DOE/SR/18048--4

STUDENT SCIENCE ENRICHMENT TRAINING PROGRAM

A PROPOSAL FOR EXTENSION

SUBMITTED

TO

U.S. DEPARTMENT OF ENERGY
SAVANNAH RIVER OPERATION OFFICE

ATTN: Ms. Jean Guy
HBCU PROGRAM MANAGER
P.O. BOX A
Aiken, South Carolina 29802
(803) 725-8104

By

Shingara S. Sandhu, Chairman
Division of Natural Science and Mathematics
and Computer Science
Claflin College
Orangeburg, South Carolina 29115
(803) 534-2710 Ext. 244

PROJECT EXTENSION REQUEST
SUMMARY

TITLE: Student Science Enrichment Training Program

Funds are requested for a Student Science Enrichment Training Program, with special emphasis on chemical and computer science fields. The residential summer sessions will be held at the campus of Claflin College, Orangeburg, SC, for six weeks during the 1990 and 1991 summers, to run concomitantly with the college's summer school. Thirty participants which will be selected for this program, will include high school sophomores, juniors and seniors and some students from the freshmen class at Claflin College. the students will come from rural South Carolina schools which, presently, have limited science and computer facilities. The program is intended to focus on high ability minority students with high potential for science engineering and mathematical careers.

The major objective is to increase the pool of well qualified college entering minority students who will elect to go into science, engineering and mathematical careers. It is expected that the division of Natural Science and Mathematics and engineering at Claflin College will derive major benefits from this program which will help it to expand the departments of chemistry, engineering, mathematics and computer science as a result of additional enrollment. It will also establish an expanded pool of recruitable graduates by the federal agencies and private corporations, in science and mathematics at Claflin College. Department of Energy's relationship with Claflin College will increase the public awareness of energy related job opportunities in the public and private sectors.

There will be two programs: Chemistry and Computer Science. The major objectives of these programs are to develop and foster knowledge, understanding and interest in physical, computer, engineering and mathematical sciences. The program

will place emphasis upon laboratory experience, visual hand on work and some research participation. visits to Scientific Laboratories and other points of scientific interests will be arranged to stimulate scientific career goals among the participants. Several guest speakers from DOE, industry and academic institutions will participate in the program. They will talk about the careers in science, engineering and mathematics and will also act as role models for the participants.

1. Program Announcement Area
   HBCU Fellowship, Traineeship, Recruitment and IPA's

2. (a.) Project Director
   Shingara S. Sandhu, Ph.D.
   (b.) [redacted]

3. Name of Institution and Mailing Address
   Division of Natural Science and Mathematics, Computer Science and Engineering
   Claflin College, Orangeburg, South Carolina 29115
   Telephone: (803) 534-2710 Ext. 244

4. Dates of Purposed Award
   Spring Semester 1990 - July 1991

5. Purposed Duration of Award
   1990 and 1991 Summer (two years)

6. Project Cost

	First Year	Total
Total	$38,785.00	$77,570.00
Claflin Contribution	7,323.00	14,646.00
Requested from DOE	31,462.00	62,924.00

7. Number of persons/year expected to receive training under the project

   30 participants for 1990 summer, and 30 participants for 1991 summer

8. Signature, Project Director — Date:
   S. S. Sandhu — 1-9-1990
   Shingara S. Sandhu, Ph.D.

9. Signature, Authorized Claflin College Representative — Date:
   Oscar Allan Rogers, Jr. — 1-9-1990
   Oscar Allan Rogers, Jr., Ph.D.
   President

Budget Explanations

Item A. Project Director and Faculty

Project instructors will be employed for 6 weeks, during 1990 and 1991 summers. Pertinent discussions about their proposed activities during the summer appear on page 7, 9 & 15.

According to the Business Office, the average 9 month salary for Schapiro and Aslam is $24,000.00 & $23,000.00, respectively. Summer salaries for project instructors for 6 weeks were calculated and are shown on the Budget Sheet.

As pointed out on pages 14 and 15, release time for project director, Dr. Sandhu, will be arranged as follows: Ten percent release time of 20 weeks during the (20 weeks x 10% = 2 weeks) Fall semester of 1990 and 10% of release time (20 weeks x 10% = 2 weeks) for the spring semesters of 1991 school year. He will spend 20% of his time during the 6 weeks (6 weeks x 20% = 1.2) each summer. This computes to 6.4 weeks of total time for two years of the project. His release time salary based on $28,000 / 9 months, plus his two summer salaries add to $4,594.00.

Item A. (b.) Other Personnel (Students)

One undergraduate student assistant will be employed for 6 weeks of summers. For pertinent discussions, see Pages 15 and 16. With a 40 hour per week and a rate of $4.25 per hour, the weekly salary is $170.00 thus, (6 x 170) = $1,020.00

Item A. (e.) Other Personnel (Secretary)

The amount requested for the salary of a secretary is ten percent during the 20 weeks (20 weeks x 10% = 2 weeks) of 1990 academic year and 25% for 6 weeks (6 weeks x 25% = 1.5 weeks) of 1990 summer, is $929.00. A similar amount is requested for 1990-1991. This amount is based on the average salary of $13,800, Claflin pays to its secretaries.

Budget info removed.

Item E, Participants Support Cost

The amount of the College General Fee is $65.00 per student and is the same as that for regularly enrolled college summer school students. Accordingly, the cost of expendable science laboratory supplies for the two disciplines Chemistry and Computer Science of this project is conservative. The General Fee also includes things such as the medical and student activities fees. It is conceived to be a residential project. Most of the students will be drawn, probably from average or less than average income families. It is urged that the participants be paid for room and board. The college charges $390.00 / student for the full summer sessions. ($390.00 / student x 30 students = $11,700.00). The college agreed to make substantial contributions towards the support cost.

Item C, Domestic Travel

A travel fund in the amount of $750.00 is requested to enable the project director to attend meetings with funding agencies, and visit other points of interest with the students as well as to visit schools in connection with recruitment.

Item F, Publication Costs

A fund in the amount of $180.00 is requested to defray the cost of printing things, such as brochures, applications forms, school nomination forms, and achievement certificates. References appear on pages 15, and 20.

An Office Supplies Funds in the amount of $250.00 is requested for office expenses. Funds ($950.00) are requested for chemical / glassware etc. An additional $200.00 is requested for use of the telephone for making interview arrangements. Reference is on page 14. The college will substantially contribute towards chemicals and computer supplies.

Item G, Consultant Services

Guest speakers from South Carolina State College (Orangeburg), University of South Carolina, Columbia (School of Engineering), Medical University of South

Carolina, Charleston, Savannah River Plant (D.O.E., facility) Aiken, South Carolina, will be invited to address the participants about the future of science, engineering and technology the career options in these fields. The guest speaker will also act as role models for the participants. Funds ($860.00 are requested to defray the cost of meals and travel.

Field Expenses Fund in the amount of $1,632.00 is requested under H for five things:

(a) Six day-long trips to scientific laboratories.
See page 5. College vehicles, Meals etc., Total, $1602.00

(b) Travel to local points of scientific interest. See pages 6-7.
College vehicles, $100.00

(c) Recruiting travel. See page 21. Personal auto and meals, $750.00.

(d) It is desired to make it a residential training program. The participants will be encouraged to stay in the college dorm. This will create fellowship and a better learning environment for the participants.

Narrative

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PROPOSAL NARRATIVE

I. Introduction

Claflin College, a predominantly black undergraduate institution located in Orangeburg, South Carolina, has served the needs of a primary rural community for more than one hundred years. Claflin offers liberal arts and teacher preparation programs, and is fully accredited by the Southern Association of Colleges and Secondary Schools.

The FTE (Full Time Enrolled) student enrollment during the first semester of 1989-90 was 925. According to the information obtained from the office of Financial Aid, approximately 98 percent of the students receive financial aid; on the average, a student is on 80 percent financial aid.

This church-related (United Methodist) school has experienced a significant expansion of its facilities in recent years. The Division of Natural Science and Mathematics is located in the James S. Thomas (JST) Science Center, a multi-million dollar modern building with good equipment and facilities. All classes offered by the Division meet in this building.

The Division of Natural Science and Mathematics is composed of four departments: The Department of Biology, the Department of Chemistry, the Department of Computer Science and the Department of Mathematics and Engineering. The Department of Biology, Chemistry, Mathematics and Computer Science offer major and minor programs. The Division offers a Pre-Professional-Pre-Medical-Pre-Dentistry, Pre-Veterinary-etc- curriculum. In addition to offering a major in mathematics, computer science, a composite major in mathematics and computer science and a composite major in computer science and business administration, the Department of Mathematics and Computer Science offers minors in computer science, Pre-engineering, mathematics, and physics. The participants in this pre-engineering

dual degree program will receive a B.S. degree from Claflin College and a B.S. (engineering) degree from South Carolina State College, Orangeburg, which is a cooperating institution.

II. Target Schools and Students

As is shown in Table I* there is a progressive decline in the Science and Mathematics Professions, chosen by the freshmen, entering colleges and universities.

Table I, Trends in majors chosen by freshmen, Nationwide

PERCENTAGE OF ALL FRESHMEN			
	1977	1985	
Biological Sciences	4.7	3.4	
Physical Sciences	3.1	2.4	
	1983	1984	1985
Computer Science / Math	8.8	6.1	4.4
	1982	1985	
Engineering	12.0	10.0	

*SOURCES NSF PUBLICATION NSB 86-100

Among students who complete degree programs in Sciences and Mathematics about one-half (1/2) of the B.S. recipients, two-thirds (2/3) of the M.S. recipients and three-fourths (3/4) of the Ph.D. recipients, actually enter the science work force. The experts are already guessing, that by 1995, there will be approximately 20 million more jobs than educated workers available for the new job openings. They also guessing, that blacks will continue to lose ground and the government will have to allow more immigrants in to make up the difference. If the present pattern of field selection continues and if employer demand does not abate, it is clear that the nation will face

serious manpower supply shortages in technical fields over the next ten years. The American Science education is in shambles as indicated by the following facts:

(1) In an educational Testing Service study of five countries and four Cadadian provinces, American 13-year-olds ranked last in math and nearly last in science. (2) In a survey of 17 countries published last year by the International Association for the Evaluation of Educational Achievement U.S. ninth-graders tied with Singapore and Thialand for 14th place in science. (3) In 1988 fewer than 1% of college freshmen said they intended to major in math, compared with 4% toward decades ago. Physics and chemistry concentrators fell from 3% to 1.5%; 1 out of 3 Ph.D's awarded in the natural sciences and engineering last year went to foreigners, compared with 1 in 4 a decade ago. Beyond these grim statistics lurks a web of equally disquieting trends: the imminent retirement of aging scientists, a shortage of new students because of the "baby bust," the homeward migration of many U.S.-educated foreigners and the burgeoning numbers of minorities and college-educated women--two groups that have generally shown less interest in science than white males. The result could be a critical shortfall of American scientists and mathematicians as the world becomes more reliant on technology. By the year 2000, the U.S. will need 750,000 more chemists, biologists, physicists and engineers than it is expected to produce. The science deficit threatens America's prosperity and possibly even its national security. Economically, the nation will be unable to compete with rising technological giants like Japan, South Korea and West Germany. "After the war and Sputnik, we were the pre-eminent economic power in the world," says John Fowler, executive director of the Triangle Coalition for Science and Technology Education. "We aren't any longer." The U. S. may also be in grave danger if its scientists cannot match those of the Communist world in developing advanced weaponry and intelligence-gathering devices.

Blacks and other minorities (Hispanics, American Indians) have a dismissal record when it comes to their freshmen year. Blacks form about 10% of the nation's

workforce. However, they form only 2.7 percent of the national professional manpower. One thousand blacks received Ph.D. degrees in 1985, out of which, only 30 Ph.D. degrees were awarded in Science and Mathematics. In South Carolina, minorities constitute 31.7 percent of the state population, but they form only 15.24 percent of the professional work force. The role of minorities in Science and technology is very disappointing. A state, possibly, can not make progress if a large segment of its citizenry are incompetent to take part in the professional decision making process.

Today, blacks and other minorities constitute about twenty percent of the public high school's student bodies and by 2010, the minorities will form over one-third of the total work force. One can go on quoting data to prove that minorities are woefully under represented in the Science and technology work force and a serious need exists to enhance their participation in these professions. This project, if funded, will make a substantial contribution towards that goal. If the Federal Government takes seriously its responsibility to increase the representation of minorities in science and engineering, ti should fund programs such as this one which will expand the poor of minority science graduates.

This project will serve thirty, predominantly minority students. Students will be high school sophomore, junior and senior applicants from rural South Carolina high schools, with limited science education programs. High School principles of all counties in South Carolina, including Bamberg and Barnwell, will be contacted. However, it is intended that the project will provide an opportunity to the freshmen class at Claflin College, if some students choose to major in science, engineering, mathematics and computer careers. The majority of these students will be under privileged and from small or medium sized towns in South Carolina.

This is gong to be a residential project. It is judged by the members of the Advisory Committee to this project that housing aid will be necessary for the students

in this project as the participants will be recruited from rural areas where family incomes are very low. Indeed, in the small and medium sized towns of South Carolina, making up for the loss of a student's summer earnings is a significant contribution by a family. It appears necessary that the participants be compensated for room and board while they are on campus enrolled in the summer project.

III. Major Objectives of the Project

In many of the rural high schools in South Carolina the science and computer educational opportunities are limited to simple classroom discussions with little in-depth exploration of subject matter. Students from such schools graduate with preconceived ideas about the difficult task of succeeding in science engineering professions. In particular, the opportunities for laboratory experiences are non-existent in such schools. in recognition of the deficiencies is scientific knowledge and techniques, the following goals were adopted for this project:

A. Increase the pool of well-qualified college-entering minority students who will select to major in science, engineering and mathematics.

B. Develop and foster knowledge, understanding, and interest in the sciences.

C. Offer Chemistry programs which places emphasis upon laboratory experiences and some research participation.

D. Develop in minority students, the belief that science, engineering and mathematics careers are exciting, challenging, and can be successfully pursued and mastered by minorities.

E. Arrange visits to scientific laboratories and other points of scientific interest for motivational purposes and to generate scientific career goals.

F. Assist students in making career choices by introducing them to a variety of information and experiences, including interaction with scientists, guest speakers and role models.

G. Motivate the participants to go back to their high schools and work hard to prepare themselves so that they will be able to pursue science careers in colleges.

H. Encourage and motivate participants to take national college entrance (SAT etc) tests and have the appropriate college faculty to guide the students in that direction.

IV. Project Description

The project for Student Chemistry Enrichment Training Program (SCETP) is planned for minorities and disadvantaged students who will be (1) rising sophomores (2) rising juniors (3) rising seniors and (4) freshmen class at Claflin College (1990-91 Freshmen Class) and who have been identified by their teachers or guiding counselors or academic advisors as capable of pursuing careers - Professional Chemists, Physicians, Dentists, Veterinarians, Biochemists, Molecular Biologist, Physiologist, Environmentalist etc - in physical sciences and engineering. Two six week summer programs for the summer of 1990 and for the summer of 1991 are planned. The Student Science Enrichment Training Programs will run concurrently with the college summer school of 1990 and 1991. The SSETP will commence on June 11 and end on July 20 for the year of 1990 and for 1991 it will commence on June 9 and end on July 17. Chemistry academic programs, assisted by computer simulation and computer assisted instructions (CAI), to make the learning of chemistry fun, will be offered in both summers. Each student will be aided to learn adequate fundamentals of computer handling and operation which can be applied to the learning of chemistry and enhancement of computer expertise. A total of thirty students will be selected for participation in this program. They will be divided into two groups, of 15 each. The one group of 15 students will take computer science and the other group will take chemistry. The groups will rotate every day during the six week's period so that each student is exposed to chemistry and computer operations and its application in solving chemical, mathematical and engineering problems.

Students will be involved in classroom instructions, laboratory activities, and some involvement in individual or small group research projects. They will be encouraged to take part in Science demonstration projects. It is believed that the

involvement in a research project stimulates high ability students to continue their education and plan for careers in science and engineering.

Instruction on the use of the library, correction of fundamental deficiencies in mathematics and science, discussions on careers in science, and the preparation and presentation of papers on the research projects are also important parts of the program.

A work assignment sheet is given below. Provision has been made for tutoring by undergraduate chemistry and computer science student assistants in supervised study sessions, and for generous time allotments to teachers for office conferences with students. A supervised study session is also scheduled for the afternoon hours.

Here is a sample of possible student schedules:

8:00 - 8:50	Chemistry (Lecture/Discussions)
8:00 - 8:50	Computer (Lecture/Discussions)
9:00 - 10:50	Chemistry (Laboratory)
9:00 - 10:50	Computer (Laboratory)
11:00 - 11:50	Conferences, guest speakers, help sessions, supervised studies, seminars, research reports.
12:00 - 1:50	Lunch Period / Recreation / Library Visit (Free Time)
2:00 - 2:50	Chemistry (Lecture/Discussions)
2:00 - 2:50	Computer (Lecture/Discussions)
3:00 - 3:50	Library, Research Projects, Tailored Programs to Individual Student Needs
4:00 - 4:50	Individual Activities, Special Events Seminar Presented by the Participants Supervised Studies, Research Reports

Some activities such as project meetings, sessions with the guest speakers, presentation of science application videos and sound filmstrips will be scheduled at 4:00 P.M. It is planned that guest speakers will be drawn from a spectrum of persons, with good scientific as well as community service backgrounds. The speakers who will

participate in this program will represent academia, - Claflin College, South Carolina State College, Medical University of South Carolina and Clemson University -, Industry - Ethyl Chemical Corporation, DuPont, Dow Chemical, Cox Wood Preservation Company -, Business World-Banks and Financial Corporation -, and Governmental agencies - Department of Energy, Department of Defense, Department of Education etc. The speakers will act as role models and will assist the participants to examine career choices in Science, Computer Science, Mathematics and Engineering. Selected sound filmstrips and videos which can contribute to student knowledge, are available from American Chemical Society, National Science Foundation and several private vendors, will be screeded from time to time. Each such presentations will be followed by open discussions in which participants as well as guest speakers will take active part.

Information about the objectives and contents of the academic programs, relating to this project, are given on the following pages.

To expose the students to science outside the program and to familiarize them with research tools in science, each group of 15 students will take a day-long field trip to scientific laboratories located at places such as the Savannah River Plant (D.O.E. facility) in Aiken or the Medical University in Charleston.

To further expose students to different scientific settings and provide appropriate role models, a series of science laboratory visitations and industrial field trips are planned. For example, students will visit the University of South Carolina which has regional Nuclear Magnetic Resonance (NMR) facilities and Savannah River Ecology laboratory which houses a Gas Chromatography/Mass Spectrometry (GC/Mass) analytical capabilities. At SRP students will also visit laboratory facilities where research relating to the handling and disposal of radio active waste material is being done. While in that area they will take a guided tour of Corning Fiber Glass facility. Additionally, there will be trips to Orangeburg Regional Hospital, Ethyl

Chemical Plant in Orangeburg, water and sewage treatment plant, the fist hatchery and the Edisto River and Garden Area. A number of get together opportunities will be made available to the students through picnics and formal dinners. The summer program for participating students will be conducted in such a way that students will leave campus, at the close of the semester, thinking that Science is a fun and rewarding field to get into.

The computer science program will be supported by a computer laboratory, housing an interactive, timesharing, mini-computer system. The Computer Laboratory is located on the first floor of the air conditioned J. T. Science Center. The College owns a Digital Equipment Corporation VAX-aa/750 RA81/TU80 computer system with 2 MB of ECC MOS memory and 456 MB of disk storage. The Laboratory, a "user oriented" computer facility, has 99 VT 102's, 6 Vt 220's and 2 VT 240 (graphic) video terminals. The CRT terminal users will be able to get hard copies from the LP 25 line printer. The participants will have excess to two well equipped P.C. laboratories.

The Chemistry Department is located on the third floor of the JST Science Center. The equipment in chemistry and the facilities in which it is housed are modern and more than sufficient for instruction at the college level (Professional B.S. in Chemistry). Claflin's chemistry department is particularly well-positioned for this kind of project, in part, because it has received, since 1972, several research grants from the Environmental Protection Agency, the United States Department of Agriculture and the Department of Energy. The Department owns or has free access to a wide variety of equipment.

V. The Chemistry Program

The departments of Chemistry and Computer Science were very fortune to receive funds from Title III in 1988 to upgrade their facilities for research and teaching.

This chemistry program was designed and will be implemented by Dr. Phillip Schapiro in addition to the previously mentioned general objectives, the chemistry program has the following objectives:

A. Develop in students the basic knowledge and skills essential to the understanding of chemistry.

B. Develop skills of accuracy and precision in thinking, communication, experimental observation and manipulation.

C. Develop an ability to interpret the properties and reactions of atoms and molecules in terms of structural theories.

D. Inspire in each student an interest in chemistry as an exciting and useful discipline.

E. Guide students to understand the elementary methods employed to conduct research in the area of chemistry.

In addition to recitation and discussion in a relaxed classroom environment about the theoretical aspects of chemistry, students will be led to perform laboratory work which will enable them to intuitively accept various chemical principles and they will be encouraged to select a research topic appropriate at their level for conducting group research. The activities of the chemistry program will be organized as outlined below.

First Week. Students will be exposed to some physical measurements, periodic table, atoms and molecules, followed by laboratory experiments relating the theoretical aspects of these discussions. The students will be exposed to chemical literature research and encouraged to select at least three topics of their choice for research. The role and importance of chemical discipline for man will be brought to their attention. Emphasis will be placed upon the job and career opportunities which exist in this field.

Second Week. The students will be led into the secret of chemical bonding, formulas, equations, and classes of compounds. Laboratory work will be designed to reinforce the theoretical experience gained by them in the classroom. The students

will be encouraged to discuss with the instructor their topics of research for final selection and approval of one of the research topics for further study.

Third Week. The students will be exposed to the mole, energy, and weight relationship. The laboratory work will be designed to calculate a molarity, normality, equivalent weight, and prepare standard solutions of various acids, bases, and salts. The students will design and set up experiments to meet their respective research objectives pertaining to their research project.

Fourth Week. During this week students will study acids, bases, and salts. Theoretical aspects of protondonor and its relation to H+ will be discussed. The laboratory work will be designed to determine the acidity of lemon juice, vinegar, and acid neutralizing power of various anti-acids available in the market. The students will conduct research and start collecting data.

Fifth Week. The Students will be exposed to the gas laws, and the kinetic-theory of gases. Laboratory work will be designed to study the diffusion and weight relations of gases, relations of pressure, temperature, and volume will be explored. Students will fabricate their own equipment for these experiments. The students will continue to collect research data and present seminars.

Sixth Week. Inorganic chemistry of representative elements and their role in human life will be discussed briefly. Research and project reports of the students will be collected and evaluated.

VI. The Computer Science Program

This computer science program was designed and will be implemented by Mr. Perwaiz Aslam. Here is the kind of textbook that will be used in the program.

Lawlor, Steven C. BASIC. Belmont, California:
Wadsworth Publishing Company, 1979.

Upon completion of the computer science program, the students will be able to analyze simple scientific/mathematical type problems, to write BASIC programs for solving them numerically, to enter the programs on the computer, to correct the errors,

and to execute them properly on the College computer system. The students will be able to:

1. Learn the word processing.
2. Analyze simple science/mathematics problems and to devise algorithms for solving them.
3. Express the algorithms in sequences of computer steps.
4. Code the steps in the BASIC language.
5. Enter the computer code into the computer system, edit the code, list the code, and execute the code.
6. Modify existing programs in order to meet a modified statement of the initial problem.
7. Use available software/methodology of C. S. for learning chemical facts.
8. Application of computer for learning chemistry.
9. Modify existing programs in order to improve them structurally, and to make them more readable, faster, and efficient.
10. Use computer jargon and concepts properly.
11. Apply computer methods in fields like sorting, simulation, gaming, word-processing, mathematics, economics, engineering and the other science fields.

Given on the next page is an outline of the subject matter for the computer science program.

Basic of BASIC (3 weeks). (1) Interacting with computer (log on/off, editing, entering, and executing programs, (2) Meaning and applications of simplest BASIC statements (PRINT, LET, END, REM, INPUT, COTO, READ, DATA), and (3) The student must write, enter, and execute a set of computer programs using these statements.

Advanced Features of BASIC (1) Meaning and applications of other features of our BASIC: FOR/NEXT loops, nested loops, IF/THEN statements, one-dimensional arrays, two-dimensional arrays, subroutines, string (Character) manipulation, (2) Writing programs in modular, readable efficient, concise fashion, (3) Use program

design methologies such as flow-charting, and (4) The student must write, enter, and execute a set of computer programs using these statements; the programs will be accompanied by a flow-chart depicting the program.

Application of BASIC (3 weeks). (1) Applications of computer in various fields, and (2) The student must write, enter, and execute a set of computer programs stressing various fields.

VII. Evaluation

Each student's performance will be quantitatively evaluated through objective type of testing procedure which will be adopted by each participating instructor. There will be at least one exit test in each area to evaluate the learning potential of each student and his or her ability to perform in science, mathematics, and engineering fields.

Each instructor will also perform a qualitative analysis on each participant to evaluate her or his motivation, energy, and desire to succeed in their chosen academic field through intelligent participation and hard work. The participants, especially the serious ones will be encouraged to select careers in science, engineering mathematics and computer science. They will be supported by the faculty in their efforts to take standardized college entrance tests (SAT) and apply for admission to the college of their choice. The students selected in this program from the college freshmen class of 1987-88 will be encouraged and urged to stay with the department of chemistry, computer science, engineering and mathematics.

The data generated by each instructor will be compiled by the program director for an overall evaluation of each participation. This will be done in the early part of the sixth week. Each participant will be awarded a certificate at the closing ceremony to be held on the last day of work at Claflin College.

The course outlines in chemistry and computer science programs offered, during the summer sessions at Claflin College will be supplied to participating

schools, department of chemistry and department of computer science at Claflin College, with the recommendation that each participant be awarded 4 semester hour credits in chemistry and 3 semester hour credits in computer science. Claflin College has tentatively agreed to award credit for summer academic work under this project.

Follow Up

Each participant will be provided with her or his confidential rating report and analysis of his or her future goals. The director will design and set up a mechanism to establish contacts with the student, the student's parents/ guardians and his or her school counselors for monitoring his or her science, engineering and computer science careers. Monitoring of student progress will continue through out his or her college life to collect data to evaluate the degree of success of the project. The monitoring of student progress and his ultimate success will continue beyond the project period of 1989 summer even though no federal funds will be available at that time. The college feels strongly about the validity and the usefulness of this project. Consequently, it is willing to commit its resources to accept the responsibilities of bringing the project to successful completion and probably develop a model for use nation wide.

IX. Organization and Management

The project will be iniated on appropriate dates - June 11, 1990 and June 8, 1991--dates to coincide with the college summer school of 1990 and 1991. Its duration will be six weeks per summer. Dr. S. S. Sandhu will bear the primary responsibility for the success of the project. A SCETP Advisory Committee consisting of individuals listed as project instructors will be established. Dr. Sandhu will serve as a chairman of this committee. An abbreviated Curriculum Vita for each member of the committee appears under Staff, selection of participants will be a responsibility of the Advisory Committee.

The project instructors will have a few days, prior to starting date, for the preparation of instructional materials and for finalizing their plans of action of class, laboratory, research and program activities.

The College General Fees allows participants to become involved in the athletic and social recreation programs organized by the College. Nevertheless, three undergraduate student assistants will be employed to serve (1) as a coordinator of recreational programs, (2) to coordinate the tutoring in the supervised study sessions and (3) help in chemistry and computer laboratories. The project director's responsibilities will include the organization of student activities and visitation by the guest speakers.

The formal evaluation of the project programs will be done first by students on end-of-semester evaluation forms. Secondly, by student laboratory assistants and finally, during the final week, the project instructor will participate in the evaluation of project activities. The instructors will meet to share experiences and evaluate the project from their perspectives. The project director will consolidate the results of the evaluation.

The final project report, the technical description of the project, and the fiscal report will be submitted to the Department of Energy on or before the dates established by the funding agency. The preparation of these reports will be the responsibility of the project director.

X. Staff

The faculty of the project programs includes the following people:

1. Dr. Phillip Schapiro, Professor
   Division of Science and Mathematics

2. Shingara S. Sandhu, Ph.D.
   Professor of Chemistry
   Chairperson of the Division of Natural Sciences and Mathematics
   Principal Investigator (DOE, Research Project)

3. Mr. Perwaiz Aslam, Director
   Computer Laboratories
   Division of Science and Mathematics

A copy of an abbreviated Curriculum Vita for each project instructor appears below.

Dr. Phillip Joseph Schapiro; Chemistry Instructor

Dr. Schapiro received his Ph.D. degree in Physical Chemistry from Ithaca, N.Y., in 1960. He specialized in x-ray determination of crystal structures. He also received his Ph.D. degree in Mathematics from Oklahoma University in 1976 and specialized in Topology.

He held several teaching positions in colleges and Universities such as University of South Carolina, Aiken; Paine College, Augusta, and Oklahoma University and presently is employed by Claflin College, Orangeburg, S.C. as Professor, Division of Natural Science and Mathematics and Computer Science. He has authored several scholarly publications and is active in many learned societies like American Chemical Society, American Mathematical Society, Phi Beta Kappa and Sigma XI. he participated in SSETP during the previous years.

Dr. Shingara S. Sandhu; Project Director

Dr. Sandhu [redacted] He received his M. S. in Chemistry form Punjab University Chandigarh in 1954, and his Ph.D. in Environmental Chemistry form Utah State University 1970.

His post-doctoral studies and training include: environmental applications of GC/mass spectrometry; water resources training; nuclear magnetic resonance spectroscopy; speciation of metal ions in aquatic system and sluice; computer applications in undergraduate chemistry programs; environmental assessment program; thermodynamics of water and heat fluxes, and instrumental applications in chemistry.

His research has related to Recondite Toxicity of Arsenic Species, Kinetics of Degradation and Transport of Pollutants in Human Environment, Development of Methods for Total Arsenic and Arsenic Speciation in Biological and Aquatic Systems. His research has been in the Environmental Analytical and Environmental Physical Chemistry. He has authored or co-authored 43 publications.

Dr. Sandhu has taught college chemistry, including physical chemistry and instrumental methods of chemical analysis, science 1955. At present, in addition to teaching, he is principal investigator for the project funded by Department of Energy. He has over 40 publications.

He is a member of American Chemical Society and its Environmental Division.

Mr. Perwaiz Aslam; Computer Instructor

Mr. Aslam was born in Pakistan. He received his undergraduate education and law degree from Punjab University, Lahore, Pakistan. He was employed by various federal agencies in Pakistan and private corporations in Oslo, Norway where he was engaged in handling export-import business for his employers.

He received his Master of Business Administration degree in 1989 and Master of Computer Science degree in 1988 from Atlanta University, Atlanta, Georgia. He worked as teaching assistant for several colleges in Atlanta and joined Claflin College in the fall of 1981, where is he employed as a director of computer Laboratory. He has full knowledge of and expertise in the areas of PASCAL, BASIC, C Language, LISP, ADA, Assembly, dBASE III, and Lotus 1-2-3.

XI. Selection of Participants

The target audience for this project are: under privileged outstanding students with limited science education opportunities, minorities, women, and students who are presently sophomores, juniors and seniors in high school. The students of freshmen

class at Claflin College will be given an opportunity to participate in this program. The objective of the project is to identify high ability students with potential for science and mathematics careers.

The project will design an application form to obtain maximum objective information about each applicant. A publicity brochure containing an application for admission to the summer academic program of the project will be designed and sent to all public and private schools in the state of South Carolina. The funding agency (DOE) will be provided with several copies of this information. The principles and counselors of each high school will be urged to have at least one student applying for admission to the program. An advertisement in the Times and Democrat - a local daily - will also be taken to encourage students to apply for the program. As a minimum, to be considered for participation in the project, each student must meet the following conditions. (1) Be a rising sophomore, junior or senior in high school or a member of freshmen class at Claflin College. (2) Have completed at least one year of high school algebra and at least one year of high school science (physical science, earth science, chemistry, biology, etc.), (3) Be in the top 15 percent of the class, (4) File a completed application form, (5) Have the school file a school nomination form including all available standardized test scores, (if available), and a transcript of grades, (6) Have two science teachers send in letters of recommendation, and (7) Write a short essay of about one hundred words (about 10 typed lines) or more on himself or herself, for his or her reading, accomplishments, interests, and future plans.

On the basis of the items mentioned above, the members of the Advisory Committee will rank each applicant as follows: 1-should not be included, 2-probably would not profit from the programs, 3-should be included with reservation and 4-definitely should be included. high ranking applicants will be interviewed by the project director in their schools. The final selection of participants will be the

responsibility of the Advisory Committee and the funding agency (DOE) which will be provided the names of all the nominees for their information.

XII. Expected Outcome

Motivational: Upon completion of the program, all of the participants will be motivated to enroll in high school science and mathematics courses, and hopefully will work hard to prepare themselves for college entrance. Hopefully, some will continue to work on their science projects. It is hoped that some of the participants will choose, when accepted by a college, to pursue a career in science, engineering, computer science and mathematics. Claflin students who will choose to participate in this program, hopefully will continue their career in chemistry, computer science, engineering and mathematics. Indeed, during the coming years, the project director will invite the school principals or their designees to estimate the general effect of the project on the participants, and on their subsequent performance in their own classrooms.

XIII. Claflin College as Beneficiary

Many of the historically minority post secondary institutions of higher learning serve a clientele which has high learning potential but is not highly motivated academically. Additionally, the freshmen are not oriented at all, towards careers in science, engineering, and mathematics. Additionally, department of chemistry at Claflin College did not escape the national trend of dwindling enrollment in science and mathematics as data in the following table show, Claflin had a very viable department of chemistry at one time. The attempt is being made again to

Years	75	79	80	81	82	83	84	85	86	87	88
CHEM MAJORS	10	8	8	6	1	0	3	1	3	1	1

expanded the department which as compared to several other campus departments has very challenging and demanding academic programs. Availability of funds for summer academic programs in chemistry will be a great attraction and inducement for future freshmen classes at Claflin College to opt for chemistry careers. Minority teens especially for rural areas, usually have a very difficult time in getting rewarding summer jobs. If the college can receive fundings through this project, it should be able to contribute to the professional growth of the student throughout his or her stay in the college. The added attraction of the academic summer program in chemistry along with the growing demand for professionals in Science, Engineering and Mathematical fields will contribute towards increased enrollment in the department of Chemistry, Engineering and Mathematics at Claflin College.

XIV. Department of Energy as Beneficiary

The administrators of HBCU programs, under the department of energy will have the opportunity to visit Claflin College and address the participants about the job opportunities with the private and public sectors, associated with the field of energy. The cooperative efforts of Claflin College and the department of energy will create rewarding opportunities for minority students. This project will generate a big poof of recruitable Science and Mathematics graduates which can be tapped by the department of energy to work of it.