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Improving the success rate of academically disadvantaged Black students in general education science classes at a small, historically Black, private, church-related college

Burrell, Selma Theresa Tuck, Ed.D.

The University of North Carolina at Greensboro, 1992

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IMPROVING THE SUCCESS RATE OF ACADEMICALLY DISADVANTAGED BLACK STUDENTS IN GENERAL EDUCATION SCIENCE CLASSES AT A SMALL, HISTORICALLY BLACK, PRIVATE, CHURCH RELATED COLLEGE

by

Selma Theresa Tuck Burrell

A Dissertation Submitted to
the Faculty of the Graduate School at
The University of North carolina at Greensboro
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of the Requirements for the Degree
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APPROVAL PAGE

This dissertation has been approved by the following committee of the Faculty of the Graduate School at The University of North Carolina at Greensboro.

Dissertation Adviser David R. Strahan

Committee Members

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BURRELL, SELMA THERESA TUCK, Ed.D. Improving the Success Rate of Academically Disadvantaged Black Students in General Education Science Classes at a Small, Historically Black, Private Church Related College. (1992) Directed by Dr. David B. Strahan. 184 pp.

The purpose of this research was to design, implement, and evaluate three methods for helping academically disadvantaged Black students succeed in the general education science course at Barber-Scotia College. The methods used in this study were enrichment, self-esteem building, and enrichment/self-esteem building. The sample comprised one hundred eight freshman students in Biology I.

A MANOVA revealed that there was a significant difference between the test scores of participants in the treatment groups and the scores of the participants in the control group. The Scheffe test revealed that participants in the enrichment and enrichment/self-esteem groups scored higher on tests than did the participants in the control and self-esteem groups. Responses from a student questionnaire provided information about how participants regarded the enrichment and self-esteem sessions. Results demonstrated that enrichment sessions helped participants perform better on tests and that self-esteem sessions did not help students as much.

Results suggest that enrichment type tutorial sessions may improve academic performance in science as well as other courses.

CHAPTER I

INTRODUCTION

Challenges to Colleges and Universities

> ... as early as 1852, Henry P. Tappan, then President of the University of Michigan, was concerned about an influx of underprepared students. As a result of the Morrill Act in 1862, Iowa State College established a preparatory program for students who could not read, write and do arithmetic. In 1907, over one-half of the students who enrolled at Harvard, Yale, Princeton and Columbia failed to meet entrance requirements, a fact conveniently overlooked since colleges were in fierce competition for students (Platt, 1986 p.21).

Institutions of higher education with open or relaxed admission policies are admitting more students with minimal preparation. A larger than average percentage of these underprepared students are from disadvantaged minority backgrounds (Uno, 1987). Some of these students, through no fault of their own, began their school careers with deficiencies in verbal and nonverbal skills and they did not use standard English to express themselves. As disadvantaged students were directed through the school systems of this nation, they continued to perform below the national averages for their respective age groups (Garton, 1984, p. 91). Lang (1986) stated that when disadvantaged students enter colleges and universities the deficiencies they had in elementary and secondary schools are still present. In the area of science, studies by Uno (1987),

Samples and Hammond (1985), Lang (1986), and Zoller, Ben-Chaim and Danot (1987) pointed out that many of the academically disadvantaged students lacked self discipline, had a deeply rooted negative attitude toward science, lacked self-responsibility, self-discipline in work and study habits, and time management skills, and lacked self-esteem.

According to Francisco (1983) and Lang (1986) Blacks are not represented in most professions in proportion to their percentage in the American population. Under representation occurs in most professional work areas including, law, medicine, engineering and all hard sciences. The under-representation by Blacks in the aforementioned professions still holds true today. As the United States is fast developing into a technocratic society, being literate in the sciences is of importance. According to Clark (1985), Black students have to be encouraged and given adequate preparation for entering careers in science (p. 679). According to James and Smith (1985):

> We live in an increasingly technological age that require a science literate citizenry. In this technological age, successful participation as citizens and consumers increase the importance of scientific literacy. If some reasonable measure of this general education goal is to be accomplished, means for reducing the alienation from science should be found (p.39).

Universities and colleges have attempted to help disadvantaged students by involving them in "special

programs" (Francisco, 1983, p.114). The special programs in a large percentage of the schools offering them have fallen short of their main goal, assisting these students toward graduation (Francisco, 1983). In some instances, the programs have not met their goal because most Black students refused to participate in them. Students refused to participate in these programs because they had no input in the establishment of the programs and because the programs were too remedial in nature. No person according to Francisco (1983), "regardless of race likes to be treated as stupid or unintelligent" (p. 119).

Attempts have been made to improve the success of underprepared students in college level general science courses, independent of the aforementioned programs. Some of these programs have met with more success in the science area. These programs range from computer-assisted instruction, tutoring, remedial courses, to smaller classes.

Research by Gravely (1988), Platt (1986), and Sevenair, O'Connor, and Nazery (1989) have provided evidence that remedial programs can be successful. However, Anderson (1988) provided evidence that some of the students who are successful in remedial classes do not perform effectively in regular college level courses.

The issues Of concern in this study are (1) The changing nature of college student populations, (2) The

underachievement by minority students from disadvantaged backgrounds, (3) The subsequent effect on self-esteem, especially in science and (4) How to help?

Conceptual Base

Information obtained from the literature suggested that minority students are victims of ineffective teaching techniques. As a result their academic performance is below that of their white counterparts. Low academic performance often leads to lowered self esteem. This study will deal with methods to improve the aforementioned weaknesses.

The perspectives to be examined in this study are (1) the impact of self-esteem building and (2) the effects of enrichment experiences on the academic performance of students in freshman science classes.

Self-Esteem

> The nexus between positive self-concept of ability and academic performance has long been perceived as an important linkage by social scientists and educators alike in assessing academic success. Self-concept is formed based on past judgements, perceptions, and feedback of the generalized and significant others and is a person's conception of his/her own ability to learn... (Gerardi, 1990, p. 402).

Understanding why Black students and especially those from the lower socioeconomic levels have low self-esteem requires one to "go back in time to the birth and creation of the "American Negro"" (Smith, 1980, p.355).

> Over 300 years ago Black men, women, and children were extracted from their native Africa, stripped bare both psychologically and physically, and placed in an alien White land . . . the most tragic, yet predictable part of all this is that the Negro has come to form his self-image and self-concept on the basis of what White racists have prescribed. Poussaint, (cited in Smith, 1980, p.355).

Unfortunately, the belief that Blacks are inferior continues to be passed on from one generation to the next. While some progress has occurred, the Blacks who remain at the lower end of the socioeconomic strata still suffer from the stigma of being slow, dull, and unable to function at a level equal to that of their white counterparts. This attitude has spilled over from society in general into the educational arena. Powell (1990) reported that society has successfully implanted on an unconscious level into the beliefs of Americans that science and mathematics are very difficult subjects. "Suffice it to point out that persons of dull intellect are not expected" (Powell, 1990, p.294) to be successful in science or math classes on any level. These preconceived notions are and can be extremely deleterious to one's functional capacity. Expectations of failure from teachers and low self-esteem discourage children from setting goals and working for success.

Studies have established a positive correlation between self-esteem and academic performance of students in

elementary, middle, junior high, and high school (Leung & Sand, 1981). The positive correlation was accurate for Black and white students as well as for students with learning problems. Students with low self-esteem are not as productive academically as those students with high self-esteem.

Gerardi (1990) reported that self-esteem was a significant predictor of academic success among Black, low income students enrolled in college. Students who have high self-esteem "are more active in classroom participation than those low in self-esteem" (p. 291). Information of this type would be especially important to instructors who conduct lecture/discussion type of classes.

In order for the Black students with low self-esteem to be successful in science classes self-esteem must be raised. It is paramount during the first year of college that students encounter experiences that will raise their level of self-esteem and encourage success. These experiences can first be encountered through sessions with trained peer counselors from similar backgrounds who have been successful in college. Instructors of science in historically Black institutions should exhibit higher expectations of their students than did the science teachers in the students previous pre-college experiences most of whom were white. If the instructors demand more academically of the students along with constant

encouragement, students will begin to feel that they are capable of performing at a higher level. The two experiences, one with the peer counselors and the other with the science instructor, should result in producing students with increased self-esteem and higher success rates.

Academic Enrichment

Once students believe that they are capable of succeeding the next experience for the students should be that of enrichment. Students should not be placed in remedial situations because it would again result in a lowering the of self-esteem. The enrichment experience, on the other hand will provide opportunities that were lacking in secondary courses.

McDermott, Piternick, and Rosenquist (1980) suggested that before the disadvantaged Black student can be successful in basic college level science classes, they must receive help to overcome the weaknesses brought with them to college. The help that most of these students need cannot be obtained within the framework of a formal classroom setting; it can however be given with tutorial support.

Francisco (1981) suggested that upper level students should be used to counsel and tutor freshman students who experience difficulty. The instructors of given classes can identify and train academically successful upperclass

students to act in this capacity. In this manner students will have someone with whom they can identify to help them smooth out the rough spots in their educational training.

The need for enrichment opportunities is especially prevalent at historically Black institutions of higher learning. The reason for the need is due to the "Open Door Policy" that many of the institutions have had to adopt in order to survive. In the days of segregation the Black institutions could afford to be selective in the admissions process. Barber-Scotia, at one time, only accepted applicants in the top 10% of high school graduating classes. With integration, many Black institutions experienced a decline in qualified applicants. In order to survive, qualifications for admissions were lowered.

Students are admitted who are unable to meet the requirements of English, math, science, and history classes etc. on the college level. In North Carolina students are required to pass a competency test before they can receive a diploma. Passage of the test is not indicative of a student's readiness for college. Graduation from high schools in the other 49 states does not assure that the graduate will be able to meet the demands of college. Reform of high school curriculum is in the making but the result of the change, a "prepared" high school graduate, is still many years in the future. Unfortunately, there is no quick fix for the underprepared student.

Enrichment opportunities will be needed in the future. The reasons for continued enrichment opportunities are varied. One reason for continued enrichment opportunities is that no matter how great future reforms are in education, there will always be students who will not be successful in college without help. According to Platt (1986), most students who will not benefit from future reforms will be Black or Hispanic for the same reasons that are present today: disadvantaged backgrounds, and lack of skills and ability (Platt, 1986). According to Bailey (1990) "socioeconomic status is highly correlated with academic achievement" (p.241).

> While many Blacks have succeeded against the odds, disproportionate numbers of them remain locked in a debilitating and oppressive state of inequality (Bailey, 1990, p.241).

Approximately 96% of the students at Barber-Scotia receive 100% financial aid and are first generation college students; approximately 50% are from single parent homes. It is the belief of this researcher that the low self-esteem exhibited by students and their lack of basic knowledge in science are due to their disadvantaged backgrounds.

Focus of this study

In order for students to be successful in the classroom they must feel that they are capable of being successful. They must have high self-esteem in order to feel that they are capable of accomplishing whatever challenges they are confronted with. However, the disadvantaged Black student for various reasons does not possess the high self-esteem that is necessary for success. Researchers have as many answers as there are reasons. Disadvantaged students bring to the postsecondary environment a feeling that success in some academic subjects is beyond their grasp. This feeling is especially prevalent in science classes. Therefore, before students can experience any type of success in freshman science classes, which are usually required in most colleges, the self-esteem of these individuals must be improved.

Powell (1990), Gerardi (1990), and Platt (1986), stated that self-esteem is a significant predictor of academic success. Students with high self-esteem generally are more successful than students with low self-esteem. The success is not correlated with intellectual ability but the belief and "feeling" that success is possible (Gerardi, 1990 p.405). It is important that disadvantaged students be placed in environments that encourage success. This should be done shortly after the student enters the college

environment. Peer counselors that come from backgrounds similar to those of the students can be of tremendous value. Regular sessions with peer counselors can improve the self-esteem of disadvantaged students and improve their chances of a successful collegiate career.

Self-esteem alone is not enough to improve the success rate of disadvantaged students. The academic background of these students must also be strengthened. Disadvantaged students, in addition to being weak in English, reading, and mathematics, usually have a weak background in the sciences as well. However, placement in additional remedial classes or just one, often is enough to strengthen the belief that the disadvantaged student is not capable of success. It also identifies the disadvantaged student as being different from the students who are academically prepared for the rigors of college. Providing disadvantaged students with an enrichment experience, with assistance from tutors, can be the means by which they can receive the additional help needed to handle the material presented in freshman college science classes. The use of fellow college students who have been successful in the course provides a model from among the ranks for the disadvantaged student. These models will provide tangible evidence that success can be accomplished in courses that may seem to be impossible to pass.

Raising the self-esteem of disadvantaged students along with providing enrichment experiences should provide a positive feeling about self. If students feel that they can be successful, success should become a reality. Success for each student will be different because it will be dependent on academic abilities. However, the feeling that success is impossible in the freshman science classes should be eliminated.

Support systems that are available to academically disadvantaged students exist in the areas of math and English, but these have very little effects on the performance of students in the freshman science classes.

The major student characteristic that will be addressed in this study will be the self-esteem of the students.

Problem

Black academically disadvantaged students are not performing well in the general education science course at Barber-Scotia College. The reasons for their lack of success are not well understood and there is a need to evaluate methods of improving the success rate.

Purpose

The purpose of this study was to design, implement and evaluate three methods for helping academically

disadvantaged Black students succeed in the general education science course at Barber-Scotia College. The methods used in this study were enrichment, self-esteem building, and enrichment/self-esteem building.

Research Hypotheses

1. Students that receive enrichment opportunities will score higher on the criterion test than students that only receive class instructions (control group). Students that receive enrichment opportunities will score higher than students that only receive self-esteem building. Students that receive enrichment/self-esteem building will score higher on the criterion test than students that receive self-esteem building, enrichment opportunities, and class instructions (control group).

2. Students that receive self-esteem training will score higher on the criterion test than those students who only receive class instruction.

Hypothesis

Null Hypothesis: There will be no statistically significant difference between the performance of students in the control group in the general education science course and students in the experimental programs.

Importance and Significance of the Study

Barber-Scotia College is a four- year liberal arts, historically Black, private, church related college located in Concord, North Carolina; it has an open admisions policy. Students entering the general education science classes, Studies In Natural Science 131, have varied high science school backgrounds. Some have had exposure to four years of physical and life sciences while most have had only one class in general science. Data collected by this researcher over the past five years suggest that over 85% of the students who have taken Studies In Natural Science 131 have had only one science class in high school. Moreover, conferences with students have revealed that approximately 75% of the students in the general education science classes believe that they are incapable of being successful in the science classes because of their previous experiences at the secondary level.

The failure rate for Studies in Natural Science 131 is about 20 - 50% per semester or 20 to 50 students per semester. The attendance rate for these students is also poor; they miss on average 15 to 30 days per semester based on 45 days of actual class for this course.*

*The attendance information was obtained from the instructors of these classes.

One plausible means of reducing the failure rate of these students is to attack the problem while the students are actually in the general education science classes.

Instructional strategies that are currently used in science-education, usually oral lectures, are inadequate for society's current science education needs Okebukola and Jegede, (1988). These authors reported that devising an effective teaching technique has occupied science education for many centuries. Recent research in education Garton (1984) and Lang (1986) has revealed that classroom instruction is simply not enough to reach the student with inadequate science backgrounds.

According to Garton (1984) the first thing that must be done is to revise the language that is used to describe the learner.

> Disadvantaged students have **low** socioeconomic status because they come from **low** income homes. They **achieve** at a low educational level, **suffer** from poor motivation and weak self-concepts (p.93).

The second thing that must be done to assist the academically disadvantaged student is to raise the self-esteem of the learner. According to Garton (1988) the low self-esteem among disadvantaged students is a factor in their level of achievement. "Raising self-esteem requires a holistic approach" (p.93). In other words, the student must be encouraged and understood. Next, the deficiencies

must be addressed. Francisco (1983) suggested involving students in the design of the enrichment program(s); this will help ensure participation in the program once it is implemented. The program must not be too remedial in nature; students know when their intelligence is being questioned. There is nothing wrong with the basic intelligence of the academically disadvantaged student. What is wrong is that they have not been adequately prepared for college (Lang, 1986).

The information obtained from this study will provide a rationale for curriculum changes that may need to be implemented in order to strengthen the backgrounds of the academically disadvantaged student entering the general education science classes. The information that this study will provide may have implications for restructuring the remedial program already in place for English and Math. Finally the information obtained from this study is not intended to be generalizable to other institutions. However, if other institutions the size of Barber-Scotia with a similar type of student body wish to use this study, the basic design would serve as a foundation on which they could develop a study that would be applicable to their population.

Limitations

The limitations of this study are as follows:

1. Only one college will be used, therefore, generalizations of results will be limited.
2. Random assignment of students is not controlled by this researcher.
3. The duration of the study will be only one semester.

Since the students are not randomly assigned, those with extremely different or similar high school backgrounds could end up in the same section. Since the backgrounds vary the results that will be obtained may not be totally due to the treatment but to the background of the students. Also the ratio of females to males may not be representative of the total population of Barber-Scotia College. Barber-Scotia was an all girls, school from 1867 to the early 1950s. While it has been coeducational since the mid 1950s, there are more females than males in the student population.

The limitations were dealt with in the following manner. While only one college was used in this study, most historically Black private colleges have similar types of students, i.e., first generation college students, most of whom are from disadvantaged academic backgrounds. The information obtained from this study can with modifications be used by other institutions similar to Barber-Scotia College.

Although the random assignment of students was not

under the control of this researcher a comparison of backgrounds was done. Test scores on the SAT-V and SAT-M were compared, the number of high school biology courses completed, and the number of males and females in each section were compared.

The duration of the study was only one semester. However, since the study began at the beginning of the semester enough information was gathered to validate the importance of tutoring.

Summary

The key components needed to improve the academic performance of students in beginning freshman science classes at Barber-Scotia College are strengthening the science backgrounds of the students and improving the self-esteem of the students.

The first component, strengthening the science background of students, can be achieved through enrichment experiences. The information needed by the students cannot be obtained within the framework of a formal classroom setting. Receiving additional help will afford students the opportunity to acquire information that was omitted from their secondary curriculum.

The second component, improving the self-esteem of students, can be achieved through counseling. It is

important that the self-esteem of students be worked on as soon as they enter college. Low self-esteem limits productive academic performance. Peer counselors can be used to assist students to improve self-esteem. Using peer counselors with background similar to the persons in need of counseling will provide role models for students . These role models can provide channels through which students can start to feel better about themselves. Once students believe that they can master the rigors of college, success will be within their grasp.

CHAPTER II

LITERATURE REVIEW

Introduction

Historically Black Colleges and Universities (HBCUs) are facing many problems. Among them are ways to encourage achievement in science, how to encourage more positive attitudes toward science, what type of academic enrichment efforts will be most successful, and how to promote more positive academic self-esteem. The literature review that follows attempts to address each of these problems.

Components of the review

There will be six components in this literature review: (1) What is the nature of the problem, (2) The Development of the Problem, (3) How Successful are Efforts to Provide Science Enrichment in College, (4) The Challenge of Enhancing Self-Esteem, (5) How Successful are Efforts to Enhance Self-Esteem in College, and (6) How can Barber-Scotia respond to these challenges?

Background

Black colleges have a rich tradition of reaching students where they are and providing them with the special

care necessary to develop needed skills.

If one examines closely the history of the nation's Historically Black Colleges and Universities a paradox will be revealed: "out of so meager a concentration of resources has come so much in the way of productivity" (Goodwin, 1991, p. 128). While most of these institutions have many shortcomings, a vast majority of them provide academic programs of outstanding quality at the undergraduate and graduate levels. HBCUs are known for their research activities and concomitant contributions to enriching the quality of life for all Americans (Goodwin, p.128). The main priorities for these institutions are (1) the training of their students and (2) the nurturing of students' capabilities by faculties united in the pursuit of excellence. An important aspect of any college's mission is assisting students of varying backgrounds to reach their educational goals. Goodwin (1991) reported that in

> addition to maintaining high academic standards and challenging those students best qualified for academic success HBCUs generally attempt to help students from *all* backgrounds, including many who must struggle to set and then reach their educational goals (p.128).

These students have various weaknesses. Many colleges and universities have programs that assist students with weaknesses in English and reading. However, the science backgrounds of many of these students are very weak and assistance in this area is often times overlooked.

Students entering freshmen science courses today represent a broad socioeconomic spectrum and divergent cultural and academic background. According to Uno (1987), Samples and Hammond (1985), and Zoller et al. (1987), many of the students lack self- discipline and have a deeply rooted negative attitude toward science.

Obebukola and Jegede (1988) believe that one of the greatest challenges facing science today is developing methodologies that are effective and will lead to improved student performance. The task is not simple since freshman science courses are taken by individuals that represent not only different science backgrounds but different age levels as well. Herein lies the problem. How can a teacher of many enable every person within a group to learn when so many different secondary academic backgrounds are represented? Assuming that students will learn no matter how the information is presented is an outdated premise. The past decade has witnessed an intensive search for methodologies that can lead to improvements in science instruction and subsequent student learning.

Prather and Shrum (1987), Idar and Hewson (1988), and Arons (1984) stated that current instructional strategies used in science-education, usually the oratory, is inadequate for society's current science educational needs. According to Okebukola and Jegede (1988)

> The problem of devising and effective teaching technique has preoccupied science educators for many centuries. In recent times, this problem has come into sharper focus as a decline in student's performance in science is becoming noticeable (p.339).

What is the Nature of the Problem?

Educators who have monitored the progress of academic achievement throughout this country have discovered that minority students with the best chances of succeeding in college enter with "good" high school grades, well-developed study habits, and consequently, relatively high self-esteem in terms of academic ability. The potential persister is also likely to have taken college preparatory courses in high school, come from a relatively affluent and well-educated family, and is relatively young at the time of college entry (Goodwin, 1991). These students will succeed anywhere. Where sufficient incentives exist, these students are often attracted to HBCUs in large numbers. However, students that come from homes without such advantages must not be cast aside.

Students that enter colleges and universities with weak academic backgrounds must be exposed to methods that compensate for their lack of early support. Black colleges have a history of reaching out to such students. The emphasis at these institutions is on "not so much what students bring to college but on what happens to them while

they are in college that better positions them to become contributing members of society" (Goodwin, 1991, p.129).

College and university faculty members at HBCUs have an obligation to see that students get the opportunity to procure knowledge and accumulate skills to utilize the knowledge while in college as opposed to allowing students to merely mark time. Although these students may have entered with numerous deficiencies, new persons must emerge at graduation. These individuals must be able to convert native ability and undiminished candor into marketable skills which, can be used to accelerate the economy.

> Ethnic or racial distinctions and their often-ravaging residue contributes to the lack of confidence that many young African American exhibits today and carry into old age. The assumption that all poor Black kids are dumb is the most damaging by-product of distinctions that have their basis in race membership rather than in the ability to actualize potential (Goodwin, p.129).

Despite the inroads that have been made toward more ethnically diverse and representative participation by minorities throughout American society, disparities still remain in the educational arena.

> An important issue for educational policymakers has been whether Black and White Americans are approaching parity after a long history of unequal access to educational institutions, particularly those of higher learning (Hatch and Mommsen, 1984, p.458).

According to Anderson (1988) parity has not been achieved. In the past two decades Blacks have had only

minimal success in being admitted to white colleges and universities. The students that have been admitted have been from rural areas or from low socioeconomic neighborhoods where educational resources are substandard, and those students are not adequately prepared to compete favorably at the university level against better educated students (Anderson, 1988). Although the percentage of Blacks who complete high school has increased steadily since 1970, the percentage of Blacks who attend college has declined since 1980. In order to understand why disadvantaged minority students experience difficulty at the postsecondary level, one must trace the problem to its origin.

According to Brookover (1985) the basic academic achievement of Blacks and other minority groups has been lower than that of more affluent white students for a considerable amount of time. The fact that some minority groups such as the Jewish and Japanese- Americans do well in academic endeavors, demonstrates that minority students need not perform at lower levels in American schools (Brookover, 1985).

"Standardized test scores show that Blacks, especially those from low income families as early as elementary school achieve at a slightly lower level than their white counterparts" (Brookover, 1985, p.257). One finds that this

slight difference in achievement between Black and white students widens as the students move through the elementary and secondary grades (Brookover, 1985). This occurrence should not be attributed to racial differences alone. The same differences in achievement occur between the children of poor white families and more affluent white families. Black students are victims of double jeopardy, both race and low income.

Secondary schools, in an attempt to "fix" or eliminate the problems that academically disadvantaged Black students brought with them, used tracking systems. Lower achieving students were placed in low tracks or remedial courses (Garton, 1984). Instead of fixing the problems, the so called remedy only aggravated them. These students did not achieve at a rate comparable to that of other students because they were not being challenged. The lack of challenge resulted from the fact that the teachers simply did not know how to teach them or more often that the teachers had such low expectations for their performance (Garton 1984).

Jibrell (1990) stated that "the instruction and performance of Black students in both mathematics and science is at a critical stage nationally" (p.493). Black students received less pre-college mathematics and science instruction than more affluent white students did and performed at lower levels (Jibrell, 1990). According to

Jibrell (1990), "it has been estimated that in inner city schools, 50 percent of students do no take any mathematics beyond basic arithmetic" (p.493). Information from the Educational Testing Service revealed that the average SAT-Math score for white students in 1985 was 490; for Black students the average score was 376.

The lack of achievement in disadvantaged minority students was not solely the fault of the teacher. In the past the educational problems of disadvantaged youths "were defined in terms of ethnicity and minority status" (Waks, 1991, p. 197). Children, especially those from disadvantaged urban areas, were perceived as "different" and having "special learning problems" due to

> (1) alleged genetic inferiority with respect to mental capabilities, (2) the categorization of their families as substandard units whose members did not or could not properly equip their young for school achievement, (3) disadvantaged environmental limitations (poverty, poor housing, etc), or (4) lack of motivation to learn what was being taught in school. These formulations are no longer useful because they locate the problems in the learners, their families, and their teachers, and they neglect the social dynamics that affect them all (Waks, p.197).

> Under the guise of individual differences, meeting individual needs, continuous progress, and humanistic education, we have sought to justify shortchanging the children of poor and minorities in American schools. The belief that large segments of the population of the population either cannot learn what others learn or do so much less is so predominate in our educational system that some minority educators have also adopted the system (Brookover, 1985, p. 261).

Some leaders in the Black community have accepted differentiated roles for Blacks and whites and requested that education for Black students fit the positions available to them in the social strata of America (Brookover, 1985). Brookover (1985) further reported that the terms "individual differences," "meeting individual need," and "humanistic education," have been used to disguise what had actually occurred in the educational system of America. What had really been occurring was the inclusion of discriminatory educational programs for children of poor and minorities in American schools. While the percentage of secondary age students has increased, the techniques of differentiating among students and justifying the unequal educational programs have also been enhanced. Although race was not the major criterion for the patterns of differentiation, results, measured by student outcomes, were highly associated with racial identification. Therefore, the system of sorting and assigning students to various programs resulted in a larger percentage of Black students from disadvantaged backgrounds being assigned to academically ineffective educational programs than their white counterparts. "A typical scenario for Black students is one in which they are filtered out of the pipeline for college science and engineering programs..." (Jibrell, 1990, p.495).

> There is a widely held belief in American society that mathematics and science are extremely difficult. Though this belief system may operate at an unconscious level, it has been incorporated into the thought processes of both African Americans and white Americans. Consequently, aspiring to become a scientist or a mathematician has been deemed antithetical to the cognitive capabilities of African Americans. The cultural expectations for one's group to perform poorly in mathematics and science is an example of a social-psychological phenomenon referred to as learned helplessness (Powell, 1990, p.294).

With such preconceived notions about the scientific abilities of Black students, these students are often doomed before they have a chance to prove themselves. "Large numbers of Black students are tracked into low-level courses in the middle grades and have difficulty gaining access to the more advanced courses needed for college study and employment" (Jibrell, 1990, p.490). Other factors that prevent Black students from succeeding in science courses are "entrenched expectations of failure and low self-concept that discourage students and teachers from setting goals, and working for success" (Mitchell & McCollum, 1983, p.48).

> Ongoing educational encounters with failure appear to cause many African American students to become victims of learned helplessness in which they observe that their academic failure is global, inevitable, and the result of personal flaws. Consequently, they give up after deciding they will never be able to succeed in mathematics and science despite concerted efforts to do so. (Powell, 1990, p.295).

The task that lies ahead is to help the academically disadvantaged Black student become science literate.

Assisting the academically disadvantaged Black student to become science literate will not fill all the gaps in the science career area. It will, however, prepare Black students to be more successful in college level freshman science courses and according to Johnson (1984) without scientific literacy:

> Blacks risk being subjugated to the vicissitudes of scientific and technological forces which are as oppressive, demeaning and domineering as are the socioeconomic and political forces of racism and exploitations (p.32).

> The lack of understanding about the new technology and its implication threatens the quality of our lives, our natural environment, our future generations, and even our democratic institutions. The extension of life by artificial means, genetic screening, strategic defense initiatives in outer space, the environmental repercussions of genetically engineered organisms--these are examples of the scientific and technological innovations about which citizens must become familiar and whose impact upon society has yet to be fully determined (Waks, 1991, p.195).

The number of students without the basic skills required to be "successful in regular university work has increased dramatically" (Ferguson & Bitner, 1984, p.99). These improperly prepared students were disproportionately represented by students who were Black and from disadvantaged academic backgrounds. This increase has created yet another area of concern in higher education, the failure of a large percentage of minority college students to qualify for careers in the allied health sciences,

natural sciences, and engineering (McDermott, Piternick & Rosenquist, 1980). McDermott *et al.*, (1980) reported that often the aforementioned students didn't pursue careers in the science related areas because of difficulties encountered in introductory science courses. There were numerous factors, not all of which have been identified, that contributed to the poor performance of the Black students. McDermott *et al.*, (1980), Anderson (1988), and others reported that the main factor contributing to the poor performance of Blacks in college science courses was their lack of adequate preparation. In addition, the following limitations also were brought to the science courses by the academically disadvantaged students:

> * lack of experience of which to build the abstraction of science
> * weakness in mathematical and verbal skills
> * lack of confidence in their ability to solve problems through their own reasoning
> * low personal standards for academic achievement (McDermott *et al.*, 1980, p.135).

These problems did not occur the moment these students graduated from high school and became college students.

> Poor performance and underrepresentation of minority students in pre-college science and mathematics courses can be attributed to several different factors including their limited access to effective schools, the poor quality of science and mathematics curriculum in their schools, the low expectations that teachers have for their performance, and the absence of informal personal networks in their lives to promote their interest and achievement in science (Vasquez & Wainstein, 1990, p. 604).

The low enrollment in high school chemistry, physics, advanced math, and other advanced science courses by Blacks and females provided evidence that the problems did not suddenly appear when the students entered the secondary phase of education (James & Smith, 1985).

The Development of Negative Attitudes Toward Science

> Self-concept plays a significant role in the way a person views things; it provides a person with an inner direction, a way or a compass as to which route one's life should travel. In many instances people act according to what others think of them. In other instances people are "forced" to look at themselves in a certain way. Self-concept is learned through interactions with others, and like a flower, it unfolds as the child develops (Smith, 1980, p.356, 358).

Once Black students enter middle school attempts to improve mathematic and scientific skills should begin. This is a crucial point because it is during the middle school grades that most young people choose careers. The curriculum design, the onset of puberty, and the climate and structure of middle schools "too often results in predictable negative outcomes for the disadvantaged and minority students.. ..Critical decisions related to choice and high school mathematics and science programs are made during the middle grades which have long-lasting impact and which greatly increase or reduce students' education and career options" (Jibrell, 1990, p.495).

Research conducted by James and Smith (1985) suggested that in grades K-6 Black students surpassed other groups in science preference (p. 44). The alienation seemed to begin in grade seven. In the middle grades the work becomes more challenging; self-directed science experiences began. Students no longer received the personal attention that they received in the lower grades. It is documented that students from disadvantaged backgrounds performe better when they receive personal attention. James and Smith (1985) reported that alienation could be prevented if "well prepared, adequately equipped, and properly supervised science experiences are provided for the student throughout the junior high years" (p.45). This may also prevent a disadvantaged student from being placed in low tracks or remedial classes. Once in the remedial classes students had very little, if any, opportunity to take advanced science, math, or any courses that would prepare them for college.

According to Jibrell (1990) the science and math teachers of Black middle school students are not fully qualified to teach the courses. Often they are not specialists but hold K-8 certification and need training in both content and instructional techniques (p.494).

The lack of success in Middle-Level science classes leads to another problem common in academically disadvantaged students, lowered self-esteem. M. L. Clark (1985) reported that "Black students often suffered from the

idea that they could not possibly succeed in science classes because of a presumed lack of ability" (p. 678). Black students often have some scientific skills but are turned off to science because of the assumption they could not do it (J. V. Clark, 1985). This attitude, which surfaced early in the academically disadvantaged student, received reinforcement in the Middle-Level grades; by the time Black students reached high school they believed that they were not capable of performing in the "hard" courses such as science and math and avoided them. On the average, Black American students were and are overrepresented among students taking remedial high school science classes. Also, they take fewer advanced science classes than their white peers in high school.

> This pattern is due in part to a failure of student support services which should have the capacity to counsel Black students at a young age about the courses and preparation needed for success in science (Vasquez & Wainstein, 1990, p. 495).

According to Pearson Jr. (1986) "Black American students with science interest are often not only ignored; more often they are discouraged from pursuing their interests" (p.51). It is evident that the underrepresentation and low achievement of Black youth in science is related to a number of school factors including:

* uneven quality of instruction in science and

mathematics,
* low teacher expectation
* outmoded mathematics and science curricula tracking, and
* insufficient counseling and other services (Vasquez & Wainstein, 1990 p.494).

It is a current belief that teachers are the key to quality and equity in science and mathematics education. It has been estimated that half of all science and math teachers are underqualified (Vasquez & Wainstein, 1990). Naysayers of science teaching methodologies point out that "instruction in science is overly dependent on textbooks, too often mechanical and procedural, and based on drill and rote learning rather than on problem-solving and higher order thinking skills" (Vasques & Wainstein, 1990 p.494) Disadvantaged students who received training of this type were not prepared to "dive" into the college level science courses; therefore, to pursue a career in these areas or take advanced courses for knowledge sake only was out of the question.

Another factor blamed for the underrepresentation of Black American students in science curricula is ongoing educational encounters with failure. Powell (1990) reported that numerous Black students become "victims of learned helplessness in which they observe that their academic failure is global, inevitable, and the result of personal flaws" (p.295). These students often times gave up after deciding that they will never be able to succeed in

math despite concerted efforts to do so. "By the time such individuals reached college, full blown, `mathematics and science phobia' along with helplessness symptomology are present" (Powell, p.295).

> Since the locus of attribution for failure is personal, the typical disadvantaged Black students become devastated when confronted with mathematics and science. The prospect of further failure is thus ego-dystonic and can be removed only by avoiding the offending subject matter altogether (Powell, p.295).

How Successful Are Efforts to Improve Science Achievement in College?

There is a need for enrichment as students begin college. Sevenair, O'Connor and Nazery (1989) reported success with underprepared students enrolled in organic chemistry courses at Xavier University when an enrichment program was added. Xavier University of Louisiana, is a historically Black institution in New Orleans. Enrollment at the university has been consistently around 2,000 over the past five years. Undergraduate enrollment at the university is approximately 1,600 students. Xavier is committed to a liberal arts education; however, nationally it is renowned for its science programs.

The organic chemistry program at the university consists of lectures three times a week, exams are given every three or four weeks, and laboratory sessions are held

separately for one three-hour period per week.

A study was conducted for a five-year period to determine how to improve the passing rate of students in the organic chemistry courses. The entire science department had input into the design of the enrichment program.

Course content was a department design; biology and pharmacy instructors put the course contents into a study guide that had to be purchased along with the textbook. Included in the study guide were behavioral objectives. The objectives began with "A student who has mastered (name of the topic) should be able to ... followed by a list of the specific types of problems students should be able to solve (Sevenair, O'Connor & Nazery, 1989, p. 237). A set of problems similar in nature to those that would appear on the exam was also included in the study guide. The results of the standardization was that all students received the same content regardless of instructor.

Students enrolling in the organic lecture were also required to enroll in a small group drill section that met for two consecutive hours weekly. The drill sections were structured as follows: (1) problem sessions for concept review, (2) quizzes on previous lecture materials to determine if students had mastered the material, if not, help could be given before students got so far behind, (3) questions and answers segments and (4) vocabulary review.

A question bank prepared over several years provided

examination questions. The examinations were equivalent, regardless of drill instructor or lecturer. This method of examination allowed objective comparison of students in various sections and in various years. Questions from previous years appeared in the study guide booklets along with the answers in the back of the book.

The questions from the bank of monthly exams were used to design the final examination for the first semester. The second semester exam is the standard American Chemical Society (ACS) comprehensive exam.

Measurement of the outcomes was twofold. The first measurement was the scores of the students on the ACS exam; the second measurement was determined by the percentage of students from the first semester who finished the second part of the course with the grade of "D" or better.

According to Sevenair *et al.* (1989) "the introduction of behavioral objectives, accompanied by list of problems taken from the text only, did not measurably affect student performance" (p.238). The introduction of drills did improve the performance of the students. "The average percentile ranking of students on the ACS exam increased by 15 percentile points" (p.238). The pass rate for both semesters with a grade of "C" or better increased from 41 to 64 percent. During the second year of the program increases in both measures were again observed. Since that time

values have remained fairly stable.

Continued improvements were observed over the six- year duration of the study. Since the improvements were substained the results were real and not the results of a Hawthorne Effect. Student improvement was observed across the board, based on information obtained from student evaluations. The drills and study guide were instrumental in helping underprepared students successfully complete the courses.

Gravely (1988) reported success in General Chemistry at North Carolina Agricultural & Technical State University when a preparatory chemistry (non-credit) course was added in order to prepare students for the General Chemistry course. North Carolina Agricultural & Technical State University is a historically Black university in Greensboro, North Carolina. Gravely's study was designed to determined the effect of the preparatory chemistry course. The population consisted of 677 students enrolled in the preparatory chemistry course between the years 1979 - 1985.

The course was designed by the chemistry department for the student who had insufficient preparation in chemistry; enrollment in the course was on a volunteer basis. The preparatory chemistry course, one semester in duration, was coordinated with the general chemistry course through the use of common syllabi and examinations.

The topics were approached from the position that

students had no prior knowledge of chemistry, difficulties with applied mathematics, and a weakness in problem solving in chemistry. During the class sessions students were taught how to solve problems using the dimensional analysis approach, encouraged to ask questions, answer questions, and work problems, individually and in groups (Gravely, 1988, p.2). Students were also required to spend a minimum of three hours per week in the Chemistry Learning Center which served as the focal point for both auto-tutorial and peer tutorial services (Gravely, p.2). Seventy-five percent of the students who took the preparatory chemistry course passed general chemistry with a grade of "C" or better.

The information obtained from students led Gravely and others to conclude that the Preparatory Chemistry course at North Carolina Agricultural & Technical State University was beneficial and successfully prepared the underprepared students for the rigors of General Chemistry. Additionally the course served as a screening mechanism for students and encouraged them to examine their career choices (Gravely, p.9).

House and Wohlt (1990) reported that there is evidence that tutoring programs benefit college students (p. 336). "Participants in the study were 646 students who began as freshmen at a large mid-western public university during one

of two consecutive academic years (1987-1988 or 1988-1989)" (House & Wohlt, 1990, p.365).

"The purpose of the study was to investigate the effect of participation in a tutoring program on the academic performance of college freshmen" (House & Wohlt, p.366).

The participants were students admitted to the university under a special admissions and academic service program for academically disadvantaged freshmen. Students in the study were traditional-age freshmen, lived on campus in resident halls, and took 12 hours each semester, with four required courses (House & Wohlt, p.366).

Black students composed 66.1% of the sample (427), Asian - American 16.1% (104), and white 36.2% (234). Participation in the tutoring program was voluntary. Tutors were juniors, seniors, and graduate students in the disciplines they tutored. They were given additional training in study skills, test-taking skills, communications skills, math anxiety, and test anxiety (House & Wohlt, 1990, p.366). Student participants met with individual tutors for approximately one tutoring session per week for a semester. Students were divided into the following three groups: (1) no participation either semester during the freshman year (n=337), (2) participation during one of the two semesters during the freshman the freshman year (n=233), and (3) participation in both semesters during the freshman year (n=76).

The information obtained from this study revealed that Black students had significantly lower GPAs (1.92) than either Asian-American (2.14) or white students (2.15), and there was no significant difference between Asian-American and white students' GPAs (House and Wohlt, 1990, p. 367). Male students showed a different pattern: male students who did not participate in tutoring had grades (1.89) that were similar to students who participated one semester (1.89), whereas male students who participated both semesters earned markedly higher grades (2.34) (House & Wohlt, p.368).

The number of credit hours earned was also affected by tutoring. Students who were tutored both semesters earned the most hours (21.3), students who participated one semester earned (20.4), and students who did not participate in the tutoring program earned the fewest credit hours during the freshman year (19.7) (House & Wohlt, p.368). Black students earned the fewest credit hours during the freshman year (19.1); there was no significant difference between Asian-American (21.6) and white students (22.6).

House and Wohlt (1990) had three main findings from this study. First, participation in the tutoring program resulted in the participants' earning more credit hours during their first year. The number of courses attempted by the students was the same; therefore, the credit hours

earned were not due to differences in the credit hours attempted. House and Wohlt suggested two possibilities for the differences observed. One reason might be due to persistence in courses that might have otherwise been dropped if tutorial assistance were not available. Another reason suggested was that students were less likely to fail a course when working with a tutor, "thus earning credit for courses that they might not have earned because of failing grades when not working with a tutor" (House & Wohlt, 1990, p.368).

The second finding was that male participants in the study earned higher cumulative GPAs than did the female participants. These investigators felt that more was needed before a logical conclusion could be reached concerning the differences.

The third finding was that Black students earned fewer credit hours during the freshman year and had lower GPAs than did Asian-American and white students (House & Wohlt, p.368). One possible explanation for the discrepancies is that Black students tend to enter college with inadequate preparation in many academic areas.

Information obtained from this study led the researchers to conclude that "tutoring is an important component of programs designed to improve the academic performance and retention of academically underprepared students" (House & Wohlt, p. 369).

Essential characteristics that must be incorporated into enrichment programs for Black students are as follows: (1) methods for studying, (2) testing, and (3) notetaking. Students must be taught that in order for them to be successful in an environment that depends more and more upon technology and science, they must understand and master science.

The Challenge of Enhancing Self-Esteem

Black American children develop their self-concepts under ususual unique circumstances. First, there is the influence of racism, which assigns Black Americans to a lower caste status. Secondly, grade retention, tracking, and "special" classes have damaged minority children. Thirdly, the family support system that is essential to the development of a balanced self-concept is often weak or non-existent for many Black children (Madhere, 1991, p.47).

According to Smith (1980), for generations to come the problems of color line will still be with us. "In the year 3000, Black people will certainly have made progress and be in better situations than we are today" (Smith, p.360), but racism will still be alive and well. "Thus, the development of the Black self-concept will always be greatly affected by the way Blacks and whites perceive skin color (Smith, p.360). According to Smith (1980), adolescents and their

mothers often experience some turbulent times; this is not true of adolescents and their fathers. "This finding had implications for the understanding of the development of home-related self-esteem, and especially so for the Black American adolescents, a high percentage of whom currently live in female-headed households" (Madhere, p. 50).

In the academic area self-esteem has been related with achievement.

> Repeatedly, learning difficulties are presented as either a cause or a consequence of poor self-esteem. It has even been suggested that, in many ways, school systems may compound the problem through practices such as grade retention and classification of children as "learning disabled" (Madhere, p.50).

Madhere (1991) reported, "given the persistent reality that a disproportionate number of Black American children meet with academic failure, the impact of these school practices on self-esteem must legitimately be under constant scrutiny" (p.51).

> Teachers intuitively know that when kids feel better about themselves, they do better in school. The simple fact is, though, that youngsters today are not receiving enough positive, nurturing attention from adults . . . The reasons are numerous and complex, but the result is that more and more students have low levels of self-esteem (Canfield, 1990, p.48).

Teachers should play a key role in attempting to raise the self-esteem of students. This can be done by establishing a classroom environment in which "goal-setting,

goal-directed behavior, and self-confidence are encouraged by the instructor" (Sadowski & Woodward, 1981, p.259).

How Successful are Efforts to Enhance Self-Esteem in College?

Since high self-esteem has a positive correlation to academic success, why do so many disadvantaged Black students exhibit low self-esteem? Reasons are numerous and varied. "Some investigators report that students in remedial programs have lower self-esteem that those in regular classes, while other researchers claim that such differences are insignificant or they certainly do not carry over beyond the academic arena" (Madhere, 1991, p.59). Others suggest that "internalizing negative evaluations from white Americans," (M. L. Clark, 1985, p.753) or "the serious sociocultural turmoil that exist in inner-city schools" (Gerardi, 1990, p.403) cause the problems. While the actual reasons for low self-esteem in the disadvantaged are still debated among researchers, studies have shown that if students believe that academic success is possible in a given subject, they will try hard to achieve it.

Jordan (1981) stated that

> if an individual does not have a need for competence in academic tasks, the belief that he or she is capable of performing these tasks adequately will be insufficient for inducing good performance (p.510).

Research on self and teacher expectancy by Haynes and Johnson (1983) revealed that students who feel good about their academic abilities will attempt to achieve according to their expectations. The study involved 172 Black students enrolled in an academic reinforcement program at an urban, historically Black university during the fall 1977 semester. The average age was 18 and the average grade point average was 2.0. The students were divided into four experimental conditions: Heightened Teacher and Student Self-Expectancy, Heightened Teacher Expectancy, Heightened Student Self-Expectancy, and Control. "Students in the heightened student self-expectancy group were sent a letter stating that he or she had been identified as an above average academic reinforcement student, and was expected to do well in the fall semester." "The other students received a general letter welcoming them to the university, with no expectancy message" (Haynes & Johnson, p.512). The students in the heightened student group received reinforcement again at midterm. At the conclusion of the study, students with high self-expectancy received significantly higher grades in liberal arts courses. The effects of teacher expectancy were not significant. "This may have been due in part to a difference in approach between instructors in academic reinforcement and regular liberal arts courses" (Haynes & Johnson, p. 514).

The study further suggested that "if parents and others wish to influence students' achievement they should tell students directly what they can and are expected to achieve, while at the same time providing them with the necessary support for achieving what is expected" (Haynes & Johnson, p. 514).

Research by Gerardi (1990) revealed that high academic concept is a predictor of academic success among minority and low socioeconomic college students. The subjects were 98 freshman engineering students who were attending one of the units of the City University of New York (CUNY) in September 1987 (Gerardi, p.403).

Black Americans constituted 57% of the sample, Hispanics 30%, Asians 5%, and Euro-Americans 4%. "Of these, 98% had graduated from a New York City high school; mean reported income was $12,500" (Gerardi, p.404). The participants in this study had not demonstrated a minimum proficiency in the CUNY Freshman Skills Assessment Examinations, in reading, writing, and mathematics, and were enrolled in remedial classes (Gerardi, 1990).

The Freshman Skills Assessment Examination program was established in the fall of 1979 on a university-wide basis. The examinations identify basic skill deficiencies and are required for all incoming freshman (Gerardi, p.404). The Assessment Examination consist of two parts: CUNY Freshman Skills Assessment test in reading and the CUNY Mathematics

Skills Assessment Test. The math test was a locally constructed test with no national norms.

The dependent variable (academic success) was the GPA of the participants after three semesters at the college. The predictor variables were high school average (HSA), scores on the CUNY assessment test in mathematics (CUNNYMATH), reading (CUNNYREAD), and the Self-Concept of Ability (Gerardi, 1990, p. 405).

Data from the study revealed that the academic self-concept variable correlated strongly and significantly (.57) with GPA. CUNNYMATH did not correlate well (.21) with GPA nor did CUNNYREAD (.07) or HSA (.20) (Gerardi, p.405).

According to Gerardi (1990) the SCA was found to be a better predictor of success than were any of the cognitive predictors among minority and low-socioeconomic background students (p.405).

> These data seem to suggest that knowledge of the self-concept of ability among minority and low-socioeconomic background students could bridge the chasm between the lack of traditional cognitive skills, of which inner city children are victims, and academic success. The findings have implications for the selection of students and development of programs to promote academic success for minority and low income students, thereby incorporating minority and low-socioeconomic student populations into the academic mainstream... (Gerardi, 1990, p. 405).

In summary Black students must be motivated to achieve in the area of science. Therefore, confidence building must

become an integral part of the college experience. It should begin soon after students arrive on campus and continue throughout the academic journey. If confidence building is incorporated into the total learning process, self-esteem will also be increased. If students feel that they are capable of achieving and understand the need for mastering information within a given area their academic performance will increase.

How Can Historically Black Colleges and Universities Encourage Achievement In Science?

One of the many problems that Black students in freshman science classes face is a lack of understanding of the role of science in their everyday lives. They feel that they are being forced to learn information that is irrelevant. Instructors at HBCUs have the responsibility to inform students of the new technology and its impact impact on our lives. Students must also be informed about the threats to our environment, the extension of life by artificial means, genetic engineering and its repercussions, the impact of space exploration, and the innovations yet to be discovered and their impact upon society yet to come. Once students learn that science impacts upon everyone and is not just a subject to be studied and forgotten, the importance of personal achievement should be realized. In order for Black students to be successful in the sciences

they must feel that they are capable of obtaining success.

How can HBCUs Encourage more Positive Attitudes toward Science?

Powell (1990) stated that

> it has been shown that repeated contacts with failure or uncontrollable events render an organism susceptible to the development of learned helplessness. The manifestation of this syndrome leads to passiveness, defeatist ideology, and negative emotion. If the failure or loss of control is perceived as global and if causation is attributed to personal inadequacies, then the individual becomes completely debilitated in the performance of the task under more favorable conditions. This set of events is familiar to large numbers of African Americans who learn early in life that they fail to perform adequately in mathematics and science (p. 296)

One way to eliminate this feeling of helplessness is by providing students with opportunities to successfully complete a task shortly after exposure to "aversive stimuli" (Powell, 1990, p.297).

Another method to remove negative attitudes toward science is to provide role models in the sciences for students in HBCUs. In order to understand the present one must look to the past. The past accomplishments of Blacks in science need to be brought to the student's attention. Once the past is understood then present day accomplishments must be presented. Students must understand that Black Americans have contributed and still are contributing in

numerous scientific endeavors. Career counseling must be updated. Because of inadequate counseling the sciences have suffered severe underrepresentation of Black Americans in science curricula. Perception of opportunities for employment in the sciences must also be updated. "Blacks are overrepresented in occupations that generate low incomes such as education and the social sciences" (Powell, 1990, p. 293). Hill *et al.* (1990) stated that "by providing students with exposure to successful scientist of their own race and providing opportunities for students to experience success in science related activities" (p. 308) a more positive attitude toward science and employment in science related occupations will begin to emerge.

What Types of Supplemental Enrichment Efforts in Science will be most Successful?

Success in science classes can only be realized when students from disadvantaged academic backgrounds receive help beyond answering questions during the class sessions. These students need some type of enrichment that will allow them to work in small groups and ask questions until a reasonable level of understanding is reached. This type of assistance can only be achieved through tutorial support. Tutors who have been successful in science classes should be utilized in order to demonstrate to the students that academic success is possible when some genuine effort is put

into the learning process. The tutor should be able to demonstrate how the information in science classes should be managed, assist with material that has not been comprehended, and later ask questions in order to ascertain whether the material is comprehended once it has been reviewed. By enhancing the weak academic backgrounds, materials presented during the class time should seem less difficult and confusing for the learner. However, if success is to be realized in the classroom, learners must feel more confident about their academic abilities.

How can HBCUs Promote more Positive Academic Self-Esteem?

The low self-esteem experienced by many disadvantaged Black students is the result of years of racism which assigned Black Americans to the bottom of the social ladder and assignment policies in some school that placed minority children in remedial or vocational classes that do not prepare them for the rigors of postsecondary academic life (Madhere, 1991, p.47).

The solution will not be quick. These students must learn that they are individuals who have something to contribute. Peer counselors who have been trained by professional counselors should be used to help improve the self-esteem of students. Through a series of regular sessions, problems and anxieties can be brought to the

surface and worked through until students begin to feel better about themselves.

Once students feel that they have something to contribute and once they learn the importance of mastering science as well as other subject material they will become well- rounded and productive.

How can Barber-Scotia Respond to these Challenges?

What we know

Barber-Scotia accepts students who have disadvantaged academic backgrounds. In order for most of these students to be successful in freshman science classes, their science background needs to be enhanced, preferably while students are enrolled in the course. Tutors, trained by biology instructors, can be used to handle tutoring sessions for students. Receiving help from students who have successfully passed the course should provide incentives for those who experience difficulties with the course.

In conjunction with the academic enrichment program there should be a program that provides the students with the means to improve their self-esteem. Some of the entering freshmen students have been made to feel that they are academically unable to succeed in science courses. If students believe that success is beyond their grasp they will not strive for it. If on the other hand they are made

to feel that academic success is possible in science classes and the importance of mastering the information, academic performance will be enhanced.

Peer counselors that have been trained by the counselors can be utilized to handle sessions with students. Discussing and finding avenues to overcome feelings of inadequacy with ones peers, whether real or imagined, can be overcome with proper help.

CHAPTER III

METHODOLOGY

Introduction

A study was needed to determine whether or not academic enrichment and confidence building sessions helped students enrolled in the freshman science course at Barber-Scotia College improved their performance. Information obtained from this research was used to determine which type of enrichment was most helpful. Once the needs were established the next factor considered was the duration of the enrichment.

This research attempted to assess whether the self-esteem building sessions were beneficial. If the sessions proved beneficial, integration of the self-esteem session into the freshman curriculum would be recommended.

This study was implemented in order to test three different methods of improving the academic success rates of students in freshman biology classes. The participants were randomly assigned to four different groups. Their performance was monitored for one academic semester and the results were statistically compared to determine whether differences occurred.

Population to be Tested

The population for this study was the 108 freshman students who completed Biology 131* at Barber-Scotia College during the fall semester of 1991. This course was designed for those students not majoring in biology, mathematics, or mathematics/computer science. Students were assigned by advisors to a class section, (high school rank, SAT, ACT scores and number of previous science courses are not considered when making assignments) providing the assignment does not conflict with students' class schedule.

A profile of each student was compiled. The profile consisted of scores on the SAT-Verbal, SAT-Quantitative, age, sex, number of science courses taken in high school, and rank in the graduating class. (See Appendix A for a copy of the profile sheet).

Instruments used in this Study

Prior to the first class all students were administered the *Self Perception Profile For College Students* (Neemann and Harter, 1986) by the Counseling Center. This instrument was selected to be used in this study became it was designed specifically for college students.

* The name of the course has changed to Biology 131 as of the fall semester 1991. The contents of the course will be the same as used in Natural Science 131.

Reliabilities of the four-item Self-Perception subscales were assessed by coefficient alpha, an index of internal consistency. Across subscales, these values ranged from .76 to .92 (Neemann & Harter, 1986, p.11).

> The Self-Perception Profile for College Students provides a domain-specific scale that allows the researcher to discern differences in college students' evaluations of competence in twelve different domains, plus global self-worth. In addition, one can determine the importance or centrality of each of these domains, as well as the types and quality of social support students receive.
>
> Global self-worth is thought to be qualitatively different from self-descriptions in the other domains, although it is influenced by certain domain-specific judgements. That is, global self-worth is determined, in part, by how competent or adequate one is in domains deemed important to the self, and since these particular domains vary across individuals, their relationship to self-worth was not expected to be systematic (Neemann & Harter, 1986, p.13).
>
> The highest correlate of Self-Worth is Appearance (r = .61). This strong relationship has been found in all age group from children to college level. Thus Appearance is the single domain most highly and systematically related to self-worth at every level.
>
> The highest correlates of self-worth other than Appearance are Job Competence, Social Acceptance, Intellectual Ability, Parent Relationships, and Scholastic Competence (Neemann & Harter, 1986, p.13).

Content of Each Domain

1. Creativity. This is a new subscale and taps the student's perception of his or her ability to be creative and inventive.

2. Intellectual Ability. This subscale taps general intellectual competence, and is similar to the intelligence subscale on the adult instrument. It differs from scholastic competence in that it assesses more global intelligence with items such as whether on

feels just as smart or smarter than other students.

3. Scholastic Competence. This subscale was patterned after the children's subscale of the same name, and ask whether one feels competent that he or she is mastering the coursework. It was of interest to discover whether college students make a distinction between scholastic competence and intellectual ability.

4. Job Competence. Unlike the adult version of this same subscale, job competence is assessed in a way suitable to college students, focusing on whether one feels proud of the work one does, and feels confident on can do a new job. Another item asks whether one feels satisfied with the way one does his or her job.

5. Athletic Competence. Very much like the child, adolescent, and adult measures, this subscale assesses whether one feels he or she is good at physical activities and sports.

6. Appearance. This domain is meaningful to people in all age groups; thus similar items appear in the children's, adolescent's, and adult's appearance subscale as well. Items ask about thinking one is physically attractive and being happy with one looks.

7. Romantic Relationships. This subscale, initially developed for teenagers, was adopted for use with college students. Items tap the ability to develop new romantic relationships, as well as whether one feels one is romantically appealing to others in whom one might be interested.

8. Social Acceptance. This subscale is very similar to the subscale used in the children's measure with few additions, and contains items about being satisfied with one's social skills, and the ability to make friends easily.

10. Parent Relationships. Another new domain, this new subscale focuses on liking and feeling comfortable with the way one acts around one's parents, as well as whether one gets along well with one's parents.

11. Finding Humor in One's Life (Humor). This new subscale emphasizes the ability to laugh at oneself and take kidding by friends, a slightly different focus than the adult humor subscale.

12. Morality. These items ask whether one feels his or her behavior is moral, and is very much like this subscale on the adult measure.

13. Global Self Worth. This subscale taps one's general feeling about the self, assessed with items such as liking the kind of person one is, and liking the way one is leading one's life (Neemann & Harter, 1986, p. 2-3).

In order to offset the tendency to give socially desirable answers, a question format was used that asked the students to indicate which of two type of students they are most like. The format implies that while some students share one type of self-perception, other students may feel quite differently, thus students are asked to identify with the reference group most appropriate for them (Neemann & Harter, 1986, p. 3).

The student is first asked which kind of student he or she is most like; the student then decides whether that description is "sort of true" or really true" for him or her. The effectiveness of this question format lies in the implication that half of the students in the world (or in one's reference group) view themselves in one way, whereas the other half view themselves in the opposite manner; either choice is legitimized. The actual questionnaire is entitled What I Am Like (Neemann & Harter, 1986, p. 4).

The target population of this measure is the traditional full-time undergraduate college student, ages 17 to 23, although it is conceivable that older single full-time undergraduate as well as graduate students would find this measure appropriate as well (Neemann & Harter, 1986, p.45).

The results of the test were provided me. Only three of the 13 subscales, scholastic competence, intellectual ability and global self-worth, were used for this study.

The *Scientific Attitude Inventory* by Moore and Sutman (1970) was used to measure students' attitudes toward science. The instrument consists of 60 Likert-type items

with four possible choices: (1) agree strongly, (2) agree mildly, (3) disagree mildly, (4) disagree strongly. Possible scores range from 60 to 240. Scores at or near 60 indicate a positive attitude toward science, and scores at or near 240 indicate a negative attitude toward science. This scale was used because it was designed to test the attitude of high school students toward science. Since approximately 80% of the freshman class had just graduated from high school, it was determined that this test would accurately measure the science attitude of these participants. "The attitudes to be assessed are based upon concerns of science educators for objectives of science teaching indicated in the NSSE Fifty-ninth Yearbook" (Moore & Sutman, 1970, p. 86). Moore and Sutman stated that "students should be aware of the "dynamic quality" of scientific knowledge and that even the non-scientist needs a "healthy understanding of the nature of science"" (p. 86).

Questions were selected to be used in this inventory by first giving a pool of 112 items to a panel of judges and high school students. From data obtained from the two groups, 60 questions were selected. Moore and Sutman (1970) used three intact groups of low-ability tenth-grade biology students to determine test-retest reliability coefficients. The coefficient was found to be 0.934. (See Appendix B for copies of the *Profile* and *Inventory.*)

Treatment Procedures

The Biology classes at Barber-Scotia were divided into eight different sections. The students were assigned to sessions according to how well the classes fit into the time students had available. Of these eight, four sections consisting of 120 students were used in this study. The students from all four sections were randomly assigned to one of the following groups: control, self-esteem, enrichment and self-esteem/enrichment by using the random table of numbers. This method was used so that each group would include students from all four sections. One professor was assigned to teach all four of the sections. The instructor did not know which treatment group the students were in. The students were encouraged not to discuss the treatment or absence of treatment with the instructor. The information to be covered during the semester was divided into six units of study. Assignment to treatment sessions was accomplished by creating a cluster sample of convenience.

The students were briefed concerning the research at the beginning of the semester. The University of North Carolina at Greensboro Consent to Act as a Human Subject form was given to all the students. Signed forms were returned to the instructor of the class; the instructor gave the forms to this researcher.

Assignment to the Four Groups

The control group did not receive any treatment beyond the course. All four sections were conducted in the normal fashion. This included lecture/discussion twice a week for 50 minutes and a laboratory session once a week for two hours. The enrichment consisted of weekly tutoring sessions conducted by a student tutor. The students in the enrichment group were required to attend only one session a week. The self-esteem group received weekly peer counseling for self-esteem building. The enrichment / self-esteem group consisted of both weekly tutoring and peer counseling. The participants in the self-esteem group were required to attend one session a week. The class format was the same for all students. Outcome criteria were the performance on six unit tests, one final exam, 15 laboratory assignments, and eight *Critical Thinking Case Study Activities.*

Utilization of Test Scores

Scores on the six unit tests, consisting of 50 multiple choice questions and the final exam, consisting of 100 multiple choice questions, were analyzed. Tests were computer generated by using the Test Item File on TestPak 3.0 from *Inquiry Into Life* (6th edition) by Sylvia Mader (Inquiry Into Life is the textbook used in freshman

biology). Once the tests were developed the instructor of the classes rated the test questions using the following scale: (1) 0 Never talked about (these questions were removed from the test and replaced with new ones), (2) 1 Minor emphasis and (3) 2 Major emphasis. (See appendix C for a copy of a test that has been rated. All 0 items were removed from the test). All students in the study took the same tests and final exam. The Counseling Center administered the *Self Perception Profile For College Students* again to students enrolled in Biology 131 in order to determine if the self-esteem of the students had changed.

Training of Peer Counselors/Class Tutor

Students used as peer counselors received two full semesters of training from the counselors at Barber-Scotia College. (Appendix D has a sample profile of the students that will serve as the peer counselors.) The term peer denotes a person who shares related values, experiences, life style and is approximately the same age (Gray &Tindall, 1981, p.7), as the clients they will serve. Students who served as peer counselors were trained according to methodologies presented in Peer Counseling An In - Depth Look at Training Peer Helpers by (Gray & Tindall 1981). Peer counselors worked in group settings with groups of 5 to 10 students. Students who were sophomores with a

grade point average of 2.5 were eligible to participate in the programs. While potential Sociology majors are desired as peer counselors, all majors were encouraged to apply. After applications were submitted to the counseling center each applicant was interviewed by a trained counselor. Those who made it through the interview process were then given a series of tests among which were the Tennessee Self-Concept Test, several communication tests, and they had to undertake self-evaluation. Those applicants who were successful in this process are then trained as follows:

> The training program is divided into twelve modules which are designed to cover all seven basic communication skills. Skills are to be introduced one at a time with each new skill introduced to trainees only after they have practiced and have become proficient in one skill before proceeding to the next skill. Each skill is cumulated on the previous skill(s) learned. After all twelve modules are completed by the trainees they will be proficient in using the communication skills in peer counseling situations (Gray & Tindall, 1981, p.69).

The 12 modules that the peer tutors covered were as follows: (1) What is Peer Counseling, (2) Introduction to the Program, (3) Let's Look at Helping, (4) Attending Skill (5) Communication Stoppers, (6) Empathy Skill, (7) Summarizing Skill, (8) Question Skill, (9) Genuineness Skill, (10) Confrontation Skill, (11) Problem-Solving Skill, and (12) Putting Peer Counseling Into Counseling Into Action. (A sample of a module can be found in Appendix D.)

The peer counselors worked with students in the

enrichment/self-esteem and self-esteem groups in weekly sessions for one hour in order to raise the self-esteem of group members. Classes began on August 26, 1991. The sessions started the second week of classes and were held on Mondays, Wednesdays, and Thursdays. Each group, consisting of 6 groups of 10 students, met with two peer counselors, one male and one female, for the entire semester. The Peer Counselors used were not biology majors. Non-biology majors were not used for the counseling because it was important that students in the group sessions see that success was possible for students in majors outside the science area. Peer counselors used information obtained in modules 4 -11 to assist science students assigned to them. (See Appendix E for an example of a group session and a sample schedule of the sessions.)

Training of Class Tutor

The student who served as the tutor for the academic enrichment sessions was a senior who received the grade of "A" in Studies in Natural Science 131 and 132 (now called Biology). This student was also chosen for her ability to work well with other students, and she was a good model for the students since she was a very successful non-biology major (See Appendix F for a profile of the tutor and a copy of the tutoring schedule). This student has served

as a tutor for this researcher for the past three semesters. The tutor received training in chapter concepts mastery, problem-solving techniques, test-taking skills, and notetaking. Additional training for the tutor took place the week before classes began. The student who was used did not need to be retrained for this project since she has done tutoring before. However, she did receive training in how to administer the pre and post quizzes and methodologies to use that helped students arrive at solutions to questions/problems without making students feel that their intelligence was being questioned. Thus, while she did not know what would be on the test, she was well prepared to help students study and master the material necessary for success on each chapter test.

The focus of the tutoring sessions was to help students identify key concepts and prepare for the unit tests. The tutoring sessions consisted of six groups of 10 students. Each session began with a pretest that covered the information presented in the previous class session. The tutor graded the quizzes immediately. Students needing additional help with the concepts were assisted by the tutor on an individual basis until the problem was mastered. The students were then given worksheets to complete. Those students who did not need assistance began to work on worksheets immediately after the quiz. The worksheets contained additional information relevant to the material in

chapters completed previously. Students who demonstrated total mastery of previous lessons proceeded to the next chapter's worksheets. The information contained on the worksheets was as follows: Key Terms, Concept Checks, and a mastery quiz. Worksheets and mastery quizzes were graded upon completion. Quizzes were maintained in a file kept by the tutor, while worksheets were returned to the students to be used as study guides. The sessions lasted for one hour. (See Appendix G for sample worksheets and quizzes).

The tutoring session began on Tuesday, September 2, 1991 and continued on a weekly basis on Tuesdays, Wednesdays, and Thursdays for the duration of the semester. All tests were administered on Wednesdays so that all sections would be tested on the same day.

This researcher visited tutoring and enrichment sessions periodically to monitor progress. When personal monitoring by this researcher was not possible a record of the attendance at the sessions was recorded on forms that were provided for all tutors. (See Appendix H for a copy of the forms)

Class attendance was one of the factors contributing to the failure rate of previous students in the freshman science classes. A new attendance policy effective August 1991 is in effect at Barber-Scotia College. The policy was enforced by the instructor participating in this study; the

attendance of all students participating in this study was given to this researcher. (See Appendix I for a copy of the attendance policy)

Data Analysis

The purpose of this study was to assess whether test performance was influenced by the treatments (self-esteem building and self-esteem plus enrichment). The treatments were the *independent variable* and the scores on the tests were the *dependent variable.* In order to evaluate the data a MANOVA was computed. Twenty-seven students were in each group and there were four levels of treatments: Control-1, Enrichment-2, Self-Esteem-3, Enrichment/Self-Esteem -4 (J=4). Descriptive statistics were used to analyze the information obtained from the student questionnaires concerning the effectiveness of the tutoring and self-esteem sessions.

Statistix PC version 2.0 was used to calculate an ANOVA of SAT-Mat and SAT-Verbal scores for all groups in the study. Raw data for analysis were put into the data file of the program. After data were entered the analysis desired was selected from the program's menu.

SAS version 6 was employed to calculate the Multivariate Analysis of Variance (MANOVA) and the Scheffe method of multiple comparisons at an alpha level

of .05 and .001. With the assistance of personnel in the Department of Mathematics the University of North Carolina at Greensboro a program was developed to run the MANOVA. A MANOVA was calculated for each of the six tests to determine by groups whether there was a statistically significant difference. Because of the repeated measures that needed to be analyzed a MANOVA was calculated, the repeated measures were the scores on the six tests and the final exam.

The Scheffe Test was run in order to determine differences among groups. This test is appropriate for making any and all possible comparisons involving a set of means.

CHAPTER IV

ANALYSIS AND RESULTS

Overview

The analysis of the data began with an initial comparison among groups to ascertain if there were any initial significant differences. Next an analysis of the effects of enrichment and self-esteem treatments was examined. A MANOVA of the test scores was performed in order to determine if treatments made a statistically significant difference in test scores. The Scheffe test was performed to determine which treatment was the most effective. Finally, an analysis of student surveys was performed to look for patterns of responses relative to the test data.

Initial Comparisons Among Groups of Participants

This study commenced with 120 students enrolled in four sections of Biology 131 for the fall 1991 semester. Due to attrition in the first two weeks of the semester 108 students actually participated in the study. The participants were randomly assigned to treatment groups. Analysis of background information was done to determine if differences existed that should be taken into consideration before the study began.

There were some differences discovered among the participants. The control group had a substantially higher number of females than males. The profile data indicated that the high school science background of participants was deficient. Fifty four percent of the students enrolled in Biology 131 did not take biology in high school. Students in the self-esteem group had taken more high school biology courses than the students in the other groups; the students in the enrichment group had taken the fewest biology courses. Table 1 provides a breakdown of the female/male participants in the study and Table 2 provides a comparison of groups based on the number of high school biology courses taken.

Table 1

Descriptions of Students Participating in the Study

Racial Composition		Sex		Age	
Black	100%	Male	44%	(18)	10%
		Female	56%	(19 -21)	70%
				(21- 36)	20%

Group	Male	Female	Total
Control	8	19	27
Enrichment	13	14	27
Self-Esteem	12	15	27
Self-Esteem/Enrichment	14	13	27
Total	47	61	108

Table 2

Number of Students with Previous High School Biology Courses 1991

	No. Biology Courses				
Group	0	1	2	3	Total
Control	17	7	3	0	10
Enrichment	19	7	0	1	8
Self-Esteem	5	22	0	0	22
Enrich/Self-Est	18	9	0	0	9

In order to determine whether or not there were pre-existing differences among groups in scholastic aptitude, scores on the SAT-Verbal and SAT-Math were compared by using descriptive statistics. Results in Tables 3 and 4 indicated that the SAT-Verbal and SAT-Math scores by groups were very similar in three of the study groups. The scores were slightly lower in the enrichment group.

Table 3

Mean SAT Verbal Scores of Groups

Group*	Means	S.D.
	SAT Verbal	
Control		
	274.8	55.77
Enrichment		
	250.2	39.82
Self-Esteem		
	275.9	66.82
Enrichment/Self-Esteem		
	274.4	56.51

*n= 27 for each

Table 4

Mean SAT Math Scores

Group*	Means	S.D.
	SAT Math	
Control	284.8	65.24
Enrichment	263.5	50.65
Self-Esteem	274.4	65.65
Enrichment	286.7	63.49

*n = 27 for each group.

An ANOVA was used to determine if the differences indicated were statistically significant. Table 5 shows the results of the ANOVA and indicated that there were no statistically significant differences between the SAT-V and SAT-M scores of the participants in the four groups.

TABLE 5

One Way ANOVA of SAT Scores

VARIABLE	MEAN	SAMPLE SIZE
SAT-VER	268.4	108
SAT-MAT	277.2	108
TOTAL	272.8	216

SOURCE	*V*	SS	MS	F	
BETWEEN	1	4.178	4.178	1.23	$p>.05$ ($_{.95}F_{1,215}= 3.89$)
WITHIN	214	7.299	3.411		
TOTAL	215	7.341			

The initial comparison among the groups revealed that the control group had more females, the self-esteem group had taken more high school biology courses and that there were no significant differences in the SAT-M, or SAT-V scores.

The *Scientific Attitude Inventory* was administered to all participants in the study at the beginning of the semester prior to treatments and again at the conclusion of

the semester after treatments were terminated. A score of 60 indicates a strong positive attitude toward science, a score of 120 indicates a mildly positive attitude toward science, a score of 180 indicates a mildly negative attitude toward science, and a score of 240 indicates a strongly negative attitude toward science.

Table 6: Results from the Inventory indicated that the participants were leaning toward the negative end of the spectrum in respect to their attitudes toward science.

Table 6

Mean Attitude Scores of Participants in the Study

GROUP*	MEAN	S.D
The Scientific Attitude Inventory		
Control		
Before	143.7	15.35
Enrichment		
Before	140.3	12.68
Self-Esteem		
Before	142.9	9.68
Enrichment		
Before	139.8	13.08

*n = 27 for each group.

The *Self-Perception Profile For College Students* by Neemann and Harter (1986) was administered to the study participants at the beginning of the semester prior to treatments and at the conclusion of the semester after treatments were terminated. The test consisted of 13 subscales. Each item was scored from 1 to 4, where a score of 1 indicates low competence, and a score of 4 reflects high competence. The scores of three subscales, scholastic competence, intellectual ability, and global self-worth -- were analyzed to assess perceptions of academic ability.

Table 7

Statistical Analysis of Student Perceptions Before Treatment

Group[a]	Means	S.D.
The Self-Perception Profile For College Students		
Control		
Scholastic Competence	2.524	7.839
Intellectual Ability	3.019	5.231
Global Self-Worth	3.349	5.171
Enrichment		
Scholastic Competence	2.737	5.517
Intellectual Ability	3.056	5.978
Global Self-Worth	3.370	4.460
Self-Esteem		
Scholastic Competence	2.824	4.943
Intellectual Ability	2.963	5.491
Global Self-Worth	3.194	5.430
Enrichment		
Scholastic competence	2.500	6.578
Intellectual Ability	2.870	6.177
Global Self-Worth	3.111	7.316

[a]n = 27 for each group.

Analysis by groups of the results of the *Self-Perception Profile For College Students* revealed that participants were not very confident about their scholastic competence. This analyses is based on the mean scores which ranged from 2.5 - 2.8. According to the Neemann and Harter scale this is in the low competence range.

The participants scored higher in their conception of their intellectual ability. The mean scores in this area of the *Profile* ranged from 2.96 - 3.19. The participants scored the highest in the area of global self-worth. The mean scores in this area ranged from 3.11 - 3.37.

Examination of Results by Hypotheses

As stated in Chapter One the null hypothesis for this study was: **There will be no statistically significant difference between the performance of students in the control group in the general education science courses and students in the experimental programs.**

The two research hypotheses for this investigation were: **1. Students that receive enrichment opportunities will score higher on tests than students that only receive class instructions (control group). Students that receive enrichment opportunities will score higher than students that only receive self-esteem building. Students that receive enrichment/self-esteem building will score higher on**

tests than students that receive self-esteem building, enrichment opportunities, and class instructions (control group).

2. Students that receive self-esteem training will score higher on tests than those students who receive only class instructions.

Effects of Enrichment

Table 8 indicates that the students in the enrichment and enrichment/self-esteem groups performed better on unit tests. Each unit test consisted of 50 multiple choice questions.

Table 8

Average Score per Group for Unit Tests

	Test					
Group	1	2	3	4	5	6
Control	20	14	17	21	17	15
Enrichment	30	30	31	32	32	35
Self-Esteem	22	15	20	23	18	20
Enrichment/Self-Est.	28	24	28	28	28	28

Note: Maxium score = 50

Overall, participants in the enrichment group did perform better on unit tests than did the students in the

self-esteem and control groups. The data suggest that participation in the enrichment sessions did improve student performance. General patterns of performance consistently favored participants in the enrichment and enrichment/self-esteem groups. This pattern was evident from the beginning and was consistent on each test.

Performance on the final exam by participants in the treatment groups was not as outstanding as originally predicted. The test data are presented in Table 9.

TABLE 9

Average Scores per Group on Final Exam

GROUP	Score
CONTROL	137
ENRICHMENT	138
SELF-ESTEEM	135
SELF-ESTEEM/ENRICHMENT	131

Note: Maximum score = 200

Effects of Self-Esteem Training

Data provided in Tables 8 and 9 indicated that students in the self-esteem group did score slightly higher, on average, than did the students in the control group. The data in these tables further indicated that, the self-esteem/enrichment participants did not perform better than the participants in the other groups on the final exam. However, this group did perform better than the control and self-esteem groups on the six chapter tests. This slight variation did not provide enough evidence to support the hypothesis.

Null Hypothesis Results

Analysis

Tables 10 and 11: Results from the MANOVA that were calculated indicated a statistically significant difference on all six tests for the treatment groups. The results from the final exam did not indicate a statistically significant difference.

TABLE 10

MANOVA of Test Scores and Final Examination Scores

MANOVA Of Test Scores for Test 1

VARIABLE	LEVELS	VALUES	SAMPLE SIZE
GROUP	4	1 2 3 4	108

SOURCE	V	SS	MS	F	Pr>F	
GROUP	3	4626	1542	22.28	0.0001	($_{.95}F_{3,104}$ = 2.69)

MANOVA Of Test Scores for Test 2

VARIABLE	LEVELS	VALUES	SAMPLE SIZE
GROUP	4	1 2 3 4	108

SOURCE	V	SS	MS	F	Pr>F	
GROUP	3	3247	1082	15.48	0.001	($_{.95}F_{3,104}$= 2.69)

MANOVA Of Test Scores for Test 3

VARIABLE	LEVELS	VALUES	SAMPLE SIZE
GROUP	4	1 2 3 4	108

SOURCE	V	SS	MS	F	Pr>F	
GROUP	3	2734	911	10.82	0.001	($_{.95}F_{3,104}$= 2.69)

MANOVA Of Test Scores for Test 4

VARIABLE	LEVELS	VALUES	SAMPLE SIZE
GROUP	4	1 2 3 4	108

SOURCE	V	SS	MS	F	Pr>F	
GROUP	3	3935	1311	24.19	0.001	($_{.95}F_{3,104}$ = 2.69)

MANOVA Of Test Scores for Test 5

VARIABLE	LEVELS	VALUES	SAMPLE SIZE
GROUP	4	1 2 3 4	108

SOURCE	V	SS	MS	F	Pr>F	
GROUP	3	4939	1646	23.57	0.001	($_{.95}F_{3,104}$ = 2.69)

MANOVA of Test Scores for Test 6

VARIABLE	LEVELS	VALUES	SAMPLE SIZE
GROUP	4	1 2 3 4	108

SOURCE	V	SS	MS	F	Pr>F	
GROUP	3	3530	1176	17.25	0.0001	($_{.95}F_{3,104}$ =2.69)

MANOVA of Test Scores for Final Exam

VARIABLE	LEVELS	VALUES	SAMPLE SIZE
GROUP	4	1 2 3 4	108

SOURCE	V	SS	MS	F	Pr>F	
GROUP	3	1929	643	2.24	0.0878	($_{.95}F_{3,104}$ = 2.69)

Analysis of MANOVAS indicated that students in the treatment groups performed statistically better on all six unit tests than did the students in the control group. The treatments did have some effect on performance. Performance on the final exam by the treatment groups was not statistically significantly higher than the students in the control group.

Table 11: The Scheffe test was used to determine which type of treatment was the most effective. This test uses the F ratio for each mean comparison of interest.

Table 11

Scheffe's Test for Variables: T1-T6 and Final

Alpha = 0.05 df= 104
Critical Value of F = 2.69
Means with the same letter are not significantly different

Group*		Mean
TEST 1		
Enrichment	A	30.296
Enrichment/Self	A	27.630
Self-Esteem	B	18.370
Control	B	14.296
TEST 2		
Enrichment	A	32.630
Enrichment/Self	A	29.296
Control	B	21.593
Self-Esteem	B	19.185

Table 11 (con't)

TEST 3			
Enrichment		A	31.148
Enrichment/Self	B	A	25.519
Enrichment	B		19.222
Control	B		18.963
TEST 4			
Enrichment		A	31.333
Enrichment/Self		A	28.185
Self-Esteem		B	20.852
Control		B	15.963

Table 11 (con't)

	TEST 5	
Enrichment		
	A	32.519
Enrichment/Self		
	A	30.259
Self-Esteem		
	B	18.222
Control		
	B	17.704
	TEST 6	
Enrichment		
	A	33.593
Enrichment/Self		
	B	26.259
Self-Esteem		
	B	25.667
Control		
	C	17.444

Table 11 (con't)

		FINAL
Enrichment	A	144.444
Enrichment/Self	A	137.037
Self-Esteem	A	135.926
Control	A	132.963

*n = 27 for each group.

Results from the Scheffe test made it apparent from the onset that participants in the enrichment group outperformed the students in the control and self-esteem groups on all six tests. Beginning with test 1 the results of the Scheffe analysis revealed that participants in the enrichment group out performed the participants in the self-esteem and control groups. Results from tests 2 through 6 followed the same pattern as test 1, the enrichment group out performed the participant in the self-esteem and control groups.

Analysis of scores of the participants in the enrichment/self-esteem group and enrichment revealed no significant differences in performance on tests 1, 2, 3, 4,

and 5. Only on test 6 was there a significant difference between the performance of the two groups. The enrichment/self-esteem group performed better than the self-esteem group and the control group on tests 1, 2, 4, and 5. There was no difference in performance between the self-esteem group and enrichment/self-esteem group on tests 3 and 6.

There was no difference between the performance of the self-esteem and control groups on tests 1 through 5. Analysis of the results revealed that these two groups performed the same throughout the investigation. However, a difference did occur in the performance of the two groups on test 6.

Results from the final exam revealed that there was no difference among the test scores on the final exam.

Analysis of Attitude toward Science

Table 12: Shows that results from a descriptive statistical analysis of student attitudes after treatment revealed that there was little change in attitude after treatment.

Table 12

Mean Attitude Scores of Participants

Group*	Mean
	The Scientific Attitude Inventory
Control	
Before	143.7
After	140.0
Enrichment	
Before	140.3
After	140.0
Self-Esteem	
Before	142.9
After	138.8

*n= 27 each

Although treatment improved the test scores of participants, the overall attitude toward science did not improve in any of the four groups.

Table 13 reveals the results from a descriptive statistical analysis of the three subscales of the Neemann-Harter test scores for all participants increased slightly.

Table 13

Statistical Analysis of Student Perceptions After Treatment

Group*	Mean	S.D.
The Self-Perception Profile For College Students		
Control		
SCHOLASTIC COMPETENCE	2.619	6.747
INTELLECTUAL ABILITY	3.056	4.668
GLOBAL SELF-WORTH	3.415	5.201
Enrichment		
SCHOLASTIC COMPETENCE	2.746	5.364
INTELLECTUAL ABILITY	3.102	5.935
GLOBAL SELF-WORTH	3.398	4.454
Self-Esteem		
SCHOLASTIC COMPETENCE	2.852	4.613
INTELLECTUAL ABILITY	2.981	4.948
GLOBAL SELF-WORTH	3.352	4.767
Enrichment/Self-Esteem		
SCHOLASTIC COMPETENCE	2.537	6.493
INTELLECTUAL ABILITY	2.880	6.481
GLOBAL SELF-WORTH	3.269	6.121

*n = 27 for each

Summary of Student Perceptions and Performance by Groups

There were some slight changes in student perceptions in the areas of scholastic competence, intellectual ability and global self-worth. The mean score of all participants increased slightly in the three aforementioned areas after treatment for the three experimental groups and during the same time frame of no treatment for the control group. Overall the increases were too small to be of any significant difference.

Initially, several pre-existing factors were identified that might have affected the outcome of this study. The self-esteem participants had taken more high school biology courses than the other participants. This could have given them a stronger knowledge base than the other participants had. The enrichment/self-esteem group had more male members than did the other groups. The literature suggests that males tend to perform better in science courses than females. However, results from this study indicated that the pre-existing differences had no significant effects on the outcome of this study. The self-esteem group scored consistently lower on all the unit tests and the final exam when compared to the other groups. The enrichment/self esteem group, which had more males, did outperform the control and self-esteem groups but did not perform better than the enrichment group.

Analysis of Student Questionnaires

A questionnaire (See Appendix J) was given to students in the enrichment and self-esteem/enrichment treatment groups at the conclusion of the session to ascertain their opinion concerning the effectiveness of the treatments they were exposed to for the fall semester of 1991. Fifty-four students received enrichment, and 54 students received self-esteem treatments. The following scale was used to answer questions 1 and 4 : 5: Yes, Very Much, 4: yes; 3: Somewhat; 2: Not very Much; and 1: Not At All. Below is a summary of the responses given by the respondents.

Table 14 provides an analysis of answers from participants. Question 1 asked if the tutoring session was helpful. Fifty-four of the respondents checked box 5. A summary of the reasons for checking box 5 were as follows: 64% of the respondents said that the information obtained in enrichment sessions helped them do better on the chapter test, 18.5% of the respondents said that the tutoring made the classwork easier to understand, and finally 16.6% of the respondents said that tutoring helped them organize their notes more efficiently and how to review for tests more effectively.

Question 2 asked what was most helpful about the tutoring sessions. A summary of responses revealed that 46% of the respondents said that reviewing the chapters helped

them grasp concepts that were not understood in class, 37% of the respondents said that the tutor used examples that they could relate to, and 9% of the respondents said that the way the tutor explained the chapter made understanding the information easier.

Question 3 asked what was least helpful about the tutoring sessions. A summary of the responses revealed that 98% of the respondents said everything about the sessions was helpful, 2% of the respondents said that they were a little disappointed when their grades did not increase immediately.

Question 4 asked if tutoring sessions would be helpful for the second part of the semester. Fifty-four of the respondents checked box 5. A summary of the reasons for checking box 5 were as follows: 83.3% of the respondents said that Biology was one of their weakest subjects and they would need help in the second part also; 16.6% of the respondents said that if they had the same tutor, understanding the concepts would be easier if she utilized the same methodology that she used for the first part.

Question 5: asked what improvements could be made if sessions were offered next semester. A summary of the responses revealed that 100% of the respondents said that they wanted to be able to attend more than one session per week.

Table 14

Results From the Tutor Questionnaire

Use the scale below for your answers.

5:Yes, Very Much, 4:Yes, 3:Somewhat, 2: Not Very Much, 1: Not At All

1. Did you find the tutoring sessions helpful? (Please check one)

   5 [X] 4 [ ] 3 [ ] 2 [ ] 1 [ ]
   100% of the participants checked this box

   Please explain. 64% of the respondents said sessions helped them do better on test.
   18.5% said tutoring made the classwork easier to understand.
   16.6% of the respondents said that tutoring helped them organize their notes more efficiently.

2. What did you find most helpful about the tutoring sessions?

   46% of the respondents said that reviewing the chapters helped them grasp concepts that were not understood in class.
   37% of the respondents said that the tutor used examples that they could relate to.
   9% of the respondents said that the way the tutor explained the chapter made understanding the information easier.

3. What did you find the least helpful about the tutoring sessions?

   98% of the respondents said everything about the sessions was helpful.
   2% of the respondents said that they were a little disappointed that their grades did not skyrocket immediately.

4. Would the tutoring sessions be helpful for the second part of the course? (Please check one)

   5 [X] 4 [ ] 3 [ ] 2 [ ] 1 [ ]
   100% of the respondents checked this box.

Please explain. 83.3% said biology was their weakest subjects and they would need help in the second part.
16.6% said if the same tutor and methodology were used their understanding of the concepts would be enhanced.

5. If we can offer these sessions next semester, how would you suggest we improve the program?

100% of the respondents said that they wanted to be able to attend more than one session per week.

A questionnaire (See Appendix K) was also given to the participants in the self-esteem and self-esteem/enrichment treatment groups. The same scale used on the tutoring questionnaire was also used for the self-esteem questionnaire.

Table 15 provides an analysis of the Self-Esteem Questionnaire. Question 1 asked if the self-esteem sessions were helpful. 92.6% of the respondents checked box 1; 7.4% of the respondents checked box 2 a summary of the reasons for checking box 1 revealed that 86.% of the respondents said that the sessions were of no value to them, 14.% said that they did not have low self-esteem and therefore, they did not need help. A summary of the reasons for checking box 2 revealed that all respondents checking that box felt that although they had some problems with self-esteem, they did not feel comfortable discussing their problems in a group setting.

Question 2 asked what was most helpful about the

sessions. It was reported by 74.1% of the respondents that sessions were not helpful with self-esteem but did offer an avenue by which they could discuss some other problems; 12.9% of the respondents said that having 10 persons in the group made it difficult to discuss problems and therefore, they received no benefits from the sessions; 13% of the respondents reported that the sessions were not helpful because they did not trust the peer tutors.

Question 3 asked what was least helpful about the self-esteem sessions. It was reported by 92.6% of the respondents that having peer tutors was least helpful because they did not feel that the tutors would keep the information revealed to them during the sessions confidential; 7.4% of the respondents reported that the least helpful portion of the session was the size of the group . They felt that having 10 persons in the sessions cut down on the time each person had to discuss personal problems.

Question 4 asked if it would be helpful to offer the course for the second part of the semester. 100% of the respondents checked box 1. A summary of the reasons for checking box one revealed that 96.3% of the respondents reported that the nature of the sessions and the persons in charge made the sessions of little value to them, 3.7% of the respondents said that they did not want anyone prying into their personal life.

Question 5 asked what improvements were needed if the sessions were offered next semester. 100% of the respondents reported that the sessions should be private, adult counselors should be in charge, and sessions should be scheduled only when needed.

TABLE 15

Results of the Self-Esteem Questionnaire

Use the scale below for your answers.

5:Yes, Very Muoh, 4:Yes, 3:Somewhat, 2: Not Very Much, 1: Not At All

1. Did you find the self-esteem sessions helpful? (Please check one)

   5 [ ] 4 [ ] 3 [ ] 2 [X]** 1 [X]*
   * 92.6% of the respondents checked box 1.
   ** 7.4% of the respondents checked box 2.

   Please explain. * 86% of the respondents said that the sessions were of no value to them. 14% of the respondents said that they did not have low self-esteem.

   ** 100% of the respondents said that although they had some problems with self-esteem they did not feel comfortable discussing problems in a group setting.

2. What did you find most helpful about the self-esteem sessions?

   74.1% of the respondents reported that the sessions were not helpful with self-esteem but did offer an avenue to discuss other problems.

   12.9 of the respondents said that having 10 persons in the group made it difficult to discuss problems.

   13% of the respondents reported that the sessions were not helpful because they did not trust the peer tutors.

3. What did you find the least helpful about the self-esteem sessions?

92.6% of the respondents reported that having peer tutors was least helpful because they did not feel that the tutors would keep the information revealed to them during the sessions confidential.

7.4% of the respondents reported that the least helpful portion of the sessions was the size of the group.

4. Would the self-esteem sessions be helpful for the second part of the course? (Please check one)

5 [ ] 4 [ ] 3 [ ] 2 [ ] 1 [X]

100% of the respondents checked this box

Please explain. 96.3% of the respondents reported that the nature of the sessions and the persons in charge made the sessions of little value to them.
3.7% of the respondents said that they did not want anyone prying into their personal life.

5. If we can offer these sessions next semester, how would you suggest we improve the program?

100% of the respondents reported that the sessions should be private, adult counselors should be in charge, and sessions should be scheduled only when needed.

Summary

In summary, the data analysis shows that the enrichment sessions were very beneficial in helping to prepare the academically disadvantaged students for success in Biology I. Students who participated in enrichment sessions performed significantly better on chapter tests than did the self-esteem group and the control group. Survey results

from the enrichment groups indicated that these sessions gave students an opportunity to receive assistance in areas that they were weakest in, to receive reinforcement on material covered in class, and to advance to new material when mastery of previous material was achieved. The data also indicated that the self-esteem sessions had little effect on test performance in Biology 131.

Analysis of survey results indicated that the enrichment sessions were helpful in raising the test scores of participants in the group. The increase in test scores was also observed for the participants in the enrichment/self-esteem group.

Survey results further indicated that the self-esteem sessions were of little benefit to the students. The test scores of the participants in this group did not increase.

The results of the data analysis confirmed the first Research Hypothesis that students in the enrichment group would score higher on tests than students in the control and self-esteem groups. The results from the data analysis did not confirmed the portion of the hypothesis that stated that participants in the enrichment/self-esteem group would score higher on tests than all the other groups. Participants in this group scored higher on tests than participants in the control and self-esteem groups but not higher than participants in the enrichment group.

Results from the data analysis did not confirm the Research Hypothesis that students that received self-esteem training will score higher on tests than those who receive only class instructions. While students in this group only scored slightly higher than those in the control group, there was no statistically significant difference in the scores of the two groups.

CHAPTER V

SUMMARY AND CONCLUSIONS

Introduction

Being from disadvantaged backgrounds, tracking, improperly prepared teachers, misconceptions about science and numerous other factors may have prevented a large number of students in this investigation from taking sufficient and adequate high school science courses that would have prepared them for the rigors of college level science courses. Many of these students are intellectually able to handle the rigors of science courses. The aforementioned problems and lack of self-confidence are among the most viable reasons students are experiencing difficulty in regular college level science courses without some additional assistance. The results of this investigation suggested that enrichment sessions can help students do better in Biology I.

Summary of the Study

The purpose of this study was to design, implement and evaluate three methods for helping academically disadvantaged Black students succeed in the general education science course at Barber-Scotia College. The

methods used in this study were enrichment, self-esteem building, and enrichment/self-esteem building.

The procedures for this study were as follows: all students were taught by the same instructor; classes consisted of 50 minutes of lecture/discussion twice a week and a laboratory session once a week for two hours. The control group did not receive any additional instruction beyond the lecture and labs. The enrichment group met for a required additional one-hour session of weekly tutoring sessions conducted by a student tutor. The self-esteem group received weekly peer counseling for self-esteem building. In addition to regular instruction the enrichment/self-esteem group consisted of weekly tutoring and peer counseling. The self-esteem group attended one session per week. The self-esteem/ enrichment group attended one enrichment session and one self-esteem session per week. Outcome criteria were the performance on six unit tests and the final exam.

Results from the study indicated that participation in the enrichment group did improve the performance of students on the six unit tests. The self-esteem sessions did not have a profound effect on the performance of the participants on the six unit tests. There were no significant differences among the groups in their performance on the final exam. Analysis of scores on *The Self-Perception Profile For College Students* by Neemann and

Harter (1986) indicated that there were no changes in the mean scores on Scholastic Competence, Intellectual Ability or Global Self-Worth before and after treatment. Similarly, an analysis of the results of the *Scientific Attitude Inventory* indicated that the negative attitude toward science was apparent before and after treatment. While enrichment improved academic performance it had little effect on the attitude of the participants.

Conclusions and Discussion of Results

The results obtained from this study indicated a statistically significant difference between the performance of students in the control group and students in the enrichment groups. This gave credence to the concepts of Sevenair et al. (1989) and House and Wohlt (1990) that academic enrichment does improve the performance of students from disadvantaged backgrounds. The enrichment sessions were organized in a fashion that allowed time for review of materials covered in the course, question and answer sessions, and quizzing of previous lecture material. Students found it easier to master the material when there was consistency in both lecture and help sessions.

The lack of improvement by students in the control group provided further evidence that enrichment was needed in science courses. Students in the control group consistently scored lower on chapter tests than did the

students in the enrichment sessions. House and Wohlt (1990) reported that "there is evidence that tutoring programs benefit college students" (p.336). Students who were able to discuss complex material in a small group setting but had difficulty comprehending during the lecture setting, and received additional review and practice did consistently better on tests than did those students who received no additional help.

The success of the students in the enrichment groups helped to rebut information contained in the literature that disadvantaged youths have "special learning problems." Waks (1991) and Brookover (1985) reported that society embraces the notion that Black students are genetically inferior lack motivation and cannot learn. However, the students in this study, who for the most part came from disadvantaged backgrounds, were successful in a course that was often perceived as "impossible."

The success of the students in the enrichment groups also helped them overcome the belief that success in a science course was impossible to achieve. Powell (1990) reported that "many Black students are the victims of learned helplessness in which they observe that academic failure is global, inevitable, and the result of personal flaws" (p.295). However, the students in the control group were not as self-assured as the students in the enrichment

groups. Since the control group did not experience the same type of success as the students in the enrichment groups the overall feeling of academic success was not as evident in this group. However, they did not feel that they were complete failures. The success of their peers encouraged many to attend enrichment sessions for the second semester.

The participants who experienced success as a result of enrichment sessions gained self-confidence. However, the students that were in the self-esteem group did not achieve the same type of self-confidence or academic success as did the students in the enrichment groups.

The self-esteem building sessions were not as successful as originally thought. Studies by Haynes and Johnson (1983) suggested that self-esteem building would enhance the academic success of disadvantaged students. This study did not support these findings. Students in the self-esteem group did not perform statistically better on tests than the students in the control group. As indicated in the survey responses, the lack of success of this group could have been due to the lack of trust by the participants in the peer counselors. The participants felt that knowing the peer counselors as peers made them less effective as counselors. They also felt that their confidentiality might be breached, that the knowledge base of the counselors was not sufficient, and talking about themselves in the presence of others reduced the effectiveness of the help sessions.

These factors, plus the high scores on the Neemann and Harter Profile which indicated that the students already had high self-esteem may have reduced the effectiveness of the self-esteem sessions.

This is not to say that the self-esteem sessions should be abandoned. Many disadvantaged Black college students do suffer from low self-esteem. It is for this reason that self-esteem building should be an integral part of the freshman college experience. However, responses from surveys indicated that the sessions might be more effective if they were conducted on a volunteer basis. Students should be made aware of the existence of such programs and told of its value but participation should not be mandatory.

Limitations

When interpreting results of this study two limitations should be considered.

1. This study only lasted for one semester.
2. Barber-Scotia students were the only participants in the study.

Although only one semester was used to obtain results, this time frame provided enough support for the hypothesis that tutorial enrichment would improve the academic performance of students. Even though Baber-Scotia students were the only participants in the study, the results obtained from the study could be used at other institutions

with populations similar to Barber-Scotia's.

Implications of the Results

The enrichment sessions were most helpful for the students. Opportunity was afforded students to ask questions and receive additional help in areas of weakness. The enrichment sessions were attended by a small number of students at a time. Therefore students were not apprehensive about speaking up and seeking help.

However, one must be made aware of the fact that often times the backgrounds of students are the results of numerous factors. The lack of confidence that many of the participants results from a lifetime of negative experiences. Many of the students had not experienced many positive experiences in science classes. Some of the participants had failed high school biology on their first attempt. Limited success had only been experienced during the taking of the course for the second time.

It must also be remembered that while many of the participants in the study had positive experiences as a result of the treatments used in this study their negative attitude toward science did not change. It is impossible to change attitudes that took a long time to develop during the framework of one semester. However it is felt that if students continue to experience positive experiences over a

period of time negative attitudes may gradually change. At the same time the role of Blacks in science must be continually emphasized as well.

The self-confidence of the students increased slightly during the study. Again, it must be remembered that confidence or lack of confidence in one's ability to be successful develops over a period of time. As stated previously diminished confidence probably resulted from numerous encounters with failure. It was determined from the results obtained from the Neemann-Harter (1986) profile that, as a result of positive experiences that resulted from this study, the participants' confidence level rose slightly. Continuing positive experiences over a period of time may eventually lead to improved confidence levels.

Tutoring should be incorporated into all aspects of the college curriculum. This is especially true when disadvantaged academic students make up a large percentage of the population. While tutoring is usual in subjects such as English and mathematics, tutors are often not available for science courses. They are especially needed on the freshman level. Often if success is not immediate for the beginning freshman, the college experience is shortened.

Competent tutors are essential in freshman college science courses. Tutors need not be science majors. Often it is best if they are not science majors. Students in these sessions have a model of success who is not a major;

therefore the idea that success is not beyond their grasp is reinforced. The tutor can also be an excellent source of motivation and confidence building. Enrichment sessions offered at varying times throughout the week afford students the opportunity to attend one or more sessions depending on their need.

Tutorial sessions should be scheduled at the beginning of the semester. Delays will create more problems for the disadvantaged students. It is known that students have problems; attacking the problem at the onset is the best way to ensure a successful year for the student. Computers can also be used as a means of improving tests performance by allowing students to practice taking test on materials covered in a chapter before the actual test is given.

The enrichment sessions in science can be successful at other institutions with a student body similar to that at Barber-Scotia College. Historically Black, private institutions of higher learning basically have similar student bodies. Therefore, adapting the information obtained from this study would be a simple task.

Classroom experiences should also be changed. Continued exposure to lectures only will only serve to further alienate students from science. It is imperative that classroom instructions be changed to adhere to the learning styles of disadvantaged students. Computers,

videos, and interactive software must be used in the freshman science classes as well as other disciplines in order to increase the success rate of students.

Based on scores on the Neemann and Harter Profile students in this study did not suffer from low self-esteem. This is not to say that low self-esteem is not prevalent among disadvantaged students. Therefore, it is important that ways to improve self-esteem be made available to students.

Information obtained from this study revealed that self-esteem group sessions should be offered in a different fashion. In this study participants were required to attend sessions. This requirement was not very popular with students. If attendance were voluntary, resentment might not be as prevalent. This would eliminate the open group sessions which were so unpopular with the participants and allow for more one-on-one sessions which might be more helpful. Enough evidence exists to justify the need for this type of support system for those students in need of self-esteem building. The information obtained from this study suggests self-esteem assistance might be more useful on a referral basis.

Self-esteem sessions must be ongoing. Since one's self-esteem develops over a long period of time it takes a long period of time to cause change. Students who undergo self-esteem building sessions should be followed throughout

their stay at Barber-Scotia. In this way it can be determined whether the sessions were instrumental in changing students' academic performance.

Major Implications for Research

One avenue that might be explored is the effect of tutoring in classes representing other disciplines. Often students experience difficulties in more than one area. If tutoring is successful in the sciences, it probably will be successful in mathematics and English. These are two areas where disadvantaged students often experience difficulties also.

The effect of Computer Assisted Instruction might also be examined. Using the computer for drill and practice might also increase the test scores of participants. Some students may feel more at ease interacting with the computer. These students could progress at a faster or slower pace than those who receive help from a person. In this manner it could be determined whether computer usage could improve test scores.

Another possibility for future research would be to use individual counseling for individuals known to have low or reduced self-esteem. Through the use of individual sessions persons with problems might be more receptive to treatment than having to discuss personal problems in an

open forum.

The long-term effects will be establishing a pattern of study habits that will enable students to have a successful stay in college. Moreover, enhancing the self-esteem of the participants will enable them to establish the confidence needed to be successful not only in college but also in life.

Ultimate Benefits

The benefits to be derived from additional research would be improved academic performance of the participant, a greater appreciation for science and its applications and finally raising the self-esteem of participants who suffer from low or decreased self-esteem.

Recommendations for Barber-Scotia College

1. Rather than self-esteem sessions, study skills and test taking should be added to the curriculum. These skills are needed because even though tutoring improved the test scores, the scores need to be higher.
2. Tutoring sessions should become part of the class scheduling. The majority of students who take freshman biology do not have sufficient high school science backgrounds. Since it is has been proven that tutoring does help improve performance, it should be available at the very beginning of the semester.

3. The training of tutors should be standardized. Presently each instructor in the sciences selects and trains class tutors. A training manual should be designed that clearly points out what should be done in tutoring sessions. In this way all tutors of freshman students will be preparing students in the same fashion.
4. Computer Assisted Instruction might also be utilized. By working with computers students can receive immediate feedback and those who are somewhat hesitant about interacting in a group setting may not feel less intimidated by the computer.

Final Thoughts

The information obtained from this study has started the foundation for building a strong tutorial support system for the freshman biology course. Academically disadvantaged students are not incapable of mastering the information necessary to pass the course. They can't master the material because they don't have the necessary background and analytical skills necessary for course mastery. It is now known that with additional academic enrichment these students can be successful. With success comes the confidence necessary to be successful not only in science classes but in other endeavors as well.

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Student Profile Sheet

Appendix A

PLEASE PRINT THE FOLLOWING INFORMATION CLEARLY:

Name: .....

Social Security #: _ _ _- _ _- _ _ _ _

Date of Birth: .....

Of Biology Courses Taken In High School: ....

Of Chemistry Courses Taken In High School: ...

SAT Score Verbal: .....; Quantitative: .....

Rank In Graduating Class: .....

Overall GPA: .....

Self-Perception Profile for College Students

Scientific Attitude Inventory

Appendix B

Biology 131 Chapter Test

Appendix C

Profile of Female Counselor

Profile of Male Counselor

Module Titles

Module 1: What Is Peer counseling

Appendix D

Female Peer Conselor

The female counselor is an education major. This student is a first generation college student from a disadvantaged socioeconomic background. She was a B student in both semesters of the freshman science classes. She is a member of a sorority, last semester she severed as an English tutor.

The student is a junior and is currently doing observations in the Public School System of Cabarrus County. This student is a third year college student at Barber-Scotia College and is from New York.

Peer Tutor Profile

Male Peer Counselor

The counselor is a Business Major with a concentration in Marketing. He has been a student at Barber-Scotia for four years. Currently he is President of the Student Council, active in several other student organizations. He is an honor student from South America. He is not a first generation college student nor is he from a disadvantaged socioeconomic background. He is a charismatic person and students follow his lead readily. He was an A student in both semesters of the freshman science classes. This is his second year as a Peer Counselor.

Module Number	Module Title
1.	*What is Peer Counseling*: The first module is devoted to explaining the program to the trainees.
2.	*Introduction to the Program*: The second module is devoted to helping the trainees to know each other, develop new listening behaviors, and begin relating to others.
3.	*Let's Look at Helping:* The third module is devoted to the following: (1) helping the trainees explore several different characteristics of helping behaviors, (2) helping trainees identify ineffective helping behaviors which are used widely, and (3) helping trainees become aware of effective helping behaviors.
4.	*Attending Skill:* Attending behavior relates most directly to the concept of helper respect for helpee, which is demonstrated when undivided attention is given to the helpee.
5.	*Communication Stoppers*: This module will assist trainees in better identification of what might occur during communication that might interfere with or stop the communication process.
6.	*Empathy Skill*: This module will assist the trainees to learn and use empathy--accurately perceiving the meaning and feeling of the helpee and then communicating the understanding to the helpee.
7.	*Summarizing Skill:* This modules enables trainees to learn summarizing skill which involves listening to trainees concerns and then summarizing not only with helpee's words but also adding in such a manner that the helpee will gain new insight and added dimensions of awareness to the problem.
8.	*Questioning Skill:* This module enables trainees to learn how to use questioning effectively and to keep the interchange ongoing with the helpee.

9. *Genuineness Skill:* This module enables the trainees to learn about, recognize, and use genuineness skill.

10. *Confrontation Skill:* This module enables the trainees to learn and use effectively confrontation skill.

11. *Problem-Solving Skill:* This module enables the trainees to understand and demonstrate problem solving strategies.

12. *Putting Peer Counseling Into Action:* To have trainees take Post-Test as one means of determining readiness to participate actively in peer counseling. (Gray and Tindall, 1981, p. 75-177)

MODULE 1

WHAT IS PEER COUNSELING?

The first module will be devoted to explaining the program to the trainees and concerned others. A pre-test will be an integral part of the introduction module.

PURPOSE: To inform interested persons of the peer counseling program, solicit their interest, and gain a commitment to participate as trainees.

APPROXIMATE TIME: 30 to 45 minutes to explain the program
30 to 45 minutes for Exercise 1.1
30 to 45 minutes for Exercise 1.2
15 to 20 minutes for Homework

PHYSICAL SETTING: Have potential trainees sit in a circle. All others sit outside the circle, i.e., parents of potential trainees.

MATERIALS

PEER POWER Book, one for each potential trainee
Module 1 "What is Peer Counseling"
Exercise 1.1 "Pre-Testing Yourself: Communications Exercise"
Exercise 1.2 "Your Reason for Training"

Pencil or pen for each trainee

INTRODUCTION TO MODULE

During the first group sessions you as trainer may want to invite not only the potential trainees but also their parents or each trainee's significant other who may make "significant" differences in the trainee's attitude and behavior throughout the training program. An important asset of the program is having all to know what the training program is, what the competencies to be learned are, and the ways in which one can work with others after completing the training program.

In discussing the program you will be able to draw upon information throughout this MANUAL. Sharing with the group will help to expand their concepts of a peer counseling program and may help them form concerns they have into questions.

TRAINING PROCUDURES

1. Explain to trainees the purpose of the program. At this point avoid lengthy details. Some of the purposes that need to be explained are as follows:

   a. Learn about self.
   b. Train people (peers) to help others (peers) with social, educational and/or vocational concerns.
   c. Train "Rap" leaders (one function of peer counselors).
   d. Explain other roles for peer counselors. Refer trainees to material in PEER POWER on "Roles of Peer Counselors," Chapter 3. Help trainees to list examples of where and how peer counselors may contribute to their peers. Examples would include the following:

      Schools
      --helping new students to adjust to school
      --helping during registration
      --helping tutor younger students

      Agencies
      --helping in crises centers
      --helping in orientation of new workers
      --helping in community outreach programs

      Churches
      --helping in church school teaching
      --helping in leadership groups
      --helping in outreach programs

2. Answer all participants' questions. (For trainees under 16, parents are encouraged to attend this orientation.)

3. Begin building trust among the trainees and to set guidelines for confidentiality. The following points might be discussed:

   a. What is meant by confidentiality?
   b. What rights do individuals have concerning confidentiality?
   c. Reasons trust is important in a group being trained as listeners and helpers.

EVALUATION PROCESS

1. Trainer can determine how well the people in attendance at orientation session understand the program by responding to all audience questions after the goals and procedures for meeting those goals have been explained.

3. From Exercise 1.2 you can determine the reasons the potential trainees have for taking the Peer Counseling Training Program.

MEASURING OUTCOMES

1. Establish that everyone in attendance at the orientation session understands the goals of the program. This is accomplished by the trainer answering all questions of participants, parents, and others in attendance.

2. The extent to which the Communication Exercise is completed by trainees including scoring establishes the beginning levels of discrimination and communication skills of the trainees. Trainees' scores indicate baseline skills of trainees.

EXERCISE 1.1

PRE-TESTING YOURSELF
COMMUNICATIONS EXERCISE

PURPOSE: To gain through a pre-test the personal interest of potential trainees, their level of competencies, and the extent to which they might commit themselves to the training program.

HOMEWORK FOR TRAINEES PRIOR TO GROUP MEETING

1. If you as trainer have met with each potential trainee individually and have had a chance to distribute the PEER POWER book, then ask each to read the first part of the book over to the Pre-Test Exercise 1.1.

2. If the potential trainees have not had PEER POWER book prior to first group meeting, then no homework would be indicated.

INTRODUCTION TO EXERCISE

The Pre-Test will provide a means for you to assess each trainee's communication skills in terms of empathy based on discrimination and response. You can discuss the items and the trainees' answers with them after the completion of the Pre-Test by them. The same items will be used as a Post-Test at the end of the training program. Therefore save the Pre-Test sheets for comparison with Post-Test results later.

TRAINING PROCEDURES

1. Have trainees turn in PEER POWER book to Exercise 1.1 entitled, "Pre-Testing Yourself: Communication Exercise." The purpose of the communication exercise is for the trainer to assess each trainee's skills in discrimination and response.

2. Refer to Exercise 1.1 in PEER POWER book for explanation of directions and rating scale.

3. Use examples to help the potential trainees better understand the rating scale. The following are examples you could use of conversations between a helpee and a helper together with an analysis of each of the helper's responses:

Person	Response High Rating "H"	Analysis
Helpee:	"I'm having a problem with Betty."	
Helper:	"Betty is really upsetting you."	Heard the problem Provided feedback Responded to feelings Helped person know feelings
	Medium Response "M"	
Helpee:	"I'm not to blame, she is."	
Helper:	"Let's talk about what she does."	Heard helpee Encourages additional talk Expresses willingness to listen
	Low Response "L"	
Helpee:	"Yeah, she is always nagging me."	
Helper:	"What do you do to cause that?"	Not helpful Makes helpee assume the blame

4. Explain the rating scale as being based upon the degree of empathy in the response.

b. Responses rated "M" included accurate paraphrase for either feeling or meaning but not both.

c. Responses rated "L" included neither accurate feeling nor meaning.

5. Ask the trainees to rate the responses for the first five statements, 1 through 5, using "L" for Low, "M" for Medium, and "H" for High.

6. Discuss the responses for the first five statements. The following level of responses for Statements 1 through 5 are accepted generally by experts.

Statement 1		Statement 2		Statement 3	
Rating	Response	Rating	Response	Rating	Response
L	1	L	1	H	1
L	2	H	2	L	2
M	3	M	3	M	3
H	4	L	4	L	4

Statement 4		Statement 5	
Rating	Response	Rating	Response
L	1	M	1
H	2	L	2
L	3	H	3
L	4	L	4

Optional: Omit the discussion and have the potential trainees proceed with Training Procedure Number 7.

7. Ask the trainees to proceed in the Pre-Test with Statements 6 through 10. Ask each to write what he/she would consider to be a helpful response to the statement.

8. In Statements 6 through 10, check each for an accurate empathic response including feeling words and paraphrasing of the content. Use ratings "L," "M," and "H" as provided previously.

9. Have the trainees turn in the Pre-Test sheets upon completion. The Pre-Test will be readministered at the end of the training sessions as a Post-Test. The trainer can compare the pre- and post-test results to determine behavioral changes in discrimination and communication skills.

10. Analyze the sheets from the Pre-Test so as to establish a base line for your training program.

11. Where necessary, talk with individual whom you are concerned about readiness for the training program.

HOMEWORK FOR TRAINEES AFTER GROUP MEETING

1. Ask trainees to do Exercise 1.2 and submit the material to you at next meeting.

   Optional: Ask trainees to do Exercise 1.2 following completion of the Pre-Test (Exercise 1.1) and collect the sheets during the meeting.

2. If Exercise 1.2 is collected, then ask trainees to do Homework as listed in Exercise 1.2.

EXERCISE 1.2.

YOUR REASON FOR TRAINING

PURPOSE: To learn the potential trainee's personal reasons for learning peer counseling skills.

INTRODUCTION TO EXERCISE

The reasons for individuals enrolling in the Peer Counseling Training Program can help you understand their motivation. The exercise is designed to have the potential trainees examine their reasons and to share these with you.

TRAINING PROCEDURES

1. Have the trainees discuss in the group meeting the answers they gave to the three questions.

2. Help the trainees gain a feel for what the training can do for them personally as well as being useful in helping others.
3. Collect Exercise 1.2 sheets.

HOMEWORK FOR TRAINEES AFTER GROUP MEETING

1. Ask the trainees to read the introduction to Module 2.

2. Ask the trainees to study Exercise 2.1 and to come to the next meeting prepared to complete that exercise.

Self-Esteem Group Session Schedule

Problem Identification

Appendix E

Self-Esteem Group Session Schedule

September

02	LABOR DAY- NO SESSION
04	GROUP SESSION
05	GROUP SESSION
09	GROUP SESSION
10	GROUP SESSION
11	GROUP SESSION
12	GROUP SESSION
16	GROUP SESSION
18	GROUP SESSION
19	GROUP SESSION
23	GROUP SESSION
25	GROUP SESSION
26	GROUP SESSION
30	GROUP SESSION

October

02	GROUP SESSION
03	GROUP SESSION
07	GROUP SESSION
09	GROUP SESSION
10	GROUP SESSION
14	GROUP SESSION
16	GROUP SESSION
17	GROUP SESSION
21	GROUP SESSION

23 GROUP SESSION

24 GROUP SESSION

28 GROUP SESSION

30 GROUP SESSION

31 GROUP SESSION

November

04 GROUP SESSION

06 GROUP SESSION

07 GROUP SESSION

11 GROUP SESSION

13 GROUP SESSION

14 GROUP SESSION

18 GROUP SESSION

20 GROUP SESSION

21 GROUP SESSION

25 GROUP SESSION

27 -28 NO SESSIONS THANKSGIVING HOLIDAY

DECEMBER

02 GROUP SESSION

04 GROUP SESSION

05 NO SESSION: CLASSES OVER

Group Session: PROBLEM IDENTIFICATION

This session may take more than one meeting to complete. The group during this session should continue to be supportive and positive. Stress to the group that problems can be identified and discussed in a positive manner from which everyone will learn and grow. Before completing this session, it is very important that each group member identify one problem which they would like to solve in group.

Exercise: What is Causing Me Problems?

Preliminaries. This content exercise can help group members identify a problem or concern which is limiting their success and can also help them identify one problem which they would like to solve. It is a good exercise for groups of eight to sixteen members and takes one to two hours to complete.

Resources. Your room should be large enough for smaller groups of three or four people to work together without disturbing the other smaller groups.

Process. The large group is broken down into smaller groups of three to four people. The leader asks members to think about some personal problems which they may have had during the past month or two. Once this has been done, the group

leader asks each member to describe these problems to the people in their small group. (*Emphasis at this time is on problem identification - not problem solving*). Each member, with the help of those members in the smaller groups, then selects one problem they would like to solve within the group setting.

When these problems are being identified, it is important that the group leader establish some basic guidelines for members to follow. Some of the following considerations will be helpful establishing these guidelines:

1. Is the problem within the capability of the group to solve? Deep-seated emotional problems, for example, probably are beyond the capabilities of the group to solve. These kinds of problems should be avoided. However, learning to control aggression, establishing life goals, and getting help in coping with daily life are examples of problems that *can be handled* within the group setting.

2. Is the problem short term in nature? Generally, it is best if group members begin by solving short-term problems. Experiencing success in solving these short-term problems will enhance a person's problem-solving ability and help them solve long-term problems.

3. Will solving this problem benefit the group member immediately? Rewards and benefits for solving this problem should be immediate. A group member should experience success as quickly as possible if their desire to work on personal problems is to continue.

The leader ensures that each member has identified one problem within the small groups according to established guidelines. When this has been completed, the leader closes the meeting by summarizing what has happened and by giving a

brief preview of what will occur during the next meeting. The summary should be a general recap of the *process* of the group meeting. The leader should stress *positive* points that occurred during the meeting (such as involvement, participation, interest, concern, etc.).

Profile of Class Tutor

Tutoring and Testing Schedule

Appendix F

Class Tutor

The class tutor is an honor Sociology Major. She is from the eastern part of North Carolina. She is a first generation college student and is from a disadvantaged socioeconomic background. In the past two years she has been awarded two academic scholarships. She is a very outgoing individual with a commanding presence. She is president of her sorority, a former member of the student council, and has served as a class tutor for this researcher in the past. She has an excellent grasp for what the students do not understand as it relates to class information and she is able to assist those students in need of help.

TUTORING SCHEDULE and TESTING SCHEDULE

September

03	Tutoring
04	Tutoring
05	Tutoring
10	Tutoring
11	TEST 1
11	TUTORING (Next chapter was started.)
12	TUTORING
17	TUTORING
18	TUTORING
19	TUTORING
24	TUTORING
25	TEST 2
25	TUTORING (Next Chapter was started)
26	TUTORING

October

01	TUTORING
02	TUTORING
03	TUTORING
08	TUTORING
09	TEST 3
09	TUTORING (Next chapter was started)
10	TUTORING
11	TUTORING

15 TUTORING

16 TUTORING

17 TUTORING

22 TUTORING

23 TUTORING

24 TUTORING

29 TUTORING

30 TEST 4

30 TUTORING (Next Chapter was started)

31 TUTORING

November

05 TUTORING

06 TUTORING

07 TUTORING

12 TUTORING

13 TEST 5

13 TUTORING (Next chapter was started)

14 TUTORING

19 TUTORING

20 TUTORING

21 TUTORING

26-28 NO TUTORING: THANKSGIVING BREAK

December

03 TUTORING

04 TEST 6

04 TUTORING Sessions Over

09-12 FINAL EXAMS

Objective Test Used In Tutoring Sessions

Appendix G

Barber-Scotia College Record of Tutorial Session

Student Sign-In Sheet

Appendix H

BARBER-SCOTIA COLLEGE

RECORD of TUTORIAL SESSION

Tutee's Name ______________________________

Date of Meeting	Time of Meeting	Summation and Comments of Meetings	Tutor's Initials

Date_____

STUDENT SIGN IN SHEET

Student Name	I.D.#	Area Tutored In	Time In	Time Out

Class Attendance and Tardiness Policy

Appendix I

CLASS ATTENDANCE AND TARDINESS

All students are expected to attend all classes (including laboratories and special sessions) for which they are registered and to be **on time** for each meeting. No **"allowed"** number of absences is automatically granted to a student. No rights or privileges exist which permit a student to be absent from any given number of class meetings. A student **will not** receive credit if he misses more than **four (4)** of the scheduled class meetings, unless extenuating circumstances exist. **Three** tardies will constitute one absence.

Regular class attendance is a student's obligation and a student is responsible for all the work, including tests and written work of all class meetings.

Individual instructors are responsible for giving each student a statement of the attendance policy for the class during the first class meeting. The **student** is responsible for observing the stated regulations. Instructors **are not** obligated to provide make-up opportunities for students who are absent without adequate cause. The Vice President for Student Affairs and the Vice President for Academic Affairs will be responsible for judging the legitimacy of cause for absence.

Tutor Questionnaire

Appendix J

Use the scale below for your answers.

5:Yes, Very Much, 4:Yes, 3:Somewhat, 2: Not Very Much, 1: Not At All

1. Did you find the tutoring sessions helpful? (Please check one)

   5 [ ] 4 [ ] 3 [ ] 2 [ ] 1 [ ]

   Please explain.

2. What did you find most helpful about the tutoring sessions?

3. What did you find the least helpful about the tutoring sessions?

4. Would the tutoring sessions be helpful for the second part of the course? (Please check one)

   5 [ ] 4 [ ] 3 [ ] 2 [ ] 1 [ ]

   Please explain.

5. If we can offer these sessions next semester, how would you suggest we improve the program?

Self-Esteem Questionnaire

Appendix K

Use the scale below for your answers.

5:Yes, Very Much, 4:Yes, 3:Somewhat, 2: Not Very Much, 1: Not At All

1. Did you find the self-esteem sessions helpful? (Please check one)

   5 [ ] 4 [ ] 3 [ ] 2 [ ] 1 [ ]

   Please explain.

2. What did you find most helpful about the self-esteem sessions?

3. What did you find the least helpful about the self-esteem sessions?

4. Would the self-esteem sessions be helpful for the second part of the course? (Please check one)

   5 [ ] 4 [ ] 3 [ ] 2 [ ] 1 [ ]

   Please explain.

5. If we can offer these sessions next semester, how would you suggest we improve the program?