CHAPTER I
Introduction

Attempts to determine the relationship of attitudes toward mathematics with grades received in mathematics have produced several studies on student performance and include survey items designed to measure attitudes of students toward mathematics (Bassarear, 1991; Ma and Kishor, 1997). The nature of mathematics learning requires exploration of affective as well as cognitive factors, stresses Leder (1987). One of the major descriptors of the affective domain in mathematics is attitudes (McLeod, 1992). Rather than exploring all the components in the affective domain as they relate to the cognitive domain, mathematics educators have traditionally taken the relationship between attitude toward mathematics and achievement in mathematics as their major concern (Ma and Kishor, 1997).

According to Ma and Kishor (1997), current efforts in reforming mathematics curriculum and instruction have placed a special emphasis on the affective and cognitive relationship. The importance of the relationship between the affective domain (attitudes, beliefs and emotions) and the cognitive domain (knowledge and thinking) is impossible to separate, just as it is nearly impossible to differentiate between one's attitudes and one's reasoning skills in any activity of teaching and learning (Fazio, 1990).

Attitudes have been defined in a variety of ways. Aiken (1996), defined attitude as a learned predisposition or tendency on the part of an individual to respond positively or negatively to some object, situation, concept, or another person. McLeod (1992) revealed that the positive or negative feeling is of moderate intensity and reasonable stability. Lefton (1997) contended that attitude is a learned predisposition to respond in a consistently favorable or unfavorable manner to a given object. Several important components emerge from these definitions: attitude is learned; it influences one to take a stated or implied attitude to something or to have such an attitude as a result of prior influences that may be either positive or negative; and there is response consistency.
Wolf and Blixt (1981) contended that some studies have been conducted to determine the relationship of attitudes toward mathematics and academic achievement in mathematics at the elementary and high school levels, but few of these studies either have used a standardized attitude instrument or have examined the relationship of attitude and grades received at the community college level.

In recent years, according to the Maryland Higher Education Commission (1996), the problem of students not prepared academically for college level work in mathematics is so prevalent that most public community colleges now provide developmental courses in basic skills including mathematics. Understanding underprepared students’ attitudes about mathematics may be one of the keys for community colleges to gain a better understanding of the mathematics learning process of these students enrolled in developmental courses (Frost, 1994).

For those underprepared students entering the twenty-first century workforce, there is great national concern about the higher education levels needed for the many technological jobs available (National Research Council, 1989). Underprepared students have been identified for interventions to keep them in school and prepare them to become productive workers (Hughes & Nelson, 1991).

According to Berenson, Carter and Norwood (1992), increasing numbers of underprepared students are enrolled in developmental mathematics at the community colleges, and these deficiencies in mathematics can preclude success in many college courses, even those courses that seem to be unrelated to mathematics. An example by Waits and Demana (1988) revealed a strong relationship between mathematics skills and success in college, regardless of the major curriculum of study. Failure in mathematics can also be a limiting factor in an undergraduates’ choice of a major curriculum concluded Berenson, Carter and Norwood (1992). Unable to place into or successfully pass beginning level mathematics courses, the underprepared students may be forced to change their career plans or even drop out of college (Stage & Kloosterman, 1995).
Background of the Study

Community colleges have been accepting an increasingly larger pool of applicants under the open door admissions policies for the past decade (Koch, 1992). This open door policy of community colleges has been instrumental in the emergence of developmental mathematics programs (Brier, 1984).

These programs are a response to the diverse and comprehensive student bodies of community colleges (Gleazer, 1980). Thus, more than 90 percent of the community colleges in Maryland offer some form of developmental mathematics (Maryland Higher Education Commission, 1996).

As greater numbers of students with limited basic skills have been admitted to institutions of higher education over the past twenty years, many colleges have developed special programs that provide developmental support to help students cope with the academic demands of college courses (Brier, 1984). In order to retain these underprepared mathematics students in the community college, early identification, often by placement testing, and referral into developmental courses were used (Hughes and Nelson, 1991; and Umoh, 1994).

Statement of the Problem

Prince George's Community College described its admission and placement policies and procedures in its Catalog (1996-1998) as follows:

The college subscribes to an open door policy and admits any person sixteen years or older with the desire and ability to benefit from postsecondary courses and programs, or socio-economic status (p. 12).

In addition, the Catalog (1996-1998) revealed that:

Prince George's Community College provides educational opportunities to students with varying academic backgrounds and experience, but expects the students to meet rigorous standards of progress and achievement. The students are required to have their basic skill levels assessed for success in introductory college level courses and, if found deficient, the students are placed in developmental courses (p. 20).
The Office of Institutional Research and Analysis Report to the Maryland Higher Education Commission (1997) showed that the proportion of students needing remediation in at least one basic skill area in 1997 was one percentage point higher than in the Fall of 1996. Two-thirds of the 1997 graduates of Prince George's County high schools who entered Prince George's Community College in the Fall of 1997 and completed the placement test in the three basic skills (reading, English, and mathematics) needed remediation in at least one of the areas and over fifty percent of those students tested needed remediation in mathematics.

According to the Maryland Higher Education Commission Report (1997), after two years of decline (1995-1996) in the number of entering students needing to improve their basic mathematics skills at Prince George's Community College, the number of students increased in 1997 by over two percent.

Mathematics educators generally believe that students will achieve better in mathematics if they like mathematics and continued attention should be directed towards developing, maintaining, and reinforcing positive attitudes toward mathematics (Willoughby, 1990; and Koch, 1992). Therefore, the research problem in this study is to assess what effect, if any, initial and exiting student attitudes toward mathematics have on the academic outcomes for students in Developmental Mathematics (DVM001) Basic Arithmetic at Prince George's Community College.

Purpose of the Study

The purposes of this study are to assess the effect, if any, on the attitudes of developmental mathematics students and the academic outcomes of students placed in the Developmental Mathematics Basic Arithmetic course (DVM001) at a community college in Maryland during the fall semester of 1997. As a result of participating in the DVM001 Basic Arithmetic course, these attitudes are measured by the pre and post attitude survey.
Research Questions

The major research questions are:

1. What is the difference, if any, between the pretest and posttest attitudes toward mathematics of students placed in DVM001 Basic Arithmetic as measured by the Aiken Mathematics Attitude Survey?
   a. Is there an attitude change between the pretest and the posttest based on age?
   b. Is there an attitude change between the pretest and the posttest based on gender?
   c. Is there an attitude change between the pretest and the posttest based on Ethnicity?

2. What is the effect, if any, of the placement test for students enrolled in Basic Arithmetic on the final exam score, attitude pretest scores, and attitude change scores?

3. What is the difference between the achievers and nonachievers in Basic Arithmetic as measured by the Aiken Attitude Towards Mathematics Survey?

4. What is the difference between the achievers and nonachievers in Basic Arithmetic based on the demographic variable students who failed the DVM001 Basic Arithmetic course based on the demographic variables of age and gender?

Assumptions

The assumptions for this study are:

1. The same students in (DVM001) Basic Arithmetic taking the mathematics placement pretest and departmental posttest will also take the initial and exiting attitudes toward mathematics test.

2. The responses to the Aiken attitude test will be positive or negative.
3. The college placement test and the course final examination test are valid measures of student performance.

4. The student response to the attitude toward mathematics test will show the actual feelings of the student enrolled in (DVM001) Basic Arithmetic.

Significance of the Study

The topic on the status of student performance in mathematics has received increased attention in postsecondary literature (National Research Council, 1989; Willoughby, 1990; Koch, 1992; and Stage, 1995). The Maryland Higher Education Commission (1996) reported that in 1995, twenty percent of all new high school graduates who entered a Maryland community college were assessed as needing developmental mathematics.

This study provides data in terms of the attitude of students toward mathematics, results of placement and exit Basic Arithmetic tests, and an understanding of some of the demographics of students enrolled in developmental mathematics at a Maryland community college.

Finally, the results of this study will underscore the importance of mathematical preparation for college, the placement and student outcomes in the course (DVM001) Basic Arithmetic, reveal the effect, if any, of the initial and exiting attitude toward mathematics, contribute to the current literature concerning developmental mathematics, and reveal the demographics of students in the developmental mathematics course (DVM001) Basic Arithmetic at a Maryland community college. This study will be useful to high schools in preparing students for college, community college placement offices, developmental mathematics departments, students planning to enter the community college, and the community college departments requiring mathematics as a requirement.
Limitations of the Study

1. The study is limited to one community college, located in Prince George's County, in the state of Maryland. Therefore, the external validity and conclusions of this study are only valid for this one community college.

2. Only students tested and placed in the developmental mathematics course titled Basic Arithmetic (DVM001) during the Fall 1997 semester participated in the study. Students are tested and depending on the results of the test are placed in this course.

3. The demographics of the students enrolled in the developmental mathematics Basic Arithmetic (DVM001) course sections were made available by the Office of Institutional Research and Analysis and the Registration Office.

4. The study was limited to the variables age group, gender, and ethnicity.

5. The use of the same test for pre and post testing may have influenced the outcome of student scores.

Definition of Terms

Achievers - students receiving a final grade of P (pass) in the DVM001 Basic Arithmetic course.

Attitude - a learned tendency or predisposition to respond in a consistently negative or positive manner to some concept, situation, or object (Aiken, 1996). For the purpose of this study, attitude will refer to the tendency on the part of a student in the Basic Arithmetic (DVM001) classes at Prince George's Community College to respond positively or negatively toward a mathematical situation that may affect the disposition of a student toward mathematics. Attitudes will be defined as the traits measured by the Aiken (1996) attitude towards learning mathematics scales test.
Basic Arithmetic (DVM001) - a noncredit course with an emphasis on whole numbers, fractions, decimals, percents, math study skills, and problem solving (Prince George’s Community College Catalog, 1996-1998).

Community College - a postsecondary two-year, open admissions institution with courses and programs leading to certificates and associate degrees. The community college provides lower-level undergraduate courses to students who plan to transfer to senior institutions and also career and continuing education courses as well as to students who do not plan to transfer (Maryland Higher Education Commission, 1996).

Developmental Education - is used in postsecondary institutions to describe programs that teach academically underprepared students assessed as having potential for success. The term includes, but is not limited to, developmental courses. Whether these students are recent high school graduates with inadequate basic skills, returning adults with dormant study skills, undecided students with low motivation for academic achievement, or English as a second language students, developmental education can provide the appropriate academic tools for success (American Association of Community Colleges, 1993).

Developmental Mathematics - courses that teach college students basic mathematical concepts and skills they need to perform college level work (Koch, 1992). Students have demonstrated by placement examinations to be underprepared to be successful in college level mathematics courses.

Non-achievers - students receiving a grade of F (fail) in the DVM001 Basic Arithmetic course.

Student Outcome - student performance in an individual course that constitutes a learning experience reflected in a final examination numerical grade or a final course grade of pass or fail (Office of Institutional Research and Analysis, 1998). Students who receive an "I" (Incomplete) or "W" (withdrawal) grade will be excluded from the study. For the purpose of this study, student outcome is dichotomized into achievers and non-achievers.
Under prepared Students - those students whose basic mathematics skills knowledge, and academic ability are significantly below the institution’s entrance standards and are unable to place into or successfully pass beginning level mathematics courses (Berenson, Carter & Norwood, 1992).

Organization of the Study

This study is divided into five chapters. Chapter One consists of the introduction, background of the study, statement of the problem, purpose of the study, research questions, assumptions, significance of the study, limitations of the study, definition of terms and the organization of the study. Chapter Two includes the review of the literature. Chapter Three contains the research methodology and procedures used in the study, design of the study, population of the study, data collecting procedures, and data analysis. Chapter Four presents the findings and the analysis of the data. Chapter Five presents the summary, conclusion, and recommendations.