

COVER SHEET

DOE/EW/ 11494-T1

USDOE GRANT #: DE-FG01-94EW11496

**STRENGTHENING PROGRAMS  
IN  
SCIENCE, ENGINEERING AND MATHEMATICS**

**THIRD ANNUAL PROGRESS REPORT**

**Shingara S. Sandhu, Ph.D.  
South Carolina Governor's Professor of the Year  
Distinguished Professor  
Director of Research and Grants  
Director of Center for Excellence in Science and Mathematics**

**Claflin College  
Orangeburg, SC 29115**

**Phone #: (803)535-5244**

**Fax #: (803)531-2860**

**Email: SSANDHU@CLAF1.CLAFLIN**

**September 30, 1997**

**DISTRIBUTION OF THIS DOCUMENT IS UNLIMITED**

**MASTER**

**Prepared  
for**

**United States Department of Energy  
Under Grant #DE-FG01-EW11496**

### **DISCLAIMER**

This report was prepared as an account of work sponsored by an agency of the United States Government. Neither the United States Government nor any agency thereof, nor any of their employees, makes any warranty, express or implied, or assumes any legal liability or responsibility for the accuracy, completeness, or usefulness of any information, apparatus, product, or process disclosed, or represents that its use would not infringe privately owned rights. Reference herein to any specific commercial product, process, or service by trade name, trademark, manufacturer, or otherwise does not necessarily constitute or imply its endorsement, recommendation, or favoring by the United States Government or any agency thereof. The views and opinions of authors expressed herein do not necessarily state or reflect those of the United States Government or any agency thereof.

## **DISCLAIMER**

**Portions of this document may be illegible  
electronic image products. Images are  
produced from the best available original  
document.**

Grant #: DE-FG01-94EW11496

Title: Strengthening Academic Programs in Sciences, Engineering and Mathematics (SEM)

Author: Shingara S. Sandhu, Ph.D.

### Summary

The Division of Natural Sciences and Mathematics at Claflin College consists of the Departments of Biology, Chemistry, Computer Science, Physics, Engineering and Mathematics. It offers a variety of major and minor academic programs designed to meet the mission and objectives of the college. The division's pursuit to achieve excellence in science education is adversely impacted by the poor academic preparation of entering students and the lack of equipment, facilities and research participation, required to impart adequate academic training and laboratory skills to the students.

Funds were received from the United States Department of Energy to improve the divisional facilities and laboratory equipment and establish mechanisms at pre-college and college levels to increase (1) the pool of high school students who will enroll in Science and Mathematics courses (2) the pool of well qualified college freshmen who will seek careers in Science, Engineering and Mathematics (3) the graduation rate in Science, Engineering and Mathematics at the undergraduate level and (4) the pool of well-qualified students who can successfully compete to enter the graduate schools of their choice in the fields of science, engineering, and mathematics.

The strategies that were used to achieve the mentioned objectives include: (1) Improved Mentoring and Advisement, (2) Summer Science Camp for 7th and 8th graders, (3) Summer Research Internships for Claflin SEM Seniors, (4) Summer Internships for Rising High School Seniors, (5) Development of Mathematical Skills at Pre-college/Post-secondary Levels, (6) Expansion of Undergraduate Seminars, (7)

Exposure of Undergraduates to Guest Speakers/Roll Models, (8) Visitations by Undergraduate Students to Graduate Schools, and (9) Expanded Academic Program in Environmental Chemistry.

The funding from USD<sup>2nd</sup> 'A and the Education Department has enabled the college to establish a center for the Excellence in Science and Mathematics, under the direction of Shingara S. Sandhu. The numbers of SEM students at Claflin and other colleges have been steadily improving. The academic background of students has taken a turn for the better. The funding has led to better training of minority students which in turn have enhanced their marketability to seek employment in industry or to enter the graduate school after graduation from Claflin College. The laboratory and computing facilities including INTERNET etc. have improved considerably which are reflected in offering wide variety of new courses and better research environment.

## **Strengthening Academic Programs in Science, Engineering and Mathematics**

### **Claflin College**

Since 1869, Claflin College in Orangeburg, South Carolina, has been in the business of preparing minority students to become productive members of society. Over the years the college has responded to and has been shaped by the vicissitudes of a nation still young, busily growing and changing. Claflin College is a Historically Black Liberal Arts College, associated with the United Methodist Church. Through more than a century, when Black Americans were denied equal access and educational opportunity by "mainstream" institutions, Claflin has remained steadfast in providing education to those who were in need of academic preparation and spiritual support.

The mission of Claflin College is to provide a liberal arts education in a nurturing environment for students of potential. Claflin aims to produce graduates who are prepared not only for a life of productive work but who also have an understanding of themselves and their world that will equip them to function as fulfilled, contributing members of society.

With new demands today for institutional effectiveness, the college remains sensitive to its special mission. Quality and access continue to be wedded, as are innovation and tradition, in the goals of Claflin College.

Claflin College is fully accredited by the Commission on Colleges of the Southern Association of Colleges and Schools, and provides teacher education accredited programs by the South Carolina State Department of Education. Academic programs are divided into four divisions with eleven departments. Twenty-four majors are housed among the various departments.

While Claflin is a Liberal Arts College, it offers majors in business and teacher preparation. The average full time current enrollment is 1050 students, with a student to professor ratio of 15 to 1. The divisional student body is at 315. The

computer science and pre-medical programs are the fastest growing areas on campus.

Over the last eight years the administration has actively supported a more central role for science and mathematics. The College President, Dr. Henry N. Tisdale is committed to allocate resources for the continuous growth of the Division. This thrust is obvious in the nomination, and support, of a science faculty for professional meetings and training. The Admissions Office has been given a special charge to intensify its efforts to recruit students with potential to study in the areas of health, physical sciences, engineering, and mathematics. Visiting scientists have been solicited and brought to the campus to address students and faculty and new science courses and programs have been developed. A strong indicator of the college's commitment to science programs is the decision of the administration to seek support for science activities under its current Title III Program.

#### **Science and Mathematics Programs**

The Division of Natural Science and Mathematics houses all of the college's programs suggested for improvement by the title of this grant. Majors in the division are the following: 1) Biology, 2) Biology Education, 3) Biology/Chemistry (Pre-Med), 4) Environmental Sciences, 5) Several Collaborative Programs with the Medical University of South Carolina (MUSC), 6) Chemistry, 7) Environmental Sciences, 8) Double major in Biology/Chemistry, 9) Computer Science, 10) Mathematics, 11) Mathematics/Computer Science, 12) Mathematics Education, 13) Management Information Science, and 14) Cooperative Engineering with South Carolina State University. About thirty percent (30%) of all majors reside in this division.

Thirty percent (30%) of the faculty teach in this division. Eighty-six percent (86%) of these individuals hold multiple master's or terminal degrees. In chemistry

every faculty member holds Ph.D. degree. The B.S. is the only degree awarded by the college in all above majors.

### Objectives of Science Education Project

Many problems regarding science and engineering careers for students originate for their lack of quantitative skills. Somehow the students going through the school system fail to acquire skills necessary to solve mathematical problems or to use mathematics to solve science and engineering problems.

In recognition of the deficiencies in scientific knowledge and techniques of Afro-American students, the following broad objectives were adopted for this project.

1. To increase the pool of qualified American born minority college students who will opt to major in science, engineering and mathematics (SEM).
2. To develop and foster knowledge, understanding and interest in SEM.
3. To increase the number of American born minority students graduating in SEM from Claflin College and other HBCUs.
4. To provide the learning experience and laboratory skills to American born minority students who can enter and graduate successfully from graduate schools in the areas of science, engineering, mathematics and technology.
5. To provide logic and critical thinking skills to minority students.
6. To develop in students the basic knowledge and skills essential to the understanding of mathematics.
7. To develop skills of accuracy and precision in thinking, communication, observation and manipulation.
8. To inspire in each student an interest in mathematics as an exciting and useful discipline.
9. To guide students to understand the elementary mathematical methods employed in science and technology.



### Conditions that Impact Negatively on Attainment of these Objectives:

1. Poor Academic Preparation of College Entering Students:  
The high school background of many minority students entering science, engineering and mathematics is inadequate to prepare them to pursue college level mathematics and science study. In particular, the analytical reasoning and critical thinking skills required for problem solving in these disciplines have not been nurtured at the high school level. This results in (a) low enrollment in many major programs relating to SEM and (b) high attrition rate for students who do elect science majors.
2. Lack of Familiarity with Rigors of College Life:  
A large majority of HBCU's students come from rural areas of inner cities and are first generation colleges. They probably do not have a close friend or a relative who is experienced with the college life. Many of the students absolutely have no idea of the rigors of college life and demand it put on a student to complete this life successfully. Such students need to be made aware of college life and its environment. These students are literally lost and confused on their arrival on HBCU campuses who can take such students by the hand and carry them through four years of their college life. This a cause of excess attrition and drop out (about 20% freshman class drop out prior to mid-term test) by college students. They need someone on campus who can be their brother, sister, mother, father and confident and a dear friend.
3. Lack of Diversity in Course Offerings:  
The number of faculty members in the division is small, so that the courses offered in each discipline meet the minimum degree program needs. Our students are not able to elect from a variety of upper level courses and thus have a narrower range of content than their peers from larger institutions.
4. Lack of Research and Laboratory Skills:  
Faculty at small institutions, like Claflin spend larger amounts of time in preparing instructional materials, setting up laboratory equipment, and inventorying equipment than their counterparts at institutions with teaching assistants, laboratory assistants and departmental secretaries. The division faculty must handle these duties, teach, advise, serve on committees and do research. The division currently has only three research grants which provide some research experience and laboratory skills to a limited number of students. Much is need to be achieved in this direction. However, it is hard for faculty members with 21 contact hours of teaching load to find time and energy to write a good fundable research proposal and do research at the same time.

5. Lack of Equipment for Teaching and Research:

The cost of laboratory equipment prevents students from receiving many experiences common to students enrolled in laboratory courses at larger institutions. Though the research environment is changing but still a large percentage of the senior thesis topics thus far undertaken by seniors graduating in the science and mathematics are theoretical investigations as opposed to experimental. The college has committed resources from Title III, MSIP and NSF to perform major laboratory renovation and buy teaching and research equipment. The division needs to provide research and laboratory experience in qualitative and quantitative techniques to its science, engineering and mathematics majors. Claflin students must experience the methods and skills normally required of professionals in SEM areas.

6. Deficiency in Quantitative Skills:

A major segment of HBCU students come from inner city or rural areas where the language of mathematics is not spoken or used. These students belong to families with relatively weak or no quantitative skills.

Consequently, these students are not exposed to smart scientific or business language. I have a theory. According to this theory and my belief, every kid is fascinated by science and the miracles of science. However; they are unable to handle the mathematical concepts of science. Every middle grader will tell you that the volume of a gas will squeeze if pressure is applied on it. But they are completely lost when the same principle is transformed on mathematical bases to seek solutions to such problems. It is obvious to me from my life long experience of working in one of the pioneering HBCU's colleges that good mathematical skills are conducive, even essential to any successful science program at the college level.

7. Public Attitude and Concepts of Science and Scientists:

There is no running away from international research and scientific development. The United States of America need to stay at the top of the community of nations to play its role as a world leader. To achieve this objective, the public concept of science and scientists need to change. The hard working science students should not be labeled as nerds. There is a feeling that many high schoolers do not work to their maximum potential because of the peer pressure. There is an enigma attached to participants in scientific-field that they have to work harder than their peers. Can you imagine a system where honest hard work is looked down upon by the peers? This has to change, and society needs to reach out to those who would like to work hard and succeed but are afraid to do so because of an environment which is not conducive for such endeavors. It is absolutely essential that the private and public agencies should provide leadership to change basic public attitude. There is a need to create feelings among our potential minority scientists and technologists that science, engineering and mathematics careers are exciting, challenging and can be successfully pursued and mastered.

8. Lack of Computer Support for Research and Research Training:  
Claflin College has an admirable record in providing computing facilities to students. The Computer Resources Advisory committee, chaired by Mr. Aslam oversees the planning, selection and installation of computer systems. Dr. Elwood and Ms. Holiday are also members of this committee. The college campus houses four computer labs: curriculum, business, humanities and the Division of Natural Science and Mathematics. Ironically, the last lab is actually the smallest. Access to computers has become more limited because of their increased use for a freshman computer concepts course (C.S. 200), remedial work in CAI Labs, upper level offerings in computer science, and independent study via computer in all disciplines.

The Division of Natural Sciences and Mathematics has made significant progress in alleviating some computer use related problems by establishing a Novel Networking System. This was accomplished with funding from the United States Department of Education (MSIP). The system presently consists of a server and twelve workstations. These workstations are assigned for use by the science and mathematics majors. There is an obvious need to provide each faculty member in the Division with a workstation in his or her office. Six additional workstations for use by the students are also required. This will expand the computer laboratory capabilities for use by senior science and mathematics majors for data acquisition and analysis in their research. All graduating seniors are required to conduct research under the watchful eye of the faculty of their choice, write a thesis and defend a seminar before their peers.

#### Strategies to be Utilized

Strategies utilized to achieve the objectives of the proposed project are listed below:

The ten major components of this project are:

1. Mentoring and Advisement
2. Summer Science Camp for Forty (40) Middle School students
3. Summer Research Internships for Ten (10) Claflin Science, Engineering and Mathematics Seniors
4. Summer Internships for Twenty-five (25) Pre-college Seniors
5. Mathematical Skill Development
6. Expansion of Computer Simulated Science, Engineering and Mathematics Laboratory
7. Student Seminars
8. Guest Speakers
9. Visits to Graduate Schools
10. Strengthening Offerings in Environmental Sciences

Each component is discussed in greater detail below.

1. **Mentoring and Advisement:** A large majority of HBCU students come from rural areas of inner cities and are first generation college educated. When they reach campus, they are bewildered, amazed and unsure, of what to make of this sudden change. This is the first time they have been away from their homes and families. The graduation rate of these students (taking into consideration the academic background of freshman) is high, but still less than thirty percent. There is a very large attrition rate. More students drop out because of personal reasons (20% prior to mid-term) rather than poor academic performance. Much attrition related to personal and family problems can be prevented with adequate mentoring and advisement. Claflin College does have in place a small mentoring program that needs to be expanded. Faculty in the Division of Natural Sciences and Mathematics serve as mentors and academic advisors to the 1994 Freshman Class. The mentors hold the incoming freshman by the hand and carry him or her through the rigors of college life.

The mentors act as parents away from home. They meet with each student at least once a month individually and once in group sessions to evaluate their academic progress as well as any difficulty relating to their private life or at the home front. They are actively involved with the students and devote a substantial amount of time of personal interaction on an individual basis. The mentors are made aware that if students miss the class, has been sick or is trying to apply for any kind of leave of absence. The mentor is the first one to know of any change in his/her mentees activities. The mentor stays constantly in touch with the dorm supervisor and parents to watch out for signs of distress. The mentor keeps his mentees informed about (I) summer opportunities in his or her area, (II) potential topics of research for his or her thesis requirements, (III) opportunities to get into a graduate school, (IV) scholarships and other financial opportunities available in different science, engineering, and mathematical areas, (V) visits to graduate schools, (VI) research mentoring during the summer.

Mrs. Alice Tisdale, First Lady of Claflin College and Director of Honors College, is in charge of the mentoring programs and provides leadership to the students and faculty to guide, motivate and direct the students towards the ladder of success. A summary of Mentee/Mentors matching for honor students is given on the following page.

**1996 Mentees / Mentors**

Wanda Bamberg - Layshia Fowler  
Latrice Belfon - Carleen Addison  
Dana Burgess - Shanelle Bowman  
Avis Burns - Yolanda Bruce  
Melissa Carter - Heather Brunson  
Ranecci Dicks - LaShay Montgomery  
Shanelle Freeman - Tanisha Jeffcoat  
Nakisha Granger - Wanda Cloud  
Usheka Haggood - Andrea Miller  
Kwane Hannible - Don Knox  
Tennille J. Paul - Angelia Sumter  
Marlina Johnson - Wakesha Jeffcoat  
Nashauna Jones - Cakeitha James  
Lola Kelly - Felicia Jamison  
Jeanine Lunsford - Tiffany J. Paul

Shaquan Young - Jamie Paulk

Marc Maynor - Mario Backman  
Eartha McFadden - Kellie Wade  
Monique Modest - Tara Williams  
Craig Nelson - Kenya Simmons  
Gregg Nelson - Terry Green  
Joe Oliver - Yusef Frazier  
Tiffany Reed - Veta Johnson  
Erica Rhett - LaKeana Jones  
Jeanine Robinson - Terrica Byrd  
Jenarda Robinson - Letisha Edwards  
Jenee Robinson - Demetrice King  
Chasity Sello - Tina Price  
Rasheda Smith - Rona Speights  
Dale Tyson - Ulriel Wood  
Abraham Wright - Kevin Amos

**1997 Mentees / Mentors**

Talitha Bing - Wakeisha Jeffcoat  
Leslie Charles - Latrice Belfon  
Kimberly Donaldson - Dana Burgess  
Nia Ford - Rona Speights  
Phaidra Glover - Veta Johnson  
Chenel Graham - Shawandra Quick  
Melvin Harris - Muhammad Bari  
Nikolai Legerton - Terry Green  
Dameon Mincer - David Manigo  
Lakinsha Petty - Jenee Robinson  
Nateisha Samuel - Eartha McFadden  
Qianah Simmons - LaKeana Jones  
LaSondra Thrash - Monique Modest  
Joseph Webb - Abraham Wright

Yolanda Brown - Jenarda Robinson  
Douglas Cox - Kenya Simmons  
Lasandra Evans - Chasity Sello  
Brandy Gamble - Kelly Wade  
Vernon Green - Terrance Turner  
Jonathan Hampton - Ivan Turner  
Shonda Jenkins - LaShay Montgomery  
Xerese McPhail - Nashauna Jones  
Rayla Parquet - Lola Kelly  
Kenia Richards - Jeanine Robinson  
Terrance Speights - Dana Colter  
Erica Smith - Tanisha Jeffcoat  
Rachel Weatherless - Tina Price  
LaKesha Williams - Erica Rhett

2. Summer Science Camp for Forty (40) Middle School Students: It is essential that the joy and miracle of science be brought to the attention of younger generations who may have the desire to pursue careers in science, engineering and mathematics. Summer Science Camp (SSC) for 7th and 8th graders created such an opportunity. The participants have become roll models for their friends, brothers and sisters.

Target Population for Summer Science Camp: Claflin College has been playing a salient roll in helping the high school graduates fulfill their dream of getting a college education. The college has several programs which are geared for the high school students. It administers Upper Bound and PRISM Programs, which are funded by the United States Department of Education. These programs focus on at risk high school students. These two programs, deal with at risk students bringing around 200 high school students to Claflin College and give them additional instruction so that they are qualified to enroll in a college of their choice.

The college also administers a Summer Science Enrichment Training Program which is funded by the United States Department of Energy Savannah River Site since 1988 and is directed by Dr. S. S. Sandhu. This program caters to better than average high school students and aims to increase the pool of well qualified college entering students who will elect to go into science, engineering, and mathematical careers. The college faculty is of the opinion that we need to reach out to a younger group of students, middle school, to encourage them to excel in high school and strive for a college education. This reasoning led to the formulation of the proposed Summer Science Camp.

The project served forty-three (43) students. Five percent (5%) of the participants were white. Students were from middle schools - 7th and 8th graders. All middle school principals in South Carolina were contacted. The total eligible student population in South Carolina and neighboring states was given the opportunity to participate. The list of participants is given below. The science camp was arranged for forty-three (43) middle school students, interested in SEM, were exposed to quantitative skills, computer and English. These were the gifted group of participants selected from a pool of two hundred and fifty (250) applicants.

Kamila Baker  
Emma Cassedy  
Troy Cooper  
La'Deindre Davis  
Robyn Gratic  
Elijah Heyward III

Tyimeka Baker  
Tawanna Chatman  
Cortney Crews  
LaPorcha Demons  
Elliott Grove  
Kimberly Holmes

Chad Burgess  
Todd Cooper  
Jenna Crum  
Nicole Gant  
Veronica Hasben  
Justin Howell

Leah Huggins	Xan Jennings	Jason Johnson
Tiphanie Johnson	Deidre Jones	Veronica Jones
Ryn Jordan	Timothy Krakue	Samantha Linning
Stephanie Livingston	Carl McGill	Jeanine McKnight
Chandre Morgan	Dionna Murphy	Nicole O'Neal
Shaana Palmer	Avian Parker	RoShanda Pringle
Elsa Rice	James Rickenbacker	Shani Simmons
Brittany Smith	Dane Smith	Tanisha Whitmore
	Sharolyn Singletary	

3. **Saturday Academy:** Saturday Academy is the follow-up of the Summer Science Camp. Participants in the Summer Science Camp come from through out the State of South Carolina as well as from adjoining states and was a residential program. To curtail the participants travel to Saturday Academy, the participation of students in this program was limited to the City of Orangeburg and surrounding communities. Saturday Academy meets twice per month. The names of Saturday Academy participants is given below:

Sinclair Abraham	Stephanie Abraham	Aleece Amaker
Kamilah Baker	Akeem Boneparte	Genathan Bookhardt
Tyimeka Brown	Madeline Caldwell	Stanyetta Carson
Taurean Cleckley	Erica Conner	Artis Coulter
La'Deidre Davis	Tanasa Davis	James Diamond
Nick Dixon	Tim Downing	Akila Gilyard
Elliott Grove	Latasha Esaw	Justin Howell
Kimberly Jackson	Raleigh Jackson	Xan Jennings
Erica Johnson	Ryn Jordan	Christopher Keitt
John H. Keitt	Johnathan Keitt	Sha-Tarah Keitt
Kweku Krakue	Stephanie Livingston	Santana Lucas
Ashley Maxwell	Antonio Mooror	Avian Parker
Cherise Pelzer	Johnathan Ravenell	Mark Robinson
James Ross	Shani Simmons	Shanitra Washington
	Brittany Williams	

4. **Summer Internships for Claflin Science, Engineering and Mathematics Students:** The involvement of undergraduates in research improves their laboratory skills and academic preparation. It is intended that the division students be provided that opportunity. However, there are only two faculty members of the division to provide release time to faculty for writing grants. A time is coming when Claflin will have enough funded research resources to have all students exposed to the laboratory research experience which will better prepare them to the rigors of graduate studies. The funds were allocated through this grant to establish ten (10) internships, two each in the areas of chemistry, computer science, engineering, mathematics and pre-med. The student's interests were matched with

one or more of the researchers in academic or industrial research laboratories across the nation. The college has collaborative understanding with Savannah River Ecology Laboratory (UGA) Aiken, SC; Savannah River Laboratory, Department of Energy Facility operated by Westinghouse; Albermarle of Orangeburg, SC; Atlanta University, Atlanta, GA; University of Georgia, Athens, GA; Medical University of South Carolina, Charleston, SC; South Carolina State University, Orangeburg, SC; University of Minnesota and University of Missouri where students conducted research under the watchful eye of a mentor for ten weeks. The students wrote reports of their summer research activities and presented in a seminar when they returned to Claflin College. It enabled them to evaluate their summer research place for potential graduate studies or employment.

For a student to be eligible for an internship, he or she must be a junior; must be majoring in the Division of Science and Mathematics; must have a GPA of 3.0 or better; must have the potential, motivation and desire to pursue graduate studies; must apply for internship with proper letters of recommendations. Final selection was done by the Project Advisory Committee.

The project was able to place eleven (11) of its SMET students in Summer Internship Programs with various universities and federal agencies. These students, all rising juniors and seniors were supported with fellowship funds from DOE and SCAMP. All students, a mix of Juniors and seniors, also received funding and financial assistance from the host institutions. Each of these summer research participants worked directly with a mentor, collected enough research data for making a research presentation on his/her return to Claflin's campus during 1997 Fall term. Many of these students continued to work on their research topic to collect additional data for use in their thesis. The name of the participants are given

below:DOE:	<u>Name</u>	<u>Subject Area</u>	<u>Place of Research</u>
	Rona Speights	Computer Science	The Babcock Center
	Keisha Cohen	Biology	The Regional Medical Center
	Nina Montgomery	Biology	Claflin College
	Terrica Byrd	Pre-Med	Argonne
	Letisha Edwards	Pre-Med	University of Florida
	Winifred Smith	Pre-Med	South Carolina State Univ.
	Veta Johnson	Chemistry	Florida State University
	Kenya Simmons	Chemistry	Brookhaven National Lab.
SCAMP:	<u>Name</u>	<u>Subject Area</u>	
	Octavia Smalls	Chemistry	
	Niya Simmons	Biology	
	Jenee Robinson	Chemistry	



5. Summer Internships for Twenty-two (22) Pre-college Seniors: There are a large number of young minority minds who are curious to explore the ways the science works and the scientists come up with new discoveries. It is believed that the involvement of curious young minds in scientific work will fuel the fire to explore further. It was suggested in this project that high school rising seniors who have a desire to pursue careers in science, engineering and mathematics be provided an early headstart and be given the opportunity to participate in research under the watchful eye of a mentor at a college campus of his or her choice. Such activities stimulate the high ability students to continue their education and plan for careers in science, engineering and mathematics. Information about Summer Science Internships was communicated to the targeted group through advertisement in news dailies. Twenty-five participants were selected. Their interests were matched with the host laboratories. The participants worked with research mentors on the campus of the mentor who were located in South Carolina or the adjoining areas of Georgia, North Carolina or Florida.

This group assembled at Claflin campus prior to their departure to the destination of their summer research. The students wrote a report of their summer research activities and presented this in a seminar on their return to Claflin Campus at the end of the summer. It enabled the participants to evaluate his or her summer research place for potential undergraduate studies. This was a great experience for these high schoolers, which, I believe, they will cherish for the rest of their life. The names of the participants are given below.

<u>Name</u>	<u>Title</u>	<u>Place of Research</u>
Shannata Robinson	Undergraduate Chemistry	Francis Marion Univer.
Alanna Williamson	Nurse's Assistant	Low Country Gen. Hosp.
Ashley Heath	Survey of Mice	Medical Col. of Georgia
Detra Dopson	Deputy Clerk Worker	Jasper County Treasurer
Jamella Chatman	General Dentistry Assistant	Dr. Traci Lennon's Office
Aparna Choudhury	Biochemical & Biophysical	Francis Marion Univer.
Louis Haynes	Cybergenetics	Med. University of SC
Brandon Toliver	Project JTB21 Intern	Trident Technical Center
Kentrill White	Engineering Assistant	Trident Technical Center
Jason McMichael	Project JTB21 Intern	Trident Technical Center
Tanya Coburn	Computer Data Analysis	Robert Bosch Corporation
Lorena Hatcher	Technology Coordinator	Clarendon Dist. 1 Office
LaRon Stewart	Plant Molecular Biology	Clemson University
Michael Jordan	Medical Technician	Dr. F. Coulter's Office
Ronada Williams	Patient Technician	Roper Berkeley Center
LaFaith Miller	Office & Dental Technician	Dr. W. Walker's Office
Jhonda Wolfe	Medical Records Specialist	Family Health Center

Morris Miller	Supervisor Teen Vol. Prog.	National Science Center
Heather Gibbs	Transmission Tech. Area	Santee Cooper
Kinako Darby	Tutor/Teaching Assistant	Orangeburg-Wilkinson
Stephanie Isaac	Tutor/Teaching Assistant	Orangeburg-Wilkinson
Doshandra Newton	Primary-Ambulatory Care	Children's Health Center

6. **Mathematical Skills Development:** There are several factors that inhibit minority students entering the field of science, engineering and mathematics (SEM). However; one of the most important is their weak preparation in mathematics. Over eighty percent (80%) of the college entering freshman do not take math courses in high school that would have prepared them for the rigors of SEM courses like general chemistry, general physics, biology, etc. These courses require a good background in College Algebra, which most of the freshman do not have. Students are required to enroll in math preparatory courses for about a year prior to their getting into any science and engineering program. This schedule puts them on a five year academic program which scares them, and many shy away from joining the science programs. Under the prevailing set of conditions, it is very challenging, to say the least, to lure freshman to the field of science. It is essential for the success of any science program that the quantitative and mathematical skills of college entering freshman be improved and developed to a level where they can start taking courses in the major area of their choice as they enroll as freshman in the college of their choice.

The project proposed to offer two courses in mathematics. College Algebra (Math 111) and Pre-Calculus (Math 112). Math 111 and Math 112 were offered for six weeks of each summer. Pre-College, Post-Secondary students were the targeted audience for these courses. The student who has graduated from high school, is college bound, and who needs to improve his mathematical skills were also approached and motivated to enroll in these courses. Opportunities to enroll in the proposed program were also given to high school rising juniors and seniors who did not have an opportunity to take such courses during their tenure in high schools.

Advertisements were taken in the daily newspapers throughout South Carolina and the adjoining areas of Georgia, North Carolina and Florida. The students applied in response to these advertisements which generated a pool of applicants. Participants selected from this pool, joined Math 111, Math 112 and Computer Science 200.

The factors which went into the selection of the participants are given below:

1. General academic background/preparation
2. Grade of B or better
3. Desire to succeed in SEM fields
4. Recommendations by classroom teachers
5. Background in science courses
6. Potential field of study in the college

The participants were notified of their selection and were required to inform the director immediately about their desire to participate in the program. Mathematical Skills Enhancement courses, Math 111 and Math 112 were held at the Claflin College campus to run concomitantly with the college's summer academic session. The programs was run for six weeks for 1997 summer. It enrolled new participants. The participants were given hands-on training in computer (PC) operation by the math instructor who was aided by four senior math/computer science students. Two of these student tutors/mentors were involved with Math 111 group and the other two with Math 112 group. After the initial training each participant was assigned a terminal on Novel Network which have a large variety of mathematical software installed including math CAD. Additional software relating to Math 111 and Math 112 were procured and installed and made available to the participants. The course material was offered in concentrated form by the instructor with the aid of math/computer software. The participants practiced on their terminals. The students' mentors who sat in classes, stayed with their assigned groups and helped them to master the material by use of CAI.

The participants were given several hourly tests and the final tests and were evaluated on the basis of those tests as well as on the basis of their participation in class discussions and question/answer sessions. The catalog descriptions of Math 111 and Math 112 is given below.

#### Math 111. College Algebra

**Prerequisite:** Satisfactory performance on a placement exam or Math 101. An extension of high school mathematics including properties of real numbers, the complex number system, inequalities, linear equations, systems of equations, exponents, and introduction of functions and applied problems. Four hours lecture per week. Required of all students, three hours.

#### Math 112. Pre-Calculus

**Prerequisite:** Math 111. Topics in algebra and trigonometry specifically needed for the study of Calculus. Introduction to functions including linear, quadratic, exponential, logarithmic, trigonometric, parametric graphing. Trigonometric equations, identities and basic concepts of analytic geometry. Four credits, five contact hours.

Each course allowed participants to earn four (4) semester hours credit, transferable to the college of their choice as long as the course descriptions match. The participants also took C.S. 200 (Computer Concepts), a required and useful course for all college bound students. The participants were also enrolled in test-taking skill improvement program. Names of the participants enrolled in these two programs are given below:

Math 111:	Sareka Davis	Lance Drayton
	Allison Gibbs	Alice Harden
	Denise Haynes	Gene Hill
	Mark Holliday	Dawn Jones
	Travia Levine	Chimere Oliver
	Shaunda Prince	Tywanda Reddic
	Miranda Shaw	Donna Smith
	Steve Triplett, III	Agnes Berry
	Laytora O'Neal	Gopal Chakrabarti
Math 112:	Cassandra Allen	David Broughton
	Tasha Brown	Kia Carson
	Shanese Cauthen	Tevia Davis
	Cathy Emineth	Harry Ferguson
	Angel Figueroa	Meresseit Herbert
	Temeshia Johnson	Trevin Johnson
	Khali Kitchings	Erica Stanley
	Ray Washington	Charee Wright
	Natalie Mason	

#### 7. Expansion of Compute Simulated Science, Engineering and Mathematics

**Laboratory:** The Division of Natural Sciences and Mathematics with funds from United States Department of Education (MSIP) was successful in establishing in 1992 a Novel Networking Laboratory for use by its students. The laboratory consists of a server and twelve IBM PC Terminals. It also includes monitors and printers. This a great facility. However; it did not meet the total needs of the division as the students interest in computer learning, operations and its applications in the areas of biology, chemistry, engineering and mathematics is growing. Additionally, some of the faculty members who are involved in teaching computer interphase courses need computer terminals in their offices so that they are well prepared for the use of computer aided instructions. Eight additional computers have been acquired and linked to the file server and VAX system. Two of these were assigned to the faculty and the remaining were installed in the computer laboratory for student use.

Software selected by faculty in each target course area (chemistry, physics, engineering, genetics and mathematics) was installed on the file server and central

computing system. A schedule was developed for use of the facility during each semester by the students and division faculty.

The computers are used by students for data acquisition, data analysis and statistical manipulations. The computer laboratory is a valuable instrument which helps the division students in their learning.

The computer laboratory has been renovated and expanded with a \$0.5 million grant from the National Science Foundation. The expansion of this facility has immensely aided our students in their computing skills and has improved their chances to compete for graduate school admissions. The college is on the Internet and has its own Web page. Every faculty member in the division has access to the Internet from his or her PC located in his or her office.

8. **Student Seminars:** The Division Seminars were established under the MSIP Grant. This activity appears to be a useful addition to prepare our students to enter graduate schools. This activity has been expanded. The total division faculty and students meet every Wednesday or Friday in the Iowa Room of the JST Science building to listen to the seminars, prepared by students (Juniors and Seniors) with the help of his or her advisor and presented by the students. The students are graded by their peers as well as by the faculty. The students present their won research findings or search the topic/s of their interests for such presentation. This kind of approach has sharpened their academic skills with respect to scientific communications and improved their chances for graduate schools. The student seminars have been institutionalized and have become a part of graduating requirements from Claflin College.

9. **Guest Speakers:** Guest speakers drawn from academia industry, federal and state agencies were invited to participate in the divisional science seminars. The guest speaker addressed such topics as:

1. Additional personnel needs in Science and Technology
2. The role of minorities in science, engineering and technology
3. Potential job opportunities in different science and engineering fields.
4. Information on graduate schools.
5. How to do well on standardized tests.
6. Tips on getting into medical and other health related schools.
7. Tips on getting into science, engineering and mathematics graduate schools.

The guest speakers were drawn from the group of minority pool of scientists. These guest speakers also acted as role models for students who discussed with them their future career options in science, engineering, and mathematics.

Most of the guest speakers donated their time and expertise free of any cost. However; the college provided them with meals. A small amount of funds are available to meet the cost of a small number of students who participated in lunch etc. arranged for the guest speaker. Only those students whose future career goals relate to the speaker's expertise participated on such occasions.

10. Visits to Graduate Schools: Claflin College encourages and guides its seniors to seek acceptance in graduate schools to pursue Ph.D. degrees in the areas of their interests. In this connection the division students visited graduate schools of Atlanta, University of South Carolina, Columbia, SC; Ohio State University, Columbus, OH; Medical University of South Carolina, Charleston, SC; and Howard University, Washington, DC to seek graduate level admission in biology, chemistry, biochemistry, computer science, engineering and mathematics. The visits were arranged by Mr. Ken Anderson, Director of Counseling and Placement.

11. Strengthening Offerings in Environmental Sciences: Early in 1992, The National Congress for the Advancement of Minorities in the Environmental Profession, consisting of several CEOs and Senior Vice Presidents of environmentally concerned corporations, met in Atlanta with the Council of Presidents of the Historically Black Colleges and Universities/Minority Institutions' (HBCU/MI) Environmental Technology Consortium. This unprecedented meeting focused on an issue of critical and mutual interest - the education and training of our country's existing and future professional environmental workforce.

At its initial meeting, the National Congress Executive Committee resolved to establish a five-year partnership between the U.S. Environmental Industry, Government and National Leaders in the Education and Training of underrepresented minorities - African Americans, Hispanics and American Indians - in the sciences, research and technology. It is envisioned that real progress can be achieved in creating opportunities and stronger participation within a variety of minority communities by working together on programs and projects of mutual interest in:

- Minority Outreach and Pre-College Education
- Undergraduate Education and Post-Secondary Training
- Graduate and Post-Graduate Education and Research
- Technology Transfer

An academic program consisting of a chemistry major with a concentration in Environmental Chemistry was approved by the Academic Affairs Committee of Claflin College and is listed in the 1992 - 93 College Catalog (pages 255-260). This

program has been redone and now is called Environmental Sciences. The courses in this program now are offered.

The institutional needs in the Environmental Sciences as given below have been satisfied. These needs embrace the objectives of the National Congress.

1. To provide learning experiences and laboratory skills which will motivate students graduating from Claflin to select careers in Environmental Sciences.
2. To provide learning experiences and laboratory skills which will enable Claflin graduates to obtain compatible employment in environmental areas.
3. To provide learning experiences and laboratory skills which will enable Claflin graduates to obtain admission to graduate programs in this discipline.

The college has been able to hire a well qualified Environmental Scientist who has superb academic training (Ph.D., Chemistry, MIT) and background work experience in this discipline. He has worked with the industry as a consultant for a long time. The department is well equipped now for offering courses in Environmental Science. Two new labs -- Atomic Absorption and I.R. Spectroscopy -- have been dedicated after renovation of the facilities with funds from NSF and DOE Grants. Atomic Absorption has been procured and is being used for undergraduate research and teaching. The college has also NMR 300 MH and with funding from the Army is in the process of acquiring a MASS SPEC/GC system, a dry box and another FTIR for use in polymer material science research.

**I DOE / SCAMP Committee:** The DOE Committee was organized as Claflin obtained status of full participant in 1996 in SCAMP. The committee consists of Dr. Vermelle J. Johnson, Senior Vice President and Vice President for Academic Affairs; Dr. John Elwood, Chair of Department of Chemistry; Dr. Bettye Stokes, Chair of Department of Biology; Dr. K. Selvavel, Chair of Department of Computer Science and Mathematics; and Mr. P. Aslam, Director of Academic Computing. The committee is chaired by Dr. S. S. Sandhu, Site Coordinator for SCAMP Programs and director of this grant. This committee held several meetings during 1996 - 97 Academic Year and guided the SCAMP Site Coordinator and director of this grant for managing the program related activities.

**II Research Activities/Emerging Scholars Program:** Claflin College is one of the few undergraduate minority schools where research is an integral part of

student's academic curricula. Every student in the SMET area has to select a research topic, conduct research under the guidance and watchful eye of a mentor, write a thesis, present his or her findings in the form of a seminar and defend his or her findings before a group of peers and faculty. The DOE Grant has encouraged research and external fundings. Consequently, there are several on-going research projects and the work continues on them, as given below:

**\*Title: Effect of Soil Mineral Phases on the Abiotic Degradation of Selected Organic Compounds**

**Authors: Leatrice Williams, Kibley Parker and Monica Lyles, Senior Chemistry Majors**

#### Summary

The study was undertaken to evaluate the effects of soil, mineral phases on the rates of abiotic degradation of tetraphenylborate (TPB) and diphenylboronic acid (DPBA). In addition to kaolinite and montmorillonite clay minerals, the role of goethite, corundum, manganite, and rutile in the degradation of organoborates was also evaluated. The effects of DPBA, argon, molecular dioxygen ( $O_2$ ) temperature, and organic matter on the degradation of organoborates were also measured.

The results indicated that TPB and DPBA degraded rapidly on the mineral surfaces. The initial products generated from the degradation of TPB were DPBA and Biphenyl, however; further degradation resulted in the formation of phenyl boric acid and phenol which persisted even after TPB disappeared. The data also showed that the rate of TPB degradation was faster than Kaolinite, a 1:1 clay mineral, than in montmorillonite, a double-layer mineral.

The initial degradation of TPB by corundum was much higher than goethite, manganite and rutile. However, no further degradation by this mineral was observed where as the degradation rate of TPB continued by goethite and rutile minerals. Overall, the degradation rate of TPB was the highest for goethite as compared to the other metal oxide minerals. The degradation of TPB and DPBA was a redox reaction where metals (Fe, Al, Ti, Mn) acted as Lewis acids.

DPBA and argon retarded the TPB degradation where as a molecular oxygen organic matter and temperature increased the rate of TPB disappearance.

**\*This grant has terminated.**



**Title: FTIR Analysis of Gaseous Products from Hazardous Waste Combustion**

**Authors: Shingara S. Sandhu, John P. Elwood, Terry B. Green, LaKeana A. Jones and Melviena V. Miller**

**Abstract**

A Fourier Transform Infrared (FTIR) System was installed to perform quantitative analysis of gaseous emissions from the incineration process. Identical instruments have been used for extractive sampling of stack gases at commercial manufacturing and incineration facilities. A series of small chlorinated hydrocarbons (as well as carbon monoxide and carbon dioxide) were run at various concentrations in the gas phase. The integrated peak area in the functional group region of the IR spectra was found to be linear with concentration and additive in binary mixtures of the analytes.

The ability to detect liquid (at room temperature), chlorinated hydrocarbons at elevated temperature was proven viable. A computerized algorithm and data analysis system to accurately calculate concentration at various pressures, temperatures, and sample volume changes was developed.

A heated, temperature controlled, long path IR cell has now been installed and made operational. A temperature controlled, two stage combustion cell will be installed shortly to feed actual combustion products to the FTIR.

Terry Green, a Junior Chemistry major, traveled with Dr. John Elwood to present their work at an incineration conference sponsored by EPA and MIT in Boston. LaKeana, Melviena and Terry were the co-authors of a paper presented by Dr. Shingara S. Sandhu at the 212th American Chemical Society National Meeting held in Orlando, Florida August 25, 1996 to August 29, 1996. The research on the Thermal Destruction of Hazardous and Household Waste has been expanded to include corporation - McCray Inc. - which is interested in commercializing the process to produce Methyl Alcohol. The Claflin students will continue to be a part of this on-going commercialization of laboratory research.

This work is in progress. The present work consists of, "Detection of Transient Species from Laser Ablated Polymers via FTIR." The summary of this work is given below:

An air tight plexiglass laser ablation cell was constructed to conduct the experiments and hold the polymer samples. Several runs with methane and methyl chloride in single dilutions were made and compared to results obtained in 1995. This information showed no difference in air and nitrogen backgrounds or ambient and 10 cm cells. It was concluded that the extinction coefficients of double dilutions were directly proportional to the coefficients of runs done with single dilutions. Additional runs were conducted with CO using double and triple dilutions. The moles of CO produced by ablation proved to be proportional to the laser duration. The numeral analysis showed that approximately 11 micromoles of CO was given off each minute. These laser ablation experiments consisted of the polymers, high impact polystyrene (HIPS) and PVC and flame retardants, hexabromocyclododecane (HBCD) and decabromodiphenyl oxide (DECA). Calibrations runs were made with HBr. However, HBr was not generated to any significant extent by laser ablation.

Title: "Detection of Transient Species from Laser Ablated Polymers via FTIR"

Authors: Shingara S. Sandhu, John P. Elwood and Jenee Robinson

#### Abstract

An air tight plexiglass laser ablation cell was constructed to conduct the experiments and hold the polymer samples. Several runs with methane and methyl chloride in single dilutions were made and compared to results obtained in 1995. This information showed no difference in air and nitrogen backgrounds ambient and 10cm cells. It was concluded that the extinction coefficients of double dilutions were directly proportional to the coefficients of runs done with single dilutions. The moles of CO produced by ablation proved to be proportional to the laser duration. The numeral analysis showed that approximately 11 micromoles of CO was given off each minute. These laser ablation experiments consisted of the polymers, high impact polystyrene (HIPS) and PVC and flame retardants, hexabromocyclododecane (HBCD) and decabromodiphenyl oxide (DECA). Calibration runs were made with HBr. However, HBr was not generated to any significant extent by laser ablation.

**Title: Assay Variation of Mitochondria DNA in Alligators at Cytochrome-b**  
**by**  
**Octavia Smalls**

The study of mitochondria DNA provides a great opportunity for studying the evolutionary changes at the molecular level. Since mitochondria DNA has a faster mutation rate than nuclear DNA, analysis of mitochondria DNA reveals more clearly how closely species are related evolutionarily. Also, by comparing the mitochondria DNA with a species, population structure and dynamics can be determined.

**Title: Thirty-three Year Results of an Open-Pollinated Progeny Test**  
**of**  
**Longleaf Pines in South Carolina**  
**by**

**Student: Niya Simmons & Mentor: Dr. Ambrose Anoruo**

The Longleaf Pine is the longest living of the Southern Pines. In 1966, two-year old pine trees at grass stage were planted in Aiken, South Carolina in order to be studied. The design was a ten-tree row plot with five replications. Each row of trees represented different counties in South Carolina. Most of the trees have now died or become diseased. In this project, I will be looking at the growth patterns of the Longleaf Pine trees planted in these plots. The purpose of the project is to determine which county produces the best trees. My main focus is measuring girth, which is the circumference of each tree. The larger the girth the more lumber can be produced. My results will be submitted to the Journal of Ecology and Management for publication.

DOE funded grant provided initiative also to receive funding from NSF, UNCF and NIH, which provided financial support to four students -- Monica Williams, LaKeana Jones, Terry Green and Melviena Miller -- to attend the NAFEO Conference held in Washington, DC during the month of April 1996. The students presented their research findings at this conference. The project also sponsored Terry Green to travel to MIT to present his research at a conference sponsored by MIT, EPA and USDOE. The topics of their presentations have been previously mentioned under research.

12. Scholar Awards to Honor Roll Students: Claflin awarded scholarships from the NSF funds to deserving students. The names and amount awarded to each are shown below. The support Claflin received from NSF is appreciated.

<u>Name</u>	<u>Amount</u>		
Amy Belton	3,110	Terrance Turner	3,000
Jerry Clark	2,000	Natasha Williams	2,452
Dana Colter	3,510	Monica Williams	2,000
Yusef Frasier	5,580	Tracey Hughes	4,000
LaKeana Jones	4,106	Demetrice King	5,506
Melvenia Miller	2,000	Sharon Maynor	3,510
LaShay Montgomery	4,716	Kenya Simmons	3,510

13. Summer Bridge Academic Program: The NSF provided additional funds to offer the Summer Bridge Program for the SEM Freshman Class of 1996. The NSF provided funds for room, board and tuition for 25 SEM students. The teachers were paid from another federally funded grant. The students were offered to take Math 111 (College Algebra) or Math 112 (Pre-Calculus) for college credit. Additionally each of the Bridge participants were required to take C.S. 200 (Computer Concept Course) for 3 S.H. (Semester Hours). C.S. 200 is required for all Claflin students. Math is one of the several hurdles for the SEM students. So these two math courses behind them, they can now go on to take the regular SEM courses rather than spending their time in pre-requisites. Most of the students did well, lot better than the average Claflin College student performance during the regular academic year. Most of the participants in Bridge are members of the Honor School. Name of the participants are given below:

Jewel Bowman	Maurice Cohen
Quiana Davis	Jude Elliott
Helena Figgures	Rochelle Jackson
Carmel Jenkins	Carlotta Johnson
Felicia Maine	Aubrey Marshall
Derrick Miller	Renee' Williams
Ebony Bellinger	

14. Student Science Enrichment Training Program (SSETP): The funds were also procured from Savannah River Site, a DOE facility which enabled us to offer science programs to thirty (30) High School Juniors and Seniors during 1996 Summer. Thirty (30) participants were selected out of a pool of 80 applicants. The program emphasized skill development in chemistry and computer science. These programs were offered at college level for seven credit hours. The credit they received from Claflin College is transferable to the college of their choice as long as the course

descriptions match. In addition to Math and Computer Science, students were trained to enhance their SAT Test-taking skills which enabled them to improve their SAT score on an average by about 75 points. The name of participants enroled in SSETP are given below:

India Adams	Marcus Alexander	Priscilla McCutcheon
Kemberly Beard	Jade Beasley	Daj Jarvis Mervin
Kendall Bolden	Naarah Bryant	Quewanda Middleton
Anastasia Burns	Nankwanga Cherry	Taluezeta Middleton
Porshia Cohen	Trevis Cooper	Victor Moses
Veronica Corbitt	Kylene Davis	Crystal Perkins
Curtis Doughty	Lannetta Elliott	Darius Porcha
Melissa Ellis	Joey Gilchrist	Shauntee Prince
Sherwin Gloston	Krystal Gooden	Shondra Ravenell
Shawntara Govan	Melodie Harrison	Joynelle Rivers
Angela Hinton	Sheldonia Jamison	Angela Williams
Harry Jenkins	Chiamaka Kalu	Shatisha Wilson
	Shelby Patterson	

15. **Group Tutorials:** NSF was able to support group tutoring and mentoring during the Academic Year (1995-96). The tutoring was arranged for Biology (Bio. 201 and 202), Chemistry (Chem. 121 and 122), Mathematics (Math 111 and 112), Physics 201 and 202. The names of the students involved in group tutoring are given below. This is one of the very useful activity that helps our students in respective areas and probably will and should continue in the future.

Name of Group Tutors:	Marsha Crosse	Trey Cooper
	Letisha Edwards	Terry Green
	LaKeana Jones	LaShay Montgomery
	Ivan Turner	Kelly Wade
	Koko Dagadu	Layshia Fowler
	Wakesha Jeffcoat	Veta Johnson
	Demetrice King	Andre Montgomery
	Shameika Moore	Jason Richards
	Christopher Walker	Winifred Smith
	Monica Williams	Victor Guinyard
	Muhammad Bari	Jason Richard

16. **Transition into Undergraduate Schools:** A good segment of students involved in Claflin College's Outreach Program were graduating seniors who have been accepted into the 1997 Freshman Class. The list of such students has been given previously (see under Mathematical Skills Improvement Program). The participants had a transition experience which I believe is going to leave an everlasting mark on their mind.

17. Modernization/Expansion of Science Facilities: Claflin College has received about a half million dollar grant from the National Science Foundation to renovate and repair its research and teaching facilities. The objective was to create additional research space for students and faculty to facilitate them in their endeavors of research. The renovation has been completed which enabled us to generate two research labs. One lab has been equipped with the state-of-the-art Atomic Absorption HITACHI Model 280 which along with accessories like Auto Sampler, Graphite Furnace, Hg Hydroxide System, etc. acquired under this grant and is being used for undergraduate research and teaching.

The second lab designated as IR Lab has been equipped with Perkin Ecmer IR, MIDAC FTIR Gas Analytical System and MIDAC FTIR Liquid Analytical System. Perkin IR was obtained from DOE under instrumentations give away plan and MIDAC instruments were procured with EPA and MSIP (Department of Education) Grants. R. McCray Corporation donated NMR to the Chemistry Department. The undergraduate teaching and research facilities developed with fundings from various federal agencies and corporations have allowed Claflin college to equip its science labs with the State-of-the-art Equipment for teaching and research.

Expected Outcomes: The computer and engineering labs have been expanded and furnished with additional computer and equipment. The Biology Department under this grant was able to build state-of-the-art animal facilities and genetics research laboratories. Each segment of the division - Biology, Chemistry, Computer Science, Engineering and Physics were the beneficiary of the renovation grant which in addition to additional space also provided them with much needed equipment.

1. Increase Enrollment in Sciences/High Graduation Rate: The implementation of the proposed project has resulted in strong science programs. An almost immediate effect has been more active participation by students in the learning process, as professors decreased reliance on lecture which was the major delivery technique. An intermediate effect has increased performance by students in science classes. As a result, the number of students entering science programs at the freshman levels has increased.

As expected the number of students graduating in science, engineering and mathematics has also increase. The freshman enrollment in the division increased by ten percent (10%) each year. Similar results have been revised for student graduation and entering the graduate schools. It has increased the pool of students seeking admission to graduate school. The data concerning student graduation is given on the following page:

Table I shows the number of students who graduated from the science division. There has been progressive increase in the number of students who graduated as compared to the baseline data of 1991. The graduation rate quadrupled by the end of 1996. This probably is inconsistent with the original estimates that went in for the formulation of the grant, but there is continuous progress in improving the graduation rate.

Table I  
SEM  
Total Degrees Conferred  
1991 - 1997

Natural Sciences	<u>1991</u>	<u>1992</u>	<u>1993</u>	<u>1994</u>	<u>1995</u>	<u>1996</u>	<u>1997</u>	<u>Total Degrees</u>
Biology	2	5	2	1	5	5	9	29
Biology/Chemistry	0	0	2	3	7	5	5	22
Chemistry	1	1	1	3	2	2	3	13
Computer Science	1	4	4	4	4	9	6	32
Computer Science/Bus.	0	3	6	1	0	1	0	11
Mathematics	3	0	0	3	2	0	3	11
Management Infor. Sys.	0	0	0	1	4	4	0	9
Math/Computer Science	0	5	2	1	1	2	3	14
<b>Total</b>	<b>7</b>	<b>18</b>	<b>17</b>	<b>18</b>	<b>25</b>	<b>29</b>	<b>29</b>	<b>143</b>

2. Increased Pool of Applications for Science and Mathematics at High School Level: The miracle of science, brought to the attention of 7th and 8th graders has motivated them to select tough subjects of science and mathematics at high school level. Summer Science Camp has planted seeds of scientific knowledge in the young minds which continues to grow and flourish. The response to this program is overwhelming and difficult to handle (see newspaper clipping).

3. Conception of Graduate Schools: The students completing the program specially those exposed to summer internships have achieved a more realistic conception about what to expect at the graduate level study of science and bachelor's level employment as a scientist, and most of them are better equipped to handle these environments. More students are seeking opportunities to participate in enrichment science activities at other institutions while they are undergraduates at Claflin. As a result of effective selection of software by faculty, students have acquire exposure to a vast, number of topics traditionally taught in courses not offered at Claflin, students have developed independent critical thinking skills, and faculty is able to measure student achievement accurately. The number of students entering graduate schools has been steadily improving.

4. Public Attitude Towards Science and Scientists: The Summer Science Camp has enthused the participant parents about the careers in Science, Engineering and Mathematics. This group of parents has continued to grow, and instill in their wards that the sciences are fun and that it is rewarding to put in honest hard work to achieve targeted objectives. The public attitude is changing to see science as a source of good, healthy, modern living rather than as a problem creating instrumentality.

5. Improved Performance of Graduates: The activities dedicated to the revitalization of the science disciplines has resulted in improved performance by

students in the various science courses. The willingness of students to undertake independent laboratory investigation as a mean of exploring a hypothesis and enrollment in upper-level variety of courses by some students has taken a turn for the better. Improved activities in research laboratories has enhanced student's academic capacity to undertake other courses with improved success.

SEM Class of 1996 graduating from Claflin has shown slightly better performance (GPA of 2.86) than the (GPA of 2.84) rest of the class.

6. Scientific and Educational Value of the Proposed Project: By the year 2000, the U.S. will need a lot more chemists, biologists, physicists and engineers than it is expected to produce. The science deficit can threaten America's prosperity and possibly even its national security. Economically, the nation will be unable to compete with the rising technical giants like Japan, South Korea and West Germany. Blacks and other minorities have a dismal record when it comes to the selection of careers in science, engineering and mathematics. Since blacks form only 2.7 percent of the national professional manpower. The execution of the proposed project has increase the pool of minority scientists both directly and indirectly, immediately and on a long term basis. On a direct basis each student completing the program qualified as a bachelors level technologist and as a potential graduate level scientist. Indirectly, each of these students are in touch with pre-college students for whom they act as good role models. The changes being effected by the proposed project are permanent, therefore its positive affect on the minority science pool is long-standing and everlasting. The project adds to the pool of scientists available for hiring by the federal and state agencies and by the industry. The division in a way, through this project, has become partners in alleviating the minority technical manpower shortage of the nation.

7. Problem Solving Skills Enhancement: Problem solving has been recognized as the primary skill required of students in science educational programs and of scientists at work. The development of problem solving skills achieved through enhanced laboratory facilities and mathematical training is a major focus of the proposed project. Since faculty has acquired facilities to increase student problem solving skills, students enrolled during the project period and future students of these faculty members are being positively impacted.

8. Increased External Funding: Since the funding of this project by USDOE, Claflin was successful in receiving grants from NSF, NIH, Lily Foundation, EPSCoRE, UNCF, NASA, and HUD just to mention a few.

Thank you USDOE for your support.