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A STUDY CONCERNING SELF-HELP GROUPS  
AND COLLEGE MATHEMATICS

DISSERTATION

Presented to the Graduate Council of the  
North Texas State University in Partial  
Fulfillment of the Requirements

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By

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The problem with which this investigation is concerned is that of determining whether utilizing self-help groups for remedial mathematics students would improve their course completion rates, achievement, and attitudes toward learning mathematics. The methods of determining the success/failure of self-help groups in this study were the Z-test from inferences concerning two proportions, the t-test from inferences concerning the difference between two independent means, and the t-test from inferences concerning the difference between two dependent means.

The participants of the study were chosen from the students enrolled in "daytime" mathematics classes at Tarrant County Junior College - Northeast Campus, Hurst, Texas. The experiment was conducted over two semesters and the data combined for statistical analysis. There were one hundred four students involved in the study. Fifty-two students comprised each of the experimental and control classes.

The term self-help group was utilized to describe a small group of two-to-fifteen people who engaged in discussion of responsibility, standards, confession, lay

leadership, and action. The students did not study mathematics in self-help group sessions. The group meetings dealt with anxieties, attitudes, and commitment that may be associated with mathematics in general.

To investigate the hypotheses of this study, data was collected to calculate the percentage completion rates, the means of the final exams taken by students, and the differences of the Semantic Differential scores given to students in the experimental class at the beginning and the end of the semester. This data was utilized for statistical analysis to determine if the experiment was successful.

The report concludes that self-help groups did not significantly improve course completion rates, achievement, or attitudes of students toward learning mathematics. Forty-four per cent of the students that completed the experimental class participated in self-help groups.

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## CHAPTER I

### INTRODUCTION

There are more than five hundred thousand self-help groups, with fifteen million members, in the nation today (12,15). According to Jaques and Patterson (8), self-help mutual aid groups are organized by those who share common problems. Through group identification, mutual support, and modeling, the participant's behavior is directed toward learning a new coping life style. Katz and Bender (10) point out that self-help groups can be classified into four categories according to what is perceived as their primary focus. The first category is composed of those groups that focus on self-fulfillment or personal growth, the second focuses on social advocacy, the third focuses on creating alternative patterns for living, and the fourth focuses on providing refuge for the desperate. Sagarin (17) views self-help groups as falling into two types of organizations, but not without overlapping. In forming, supporting, or joining a group the person is seeking escape by either trying (1) to conform to the norms of society, or (2) to change those norms to include acceptance of his own behavior. The self-help groups which focus on self-fulfillment and/or personal growth are the types of groups which will be utilized by this study.

Beach (1) states that the value of student-led discussions and the interaction of small groups is now known. Additionally, Beach maintains that there were some interesting findings about students with low grades. Those students with lower grade point averages reported significantly better study habits than those in other similar courses which did not use small group discussions. Beach also claims that

if the advantages of small group interaction and learning can be coupled with the established values of the more traditional instructional techniques, the resulting innovations are quite certain to be more productive of learning which produces changed persons -- and not mere computer-type information storage (1, p.3).

Students who enroll in remedial math courses are described by Bittinger (2) as people with poor mathematical backgrounds, bad experiences in mathematics classes, and bad attitudes. Continuing, Bittinger outlines an innovative approach where students are grouped by fours so that they can study together and take group open-book tests. Advantages cited are the results of group therapy and peer learning achieved. The idea is that students can relate to each other better than to an instructor, at least when none of the students understands a concept. Students get angry at one another and prod one another in ways that would be unacceptable if done by the instructor (2).

Gemignani (7) views funds for colleges and universities as money that should be spent primarily on instruction at a



level appropriate to a college or university. Continuing, Gemignani states that

while society and our private consciences may insist that we give the educationally disadvantaged an opportunity to prepare themselves for college level work, even while they are actually attending a college, I do not feel that it does either the student, the institution, or even society, a favor by diverting funds intended for higher education to this purpose (7, p.484).

Edwards (5) states that in keeping with the basic philosophy of "higher education for those who can benefit from the instruction" and by the necessity of their "open-door" admissions policy, most community/junior colleges offer remedial courses in basic skills including mathematics. Roueche (16) points out that reports of high attrition rates in these courses bring into question the "salvage function" of remediation in the community college. Developmental mathematics programs at the college level have helped students in college mathematics courses but, Miller (14) claims, many problems persist.

Attrition in mathematics classes at Tarrant County Junior College - Northeast Campus, Hurst, Texas has been of concern and has resulted in two internal studies to determine the reasons for high attrition rates (18). Such concern has led to the development of this study which will assess the influence that self-help groups have on completion rates, achievement and attitudes toward learning mathematics in elementary algebra classes at Tarrant County

Junior College - Northeast Campus. Although innovative methods of instruction in mathematics classes have resulted in a measure of success, this technique may provide a simple answer to what has been thought of as a complex problem for mathematics students (4).

#### Statement of the Problem

The problem of this study is to determine if there is a relationship between participation in self-help groups and completion rates, achievement and attitudes in elementary college algebra.

#### Purposes of the Study

The purposes of this study are

1. To compare completion rates between elementary algebra classes utilizing self-help groups with classes not utilizing self-help groups at Tarrant County Junior College - Northeast Campus, Hurst, Texas;
2. To compare the achievement of elementary algebra students who have had the opportunity to participate in self-help groups to the achievement of students in elementary algebra classes not utilizing self-help groups as measured by The Descriptive Test of Mathematics Skills (DTMS);
3. To compare the attitudes of elementary algebra students toward learning mathematics before they have the opportunity to participate in self-help groups to their attitudes toward learning mathematics after the experiment;

4. To record the techniques and procedures employed by the self-help group facilitators.

#### Hypotheses

1. Algebra classes utilizing self-help groups will show a significantly greater completion rate than will classes not using self-help groups.

2. Students in algebra classes utilizing self-help groups will achieve a significantly greater increase in their mean score on the DTMS than will students in algebra classes with no self-help groups.

3. Students participating in self-help groups will show a significant increase in their mean attitude score on a Semantic Differential when compared to their mean score on the same instrument given at the beginning of the experiment.

#### Definition of Terms

The following terms have specific meanings in relation to the topic of this study.

1. Experimental Class(es) - A phrase which includes all members of the experimental class; both those that participated in self-help groups and those that did not participate in self-help groups.
2. Self-help groups - A small group of college students (two-to-fifteen) who engage in discussion of responsibility, standards, confession, lay leadership and action to help its members attain

the objectives that they have established for themselves under the direction of a group facilitator (4).

3. Group facilitators - Counselors who are employed by the college who direct the self-help groups on a regular basis to keep the participants on "track." The facilitators will be instructed not to lapse into the traditional role of the teacher but instead to participate in the circle as one of its members. It is their job to assist the participants by providing information, indicating means of solving different problems and ensuring that everybody takes part in the discussion, but they are not there primarily in order to teach. All the members of the study circle become teachers and pupils in relation to one another. Each member will be encouraged to provide assistance to others (11). Two counselors will be utilized in this study with each counselor meeting with two different groups each week.
4. Retention rate - A term which refers to the group of students, out of those which enrolled, that complete a course.
5. Remedial - When arithmetic, elementary algebra, and intermediate algebra are taught at the college level, they are considered remedial (2).

6. Developmental - the process of upgrading students for entry into college level courses.

The remaining terms are identified in the context of the Tarrant County Junior College - Northeast Campus mathematics program.

7. Math 1403b - a remedial class in elementary algebra at Tarrant County Junior College, Hurst, Texas.
8. Descriptive Test of Mathematics Skills (DTMS) - A mathematics placement test published by the Educational Testing Service and utilized by the college to assess students' mathematics skills.
9. Semantic Differential - A list of bipolar adjectives utilized to measure attitudes.

#### Background of the Study

Attrition in mathematics classes at Tarrant County Junior College - Northeast Campus, Hurst, Texas has been of concern to teachers and the college administration and has resulted in two college studies to determine the reason for high attrition rates and provide answers to this problem (18). No definitive answer has been found so could it be possible that students can resolve the problem themselves? Johnson (9) states that in learning new skills, the support and approval of a group is a strong motivating influence, and that there are few influences with more power to shape

behavior than that of support and approval of friends. This influence is recognized and utilized to shape behavior in people by organizations such as Take Off Pounds Sensibly (TOPS), Alcoholics Anonymous, Recovery Incorporated, Yokefellows, and Seven Steppers to name a few (4). According to Chaikin (3), people feel better when they know that there are others that share similar problems and fears and are willing to talk about them. Just the opportunity to verbalize and "get them off the chest" helps a person to feel better.

The modern comprehensive community college is typically a commuter college where students commute for classes and then leave for work. There is little time for students to benefit from the work and concerns of their classmates (13). It has been demonstrated that successful college students are more likely to score higher on an arithmetic achievement test, enroll in a course featuring traditional instruction, be older, assess their mathematical ability higher and assess their attitude toward mathematics more positively (6).

As a result of self-help groups many alcoholics have found a whole new way of life in a caring community, drug addicts have found deliverance, many depressed and frustrated people have found new pathways to an optimistic outlook on life and criminals have been able to come to terms with society and live a free and meaningful life (4).

### Significance of the Study

There are a number of articles indicating the lack of preparation in mathematics of large numbers of freshmen entering colleges and universities (2). Not only do students lack preparation, but most have poor attitudes toward mathematics (2). This study will focus on three problem areas: course completion rates, achievement and attitudes toward learning mathematics.

The faculty and administration at Tarrant County Junior College - Northeast Campus have attempted to reduce the attrition rates in remedial mathematics classes. The use of placement tests, mathematics labs, tutors, and programmed text have been tried, but high dropout rates continue to be a problem (18). Achievement in the field of mathematics has received national attention as students in the United States have been portrayed by the news media as falling farther behind students from other industrialized nations on mathematics achievement tests. There is a lot of dialogue among politicians concerning the cost of upgrading the educational system in Texas and the United States and how the fiscal resources will be raised.

This study is significant in that it will

1. Determine if the utilization of self-help groups can increase the completion rate in mathematics classes at Tarrant County Junior College - Northeast Campus. Self-help groups would result in no additional cost to the college.

If, as in Alcoholics Anonymous and other organizations, students can receive the needed support from their peers to complete their mathematics class, a positive community feeling toward the college could result;

2. Determine if the self-help group concept will result in higher achievement by students in mathematics classes at Tarrant County Junior College - Northeast Campus;

3. Determine if the attitudes of students toward learning mathematics can be improved through the use of self-help groups.

#### Delimitations

For this study the experiment will be limited to "day-students" enrolled in elementary algebra classes at Tarrant County Junior College - Northeast Campus, Hurst, Texas.

#### Basic Assumptions

The following basic assumptions have been drawn for the purposes of this study.

1. Group facilitators will not talk to students regarding the experiment.

2. Students will cooperate with the group to which they belong as they participate in the self-help group activities.

3. Teachers will not talk to students regarding the experiment and will remain unbiased toward the control and experimental treatments.



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## CHAPTER II

### REVIEW OF THE LITERATURE

#### Introduction

Included in this review of related literature is a discussion of the history of self-help groups in the United States, the dilemma of developmental mathematics, and self-help groups as a solution to this dilemma. Research material concerning the utilization of self-help groups in mathematics has not been found.

#### History of Self-Help Groups

Katz and Bender (21) maintain that the early American colonists followed the pattern of mutual aid through the neighborliness of small communities where they banded together both to produce necessities and for protection against nature and hostile Indians. However, they point out that this phase was short lived because freedom from oppressive state controls and the natural fertility of the land led to the abandonment of communal effort in agriculture and craft and its replacement by the marked individualism and ownership that has characterized American society ever since. Mutual aid principles were not completely lost since the colonists continued to assist each other in farming chores such as crop seeding and harvesting, home and barn raising, and cutting hay.

In the summer of 1793 a yellow fever plague decimated the population of Philadelphia by killing off 10 per cent of the citizenry (11). During that plague the College of Physicians, which consisted of sixteen physicians, speculated and argued about the cause and cure of the disease without coming close to either. During this epidemic, a citizen of the city wrote a letter to the newspaper suggesting that rain-barrels provided breeding water for mosquitoes, which were the source of the plague. The citizen signed himself A. B. and proposed that oil be poured on the water to cover it with a film to prevent mosquitoes from breeding. The problem was that A. B. was only an ignorant layperson, but had his suggestion been followed, a hundred years of human misery might have been avoided. "Had Philadelphia's leaders listened to A. B.'s suggestions, the course of history might have been changed" (11, p.X). The professionals of that day were very precise in their descriptions of the disease, but they failed completely in finding the cause and the cure. Katz and Bender point out that

throughout the eighteenth and nineteenth centuries the frontiers could not have been explored and conquered and the wilderness tamed without the defense of homestead and land claims through common efforts against both the environment and the constant encroachments of railroad and other monopolies (21, p.18).

Katz and Bender also recount that "as the problems of town and rural living grew more complex, self-help forms

emerged to meet common difficulties" (21, p.19). By 1800, dairymen were forming mutual assistance associations to buy feed for stock and to ensure markets for their products. Katz and Bender describe the mid-1800's as a society where most of the ills of the Industrial Revolution were manifest: long working hours, low wages, child labor, illness, overcrowded and unsanitary cities, and unemployment. Campaigns for better living conditions led to the formation of trade unions, but they did not survive the pressures of poor leadership, repressive legislation, and the disruptions of the civil war (21). Although not very successful, early mutual aid groups point out that men with like needs and goals persistently seek each other out to give and take help from one another. According to Toch,

when people feel themselves abandoned or frustrated by conventional society, they can sometimes bypass established institutions and create informal organizations on the side. Such grass-roots movements serve to provide otherwise unavailable services, to protest indignities, to escape suffering, to relieve tension, to explain confusing events, or in some way to create a more tolerable way of life than is afforded by existing formal organizations (21, pp.24-25).

Cooperative endeavors experienced a strong surge in response to the postwar depression of the late 1860's. Soldiers returning home to the war-wasted land sought new opportunities in the still-virginal West. Joined by large numbers of unemployed city workers and European immigrants, they produced record crops. The high agricultural output precipitated calamitous drops in market prices and high

transportation costs which ruined many farmers and led to the loss of their farms. As a result, a large number of consumer cooperatives emerged. Ensuring economic security was their goal, but many of the cooperatives failed because of economics, legal difficulties, and public hostility toward groups associated with labor movements. Unionists continued to strive for economic security by developing their own insurance plans, pension programs, banks, and homes for retired workers. In the 1920's, unionists pushed for worker's education due to the rapid growth of corporate power and the dehumanization of the conditions of employment. Adult education was seen as a way to improve the workplace as well as the worker's neighborhood (21).

The reports of satisfaction by self-help group members and the dramatic results they have achieved for themselves have been impressive to some professionals. These reports seem to be in contrast to the general aura of self-doubt and dissatisfaction permeating the professionals' helping fields. Hard evidence that the professional service system works effectively for those seeking help is sparse. Too many persons with problems are either not cared for or cared for in an unsatisfactory manner (19, p.48-49). Maguire says that regardless of how self-help groups develop, they all have clearly defined goals in mind. These goals may involve

1. raising money (for example, the March of Dimes or the American Cancer Society);
2. political/social action (for example, the Gay

- Caucus, most neighborhood organizations, the National Organization for Women - NOW);
3. consciousness raising (for example, the many women's groups that meet to support each other, often referring to themselves as "net-works");
  4. mutual aid and support (for example, Recovery Incorporated, Alcoholics Anonymous, Candlelighters) (24, pp.83-84).

Self-help groups are predicated upon faith in the ability of common people to set up a satisfying social order through their own efforts (21).

The Oxford Group movement of the 1930's is credited by Jaques and Patterson (19) for providing the background for the formation of Alcoholics Anonymous (AA). In 1973, AA reported 600,000 members throughout the world, with 405,858 United States members in 14,037 different groups. The AA movement is a phenomenal story of development and growth, which began with two members in 1935. Drakeford (11) lists the central assumptions of the Oxford Group:

1. Men are sinners.
2. Men can be changed.
3. Confession is a prerequisite to change.
4. The changed soul has direct access to God.
5. The age of miracles has returned (through changed lives, miraculous incidents, etc.).
6. Those who have been changed must change others (11, p.26).

Codification of the twelve steps that are at the heart of the AA program emerged and in their final form they read:

1. We admit we are powerless over alcohol - that our lives had become unmanageable.
2. Came to believe that a Power greater than ourselves could restore us to sanity.
3. Made a decision to turn our will and our lives over to the care of God as we understood Him.
4. Made a searching and fearless moral inventory of

- ourselves.
5. Admitted to God, to ourselves, and to another human being the exact nature of our wrongs.
  6. Were entirely ready to have God remove all these defects of character.
  7. Humble asked Him to remove our shortcomings.
  8. Made a list of all persons we had harmed and became willing to make amends to them all.
  9. Made direct amends to such people wherever possible, except when to do so would injure them or others.
  10. Continued to take personal inventory and when we were wrong promptly admitted it.
  11. Sought through prayer and meditation to improve our conscious contact with God as we understood Him, praying only for knowledge of His will for us and the power to carry that out.
  12. Having had a spiritual awakening as the result of these steps, we tried to carry this message to alcoholics and to practice these principles in all our affairs (11, p.30).

"AA has been used as a model for the development of other self-help groups, such as Synanon, Gamblers Anonymous, Neurotics Anonymous, Weight Watchers, and Overeaters Anonymous" (19, p.50). Riessman (32) claims that there are more than 500,000 self-help groups, with 15,000,000 members, in the nation today. Most groups operate informally, holding meetings wherever they can find the space. Most groups are self-supporting - usually members make voluntary contributions or pay minimal dues. Meetings are usually confidential, and members can attend once or for a lifetime. The groups are not a replacement for, but an adjunct to, care by a physician, therapist or other professionals (39). Examples of self-help groups for family problems are Alcoholics Anonymous (for alcoholics who want to stop drinking), Al-Anon Family Groups (for the family and friends



of alcoholics), The Compassionate Friends (for parents mourning the death of a child), Families Anonymous (for those concerned with a family member's drug abuse and related problems), Gamblers Anonymous (for compulsive gamblers who want to stop), Gam-Anon International (for the families and friends of compulsive gamblers), Narcotics Anonymous (for recovering drug addicts), National Federation of Parents for a Drug-Free Youth (for parents opposed to adolescent drug and alcohol use), Parents Anonymous (for families with child-abuse problems), and Widowed Persons Service (for widows and widowers) (39).

Examples of self-help groups for physical health include American Diabetes Association (for diabetics and their families), Association for Children and Adults with Learning Disabilities, Association for Retarded Citizens, Candlelighters Foundation (for the parents of children with cancer), Epilepsy Foundation of America, Lost Chord Clubs (for those who have lost their larynxes), La Leche League (for breast-feeding and other new mothers), Make Today Count (for cancer patients and their families), Mended Hearts (for people who have undergone heart surgery), National Federation of the Blind, National Society for Children and Adults with Autism, Overeaters Anonymous, Reach to Recovery (for women who have had breast cancer), Stroke Clubs, and United Ostomy Association (for people who have had colostomies, ileostomies, or urostomies) (39).

Mental Health self-help groups include Emotions Anonymous, National Alliance for the Mentally Ill, Neurotics Anonymous, and Recovery, Inc. (for nervous persons and former mental patients) (39). Riessman (32) argues that self-help groups are cost-effective, decentralized and untainted by government interference. In the past, self-help groups have not engaged in advocacy. AA is a group that has always seen the problem it deals with as solely the alcoholic, not in social conditions. AA, like many self-help groups, remains apolitical.

Many newer groups, however, fight for social change and have been deeply involved in legislative action. Black Single Mothers, Disabled in Action, Hard of Hearing, Center for Independent Living, and women's health groups are examples of this type of group. Additionally, some groups, originally concerned mainly with neighborhood problems such as traffic issues and local crime, have taken on a more political character. Riessman (32) describes the Citizen Action as a national federation of twenty statewide groups totaling more than a million members, which has organized broad-based coalitions around such issues as gas prices, Social Security, and toxic waste. The Citizen Action group has 1,500 full-time staff members and an annual budget of \$12,000,000.

Mann (25) maintains that the idea of self-help groups has become so popular that at least twenty-four regional

clearinghouses have been set up around the country to refer troubled callers to organizations that can lend them a hand. In most groups, members usually discuss personal experiences and feelings at regular meetings and have "sponsors" who can be called on for sympathy or advice at any hour of the day or night. Informal talk sessions with people suffering problems like yours are a cheap alternative to the fifty to seventy-five dollar an hour charge for a professional. Naisbitt (29) recounts that self-help has always been part of the American way. In the 1970's there was a rebirth of the movement that cut across institutions, disciplines, geographic areas, and political ideologies. Slowly the American people have begun to wean themselves off collective institutional dependence and are learning to trust and rely on themselves. Jaques and Patterson outline the basic operational assumptions of the self-help group approach as follows.

1. Individuals come together because they have a specific personal problem or condition which they share.
2. The status of peer relationships is maintained for all members within the group.
3. Peers, sharing the condition or problem, come together with the expectation of helping themselves and each other; that is, both the self-help and mutual aid aspects are central to the group process.
4. Behavior change is expected by and for each member. Learning a new way of life, presumably more satisfying, is undertaken at the individual's own pace.
5. Peers identify with the specific program developed by the group, become committed to its basic beliefs, tenets, and procedures, and actively

- support the program through practicing its principles in daily life.
6. Although the basic form of interaction is a regularly scheduled group meeting, peers are readily accessible and available to each other as needed outside of group meetings. This interaction is of a one-to-one type relationship, so both group and individual modes of contact are used.
  7. The group process consists of actively relating, "owning," and revealing problems, receiving and giving feedback to each other, sharing hope, experiences, encouragement, and criticism in relation to the day-to-day goals of individual behavior change.
  8. Members are held responsible for themselves and their behavior. That involves being honest about themselves, both within and outside the context of the group interaction.
  9. Group leadership develops and changes from within the group on the basis of giving and receiving help in keeping with the program's purposes and principles.
  10. Status comes from helping and being helped effectively, which in turns provides the validity for the program. Status achieved outside the group is of little, if any, value after joining the group; in fact, if it is used manipulatively, it can work against a member's status within the group (19, pp.53-54).

Although the assumptions are untested, they are supported by the help group members receive.

#### Dilemma of Developmental Mathematics

Remedial mathematics, as defined by Bittinger (2), is any arithmetic, elementary algebra, or intermediate algebra course taught at the college level. At some colleges, courses such as pre-calculus (algebra and trigonometry, elementary functions, and etc.) are also considered remedial or developmental. Bittinger (2) states that remedial students have learning difficulties related to language.

Language used in learning mathematics consists of two languages: ordinary English, and mathematical English, which consists of technical jargon such as "solutions," "linear equations," and symbol jargon such as  $1/4$ ,  $3x = 7$ , and etc.

Cornelius (7) asks, if students resort to learning mathematics without understanding in order to pass exams, scrape out a degree and perhaps become a school-teacher and then start up the cycle again!

We will always have idle pupils in school and lazy undergraduates at the university. Student patterns of behavior will not be changed easily, but it is surely essential that teachers, both in school and university, produce people who are interested in mathematics (7, p.212).

According to Bittinger (2), the use of behavioral objectives are helpful in remedial mathematics courses. He says that an argument against using behavioral objectives is that students' learning would be finite rather than open-ended. Additionally, Bittinger outlines the continuum of teaching from lecture-oriented to self-study. Because the psychological factor of change is advantageous, several approaches within the same course is recommended.

Schoenfeld (35) outlines several techniques to help teachers overcome the obstacles which lie between the teacher and his or her students in the classroom. These techniques include class evaluation, alternate class structure, student written class notes, in-class experiments, quizzes without trauma, the class dummy,

"programmed" spontaneity, and "treats." These are some of the techniques that have been utilized to overcome student's problems associated with mathematics.

In the third or fourth week of the class students are given the chance to write a paragraph or two about the class: pace and clarity of lectures, blackboard techniques, homework load, and etc., are all part of class evaluation. After the papers have been reviewed, the teacher should explain the procedures challenged and changes (if any) as a result (35).

Alternate class structure could include changing the lecture method to group work. If the material is appropriate or for the purpose of review, a list of problems could be given to small groups (4 or 5 students each) and the teacher act as a consultant. During the latter part of the class, the teacher could present brief solutions and tie the material together (35).

One student could be designated "official note-taker." The note-taker's responsibility would be to take a complete set of notes for the class that day. The notes are then copied and distributed to the class. Freed from the responsibility of taking their own notes, all the other students would feel freer to participate in class discussion (35).

Unlike the physical sciences, mathematics classes have no laboratories for experiments but experiments could still

be performed to demonstrate problem solving. Quizzes taken anonymously, unannounced, could give clues as to the material that is getting across and that which students are not getting. Class "dummies" could be designated to ask all the dumb questions for the day that others are afraid or ashamed to ask. Once students see that the teacher is open to questions, they will start asking their own; and the "dummy" can be retired (35).

"Programmed" spontaneity refers to students becoming a part of constructing routine problems (35). Since most mathematics teachers enjoy math games and problems, some of the favorite ones could be shared with the students as "treats." Schoenfeld (35) credits these techniques as methods for surmounting (or circumventing) barriers between teachers and their students.

Meeting the needs of each student has long been a concern to educators (18). Techniques to assist teachers in meeting individual needs include computer-assisted instruction (CAI), learning packets, programmed instruction, modularized approaches, and etc. Barns and Bozeman (3) conclude that while no ultimate final answer to the effectiveness of computer assisted instruction has been delineated, the analysis of many studies do point to a significant enhancement of learning mathematics in instructional environments supplemented by computer assisted instruction. Dammeyer (9) argues that the potential for

effective use of computers in education is limited only to attitudes and imagination, but adds that computers will not make appreciable improvements in education until used to deliver mainstream curriculum. Holmes says that

the picture is clear: any attempt at implementation of a CAI system is more likely to succeed if the system is viewed as a supplement to traditional modes of instruction. This does not mean, of course, that it cannot be a compulsory supplement and constitute a full-fledged component in a systems approach. It is not inconceivable that, if the computer proves useful in a supplemental role, teachers will welcome its extended use (17, p.12).

Palmer (31) claims that if more thought and energy were expended on the effectiveness of the training process for using the computer, students would not get so bogged down and frustrated by the methodological details. In many situations the computer is more "user friendly" than the process that introduces them to students.

In a recent study, Freeman (13) compared two dissimilar remedial courses in chemistry - one traditional and one having the personalized system of instruction (PSI) or self-paced format. Although the PSI remedial course suffered heavy attrition, students who passed the PSI course did significantly better in later courses in chemistry than those who took the traditionally formatted remedial course. Also, students who passed the PSI course performed comparable to a non-remedial group on three subsequent courses in chemistry. Thus, from the instructor's view, the self-paced course gave a lower rate of completion but a better grasp of the topic.



Tobias (37) views remedial as an inappropriate term and feels that reentry would be less humiliating to students. "Mathematics avoidance" has long been recognized by educators as a characteristic of students who were otherwise motivated and successful at school.

While concern with generally low achievement in mathematics in the population at large was leading to the establishment of remedial mathematics courses, few educators were willing to focus in on the mental blocks and prejudices that kept large numbers of able students away from math at the college level (37, p.1).

To help prevent students from having more bad experiences, anxiety will have to be reduced. Many journals, popular magazines, and newsletters have carried information about mathematics anxiety and avoidance during the past few years (37).

As pointed out by Dahlke (8), there are two types of students enrolled in remedial courses. Some need only a review while others need much more. It was found that those needing only a review (a clear majority of those enrolled) benefited from an individualized course using semiprogrammed materials. Students that needed more than a review needed a large amount of confidence-building and the importance of the instructor for them can not be emphasized enough.

The mathematics placement test is viewed by Wood (38) as a means of evaluating the needs of students. It must be pointed out, however, that there is no defense against the resolute underachiever. Out of 625 students at one college, only 40 scored above 70 on the placement exam. Five hundred

eighty-five students were not prepared for any kind of college level mathematics.

Edwards (12) claims that prediction of success in remedial mathematics courses can be made correctly 71 per cent of the time using five select predictors: high school average, mathematics test score, attitude toward mathematics score, sentence test score, and mathematics interest score. In the end it is a question of where the limited funds available are to be spent (15). Frerichs and Eldersveld (14) state that successful students were more likely to be enrolled in a lecture-discussion class, scored significantly higher on the numerical skills test, were older, and had better attitudes toward mathematics.

In his study of the relation between sex and mathematics anxiety, Calvert (4) concludes that females suffer the most anxiety. Additionally, students with fewer background courses in math were seen to suffer greater anxiety.

#### Self-Help Groups - Developmental Mathematics

Miller (28) maintains that developmental educational programs are not "miracle workers." However, they are needed as long as institutions admit minimally-prepared students into the academics of higher education. Wood summed up her conclusions about developmental mathematics in community colleges in six statements.

1. A majority of junior college freshmen have deficiencies in mathematics that range from partial to total.
2. Records show that these deficiencies do not necessarily imply a lack of ability. They frequently spring from insufficient high school training and/or time lapse between high school and college.
3. For students of normal or above-normal ability, these deficiencies can be effectively removed by a review course of one or two semesters. Our experience leads us to believe that the two-semester plan is the better one for any college with an open-door policy.
4. Presidents and academic deans of colleges need to be aware that short of returning to high school, students with serious mathematical deficiencies have no way to improve without such a review course or courses. This is especially true of mathematics because of its cumulative nature.
5. Placement tests for entering freshmen as well as advanced-standing examinations (in college algebra and trigonometry) for well-prepared students provide an efficient way to achieve accurate student placement.
6. The results of our investigation support the philosophy that any junior college that maintains an open-door policy to all high school graduates accepts responsibility for providing students with courses in which they have a reasonable chance to succeed (38, p.64).

It is pointed out by Tobias (37) that without four years of high school mathematics, students were ill-equipped to study statistics and economics, to major in the natural sciences, and to take the calculus sequence. In reality, they would be restricted to half the majors offered by the University of California at Berkeley. In a study which surveyed recruiters at the University of Maryland, it was found that three-fourths of the job recruiters would not interview seniors who did not have at least one semester of college calculus on their transcript. "The United States

graduates more young people from high school than most other nations, and we have a larger proportion of people enrolled in some sort of postsecondary schooling than any other nation in the world" (37, p.3). The study of mathematics is useful to students in many other fields: economics, physics, statistics, business-related quantitative analysis, engineering, social science, and natural science.

Naisbitt (29) argues that as people become disillusioned they begin to ask, what, or whom, can we trust? Motivated by mutual self-interest, people begin to help each other and themselves. Although data concerning self-help groups used in mathematics classes is not available, there is evidence of the successful use of these groups in areas where people have low concepts of their abilities. According to Drakeford (11), the success of self-help groups have been in the areas that are most complex and difficult to control, not in the so called simple problems of life. Jaques and Patterson (19) say the positive aspects to members of self-help groups include knowledge, therapeutic, and skills dimensions. These three dimensions include: gaining facts and knowledge of the condition; social learning of coping mechanisms from those who are successfully living with the condition; motivation and support by communicating with others who have shared a similar life experience; the modeling effect of successful problem-solving behaviors which provides reinforcement for

new members and for long-term members; self evaluation of progress resulting from feedback and sharing with members at various stages of problems, knowledge, and levels of coping behavior; identification with the group providing a tangible sense of belonging, of an individual and social nature, and minimizing isolation and alienation; and in the mutuality of the altruistic concern for others, finding self-help.

Part of the cathartic value of self-help groups is in sharing past frustrations with other members who have experienced them, knowing there is hope and help within their program. The self-help experience was described in the words of one member as "a weight of despair being lifted from my life" and "at last I can experience some joy in living" (19, p.54).

According to Jaques and Patterson (19), self-help groups appear where professionals did not or could not help. At each formation of a new self-help group, a few people out of step with their colleagues and the times, in thinking and in practice, turned the tide to a new approach. On invitation a professional can act as a consultant or speaker but the professional therapeutic skills cannot be used inside the self-help group. To do so would be a violation of self-help precepts. Desmond and Seligman (10) point out that the environment of the members of self-help groups contributes to positive or negative results. If the environment is an open one, that is, the subjects were not institutionalized, the results were more positive.

Research conducted suggest that facilitator-directed groups are equally effective as self-directed groups (6).

Beach (1) recounts that her study added further support to the contention that small self-directed student discussions does accomplish some things that other teaching approaches do not. Some negative reactions and observations were that some members complained that others in the group were not properly prepared much of the time. Also, some found the small group interactions somewhat threatening. Mayer and Wynn (26) state that the preponderance of the literature is concerned with a basic group structure in which some type of leader is involved. Perhaps of greatest importance, students choose activity-oriented groups in counseling over non-directive or other interview types of counseling groups.

Kurland (22) points out that in the United States, the concept of the study circle has not been elevated to the level of consciousness as an educational method as has been done in Scandinavia. Some of the advantages of the study circle may be missing because we are not doing all that can be done to spread the idea - an idea that may help solve some of our current problems. Kurland continues,

The pressing need in this country is a systematic means for engaging large segments of the general public in serious discussion of public-policy issues. Every student of democracy cannot long endure without a solid base of informed public opinion. Today we are faced with the prospect that this base has been so seriously eroded that popular support for new directions on public policy are difficult to achieve (22, p.27).

Kurland agrees that the effectiveness of study circles as an instructional device is unknown. Because of the strong

commitment to informality, there is resistance to subjecting participants to any sort of formal evaluation. Orsak (30) says that study circles have an impressive historical precedence in adult education by providing inexpensive learning for the people in Scandinavian countries for over one hundred years. Orsak maintains that if the system is implemented in the United States it will provide one of the best networks for facilitating widespread education and gaining input from the public on issues and policies.

Drakeford (11) describes members of self-help groups, that produce almost miraculous results, as the nonprofessional who is blissfully ignorant of many of the scientific investigations and the detailed descriptions of the social scientists. Drakeford says that self-help groups:

1. Utilize nonprofessional leaders. Sometimes they are even suspicious of highly trained professionals.
2. Emphasize personal responsibility. They will not allow people to blame the past or the influence of others for their problems.
3. Maintain high standards. They will not let participants offer good excuses for bad behavior.
4. Provide a setting for and encourage self-disclosure, most of them emphasize some form of confession.
5. Use distinctive techniques of teaching and inspiration. These may include slogans or songs.
6. Motivate participants into action. They refuse to let members speculate about insights or causes, but insist they do something.
7. Utilize peer groups. "Like speaks to like" is a basic concept (11, p.XVI).

Alcoholics Anonymous is credited by Mann (25) as being enormously successful with a league of one million drinkers

that began when two seemingly hopeless alcoholics began devising a twelve-step recovery plan in Akron, Ohio, in 1935. Rather than expecting government aid or expending money on counselors, more people are turning to those who have direct personal experience with the same problem. There are self-help groups to deal with almost every physical, mental, or family problem.



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## CHAPTER III

### PROCEDURES FOR COLLECTION AND TREATMENT OF DATA

#### Introduction

Tarrant County Junior College - Northeast Campus of the Tarrant County Junior College District is a large community college located in Hurst, Texas with a range of 10,000 to 12,000 student enrollment. The Northeast campus' comprehensive curriculum spans the full range of transfer courses, developmental courses, adult continuing education courses, and occupational programs. The developmental mathematics program is the focus of this study with particular interest in elementary algebra (Math 1403b). Since attrition continues to plague the developmental mathematics program, it is hoped that this study will suggest methods by which to help student achievement while providing an economical solution to the attrition problem.

#### Population

The participants for this study were chosen from the students enrolled in "day" mathematics classes at Tarrant County Junior College - Northeast Campus. There were one hundred four students involved in the study. The population was restricted to "day" students for control purposes. Fifty-two students comprised each of the experimental and control groups.

### Selection of the Sample

The sample for this experiment consisted of students who enrolled at Tarrant County Junior College - Northeast Campus for Introductory Mathematics (Math 1403b) at 10:00 a.m. Monday-Wednesday-Friday (MWF) during the fall semester of 1984 and at 8:00 a.m. Tuesday-Thursday (TTH) during the spring semester of 1985. These classes were chosen because of the large number of students taking classes at these times. For the fall semester seventy-two students enrolled for Math 1403b at 10:00 a.m. MWF. Thirty-two students enrolled at 8:00 a.m. TTH for the spring semester. It is assumed that the sample is representative of the "daytime" developmental mathematics students (Math 1403b) at Tarrant County Junior College - Northeast Campus.

At the beginning of each semester the students were divided into two classes by the use of a random number table. One of the classes became the control group and the other class the experimental group. For statistical analysis data from the experimental class taught during the fall semester was combined with data from the experimental class taught during the spring semester. Likewise, data from the control classes were combined. By combining the data from the fall and spring semesters there were fifty-two students participating in each of the experimental and control groups. Of the fifty-two students enrolled in the experimental classes, twenty-five completed the course.

Thirty-four of the fifty-two students enrolled in the control classes completed the course.

#### Research Design

Borg and Gall (1) describe the experiment, while not easy to control, as the most powerful method available to establish cause-and-effect relationships between two or more variables. The experimental study was the research design utilized for this study. This design provided answers concerning the relationships between self-help groups and completion rates, achievement, and attitudes in Math 1403b.

Students from the experimental class were given the opportunity to earn extra credit by becoming participants in self-help groups. Participating students were required to attend thirty minute group meetings once per week or a sixty minute meeting every other week during the semester for a total of seven hours. Extra credit was calculated on the number of meetings attended. Five bonus points were added to the semester average for attending all of the sessions. The bonus points decreased by one point for each thirty minute and two points for each sixty minute session missed down to a single bonus point for five hours attended. If a student missed more than five sessions or two and one-half hours, he/she did not receive extra credit. Each student demonstrated his/her understanding that the self-help groups had implication for high standards, participation, and

commitment to others as a means of helping themselves to higher achievement in mathematics by signing a commitment contract (See Appendix B).

Two counselors, employed by the college, acted as facilitators of the self-help groups. Each counselor was responsible for two self-help groups during the fall semester and one self-help group during the spring semester. Forty-four per cent of the students in the experimental classes participated in self-help groups.

The term self-help group was utilized to describe a small group of two-to-fifteen people who engaged in discussion of responsibility, standards, confession, lay leadership, and action under the direction of a group facilitator. Drakeford (2) maintains that these groups do not usually accept easy excuses for poor behavior but insist that individuals accept responsibility for their actions. Facilitators arranged for individual members to establish, in writing, their standard of achievement with the group providing periodic checks for progress. Provisions were made for admission of failure so that plans of action could be initiated to overcome failure. The students did not study mathematics in self-help group sessions. The self-help sessions dealt with anxieties, attitudes, and commitment that may be associated with mathematics courses in general.

As utilized for this study, self-help groups first assisted the student to realize that he/she is not in



isolation, but has common fears, deficiencies, and frustrations as do other students. The group gave the student a place to admit his/her weaknesses and accept the responsibility for his/her own actions. Peers were then available to help members overcome those weaknesses (2).

Control group participants were also able to earn bonus points by attending class on a regular basis. Bonus points were awarded based on the student's attendance record. The bonus points decreased from five points by one point for each class missed down to a single bonus point for attending all but four class periods. If a student missed more than four class periods on MWF or two class periods on TTH, he/she received no bonus points.

The research design was the "randomized post-test only control-group design" (1). The original two groups were equated by random placement. This design provides good internal validity and, by generalizing only to "daytime" mathematics students at Tarrant County Junior College - Northeast Campus, provided adequate external validity (1,3).

Completion percentages were calculated and analyzed utilizing inferences concerning two proportions (4). A "Z" score was calculated to check for significance of difference.

Achievement was measured by the The Descriptive Test of Mathematics Skills (DTMS). The problems from the DTMS were a part of the student's final exam in each of the

classes so that students were not to be aware that they were a part of an experiment and all students who finished the course would take the test seriously.

The DTMS has a reliability co-efficient of .91 as estimated by the Kuder-Richardson Formula 20 and a standard error of measurement of 2.3. The DTMS was developed by The College Board which has established content specifications so that the test could be broadly applicable for placement within a typical sequence of introductory mathematics courses.

Class scores on the DTMS for each the control and experimental classes were used to calculate means. Since the sample size was less than thirty, a t-test for independent means was used to test for significance of difference between the means of the treatment and control groups (4,5).

Attitudes toward learning mathematics were assessed by a Semantic Differential which consisted of a list of bipolar adjectives including potency, activity, and evaluative adjectives (See Appendix A). The Semantic Differential was developed with the assistance of a statistician from North Texas State University. Evaluative adjectives were selected to measure student's attitudes. Positive evaluative adjectives were placed on the left of the instrument and negatives to the right. Potency and activity adjectives were reversed with positives on the right. A t-test for dependent means was calculated to test for significance between the

paired differences of "pre" and "post" experimental class scores from the Semantic Differential.

#### Experimental Variable

The independent variable for this study was the self-help group treatment. The dependent variables were the percentage completion rates, the mean achievement scores from the DTMS, and the mean attitude scores from the Semantic Differential.

#### Control Procedures

The control and experimental classes were taught by different mathematics teachers. All teachers have Masters' Degrees and have been teaching at the college for about the same amount of time. It was assumed that they did not talk to students regarding the experiment and that they remained unbiased toward control and experimental treatments. Tarrant County Junior College - Northeast Campus is a commuter college with no on-campus housing so students generally do not see each other on a social basis. With the exception of friends that were divided because of random assignment between control and experimental classes there appeared to be minimal interaction between the groups.

#### Procedures for Analysis of the Data

To investigate the hypotheses of this study, data was gathered to calculate the percentage completion rates, the

means of the final exams taken by students, and the differences of the Semantic Differential paired scores given to the students in the experimental class at the beginning and the end of the semester. Statistical analysis of the data collected exclusively from self-help participants were also tabled and compared with the experimental class results.

The first hypothesis was: Algebra classes utilizing self-help groups will show a significantly greater completion rate than will classes not using self-help groups. The percentage completion rates were analyzed utilizing inferences concerning two proportions and a "Z" score was calculated to test for a significant difference.

The second hypothesis was: Students in algebra classes utilizing self-help groups will achieve a significantly greater increase in their mean score on the The Descriptive Test of Mathematics Skills than will students in algebra classes not utilizing self-help groups. A t-test for independent means was calculated to test for a significant difference.

The third hypothesis was: Students participating in self-help groups will show a significant increase in their mean attitude score on a Semantic Differential when compared to their mean score on the same instrument given at the beginning of the experiment. The two dependent means were derived from the Semantic Differential and a t-test for

dependent means was calculated to test for a significant difference.

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## CHAPTER IV

### PRESENTATION AND ANALYSIS OF DATA

#### Introduction

During the fall semester 1984 seventy-two students enrolled for Introductory Math (Math 1403b) at the 10:00 a.m. Monday-Wednesday-Friday (MWF) class time. By the use of a random number table the group was divided into two classes of thirty-six students each. Both classes met at the 10:00 a.m. time but in different classrooms with different teachers. One of the sections became an experimental class and its members were offered bonus points to become members of self-help groups. The other section became a control class where students were offered bonus points for regular class attendance.

The concept of self-help groups was presented to members of the experimental class during the first week of the fall semester. Included in the presentation was an explanation of the bonus points that could be earned by participating in self-help groups (See Appendix B). Each student demonstrated his/her understanding that the self-help groups had implications for high standards, participation, and commitment to others as a means of helping themselves to higher achievement in mathematics by signing a commitment contract. A copy of the commitment

contract is included in Appendix B. Each participating student was required to attend a thirty minute group meeting once per week or a sixty minute meeting every other week during the semester for a total of seven hours. Extra credit was calculated on the number of meetings attended. Five bonus points were added to the semester average for attending all the sessions. The bonus points decreased by one point for each thirty minute and two points for each sixty minute session missed down to a single bonus point for five hours attended. If a student missed more than five sessions or two and one-half hours, he/she did not receive extra credit. Eighteen students from the fall experimental class of thirty-six students joined one of four different group sessions. The self-help group meeting times offered and bonus points that could be earned based on the students attendance in the group sessions is included in Appendix B. The commitment contract (Appendix B) was generated by the facilitators in an effort to make the goals and expectations of the self-help groups as plain to students as possible. The contract included statements indicating that members of the self-help groups would have to participate to receive extra credit. Attendance, without participation, would not guarantee the student extra credit. Eight of the eighteen students that joined self-help groups finished the fall semester. Each of these eight students received the maximum number of bonus points or five points each. Eighteen of the



original thirty-six experimental class members or 50 per cent completed the fall semester. Forty-four per cent of those who completed the course were participants in self-help groups. The results are included in Table I.

TABLE I  
ENROLLMENT AND COMPLETION TOTALS FOR THE  
EXPERIMENTAL CLASS - MATH 1403b  
FALL 1984

	No. Enrolled	No. Completed
Experimental Class-Fall 1984	36	18
Participated in Self-Help Groups	18	8

Control class participants were able to earn bonus points by attending class on a regular basis. Bonus points were awarded based on the students attendance record. Students with perfect attendance records earned five bonus points. The bonus points decreased by one point for each class missed down to a single bonus point for attending all but four class periods. If a student missed more than four class periods on MWF, he/she received no bonus points. A copy of the form given to students indicating the bonus points that could be earned based on the student's attendance record is included in Appendix C. Twenty-two of the thirty-six students that started in the control class

completed the semester. Twenty-one of the twenty-two students completing the semester received bonus points for regular class attendance. Bonus points awarded varied from one to five depending on the number of classes attended. The results are included in Table II.

TABLE II  
ENROLLMENT AND COMPLETION TOTALS FOR THE  
CONTROL CLASS - MATH 1403b  
FALL 1984

	No. Enrolled	No. Completed	No. Receiving Extra Credit
Control Class - Fall 1984	36	22	21

Since it was agreed that for the purpose of the experimental design a minimum of twenty-five students should complete the experimental treatment, the experiment was repeated during the spring semester 1985. During spring 1985 registration an 8:00 a.m. Tuesday-Thursday (TTH) period was selected for a repeat of the experiment. Thirty-two students enrolled for Introductory Math (Math 1403b) at the 8:00 a.m. TTH class time. The students were divided into two classes by using a random number table. One of the classes became the experimental class and the other became the control class.

As in the fall semester, the concept of self-help groups was presented to members of the experimental class

during the first week of the spring semester. The presentation included an explanation of bonus points that could be earned by participating in self-help groups. Each student demonstrated his/her understanding that the self-help groups had implications for high standards, participation, and commitment to others as a means of helping themselves to higher achievement in mathematics by signing a commitment contract. An example copy of the fall commitment contract is included in Appendix B. The only difference between the fall and spring commitment contracts was the times for the self-help group meetings. The number of bonus points awarded remained the same as in the fall semester. Each participating student was required to attend a thirty minute group meeting once per week or a sixty minute meeting every other week during the semester for a total of seven hours. Extra credit was calculated on the number of meetings attended. Five bonus points were added to the semester average for attending all the sessions. The bonus points decreased by one point for each thirty minutes missed down to a single bonus point for five hours attended. Students who missed more than two and one-half hours received no extra credit.

Eight of the sixteen spring experimental class members each joined one of two group self-help sessions. Seven of the sixteen original class members completed the spring semester. Three of the seven or 43 per cent of those who

completed the spring class participated in self-help groups and received bonus points which were added to their final averages. The results are included in Table III.

TABLE III  
ENROLLMENT AND COMPLETION TOTALS FOR THE  
EXPERIMENTAL CLASS - MATH 1403b  
SPRING 1985

	No. Enrolled	No. Completed
Experimental Class-Spring 1985	16	7
Participated in Self-Help Groups	8	3

Twelve of the sixteen students enrolled in the control class completed the semester. Bonus points for regular class attendance was offered to students, but only two students' attendance records met the criteria for receiving extra credit. Five bonus points were offered to any student with a perfect attendance record. The number of bonus points that a student could receive decreased by two points for every class missed down to a single point for students missing two classes. Any student that missed more than two classes received no extra credit. There were several days of bad weather in the spring semester and some of the students that would have come to class were not able to get to school. Most of the students displayed a real interest in obtaining

the extra credit. The results are included in Table IV.

TABLE IV  
ENROLLMENT AND COMPLETION TOTALS FOR THE  
CONTROL CLASS - MATH 1403b  
SPRING 1985

	No. Enrolled	No. Completed	No. Receiving Extra Credit
Control Class - Spring 1985	16	12	2

It was agreed that a minimum of twenty-five students should complete the experimental group for the study, therefore, the two experimental classes were combined and the two control classes were combined which resulted in fifty-two students who began each treatment. By combining the classes for statistical analysis the criteria for twenty-five students to complete the experimental class was met. The results are included in Table V.

TABLE V  
ENROLLMENT AND COMPLETION TOTALS FOR THE  
EXPERIMENTAL AND CONTROL CLASSES  
BOTH SEMESTERS- MATH 1403b

	No. Enrolled	No. Completed
Experimental Class	52	25
Control Class	52	34

Statistical Analysis of the Data  
and Responses to the Hypotheses

The percentage completion rate for the experimental group, which consisted of both the fall and spring experimental classes, was 48 per cent and for the control group, which consisted of both the fall and spring control classes, the percentage completion rate was 65 per cent. The research hypotheses were tested in the null form.

Hypothesis I

Algebra classes utilizing self-help groups will show a significantly greater completion rate than will classes not using self-help groups. Twenty-five of the original fifty-two experimental students or 48 per cent completed the treatment. Thirty-four of the original fifty-two control students or 65 per cent completed the class. The results are shown in Table VI.

TABLE VI  
COMPLETION PERCENTAGE RATES FOR EXPERIMENTAL  
AND CONTROL GROUPS IN  
MATH 1403b

Group	Percentage Completion Rates-Math 1403b	Z	Z(0.05)
Experimental	48%	-1.75	1.65
Control	65%		

A study of Table VI revealed that the calculated "Z" value for the completion rates was -1.75, therefore, the research hypothesis was rejected. The null hypothesis was accepted which stated that the completion rate for the experimental class would be no different than the completion rate for the control class. Based on the data from this study, extra credit given for regular class attendance appears to have a greater influence on class completion rates than does participation in self-help groups.

Eleven of the original twenty-six students who joined self-help groups, 42 per cent, completed the semester. This completion rate was compared to the control class completion rate of 65 per cent utilizing inferences concerning two proportions (2, p.380). The results are shown in Table VII.

TABLE VII  
COMPLETION PERCENTAGE RATES FOR SELF-HELP  
PARTICIPANTS AND CONTROL GROUPS IN  
MATH 1403b

Group	Percentage Completion Rates-Math 1403b	Z	Z(0.05)
Self-help Participants	42%	-1.94	1.65
Control	65%		

A study of Table VII revealed that the completion rate for self-help participants was less than that of the control class. Compared to the completion rate for the experimental class from Table VI, the completion rate for the self-help group participants was less.

The mean scores on The Descriptive Test of Mathematics Skills (DTMS) for both the experimental and control classes were calculated. The mean score for the experimental class was 80 and for the control class 82.94. The standard deviation for the experimental class was 13.49 and for the control class was 8.37. The difference in the percentage completion rates between the experimental and control classes may be partially responsible for the spread between the values of the two standard deviations. In a larger group of students the standard deviation is more likely to be smaller due to more scores around the mean. The test score means were analyzed utilizing inferences concerning the difference between two independent means (2, p.365).

#### Hypothesis II

Students in algebra classes utilizing self-help groups will achieve a significantly higher mean score on the DTMS than will students in algebra classes with no self-help groups. The research hypothesis was tested in the null form. The results are shown in Table VIII.



TABLE VIII  
 MEANS AND STANDARD DEVIATIONS  
DTMS SCORES-MATH 1403b

Group	No. Subjects	M	SD	t	t(24,0.05)
Experimental	25	80.00	13.49	-0.96	1.71
Control	34	82.94	8.37		

An examination of Table VIII reveals that the difference between the mean achievement scores was not significant. Based on the value of "t" (-0.96), the null hypothesis which stated that the achievement scores for students completing the experimental class would be no different than the achievement scores for students completing the control class was accepted. The research hypothesis stating that the achievement scores for students completing the experimental classes would be significantly higher than the scores of students completing the control classes was rejected.

The mean Score on the DTMS for the eleven students who participated in self-help groups was 79.6. The standard deviation was 12.7 and the variance 161.53. The mean score on the DTMS for the self-help participants was compared to the mean score from the DTMS of the control group utilizing inferences concerning two independent means. The results are

shown in Table IX.

TABLE IX  
MEANS AND STANDARD DEVIATIONS  
DTMS SCORES-MATH 1403b

Group	# Subjects	M	SD	t	t(10,0.05)
Self-Help Participants	11	79.56	12.70	-0.82	1.81
Control	34	82.94	8.37		

An examination of Table IX reveals that the difference between the mean achievement scores was not significant. The mean achievement score from the DTMS of the self-help participants was about equal to the mean score from the DTMS of the experimental class.

The Semantic Differential was scored on a basis of one to seven for the individual evaluative, bipolar adjectives. The number "one" represented a strong negative feeling and "seven" a strong positive feeling. The results of the students responses were included in Appendix D. Because of the relationship between two dependent samples, the data from the Semantic Differential administered at the beginning of the semester to the experimental class was compared to the data from the Semantic Differential administered at the end of the semester to the same class. The two data, one

from each set, were compared using the difference in their numerical values. The two dependent means were then compared by using the observed mean (" $\bar{d}$ " in Table VIII) of the resulting paired differences (2, p.374).

### Hypothesis III

Students participating in self-help groups will show a significant increase in their mean attitude score on a Semantic Differential when compared to their mean score on the same instrument given at the beginning of the experiment. The research hypothesis was tested in the null form. The results are shown in Table X.

TABLE X  
MEAN AND STANDARD DEVIATION OF THE  
SEMANTIC DIFFERENTIAL SCORES FROM  
MATH 1403b-EXPERIMENTAL GROUP

Group	No.Subjects	$\bar{d}$	Sd	t	t(24,0.05)
Experimental	25	0.84	6.94	0.61	1.71

The "Sd" value of 6.94 in Table X was the observed standard deviation of the paired differences of the scores on the Semantic Differential. Table X reveals that there was not a significant difference in the attitudes of students toward learning mathematics after participating in the experimental class. The calculated "t" value was .61 and the

critical value at the .05 level of significance for 24 degrees of freedom was 1.71. Based on the value of "t", the null hypothesis which stated that the attitudes of students toward learning mathematics before the experiment would be as positive as their attitudes toward learning mathematics after the experiment was accepted. The research hypothesis that students' attitudes toward learning mathematics would be significantly more positive after participating in self-help groups was rejected.

The "Sd" value for the self-help group participants was 8.65. The " $\bar{d}$ " value was .33. The results are shown in Table XI.

TABLE XI  
MEAN AND STANDARD DEVIATION OF THE SEMANTIC  
DIFFERENTIAL SCORES FROM MATH 1403b  
SELF-HELP GROUP PARTICIPANTS

Group	No. Subjects	$\bar{d}$	Sd	t	t(10, 0.05)
Self-help Participants	11	0.33	8.65	0.11	1.81

Table XI reveals that the attitudes of the self-help participants toward learning mathematics was not significantly more positive after the treatment compared to their attitudes at the start of the experiment.

Techniques and Procedures Employed  
by Group Facilitators

Facilitators reported that activities in the self-help group sessions, which are discussed below, included self-disclosure, mathematics history, daily-log, support system, accountability, and integration. An example for each activity is given.

1. Self-disclosure - Each student was asked to tell the group about himself/herself. Self-disclosure included topics such as hometown, hobbies, interests, employment, career goals, relationships, and college goals. In harmony with Jaques and Patterson's (1) outline of the basic operational assumptions of self-help groups it was thought that, through self-disclosure activities, participants would be able to encourage and assist other members of the group in their efforts to learn mathematics. Jaques and Patterson state that, "peers, sharing the condition or problem, come together with the expectation of helping themselves and each other; that is, both the self-help and mutual aid aspects are central to the group process" (1, p.53).

One of the group members was a twenty-three year old student from Iran. She, her parents, and one brother left Iran in 1981 under political pressure. While a child in Iran, she was always drawing buildings. Friends had encouraged her to study architecture. She is now working part-time as a draftsman.

2. Mathematics history - Participants related their earliest memories of mathematics, number courses taken in school, self exploration as to the positive and negative feelings about mathematics with reasons for those feelings. It was thought that participants shared similar problems concerning mathematics and by relating their mathematics history they would be drawn closer together. Jaques and Patterson point out that, "individuals come together because they have a specific personal problem or condition which they share" (1, p.53).

An example of mathematics history involves a thirty-seven year old woman who had always had difficulty with mathematics. Her earliest memories of elementary school were filled with recollections of always being the last one to turn in her arithmetic paper, and always being the one with the most "red ink" on her paper. Her two brothers were superior mathematics students and her father was an engineer who continually put pressure on her to do well in mathematics.

3. Daily-log - Students were required to maintain specific, detailed, accurate records of where they studied, with whom, how long, breaks, and interruptions. It was felt that, by keeping a daily study log, group members would be able to fulfill their study commitments.

A thirty-four year old female with a family reported the following study-log. "Tuesday p.m. - 2 hours - I study

in the a.m. after I return from school - bedroom is the quietest place - some interference. Helped son with reading - not much time left for me. etc."

4. Support system - Individuals which make up each student's support system such as boyfriend, wife, children, mother, or brother/sister. Students were asked to relate methods of resolving conflicts within the support system. It was thought that, as members identified their support system, they would be able to capitalize on the support offered by the group. Jaques and Patterson state that "although the basic form of interaction is a regularly scheduled group meeting, peers are readily accessible and available to each other as needed outside of group meetings. This interaction is of a one-to-one type relationship, so both group and individual modes of contact are used" (1, p.54).

A forty-one year old married woman with three children reported that she was under continuous stress at home. The conflict was with her children who resented that she was not spending as much time with them as she had done before attending school. They had little or no understanding of her need for quiet, study time. She resolved the conflict by spending more time at the college library where she could study her mathematics. She was able to achieve her goals in mathematics.

5. Accountability - Each student was required to draw

up a "contract" outlining personal goals for math study and exam scores. Each member of the group was then held accountable to the group for meeting the goals set. It was judged that, as members established their own goals for mathematics study and exam scores, they would strive harder to obtain their goals. Jaques and Patterson point out that, "members are held responsible for themselves and their behavior. That involves being honest about themselves, both within and outside the context of the group interaction" (1, p. 54).

The following is a "contract" drawn up by one of the participants.

I will study one hour every Monday, Wednesday, and Friday. I propose that I stay at school in the library during these study times. I also expect to receive an "A" in this class and to do so I must discipline myself to study. I will come to the library right after my classes and stay until I have studied for an hour.

6. Integration - The group facilitator met with each group member on an individual basis to show how mathematics specifically related to his/her personal educational and career goals. It was judged that, as students became aware of how algebra relates to his/her own goals, integration would enhance his/her desire to be successful in class.

A facilitator reported the following conference with one of the participants. R. T. was a twenty-seven year old male student majoring in electrical engineering. He was rather familiar with the engineering profession, but not



with the specific educational requirements necessary to become an engineer. The group facilitator had an individual session with him in order to explain to him the mathematics and physics sequencing necessary for an engineering degree. After finishing his elementary algebra class, he would need: intermediate algebra; college algebra; college trigonometry; calculus and analytical geometry I, II, and III; and differential equations. It was also explained to him that he would need to finish, or be enrolled in, calculus I before he could take his engineering physics, since engineering physics is calculus based physics.

Based on the outline of student activities in self-help groups reported by the facilitators, the self-help sessions were conducted in the manner that was called for in this study. The group activities were conducted in harmony with the basic operational assumptions of self-help groups outlined by Jaques and Patterson (1).

#### Implications

1. Although the results of this study indicate that the eleven students who completed the self-help groups did not exhibit a better completion percentage rate, a higher mean test score on the DTMS, not a significantly more positive attitude toward learning mathematics than the experimental class or the control class, the sample size of eleven would prevent generalizing the results to the population.

2. The results of this study indicate that there may be a relationship between giving extra credit for regular class attendance and completion rates. Administration should examine the possibility of more stringent attendance policies for remedial type students at Tarrant County Junior College - Northeast Campus, Hurst, Texas.

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## CHAPTER V

### SUMMARY, SUMMARY OF DATA FINDINGS AND CONCLUSIONS, AND RECOMMENDATIONS

#### Summary

Students who enroll in remedial math courses are described by Bittinger as people with poor mathematical backgrounds, bad experiences in math classes, and bad attitudes (1). The purposes of this study were to determine the effect that self-help groups have on completion rates, achievement, and attitudes of students enrolled in developmental math courses at Tarrant County Junior College - Northeast Campus, Hurst, Texas. The purposes of this study also include the presentation of the procedures and techniques utilized by facilitators in their self-help group meetings. It is hoped that, as the result of this experimental study, continued efforts on the part of faculty and administration will result in solutions to the problems that students have in remedial math courses.

#### Summary of Data Findings and Conclusions

The following is a summary of data findings from this study. In addition, conclusions will be reached in relation to the findings.

1. Twenty-five of the fifty-two students enrolled in the experimental class finished the course for a completion

rate of 48 per cent. Thirty-four of the fifty-two students enrolled in the control class completed the class for a completion rate of 65 per cent.  $Z(0.05)$  is 1.65 and the calculated "Z" score of -1.75 resulted in the rejection of the research hypothesis which stated that the percentage completion rate for the experimental class would be significantly higher than the percentage completion rate for the control class.

It was found that the percentage completion rate for the experimental class was lower than the percentage completion rate for the control class, therefore, a reasonable conclusion is that self-help groups, as utilized in this study, did not improve percentage completion rates in Introductory Mathematics. Twenty-three of thirty-four or 68 per cent of the students that completed the control class received extra credit for regular class attendance. There appears to be a connection in this study between extra credit given for regular class attendance and course completion rates.

2. Achievement, as measured by the Descriptive Test of Mathematics Skills (DTMS), between the experimental and control classes was about equal. The final exam test scores were utilized to assess achievement. The problems for the final exam were taken from the DTMS. The mean test score for the experimental class was 80.00 and for the control class 82.94. The standard deviation of 13.49 for the experimental

class compared to 8.37 for the control class indicates that test scores appear dispersed more widely about the mean for the experimental class compared to the control class. The larger completion percentage rate in the control class may contribute to the lower standard deviation score for that class. It was stated in the second research hypothesis that students in classes utilizing self-help groups would achieve a significantly greater mean score on the DTMS than would students in the control class. The research hypothesis was rejected.

The "t" score for the difference between two independent means was -0.96 which was not significant at the .05 level. It was found that the "t" score of -0.96 did not demonstrate that the achievement of the experimental class was significantly greater than the achievement of the control class at the .05 level of significance, therefore, a reasonable conclusion is that self-help groups, as utilized in this study, did not improve achievement.

3. The mean attitude scores before and after the experiment calculated from the students responses to the Semantic Differential (Appendix D) show that the mean attitude score after the experiment of 4.89 was slightly more positive compared to the mean attitude score of 4.79 before the experiment. However, the positive gain was not statistically significant. The observed mean value of the paired difference was 0.84. The observed standard deviation

of the paired difference was 6.94 and the resulting "t" score was 0.61. It was found that the "t" score of 0.61 was not significant at the .05 level, therefore, a reasonable conclusion is that the slight positive gain in the mean attitude score on the Semantic Differential cannot be attributed to anything other than chance. It was stated in the third hypothesis that students participating in self-help groups would show a significantly more positive attitude toward learning mathematics after the experiment compared to their attitudes toward learning mathematics before the experiment. The research hypothesis was rejected.

4. Self-disclosure, mathematics history, daily-log, support system, accountability, and integration were the activities, reported by the facilitators, in which students in self-help groups participated. These activities were in harmony with Jaques and Patterson's (2) outline of the basic operational assumptions of self-help groups which are listed below.

1. Individuals come together because they have a specific personal problem or condition which they share.
2. The status of peer relationships is maintained for all members within the group.
3. Peers, sharing the condition or problem, come together with the expectation of helping themselves and each other; that is, both the self-help and mutual aid aspects are central to the group process.
4. Behavior change is expected by and for each member. Learning a new way of life, presumably more satisfying, is undertaken at the individual's own pace.
5. Peers identify with the specific program developed

- by the group, become committed to its basic beliefs, tenets, and procedures, and actively support the program through practicing its principles in daily life.
6. Although the basic form of interaction is a regularly scheduled group meeting, peers are readily accessible and available to each other as needed outside of group meetings. This interaction is of a one-to-one type relationship, so both group and individual modes of contact are used.
  7. The group process consists of actively relating, "owning," and revealing problems, receiving and giving feedback to each other, sharing hope, experiences, encouragement, and criticism in relation to the day-to-day goals of individual behavior change.
  8. Members are held responsible for themselves and their behavior. That involves being honest about themselves, both within and outside the context of the group interaction.
  9. Group leadership develops and changes from within the group on the basis of giving and receiving help in keeping with the program's purposes and principles.
  10. Status comes from helping and being helped effectively, which in turns provides the validity for the program. Status achieved outside the group is of little, if any, value after joining the group; in fact, if it is used manipulatively, it can work against a member's status within the group (2, pp.53-54).

Based on the outline of student activities in self-help groups reported by the facilitators and the operational assumptions of self-help groups reported by Jaques and Patterson, the self-help sessions were conducted in the manner that was called for in this study.

#### Recommendations

1. A study which utilizes self-help groups which are open to all students. Students with internal motivation to conquer their fears and anxieties should gain the support they need in self-help groups.



2. A study utilizing an experimental approach which includes the stipulation that all students signing up for the experimental course be required to participate in self-help groups. Better participation by members of the experimental class could result in more positive results.

3. As a result of the findings and conclusions the administration at Tarrant County Junior College - Northeast Campus should investigate the possibility of enforcing a more stringent attendance policy in remedial mathematics classes to reduce the attrition rate. The results of this study also indicate that completion rates and extra credit awarded for regular class attendance could be related.

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## APPENDICES



## APPENDIX B

## SELF-HELP GROUP COMMITMENT CONTRACT

<b>Name</b>		<b>Group Meeting</b>	
_____	_____	_____	_____
Last	First	Day	Time

**MATHEMATICS MOTIVATION GROUP**

Understanding that the Mathematics Motivation Group has an implication of high standards, participation, and commitment to others as a means of helping myself to higher achievement in mathematics, I undertake to become a part of this group for the fall semester 1984. This commitment includes attending a thirty minute group meeting and **PARTICIPATING IN THE GROUP ACTIVITIES** once a week for 14 weeks. Since participation in the Mathematics Motivation Group is a course supplement, it will determine a part of my course grade as follows:

Number of meeting attended:	14	13	12	11	10	9
Bonus points added to average:	5	4	3	2	1	0

I will select a time to meet each week. If I miss the meeting for that week and the absence was because of an emergency, I will contact the facilitator to make up the absence by meeting with the facilitator on an individual basis providing the facilitator has the time.

**REMEMBER: YOU MUST PARTICIPATE IN THE GROUP ACTIVITIES FOR BONUS CREDIT**

Meetings will begin on September 12, 1984 and will meet once per week for 14 weeks (last meeting 12/12/84).

GROUP	DAY	TIME	LOCATION
A	WEDNESDAY	12:00 - 12:30	LRC 124
B	WEDNESDAY	12:30 - 1:00	LRC 124
C	WEDNESDAY	1:30 - 2:00	LRC 124
D	WEDNESDAY	2:00 - 2:30	LRC 124

## APPENDIX C

## BONUS POINTS FOR REGULAR CLASS ATTENDANCE

## INTRODUCTORY MATHEMATICS (MATH 1403b)

10 - 10:50 MWF

Class attendance is required and expected. Since it is believed that you will do best if you come to class, the following bonus points will be added to your final average based on attendance:

Number of classes attended:	42	41	40	39	38	37
Bonus points added to semester average:	5	4	3	2	1	0

APPENDIX D  
 UNGROUPED FREQUENCY DISTRIBUTION OF THE RESPONSES  
 TO SEMANTIC DIFFERENTIAL-EXPERIMENTAL  
 CLASSES-BEFORE THE EXPERIMENT  
 EVALUATIVE ADJECTIVES

POS. ADJ.	Point Values							NEG. ADJ.
	7	6	5	4	3	2	1	
Number Responses for Each Value								
1. Pleasant	2	5	7	7	3	1	0	Unpleasant
2. Beautiful	1	2	3	14	4	1	0	Ugly
3. Sweet	1	1	4	13	3	3	0	Sour
4. Good	3	4	7	10	0	1	0	Bad
5. Nice	1	3	8	9	2	2	0	Awful
6. Bright	2	3	8	10	1	1	0	Dark
7. Fair	2	5	13	3	2	0	0	Unfair
8. Honest	2	7	10	5	1	0	0	Dishonest
9. Clean	4	2	10	9	0	0	0	Dirty
10. Sacred	0	1	4	18	2	0	0	Profane
11. Valuable	13	7	3	1	1	0	0	Worthless
12. Fragrant	1	5	5	14	0	0	0	Foul
13. Fresh	4	5	6	7	3	0	0	Stale
Totals	36	50	88	120	22	9	0	

APPENDIX D -- CONTINUED  
 UNGROUPED FREQUENCY DISTRIBUTION OF THE RESPONSES  
 TO SEMANTIC DIFFERENTIAL-EXPERIMENTAL  
 CLASSES-AFTER THE EXPERIMENT  
 EVALUATIVE ADJECTIVES

POS. ADJ.	Point Values							NEG. ADJ.
	7	6	5	4	3	2	1	
Number Responses for Each Value								
1. Pleasant	2	4	8	4	7	0	0	Unpleasant
2. Beautiful	1	1	6	13	4	0	0	Ugly
3. Sweet	2	2	4	12	4	1	0	Sour
4. Good	6	7	5	4	3	0	0	Bad
5. Nice	2	4	7	9	3	0	0	Awful
6. Bright	2	6	6	9	1	1	0	Dark
7. Fair	4	5	7	7	2	0	0	Unfair
8. Honest	6	7	4	7	1	0	0	Dishonest
9. Clean	2	5	10	7	1	0	0	Dirty
10. Sacred	0	2	5	15	3	0	0	Profane
11. Valuable	13	6	4	2	0	0	0	Worthless
12. Fragrant	1	2	7	15	0	0	0	Foul
13. Fresh	2	8	7	4	3	1	0	Stale
Totals	43	59	80	108	32	3	0	



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