chemistry GPA, high school GPA, humanities GPA, social science GPA, CAT, ACT natural science, ACT mathematics, ACT composite, and ACT social science.

The step-wise multiple regression analysis accepted the following four variables for the prediction equation: sophomore GPA, physics GPA, chemistry GPA, and KPR persuasive score. When the regression equation was applied to the sample, successful completion of the engineering program was predicted 83 percent of the time. Therefore the predictive equation was accepted as useful for the selection of students for the upper division engineering program.

"Since the best single predictor of success in this study was sophomore GPA," Mann stated (1971, p. 63), "one might conclude that the best predictor of success in any academic program is past performance in an academic program."

In a study of self-prediction of academic achievement by college students, Keefer (1969) found that cumulative college GPA was the best predictor for college achievement when compared with ACT composite scores, high school GPA and self-predicted GPA. The study, which involved 154 liberal arts undergraduate volunteer participants, also indicated that high school GPA and ACT scores became less valid as predictors after the freshman year and that, "By the senior year, the ACT has become almost a contraindicator of achievement" (Keefer, 1969, p. 55).

The ACT Assessment of the American College Testing Program is designed for use by students planning to enter a postsecondary institution (Using ACT on the Campus, 1975). ACT data is provided for the

schools of the students' choice for placement and credit by examination decisions with the suggestion that the data be used as predictors for freshman courses only (p. 12).

According to another ACT publication (Highlights of the ACT Technical Report, 1973), the reliability and validity of ACT test scores have been tested and retested and ACT test scores and high school grades can be used to predict grades in individual college courses, as well as over-all college GPA.

In a recent study Norris and Cochran (1977) investigated the relationship of ACT scores, as well as several self-reported variables, to final grade in each of four courses. Students' level of work was not indicated. Zero order correlations for ACT scores and final grades showed a significant relationship (at the .01 level) in history and (at the .05 level) in speech.

In a similar study with 81 freshman students, Stock, Schmid and Heinen (1977) found ACT composite score and high school GPA to be significant at the .01 level as predictors of college GPA. However, ACT scores and secondary school grades are not the only factors related to academic success in college. Interest, motivation, values and study habits are other types of variables (Using ACT on the Campus, 1975, p. 12).

#### Attitude and Motivation as Predictors

Success in an individualized course may depend upon degree of motivation and attitude of the student. As Mayhew (1965, p. 42) recognized, motivation seems to be an important factor in determining academic success or failure. However, he noted that "no one apparently has

succeeded in measuring it with sufficient stability to allow reasonable predictions."

A workable definition for academic motivations has been offered by Moen and Doyle (1977, p. 509). "Academic motivations are those material, psychological, or social forces that draw or impel students to put effort into curricular activities." The researchers suggested that an instrument measuring academic motivations could be useful in admissions decisions, guidance and counseling, adjustment, curriculum planning and evaluation and improvement of instruction.

According to Khan (1970), even students with high mental ability may not achieve academic success if they have low motivation, poor study skills and negative attitudes. Conversely, he suggested that students with lower aptitude for the subject may perform at a higher level if they are highly motivated and have favorable attitudes. In addition, he noted that affective characteristics such as motivation and attitude are more likely to be changed through counseling than is ability.

Khan's longitudinal study was conducted in order to determine (1) the relationship between affective characteristics (attitude and motivation) and academic achievement, and (2) whether those characteristics, used as predictors of academic achievement, added to the accuracy of predictions based on aptitude.

The participants were 1,038 students enrolled in the eighth grade at three schools in Florida. Attitude, motivation and study habits were measured by a modified version of the Survey of Study Habits and Attitudes (SSHA). The School and College Ability Test (SCAT) verbal and mathematical scores, obtained during the ninth-grade year were used as the measures of aptitude. Academic achievement was measured during the

12th grade by means of a standardized achievement test battery developed by the Educational Testing Service for the Florida Statewide Testing Program.

Khan found significant correlations between attitude-motivation measures and academic achievement. However, he found that those measures did not increase the accuracy of prediction of academic success over predictions made by the measure of aptitude alone. A positive result of the study was the discovery that individual differences in attitude and motivation, as well as in aptitude, remained stable over the four years encompassed by the study; thus they could be used as predictors of future academic achievement.

Cazell (1970) noted:

In general, researchers agree that non-intellective factors can be utilized as predictors of college success, and that once groups of ability levels are controlled, non-intellective factors account for an increasing degree of prediction (p. 5).

However, according to Reed, Feldhusen and Mondfrans (1972), the many studies conducted recently using personality or demographic variables as predictors have not yielded conclusive results.

Wood and McCurdy (1975) developed a Self-Directedness Rating Scale (SDRS) to measure attitudes of students toward their self-directedness in the following areas:

- (1) ability to operate independently of the teacher's direction,
- (2) ability to seek answers to questions and problems without assistance,
- (3) ability to use class time effectively,
- (4) ability to develop a plan for completing his work,
- (5) ability to use basic study skills,
- (6) ability to proceed through the . . . learning materials on his own,



- (7) ability to adapt activities and assignments to his needs,
- (8) ability to work at a pace commensurate with his perceived ability (p. 384).

The sample for the study by Wood and McCurdy (1975) was made up of 135 high school freshmen who were completing the first year of the two-year Nebraska Physical Science Project (NPSP). The authors described NPSP as an integrated and individualized chemistry-physics course (p. 382). The sample included 72 students, rated by their teachers as being in the top 15 percent of their class, and 63 rated in the bottom 15 percent.

The SDRS was administered to the students and they were requested to rate themselves on a five-point scale as to the degree to which they had attained each of the eight skills. A rating of one or two was considered low ability, three was considered moderate ability, and four or five was considered high ability. The ratings for all of the skills were totaled to obtain a total SDRS score. The researchers used a t-test to determine significant differences at the .01 level between the top 15 percent and the bottom 15 percent for six of the eight skills and for the total SDRS score.

The results indicated that the top students rated themselves significantly more capable of operating independently of teacher direction, using class time effectively, planning a work schedule, using study skills, using materials without assistance, and working at a pace commensurate with ability. The top students also rated themselves slightly higher on the other two skills, ability to seek answers to questions without assistance and to skip learning activities already mastered, although the between-group differences were not large enough to be significant. Sixty percent of the top students and only 15

percent of the bottom students rated themselves as highly self-directed, according to total scores.

The researchers concluded from the results that student success in courses which use teaching packages such as those employed in the Nebraska Physical Science Project require the skills of self-direction. Therefore, they urged that entry pre-assessment of behavior for classes using teaching packages should include a measure of the students' self-direction skills. The information could be used to plan instruction, counsel students, provide a basis for remediation, and diagnose problems with the material.

Sisler (1977) used an adaptation of the SDRS with 48 students enrolled in CTM 4553 during the spring semester of 1977. Sisler found significant differences between the top and bottom 15 percent of CTM 4553 in five of the eight skills, operate independently of teacher direction, seek answers to questions without assistance, use class time effectively, use study skills, and use curriculum materials without assistance. Four of these skills were the same as those found to be significant by Wood and McCurdy (1975).

#### Self-Predicted Grades

Calhoun (1975) investigated the relationship between student characteristics and academic achievement in an individualized psychology course. Participants in the study were the 231 university undergraduate students enrolled in a psychology of personality course. The characteristics were grouped by multiple correlations into three variables, experience (age, class, transfer status and number of semesters), knowledge and motivation (grade point average and self-predicted final

grade) and psychology background (major course of study and previous psychology courses).

The variables were found to be differentially related to various aspects of academic achievement. Experience was related to drop-outs; grade point average and self-predicted grade were related to rate of progress; grade point average was related to performance on quizzes, and self-predicted grade was related to final examination scores.

Calhoun (1975) concluded that,

Comparing the relation of students' characteristics to pretest scores and posttest scores, it appears that regardless of pre-course experience and background, the only differences on final course achievement are related to expected grade. Thus, how well a student did over-all in the Keller-type course in this study seemed to be more a function of his initial goals and expectations than his specific background or general experiences (p. 17).

In 1967 Biggs and Tinsley (1970) conducted a study of the relationship between student-made academic predictions and the academic achievement of entering college freshmen. The eight-item Michigan State General Self-Concept of Ability to Learn Scale (SCDA), already in use at the secondary level, was adapted for the study by changing the words "high school" to "college" and by changing the name to College Opinion Survey (COS). The questionnaire "requires the student to estimate and/or evaluate his academic ability in relation to past, present, and future academic reference groups" (p. 196). The COS scores were used as the measure of self-made predictions. The COS was tested with 118 sophomores at Creighton University. Analysis showed a reliability coefficient of .82.

The questionnaire was then administered to two samples of freshman students during orientation programs. The first sample was a group of 72 freshmen enrolled in arts and sciences and business administration at

Creighton University. The second sample consisted of 62 liberal arts freshmen at the University of Minnesota.

Statistical analysis indicated a significant relationship between student-made predictions and college grades during the freshman year, even when differences in aptitude were controlled. Carrying the study a step further, the researchers obtained the high school rank for each of the students in the second sample. A negative correlation was found between self-made predictions of college academic achievement and previous high school achievement. The authors suggested that the data obtained by use of the COS could be particularly helpful in the development of programs for underachievers since students rate themselves in terms of self-evaluation and self-acceptance.

During the fall semester of 1968 Biggs, Roth and Strong (1970) conducted further research with COS predictions of academic achievement, relating the predictions to past and future academic performance, scholastic aptitude and interest in academic achievement. The COS was expanded to include eight items from the Importance of Achieving Higher Grades than Others Scale (IG). The IG items require the student to rate the importance he gives to getting grades, having a high academic standing and doing better than others. The score for the first half was called  $COS_1$ , the score for the second half was  $COS_2$  and the total score was  $COS_T$ .

The measure of past academic performance was percentile rank in high school class (HSR) at the end of the junior year. First quarter college GPA was the measure of future academic performance. The measure of aptitude was the Minnesota Scholastic Aptitude Test (MSAT) score. The Academic Achievement Scale (AACH) of the Strong Vocational Interest

Blank was the measure of interest in academic achievement. The population consisted of 4,300 entering liberal arts freshmen at the University of Minnesota.

$COS_1$  and  $COS_T$  scores were significantly related to HSR, GPA, MSAT and AACH.  $COS_2$  was significantly related only to HSR and GPA.

Apparently, past performance, future performance, academic aptitude, and academic achievement interest are more related to students' estimates of future performance relative to other students than to students' feelings of the importance of good performance. This suggests that a student's knowledge of his relative standing in different reference groups strongly affects the accuracy of his self-made academic predictions (Biggs et al., 1970, p. 83).

The fact that  $COS_2$  was not significantly related to interest nor to aptitude scores, but was related to past and future achievement, indicated to the researchers that  $COS_2$  "may measure a motivational factor which, in some ways, is compensatory . . . for lack of ability or lack of interest" (Biggs et al., 1970, p. 84).

The extent of the contribution of COS to the prediction of academic performance was tested. Multiple correlations of HSR, MSAT and COS to GPA indicated that adding self-made predictions of academic achievement did not increase the validity of predicted GPA. The authors explained that self-made predictions of academic achievement are expressions of the individual's concept of his own ability which could be valid guides to the student for decision making and pacing. However, there was substantial error in the self-made predictions. The authors noted that this finding was in agreement with previous research results which have shown that self-estimates are not necessarily accurate predictors of academic achievement.

Doleys and Renzaglia (1963) noted that previous studies had yielded low correlations between self-predicted test scores and the actual test

scores. They pointed out that the participants were usually required to predict behavior in an unfamiliar situation, and by means of a standardized test which the subjects had never seen or taken before. The investigators proposed to determine the accuracy of self-predictions in a familiar situation in order to obtain more accurate self-predictions.

A sample of 211 first-quarter freshmen was drawn from one advanced section, six regular sections and three remedial sections of basic English at Southern Illinois University. Results were based on the 183 students who completed the course work.

During a regular class period participants were asked to estimate their expected performance for the first two quarters of college on a scale of 5 (A) to 1 (E). The scale was subdivided into tenths of points. The School and College Tests (SCAT) score, obtained for each participant was used as the measure of aptitude. At the end of the second quarter grades achieved by the students were obtained and GPAs were computed on the same scale as that used for the self-predictions.

Statistical analysis indicated that, while the correlation between the estimated and actual performance was positive and significant, the self-estimates were less effective as predictors of academic achievement than the SCAT scores. The multiple correlation among the self-predictions, SCAT scores and GPA indicated that the addition of self-predictions did not significantly improve the predictive accuracy of the aptitude scores. The results of the study also indicated that the self-predicted grades tended to be higher and less variable than the grades that were actually earned.

The correlation between SCAT total score and difference between actual and self-predicted GPA was not significant. Therefore, it was

concluded that accuracy of prediction is not necessarily a function of intelligence.

A measure of underestimation-overestimation was computed by subtracting self-predicted GPA from actual GPA and adding a constant of five to eliminate negative values. The correlation of the measure with SCAT total score was significant at the .01 level. The results indicated that intellectually more able students are more likely to accurately predict or underestimate their GPA while less able students tend to overestimate their expected GPA.

Goldman and Slaughter (1976, p. 9) suggested that the problem encountered in predicting college GPA "is a criterion problem rather than a predictor problem." The authors strongly suspected that GPA was not behaving as a normal composite variable.

In order to demonstrate that grades within specific classes are highly predictable while GPA is not, a study was conducted with 254 undergraduate students at the University of California during the fall quarter of 1974. The five classes involved in the study were general biology, general physics, general chemistry, introductory psychology, and introductory sociology.

"Unlike previous investigations, the mean ability levels of the students in the five classes were rather similar" (Goldman and Slaughter, 1976, p. 13). However, mean grades for the five classes indicated an obvious difference, suggesting that the instructors for the five classes employed different grading standards. The multiple correlations of grades in each class with Scholastic Aptitude Test (SAT) scores and high school GPA were as high or higher than the multiple

correlations of SAT and high school GPA with overall GPA. Therefore, the researchers concluded:

Herein lies the paradox - GPA is the composite formed from the grades in many classes. Thus, it ought to be more reliable, and, hence more predictable, than grades from a single class. The fact that it is not supports our original contention that the class grades that form the GPA composite are not identical components (Goldman and Slaughter, 1976, p. 13).

Murstein (1965) studied the relationship of expected grades, grades believed to be deserved and actual course grades. Participants were 76 students enrolled in four sections of educational psychology at Louisiana State University. The results indicated that students who received grades of A and B were generally realistic in their expectations and statement of the grade they believed they deserved. However, students receiving a grade of C or below tended to be grossly unrealistic in their initial estimates and they usually stated that they deserved a grade of B.

Keefer (1969) also investigated self-prediction of course grades. At the beginning of the semester he asked 154 liberal arts undergraduate volunteers to list the courses in which they were enrolled and the grade they expected to receive in each course at the end of the first grading period. At the beginning of each of the next three grading periods the procedure was repeated.

From the results of the study the author reached the following conclusions:

1. The self-estimate of academic achievement is as valid a predictor as standardized entrance test scores or GPA.
2. The self-estimate of academic achievement, based on mid-term grades is a significantly better predictor than entrance test scores or high school GPA.



3. Self-estimates of grades are stable. Such predictions neither increase nor decrease in accuracy during a four-year period.

4. Predictions based on standardized entrance tests and high school GPA tend to lose accuracy over a four-year period.

5. The grades most recently earned tend to be the best predictors of future grades at any point during the college program.

Another study investigating self-predictions of course grades was conducted by Norris and Cochran (1977) with students at Illinois State University. On the first day of classes a questionnaire was administered to the participants. Information incorporated into the questionnaire included the competencies that the instructors felt would contribute to getting a good grade in the course and a histogram showing the distribution of grades for the previous students taking the course. Questions about the past academic achievement of the students were included, and students were asked to rate themselves on the listed competencies. Finally, each student was requested to estimate his final grade in the course after considering the competencies, the previous grade distribution and his own past performance.

The results of the study indicated that self-estimates afforded a higher level of prediction than did ACT scores. Further, the prediction level attained by the self-estimates was not significantly improved by the addition of ACT scores.

#### Combinations of Predictive Factors

Sheehan and Hambleton (1977) investigated variables in an effort to determine which would best predict academic achievement in a ninth-grade individualized science course. The predictor variables included

measures for overall intelligence and aptitude, subject matter aptitude (in science, language arts, arithmetic, reading), attitude, motivation, study habits and anxiety. The best predictors were determined by computer with a step-wise regression program.

The researchers found that any one of seven single predictors could be used to explain about 40 percent of the variance of academic achievement as measured by final grades in the science course. The single predictors were non-verbal IQ score, Science Research Associates' Achievement Series (SRA) science score, SRA arithmetic score, SRA composite, SRA work study skills score, Educational Testing Service (ETS) mathematics score, and ETS letter sets score.

A combination of SRA arithmetic score, ETS letter sets score, SRA science score and Psychological Corporation's Survey of Study Habits and Attitudes (SSHA) was found to explain approximately 60 percent of final grade variance. The four predictors are measures of past arithmetic and science achievement, inductive reasoning ability, and study habits and attitudes. Their diversity indicates that academic achievement in the course studied is related to diverse competencies.

Mayhew (1965) noted that the addition of affective measures to high school rank and aptitude measures has sometimes increased and sometimes decreased predictive success. For some time educators have sought to identify the non-intellective variables which might improve the predictive power of measures of achievement and aptitude.

From a review of several studies, Mann (1971) concluded that several variables in combination tend to have a higher correlation with academic achievement than each variable alone. He noted also that the

relationship of interest variables and academic variables to academic achievement needs to be studied further.

Lehrer and Hieronymous (1977) stated the findings of their study indicated that prediction equations which include intellectual and non-intellectual variables are more effective for predicting academic achievement than combinations of nonintellectual variables.

#### Summary

For some time educators have recognized the need for more effective means of predicting academic achievement. Various measures of aptitude, past achievement, attitude and motivation have been investigated as to their relationship to academic achievement and their predictive validity.

Educators in many colleges and universities are concerned with finding better ways to preassess student performance in order to effectively plan instructional methods, make admission and retention decisions, and to counsel students as to major course of study or remediation. The following conclusions were drawn from the review of literature:

1. Students enter college with a variety of backgrounds, experience and abilities.
2. Not all students learn at the same rate nor in the same manner.
3. Previous academic achievement has been found to be a valid predictor of future academic achievement for short periods. However, there is unexplained variance in such predictions.

4. Predictions of academic achievement based on measures of aptitude tend to remain stable over longer periods of time. In many cases, however, such predictions have not been found to have significant correlation with actual achievement.

5. Attitude and motivation are thought by many researchers to constitute the missing factor in prediction equations based on past achievement and/or aptitude.

6. Attitude and motivation have remained elusive and difficult to measure and evaluate. Researchers agree only that much further study needs to be undertaken in order to determine the effect that attitude and motivation have on academic success or failure.

7. Self-predictions of grades tend to be more accurate for students who make A or B grades than for students who achieve a grade of C or below.

8. Predictive success has sometimes been increased and sometimes been decreased by combining measures of attitude and motivation to measures of aptitude and past achievement.

## CHAPTER III

### PROCEDURE

The purpose of the study was to determine the relationship of aptitude in the subject area, past achievement, attitude, motivation and a combination of those factors to academic achievement in a course using an individualized method of instruction. The objectives of the study entailed making predictions of final grades in the course and testing the validity of those predictions.

#### Participants in the Study

The participants were the 59 students enrolled in Profitable Merchandising Analysis (CTM 4553) for the spring semester of 1978. The course is required for students whose major plan of study is fashion merchandising in the Clothing, Textiles and Merchandising Department at Oklahoma State University. Fifty-six of the students were females and two were males in their fourth year of university course work. The other student was a female in graduate school.

#### Evaluative Measures Used

In order to predict a final grade for each student based on each of the predictive variables, some measurement for the variables had to be obtained. Existing and previously tested instruments were used for

measuring each of the variables, since creating and testing such instruments would require an excessive amount of time.

#### Aptitude in the Subject Area

Since a knowledge of basic mathematics is essential to understanding the concepts presented in CTM 4553, students enrolled in the course are given the Basic Math Review test (BMR) during the first week of class. Students who score 19 or lower on the 25 point test are encouraged to do remedial work in basic mathematics before attempting to take the first unit examination. For the purpose of the current study, each student's score on the BMR was deemed acceptable as a measure of his or her aptitude in the subject area.

#### Past Achievement

The one indication of past achievement which was available for all participants and accessible to the researcher was cumulative college grade point average (GPA).

Although ACT scores were available for only 35 of the 59 participants in the study, the available composite ACT scores were used as a second measure of previous achievement.

A combination of GPA and ACT scores was used as a third measure of previous achievement.

#### Attitude

Since individualized instruction requires the student to be self-directing in his study, the assumption was made that the Self-Directedness Skills rating scale (SDS) developed by Wood and McCurdy

(1975) would be a valid measure of attitude. During the first class period of the semester participants were asked to complete the Self-Directedness Skills rating scale (Appendix A). The total SDS score for each student was used as the measure of his or her attitude.

### Motivation

The students themselves are in the best position to know the extent of their own motivation. Some researchers (Calhoun, 1975; Keefer, 1969; Norris and Cochran, 1977) have found that students' predictions of final grades were accurate in many cases. During the first class period participants were shown the objectives of the course and a transparency depicting the grade distributions for CTM 4553 during the past four years. They were then asked to predict their own final grades for the course. The self-predicted grade for each student was considered the measure of his or her motivation.

### Predictive Method Used

A prediction formula for each predictor variable was determined by computer using a multiple linear regression program. The data for the regression had been obtained in an earlier study (Sisler, 1977) and consisted of SDS scores, BMR scores, ACT scores, GPA and final course grades of students who had been enrolled in CTM 4553 during the spring semester of 1977.

Prediction equations were formulated by computer for each of six predictor variables (SDS, BMR, GPA, ACT, GPA + ACT, SDS + BMR + GPA + ACT). The 1977 students were not asked to predict their own final grades; therefore, the self-predicted grades for 1978 could not be included in the prediction equation.

Actual prediction of grades was also accomplished by use of the computer. The prediction variables for the spring of 1978 participants were used with the prediction equation in the multiple linear regression program to predict a final grade for each student for each of the six variables.

#### Statistical Analysis Used

The relationship of each of the seven predictor variables (including self-predicted grades) to the dependent variable (final grade) was tested by computer with a chi-square test, which indicated discrepancy between obtained frequencies and expected frequencies. The chi-square statistic, degrees of freedom, probability and a contingency table for each predictor variable were obtained.



## CHAPTER IV

### RESULTS OF THE STUDY

The purpose of the study was to determine the relationship of aptitude in the subject area, past achievement, attitude, motivation and a combination of those factors to academic achievement in a course using an individualized method of instruction. Participants in the study were the 59 students enrolled in CTM 4553 during the spring semester of 1978. Of the 59 students who were enrolled in the course at the beginning of the study, five dropped the course with failing grades shortly before the final examination. Those five students are included in the results as having received an F grade.

To accomplish the purpose of the study, final grade predictions were made for each participant, based on the BMR score, GPA, ACT score, GPA + ACT score, SDS score and a combination of the factors. In addition, each participant was asked to predict his or her own final grade in the course. See Tables VIII and IX in Appendix B. The validity of the predictions was determined by applying a chi-square test to ascertain the relationship between predicted grades and actual final grades.

#### Aptitude in the Subject Area

The Basic Math Review (BMR) test scores were used as the measure of aptitude in the subject area. See Table I. The relationship of the predicted grades based on BMR scores to actual final grades was

significant at the .002 level with 16 degrees of freedom. The majority of the accurate predictions were at the upper end of the grade scale. Eighteen of 24 A grades (75%) were correctly predicted, as were one of ten B grades (10%) and five of 14 C grades (35.71%). None of six D grades and only one of five F grades (20%) were correctly predicted.

TABLE I  
CONTINGENCY TABLE SHOWING RELATIONSHIP OF GRADES  
PREDICTED BY BMR<sup>a</sup> WITH ACTUAL 1978 FINAL  
GRADES ACHIEVED IN CTM 4553

Final Grade	Grades Predicted by BMR					Total Grades (Actual)
	A	B	C	D	F	
A	<u>18</u>	3	3	0	0	24
B	7	<u>1</u>	1	1	0	10
C	5	2	<u>5</u>	2	0	14
D	0	1	4	<u>0</u>	1	6
F	0	3	1	0	<u>1</u>	5
Total Grades (Predicted)	30	10	14	3	2	59

Note. Underlined numbers indicate final grades correctly predicted.

<sup>a</sup>Basic Math Review Score

Probability was 0.0022 with 16 degrees of freedom and chi-square of 36.8.

## Past Achievement

The following three measures of past achievement were used: college cumulative grade point average (GPA), ACT composite score and a combination of GPA and ACT scores.

Grades predicted from GPA had a high relationship with actual final grades. See Table II. With 12 degrees of freedom, the significance level was .0001. Grades correctly predicted were eight of 24 A grades (33.33%), six of ten B grades (60%), 12 of 14 C grades (85.71%) and one of six D grades (16.66%). No F grades were correctly predicted.

TABLE II  
CONTINGENCY TABLE SHOWING RELATIONSHIP OF GRADES  
PREDICTED BY GPA<sup>a</sup> WITH ACTUAL 1978 FINAL  
GRADES ACHIEVED IN CTM 4553

Final Grade	Grades Predicted by GPA					Total Grades (Actual)
	A	B	C	D	F	
A	<u>8</u>	13	3	0	-	24
B	2	<u>6</u>	2	0	-	10
C	0	2	<u>12</u>	0	-	14
D	0	1	4	<u>1</u>	-	6
F	0	0	5	0	-	5
Total Grades (Predicted)	10	22	26	1	-	59

Note. Underlined numbers indicate final grades correctly predicted.

<sup>a</sup>Cumulative College Grade Point Average

Probability was 0.0001 with 12 degrees of freedom and chi-square of 41.18.

ACT scores were available for only 35 of the 59 participants. Twenty-eight B grades and seven C grades were predicted based on ACT scores, and no A, D or F grades were predicted. Six B grades (60%) and one C (7.14%) were correctly predicted. No significant relationship was shown. See Table III.

TABLE III  
CONTINGENCY TABLE SHOWING RELATIONSHIP OF GRADES  
PREDICTED BY ACT<sup>a</sup> WITH ACTUAL 1978 FINAL  
GRADES ACHIEVED IN CTM 4553

Final Grade	Grades Predicted by ACT					Total Grades (Actual)
	A	B	C	D	F	
A	-	12	3	-	-	15
B	-	<u>6</u>	1	-	-	7
C	-	8	<u>1</u>	-	-	9
D	-	1	1	-	-	2
F	-	1	1	-	-	2
Total Grades (Predicted)	-	28	7	-	-	35

Note. Underlined numbers indicate final grades correctly predicted.

<sup>a</sup>Composite Score, American College Testing Program Assessment

Probability was 0.5854 (not significant) with 4 degrees of freedom and chi-square of 2.84.

When GPA and ACT scores were used together as a predictor of final grade, there was no significant relationship at the .05 level between predictor and grade. See Table IV. Fifteen of the A grades (62.5%), three of the B grades (30%) and six of the C grades (42.86%) were correctly predicted. None of the D or F grades were correctly predicted.

TABLE IV  
CONTINGENCY TABLE SHOWING RELATIONSHIP OF GRADES  
PREDICTED BY GPA+ACT<sup>a</sup> WITH ACTUAL 1978  
FINAL GRADES ACHIEVED IN CTM 4553

Final Grade	Grades Predicted by GPA+ACT					Total Grades (Actual)
	A	B	C	D	F	
A	<u>15</u>	5	4	0	-	24
B	4	<u>3</u>	2	1	-	10
C	1	6	<u>6</u>	1	-	14
D	1	2	3	<u>0</u>	-	6
F	0	3	2	0	-	5
Total Grades (Predicted)	21	19	17	2	-	59

Note. Underlined numbers indicate final grades correctly predicted.

<sup>a</sup>Cumulative College Grade Point Average + Composite Score, American College Testing Program Assessment

Probability was 0.0701 (not significant) with 12 degrees of freedom and chi square of 19.84.

## Attitude

The total score on the Self-Directedness Skills (SDS) rating for each student was used as his or her measure of attitude. There was no significant relationship shown between the grades predicted by SDS scores and the final grades achieved in the course. See Table V. Four of the A grades (16.67%), seven of the B grades (70%) and four of the C grades (28.57%) were correctly predicted. None of the D or F grades were correctly predicted.

TABLE V  
CONTINGENCY TABLE SHOWING RELATIONSHIP OF GRADES  
PREDICTED BY SDS<sup>a</sup> WITH ACTUAL 1978 FINAL  
GRADES ACHIEVED IN CTM 4553

Final Grade	Grades Predicted by SDS					Total Grades (Actual)
	A	B	C	D	F	
A	<u>4</u>	13	6	1	-	24
B	0	<u>7</u>	3	0	-	10
C	2	7	<u>4</u>	1	-	14
D	0	2	4	<u>0</u>	-	6
F	0	2	3	0	-	5
Total Grades (Predicted)	6	31	20	2	-	59

Note. Underlined numbers indicate final grades correctly predicted.

<sup>a</sup>Self-Directedness Skills Rating Scale, developed by Wood and McCurdy (1975)

Probability was 0.6589 (not significant) with 12 degrees of freedom and chi-square of 9.51.

## Motivation

Each student's own prediction of his or her final grade was used as the measure of motivation. No student predicted that he or she would make a grade lower than C. See Table VI. There was no significant relationship at the .05 level between self-predicted grades and final grades. Fourteen of the A grades (58.33%) and three of the B grades (30%) were correctly predicted. No C, D or F grades were correctly predicted.

TABLE VI  
CONTINGENCY TABLE SHOWING RELATIONSHIP OF GRADES  
PREDICTED BY SPG<sup>a</sup> WITH ACTUAL 1978 FINAL  
GRADES ACHIEVED IN CTM 4553

Final Grade	Grades Predicted by SPG					Total Grades (Actual)
	A	B	C	D	F	
A	<u>14</u>	9	1	-	-	24
B	6	<u>3</u>	1	-	-	10
C	4	10	<u>0</u>	-	-	14
D	2	3	1	-	-	6
F	0	4	2	-	-	5
Total Grades (Predicted)	26	29	4	-	-	59

Note. Underlined numbers indicate final grades correctly predicted.

<sup>a</sup>Self-Predicted Grade

Probability was 0.1469 (not significant) with 8 degrees of freedom and chi-square of 12.1.

## Combination of Factors

A final grade was predicted for each student based on a combination of BMR score, ACT score, GPA and SDS score. Since there were no self-predicted grades in the earlier study (Sisler, 1977), it was not possible to include the self-predicted grades in the prediction equation. The relationship between final grades and predicted grades based on the combination of factors was significant at the .05 level of confidence with 16 degrees of freedom. See Table VII.

TABLE VII

CONTINGENCY TABLE SHOWING RELATIONSHIP OF GRADES PREDICTED BY COMBINED VARIABLES (BMR+GPA+ACT+SDS)<sup>a</sup> WITH ACTUAL 1978 FINAL GRADES ACHIEVED IN CTM 4553

Final Grade	Grades Predicted By BMR+GPA+ACT+SDS					Total Grades (Actual)
	A	B	C	D	F	
A	<u>19</u>	4	1	0	0	24
B	6	<u>2</u>	0	2	0	10
C	4	3	<u>4</u>	3	0	14
D	1	3	1	<u>0</u>	1	6
F	2	1	1	0	<u>1</u>	5
Total Grades (Predicted)	32	13	7	5	2	59

Note. Underlined numbers indicate final grades correctly predicted.

<sup>a</sup>Basic Math Review score; cumulative college grade point average; composite score, American College Testing Program; Self-Directedness Skills rating scale score

Probability was 0.0137 with 16 degrees of freedom and chi-square of 30.91.



The correct predictions based on the combination of factors included 19 of the A grades (79.16%), two of the B grades (20%), four of the C grades (28.57%) and one of the F grades (20%). None of the D grades were correctly predicted.

### Conclusions

Part of the need for this study was to find valid predictors for academic achievement in CTM 4553 taught by an individualized method. If ways could be found to identify the students who might not pass the course, they could be more effectively counseled. They could be taught by another method or they could be encouraged to take a remedial course in mathematics before attempting CTM 4553.

### Ability in the Subject Area

Grades predicted from BMR showed a significant relationship with actual final grades in the course. The results would seem to indicate that ability in the subject area as measured by the BMR test has a relationship with academic achievement and that BMR can be used as a predictor of academic achievement in CTM 4553. However, 18 of the 25 (72%) correct predictions occurred at the A grade level. Although six final grades were D and three predicted grades were D, none of those were correctly predicted. Five final grades were F and three predicted grades were F, but only one of those was correctly predicted. See Table I, page 34.

From this observation, it would appear that BMR did not seem to be a good predictor factor for students at the lower grade levels. Perhaps factors other than ability in the subject contributed to the lower grades.

### Past Achievement

Grades predicted from GPA were significantly related to final grades achieved in CTM 4553. More of the C grades (85.71%) and B grades (60%) were correctly predicted with GPA than with BMR. The one D grade that was predicted by GPA was correct. However, the five grades of F were predicted by GPA as C grades. See Table II, page 35. GPA did not seem to be a valid predictor factor for students in the lower grade levels.

Although all five grade categories were represented by ACT scores in the regression equation, only B and C grades were predicted by the ACT scores for the 1978 students. The results were not significant and ACT should not be considered a valid predictor for student grades. See Table III, page 36.

Grades predicted from the combination of GPA and ACT scores were not significantly related to final grades achieved in CTM 4553. The addition of ACT scores to GPA actually lowered the predictive validity of that achieved by GPA used as a predictor. See Table II, page 35, and Table IV, page 37.

### Attitude

Although a significant correlation between SDS scores and final grades for 1977 was shown in the multiple linear regression procedure, there was no significant relationship between grades predicted by SDS and final grades for 1978. No D or F grades were correctly predicted. Therefore, SDS was not found to be a reliable predictor for students in the lower grade levels. See Table V, page 38.

### Motivation

Self-predicted grades (SPG) also showed no significant relationship to final grades. No student predicted a grade lower than C. Therefore, SPG was not found to be a reliable predictor for students in lower grade levels. See Table VI, page 39.

### Combination of Factors

The relationship between grades predicted by a combination of BMR, GPA, ACT, SDS and the final grade achieved was found to be significant. However, as already shown with the individual predictors, the lower grades were not predicted accurately. Only 20 percent of the F grades were correctly predicted. None of the D grades were correctly predicted. Almost 80 percent of the A grades were accurately predicted. Therefore, the combination of factors as a predictor was shown to be more helpful for predicting which students would make high grades than for identifying students who would make a D or F in the course.

## CHAPTER V

### SUMMARY AND RECOMMENDATIONS

The purpose of the study was to determine the relationship of aptitude in the subject area, past achievement, attitude, motivation and a combination of those factors to academic achievement in a course using an individualized method of instruction. The objectives of the study entailed making predictions of final grades in the course and testing the validity of those predictions. Participants were the 59 students enrolled in Profitable Merchandising Analysis (CTM 4553) during the spring semester of 1978.

Predictive variables included aptitude (BMR score), past achievement (GPA and ACT score), attitude (SDS score), motivation (self-predicted final grade) and a combination of BMR, GPA, ACT and SDS. The criterion variable was the final course grade.

Significant relationships at the .01 level of confidence were found between final grade and the following predictor variables: BMR score, GPA, and the combination of BMR, GPA, ACT and SDS. However, the majority of correctly predicted grades appeared at the upper end of the grade scale. None of the D grades were correctly predicted by BMR. Only one of the F grades was correctly predicted by BMR. More C grades were correctly predicted by GPA. However, only one D grade was accurately predicted by that variable. No F grades were predicted by GPA. When the factors were combined as a predictor, the predictive validity for

prediction at the lower level was not increased. Again, only one F grade was accurately predicted. No D grades were predicted by the combination of factors. None of the predictors proved to be of help in determining which students would make low grades in the course. No significant relationships were found between final grade and ACT score, SDS score or self-predicted grades when used as separate predictors.

#### Recommendations

Although the results were disappointing in that accurate predictors for low academic achievement were not found, such weeding out of unsatisfactory variables is a necessary part of the search or experimental process. Feshbach, Adelman and Fuller (1977) noted that the best predictors of achievement may not necessarily be the best predictors of failure. It is suggested that further research be conducted toward predicting academic failure.

Such research might well build upon the variables which have proved to have significant correlation with level of academic achievement in order to determine the predictive validity of those variables. As Holland and Astin (1962) pointed out, many variables with concurrent validity are not found to have predictive validity.

In view of the small sample upon which this study was based, it is recommended that the study be replicated with a larger sample or with several small groups. Derrick (1976) recommended that experiments be repeated frequently in order to provide more credible results.

Finally, it is recommended that research be continued in the area of motivational predictors of academic behaviors. As Moen stated (1977, p. 511), "A measure of academic motivations could also be expected to

provide motivational typologies of students and of instruction and gradually to contribute to a theory of academic motivation."

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## APPENDIXES

APPENDIX A

SELF-DIRECTEDNESS SKILLS RATING SCALE

## SELF-DIRECTEDNESS SKILLS

You have been chosen to participate in a research project being conducted in the CTM Department. Please complete the questionnaire as honestly as you can. Because we will be comparing data collected at the beginning and end of the course, please write your ID number or name below. Your name will not be used in the final report and this form cannot influence your grade in any way. Your cooperation is greatly appreciated.

ID Number or Name \_\_\_\_\_

Circle the number which represents your ability to:	Low Ability	Moderate Ability	High Ability		
1. Operate independently of teacher direction . . . . .	1	2	3	4	5
2. Seek answers to questions without assistance . . . . .	1	2	3	4	5
3. Use class time effectively . . .	1	2	3	4	5
4. Plan a study schedule and follow it. . . . .	1	2	3	4	5
5. Use study skills (e.g. make an outline of notes, review notes regularly, complete assignments).	1	2	3	4	5
6. Use curriculum materials, text- books, syllabus, audio-tutorial materials without assistance . .	1	2	3	4	5
7. Skip activities already mastered.	1	2	3	4	5
8. Work at a pace consistent with ability . . . . .	1	2	3	4	5

Considering the grade distribution in this class for the past four years (see transparency) what do you predict your grade will be in the course? (Circle)

A    B    C    D    F

APPENDIX B

RAW DATA AND PREDICTOR VARIABLES

TABLE VIII

RAW DATA INCLUDING BMR, GPA, ACT, SDS, SPG<sup>a</sup>  
AND FINAL COURSE GRADE IN CTM 4553

Observation	BMR	GPA	ACT	SDS	SPG	Final Grade
1	24	3.01	23	34	A	B
2	23	3.42	22	31	A	A
3	12	3.60	18	37	B	A
4	14	2.51	--	33	B	C
5	20	3.27	13	38	A	A
6	17	2.20	16	28	B	C
7	23	3.29	19	28	A	B
8	20	3.34	--	33	A	A
9	13	2.23	--	23	B	C
10	10	2.40	--	38	A	C
11	22	3.15	17	23	B	A
12	17	2.52	12	37	A	A
13	12	3.49	20	33	A	B
14	20	2.67	--	26	A	C
15	16	3.37	--	29	B	A
16	23	3.63	--	30	A	B
17	14	2.38	14	27	B	D
18	13	2.40	--	24	A	D
19	18	2.36	--	30	B	F
20	20	2.50	20	26	C	A
21	08	2.23	14	29	B	C
22	13	2.23	--	28	B	F

TABLE VIII (Continued)

Observation	BMR	GPA	ACT	SDS	SPG	Final Grade
23	23	3.26	--	36	A	A
24	23	3.80	--	31	A	A
25	17	2.35	17	25	B	F
26	22	3.60	24	27	A	A
27	23	3.37	--	31	A	A
28	22	3.67	--	30	A	A
29	12	2.41	19	22	B	C
30	15	2.42	--	32	B	C
31	15	2.70	--	36	A	D
32	22	3.36	--	23	B	A
33	20	2.73	12	34	A	B
34	22	3.03	23	30	A	A
35	13	2.31	--	27	B	D
36	14	3.22	--	30	B	A
37	16	2.88	16	34	B	C
38	20	2.26	18	30	B	C
39	17	2.16	--	33	B	F
40	25	2.82	19	32	B	A
41	06	2.23	09	23	C	F
42	22	2.87	--	29	A	B
43	17	2.65	19	34	B	D
44	21	2.11	11	32	B	A
45	25	3.98	26	33	A	A
46	19	3.03	22	28	A	A

TABLE VIII (Continued)

Observation	BMR	GPA	ACT	SDS	SPG	Final Grade
47	25	3.05	24	31	B	C
48	20	2.30	23	30	A	C
49	20	2.58	24	38	A	C
50	01	1.75	--	27	C	D
51	12	2.56	19	32	B	C
52	09	2.45	16	36	B	B
53	23	2.87	--	26	B	B
54	16	1.95	16	30	C	B
55	23	2.70	21	32	B	B
56	22	2.69	--	30	B	A
57	23	3.72	29	39	A	A
58	25	3.94	20	16	A	A
59	15	3.46	20	36	B	A

<sup>a</sup>BMR = Basic Math Review Test score  
 GPA = Cumulative College Grade Point Average  
 ACT = Composite score, American College Testing Program Assessment  
 SDS = Self-Directedness Skills self-rating score  
 SPG = Self-Predicted Grade



TABLE IX

PREDICTED FINAL GRADES FOR ALL PREDICTOR VARIABLES (SDS, GPA, ACT, BMR, GPA+ACT, SDS+GPA+ACT+BMR, SPG)<sup>a</sup> AND FINAL GRADES ACHIEVED IN CTM 4553 FOR SPRING, 1978

Observation	Predicted Grades							Final Grade
	<u>SDS</u>	<u>GPA</u>	<u>ACT</u>	<u>BMR</u>	<u>ACT+GPA</u>	<u>SPG</u>	<u>SDS+BMR</u>	
1	B	B	B	A	B	A	A	B
2	B	B	B	A	B	A	A	A
3	A	A	B	C	A	B	A	A
4	B	C	-	C	B	B	A	C
5	A	B	C	A	A	A	A	A
6	C	C	B	B	C	B	C	C
7	C	B	B	A	B	A	A	B
8	B	B	-	A	A	A	A	A
9	C	C	-	C	B	B	C	C
10	A	C	-	D	B	A	B	C
11	C	B	B	A	B	B	A	A
12	A	C	C	B	C	A	B	A
13	B	A	B	C	A	A	B	B
14	C	C	-	A	A	A	A	C
15	C	B	-	B	A	B	A	A
16	B	A	-	A	A	A	A	B
17	C	C	C	C	C	B	C	D
18	C	C	-	C	B	A	B	D
19	B	C	-	B	B	B	A	F
20	C	C	B	A	C	C	C	A

TABLE IX (Continued)

Observation	Predicted Grades							Final Grade
	<u>SDS</u>	<u>GPA</u>	<u>ACT</u>	<u>BMR</u>	<u>ACT+ GPA</u>	<u>SPG</u>	<u>ACT+GPA+ SDS+BMR</u>	
21	C	C	C	D	C	B	D	C
22	C	C	-	C	B	B	B	F
23	B	B	-	A	A	A	A	A
24	B	A	-	A	A	A	A	A
25	C	C	B	B	C	B	C	F
26	C	A	B	A	A	A	A	A
27	B	B	-	A	A	A	A	A
28	B	A	-	A	A	A	A	A
29	D	C	B	C	C	B	D	C
30	B	C	-	C	B	B	A	C
31	B	B	-	C	A	A	A	D
32	C	B	-	A	A	B	A	A
33	B	B	C	A	B	A	A	B
34	B	B	B	A	B	A	B	A
35	C	C	-	C	B	B	B	D
36	B	B	-	C	A	B	A	A
37	B	B	B	B	B	B	B	C
38	B	C	B	A	C	B	C	C
39	B	C	-	B	B	B	A	F
40	B	B	B	A	C	B	A	A
41	C	C	C	F	C	C	F	F
42	C	B	-	A	A	A	A	B

TABLE IX (Continued)

Observation	Predicted Grades							Final Grade
	<u>SDS</u>	<u>GPA</u>	<u>ACT</u>	<u>BMR</u>	<u>ACT+ GPA</u>	<u>SPG</u>	<u>ACT+GPA+ SDS+BMR</u>	
43	B	C	B	B	C	B	B	D
44	B	C	C	A	C	B	B	A
45	B	A	B	A	A	A	A	A
46	C	B	B	B	B	A	B	A
47	B	B	B	A	B	B	A	C
48	B	C	B	A	D	A	C	C
49	A	C	B	A	C	A	B	C
50	C	D	-	F	C	C	F	D
51	B	C	B	C	C	B	D	C
52	B	C	B	D	C	B	D	B
53	C	B	-	A	A	B	A	B
54	B	C	B	B	D	C	D	B
55	B	B	B	A	C	B	B	B
56	B	B	-	A	A	B	A	A
57	A	A	B	A	B	A	A	A
58	D	A	B	A	A	A	A	A
59	B	A	B	C	A	B	A	A

<sup>a</sup>SDS = Self-Directedness Skills score  
GPA = Cumulative College Grade Point Average  
ACT = Composite score, American College Testing Program Assessment  
BMR = Basic Math Review Test score  
SPG = Self-Predicted Grade

VITA 2

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