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ABSTRACT

There are many problems involved in upgrading scientific literacy in high schools: poorly qualified teachers, the lack of good instructional materials, and economic and academic disadvantages all contribute to the problem. This document describes a project designed to increase the opportunities available to the high school science student to experience science in an exciting and nonthreatening environment, to provide students with interactive experiences to maximize the learning of science processes and concepts, and to increase interest in science and technology among black students. The report gives the descriptions of 21 courseware packets consisting of simulations and interactive videotape modules designed to promote knowledge processing and application strategies in physics, chemistry, trigonometry, and physical science. In addition, the Talented Youth for the Physical Sciences and Engineering (TYPSE) program is discussed. This program is designed to identify and encourage talented minority students in grades 8 through 10. An evaluation of the TYPSE program is provided. An appendix includes a student evaluation form for the TYPSE program. (CW)

# COMPUTER LAB MODULES AS PROBLEM SOLVING TOOLS

Final Report



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# FINAL REPORT

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## PROJECT OBJECTIVES

Science and technology are becoming a major force in determining the course of this nation's progress and security.

In recent years, however, too many students have been leaving high schools scientifically and technologically illiterate.. Fewer students are taking science and math courses beyond the most basic levels and the courses that they do take are often taught by inadequately prepared science and math teachers.

There are fewer high-ability students choosing science and science education majors in college. Many teachers who are originally well-trained have had few opportunities or incentives to upgrade their knowledge or their teaching skills. Fully qualified physical science and math teachers are in very short supply and is expected to get worse. Business and industry are recruiting many of the best science and math teachers away from the schools. Many of the best teachers are gone and the universities are producing very few qualified replacements.

Good and effective instructional materials are in short supply. For the most part, the instruction that the student gets is the blackboard-and-textbook type of instruction. The sense of wonder, and discovery that typifies science is hardly communicated in a science classroom.

This nation's advancement in science and technology depends increasingly on our ability to recruit the widest possible array of talent. However, minorities continue to be underrepresented in the science and engineering fields as shown in recent data collected by the National Science Foundation.

One major reason for the persistence of this underrepresentation of minorities in science and engineering fields is that the majority of them come from economically and academically disadvantaged environments. Parents from these backgrounds are not as financially able to provide their children with toys, books, magazines, science kits, microcomputers as those in the more affluent segment of society. Another reason is the quality and quantity of education in science and mathematics available to them at the pre-college level and beyond. Lack of qualified

teachers, inadequate equipment, crowded facilities, and unmaintained facilities inhibit the quality of education in science and mathematics of many students from underpriveleged backgrounds. For many high school students, the attitudes of counselors and teachers serve as inhibitors.

In light of these problems, the need for cost-effective and well-planned teacher support systems applying sophisticated computer technologies that require little or not programming or electronic expertise; and programs to increase interest in science, engineering and technology careers among minority youth are in order.

The objectives of this project were:

1. to continue to increase the opportunities available to the high school science students to experience science in an exciting and non-threatening environment,

2. to continue to provide students with interactive experiences to maximize the learning of scientific processes and concepts, and

3. to continue to increase interests in science and technology among Black students.

## A. COURSEWARE DEVELOPMENT, EVALUATION & DISSEMINATION

A total of 21 stand-alone, cost-effective and transportable courseware packets have been developed, field-tested and are being disseminated.

These packets consist of simulations and interactive videotape modules designed to promote knowledge processing and application strategies in physics, chemistry, trigonometry and physical science.

Each of the modules addresses one or more of the following goals of science education: (1) the development of scientific and technological literacy, (2) the development of science process skills and concepts while taking advantage of students' increasing command of mathematics, and (3) the development of skills in identifying

science-based societal problems and in making decisions about their solution.

Students are presented with specific objectives at the beginning of each module.

All programs capitalize on the interactive capabilities of the computer. The science programs put the student in the role of a scientist conducting or participating in the experiment, collecting data, and drawing conclusions while the computer provides immediate feedback regarding the correctness or appropriateness of the response. The science simulations also provide for experimental error so that the student does not acquire the impression that science measurements are exact and experimental procedures are immune to human error.

The majority of the science programs deal with experiments not normally provided in the secondary classroom due to factors including cost, time and safety. Some deal with concepts which students find difficulty grasping and can be taught more successfully by means of an individualized approach.

Multiple tracking is built into the program so that students with different abilities proceed through the program through different routes. Problem solving experiences are provided to advanced students and additional help is available to those students who need them.

All programs are designed so that the student has ample time to complete a lesson or a lesson segment within on period.

## Evaluation

The materials were tested with small groups of high school chemistry, physics, and physical science students at the FAMU Developmental Research School. The programs were revised according to the feedback received from the students, the science teachers and consultants. The programs were later field-tested with entire physics, chemistry and physical science classes. The modules were again modified or revised depending upon the feedback acquired from the students, input from the instructor, and observations made by the program developers.

## Courseware Dissemination

The following modules are now being disseminated:

A. A Scientific Process
Grade level: 8th to 12th

In this simulation, the student is presented with four cannons which fire projectiles at different speeds. The student selects a cannon and inputs angles of elevation for the cannon. The student observes the projectile and collects data on the projectile range. The data on the projectile ranges and angles of elevation for each of the four cannons are collected and plotted.

The student infers from the graph which cannon to fire at a corresponding angle of elevation for the projectile given a randomly selected range.

B. Millikan Oil Drop Experiment
Grade Level: 8th to 12th

This simulation enables the student to determine the charge of an electron. Oil droplets with different charges or no charge are randomly selected and appear between two charged plates. The student observes each oil droplet while regulating the voltage between the plates until the droplet becomes stationary. The student calculates and plots the charges on the droplets. The student infers the smallest possible charge of an electron from the graph.

C. Periodicity of Elements
Grade Level: 8th to 12th

Through a highly interactive process and given a periodic chart of elements, the student builds a mental model to (1) determine the electronic configuration of an element, (2) predict the number of electrons in the outermost energy level, and (3) predict the sublevel entered by the last electron. Exceptions to the model are explained.

Using the mental model, the student accounts for the differences in the ionization energies of elements in the periodic chart.

D. Titration
Grade Level: 8th to 12th

This is a simulation of an experiment that enables the student to titrate acids and bases of different concentrations. Techniques such as taking buret readings, shaking the solution in the flask to prevent overtitration and the addition of a drop to check the equivalence point are simulated.
(Available with or without the interactive videotape demonstration.)

E. Mass of An Atom
Grade Level: 10th to 12th

The mass of a copper atom is determined experimentally using the method used originally by Faraday. The student observes an experiment and participates in data collection. The student calculates the mass of an atom based on the total mass of copper transferred during an electrolytic process and the total amount of charge transferred by a particular amount of current in a specified time interval.

F. Length of a Molecule
Grade Level: 10th to 12th

The student observes the experiment and participates in the data collection. The student determines the length of an oleic acid molecule from the volume of the oleic acid in a drop of oleic acid-alcohol mixture, and the diameter of the area occupied by the drop on the surface of water.

G. Uniform and Accelerated Motion
Grade Level: 8th to 12th

Carts with uniform and accelerated motion are simulated on the screen. The student collects data, plots graphs of time versus distance, calculates the speed, and plots graphs of speed versus time. He/she interprets the graphs, calculates the acceleration for the cart simulating accelerated motion, and differentiates between uniform and accelerated motion.

H. Mass and Weight
Grade Level: 8th to 12th

This program demonstrates experiments to the student and provides simulations of the behavior of two masses. Problem solving experiences are provided whereby the student calculates the acceleration of gravity for the masses and reaches an explanation why two masses dropped at the same time and traveling the same distance would reach the ground at the same time. Illustrations are provided to enable the student to differentiate between the concepts of mass and weight.

I. Pressure
Grade Level: 8th to 12th

This is a single concept courseware demonstrating the effect of cold water on a can filled with steam. The student calculates the total force on the can and compares its magnitude with that of the weight of a car.

This interactive videotape program was designed to precede the module on the Boyle's Law experiment.

J. Boyle's Law Experiment
Grade Level: 8th to 12th

The student performs an experiment by adding masses on the plunger of a syringe with trapped gas from the keyboard. The student observes the effect on the volume of the gas, collects the data, calculates the pressure on the gas, makes a graph of volume vs. pressure, and interprets the graph. He/she predicts and verifies through calculations the volume of the gas given the mass on the plunger.

K. Chemical Formulas
Grade Level: 8th to 12th

This is a drill and practice program useful in sharpening skills of students who need them. Fifty names of chemical compounds are printed on the screen and the student enters the corresponding chemical formulas.

L. Rates of Reaction
Grade Level: 8th to 12th

This is a simulation of the formaldehyde clock reaction. In part one, the student mixes various concentrations of formaldehyde with a constant concentration of sodium bisulfite-sodium sulfite solution and plots the time it took for the first sign of each reaction as a function of the concentration of formaldehyde. In part two, the student follows the same procedures to investigate the effect of temperature on the reaction between the solutions.

M. Charles's Law Experiment
Grade Level: 8th to 12th

A syringe with 10 ml of trapped air is immersed into a beaker of oil at 120 degrees centigrade. The student collects data on the volume of air in the syringe with every 10-degree change in temperature until the temperature is 30 degrees centigrade. The student makes a graph of temperature vs. volume, interprets the graph, and extrapolates the graph to determine absolute zero temperature. He/she predicts and verifies through calculations the volume of the gas at a given temperature.

N. Florida's Wetlands
Grade Level: 8th to 12th

This interactive videotape program provides data and scientific information impacting on the status and future of coastal wetlands which the student interprets, evaluates and bases decisions for the resolution of social, political and economic issues related to the coastal wetlands.

O. Projectile Motion
Grade Level: 11th to 12th

This interactive videotape program demonstrates in a dramatic fashion some experiments comparing the behavior of projectiles and falling objects. Simulations of the path of projectiles and falling objects using vectors are utilized to promote understanding.

P. Force Vectors
Grade Level: 11th to 12th

Student employ vectors to resolve three forces into horizontal and vertical components. This is a good laboratory exercise to enable students to recognize that a number alone is insufficient for describing some physical concepts. While interpreting a situation in which more than two forces act on a point, the students readily see the significance of vectors.

Q. Graphing of Sinusoids
Grade Level: 11th to 12th

In the general equation for sinusoids, there are four constants: A(amplitude), B(number of cycles in 360 degrees), C(vertical displacement) and D(phase displacement).

This instructional program was designed to promote constant manipulation so the student can determine for himself what the constants stand for. The student assigns a value to the A and B and to the C and D constants and the microcomputer will draw the graph for the resulting equation.

Lastly, the microcomputer demonstrates how to determine the critical points from the graph from a given equation prior to sketching the graph for the equation.

R. Energy Resources
Grade Level: 8th to 12th

This is an interactive videotape program presenting and describing the uses of energy, sources of energy, the status of energy resources and alternative sources of energy.

S. Plate Tectonics
Grade Level: 7th to 10th

Based on existing evidences and data collected by the Glomar Challenger, students are led to the formulation of the theory of plate tectonics and the interpretation of observations and activities at the crustal plate boundaries such as the formation of mountains, volcanic activity and earthquakes.

Equipment

The equipment required for the following microcomputer programs is the apple II+, IIe or IIgs. A color monitor is recommended for the titration module.

Millikan Oil-Drop Experiment
A Scientific Process
Uniform and Accelerated Motion
Titration
Periodicity of Elements
Chemical Formulas
Charles's Law Experiment
Rates of Reaction
Graphing of Sinusoids (6 program)
Boyle's Law Experiment

Equipment required to run the interactive videotape programs below are Apple II+, IIe or IIgs, color monitor, CAVRI or BCD Model 450 control interface and a betamax or 3/4 inch videotape recorder. Programs are currently being revised so that the programs can be used with VHS and JVC videocassette recorders.

Force Vectors
Projectile Motion
Mass of an Atom
Length of a Molecule
Pressure
Graphing of Sinusoids
Titration
Plate Tectonics
Mass & Weight
Florida's Wetlands
Energy Resources

## B. TALENTED YOUTH FOR THE PHYSICAL SCIENCES AND ENGINEERING (TYPSE)

The goal of the Talented Youth for the Physical Sciences and Engineering summer camp was to increase the number of minority students pursuing careers in chemistry, physics, engineering and technology by:

* identifying young minority students possessing an aptitude for the physical sciences, engineering and technology,

* providing an enrichment program that will encourage them to enroll in chemistry, physics and advanced mathematics courses in their respective schools; and

* providing information to students concerning careers in the physical sciences, engineering and technology.

Talented minority students in grades 8-10 in and around Leon County participated in any one of three-week programs aimed at increasing opportunities available to them to experience physics, chemistry and trigonometry in an exciting and non-threatening environment. Students were provided interactive experiences to maximize the learning of scientific processes and concepts by means of a variety of microcomputer simulations and interactive videotape materials.

Students worked on activities that introduced them to the concepts of artificial intelligence and computer process control with the use of circuit modules and robots. They also performed experiments involving labortory interfacing equipment that transformed the computer into a scientific instrument, such as a thermometer, voltmeter, light meter, timer or data recorder.

Students acquired skills and experience in computer programming, data processing and word processing. Field trips to the FSU Supércomputer, FAMU/FSU College of Engineering and the science departments of the Florida A&M University are included in the schedule.

To be eligible to participate in the TYPSE summer camp, a student must:

* have earned a grade of B or above in Algebra I, Pre-Algebra or scored at least at the 65th percentile in the math section of a standardized test that was last taken;

* have a grade of B or above in a science and mathematics subject that the subject has completed at the time of application; and

* be recommended by a science teacher, math teacher and the guidance counselor.

Program Evaluation

Thirty-two students from Tallahassee, Marianna, Tampa and Cottondale participated and completed the TYPSE summer camp of 1987. Although 38 students were accepted into the program, three students decided to participate in other summer programs, one went to summer school and two were unable to complete the program.

All of the participants were ninth graders with the exception the one student who was an exceptionally bright seventh grader and two who were tenth graders. Forty-one percent of the participants were boys. Thirty-one participants were Black and one was Asian.

All of the students passed at least 80% of the cognitive objectives designed to measure the successful completion of the science, mathematics and robotics modules. All of the students completed three projects--one in each of the units from computer programming, word processing and data processing components.

The students were asked to fill out the program evaluation form at the end of each session (Please see the attached Student Program Evaluation). The percentage of students selecting a response to each item is recorded on the form.

## Results and Interpretation of Results

The majority of the students selected response 4(successful) or response 5(very successful) to the items in Part One indicating that Project TYPSE, on the whole, was successful in (1) introducing students to the various fields of the physical sciences and engineering, (2) increasing their awareness of, and interest in, career opportunities for minorities in these areas, and (3) providing them with challenging and exciting learning activities.

The majority of the students gave a good or excellent rating for the implementation of the TYPSE program and the attainment of the objectives of the TYPSE program.

Most of them gave the instructors a good or excellent rating for program delivery, ability to interact with the students and ability to maintain order and discipline.

Comments such as the following were given by the students:

*Did Project TYPSE meet your expectations?

Yes, it was very educational.

It was very challenging.

No, I thought it was going to be boring, but it wasn't.

No, it went over and beyond my expectations.

It helped me narrow down what I want to do in life.

They showed me things I needed to know to prepare for science and engineering.

Yes, I expected to learn a lot and I did.

*What did you like most about Project TYPSE?

-the science modules and writing my own programs.

-all the new material I learned.

-the field trips.

-robotics and circuit modules.

-assembling robots.

-the way they let you go at your own pace.

-working with the word processor and data files.

*What did you like least about Project TYPSE?

-nothing.

-the science modules.

-sessions were too long.

-Everything was great!

-word processing.

*Would you recommend Project TYPSE to a classroom?

-Yes, it gives a chance to broaden your horizons.

-Yes, it teaches you a lot more.

-Yes, it helps students progress at their own rate.

-Yes, it helps you learn.

-No, there are too many ability levels in the classroom.

-Yes, it will increase interest in science and engineering.

-No, it will not be too appealing to other students.

*What suggestions or recommendations do you have for improving Project TYPSE?

-more field trips.

-more science modules.

-more experimentation.

-longer sessions.

-shorter sessions.

-Nothing. You cannot improve on perfection.

-refreshments and longer breaks.

-more math modules.

-more computers and more participants.

Career Aspirations of Students

All of the students aspired to go to college and more than half were considering a career in science or engineering but only one considered being a science educator.

The project targeted a population of 8th, 9th and 10th grade students because it is at this stage that young students begin to consider future careers and there is time for them to include upper level science and math subjects in their high school backgrounds--subjects that are critical to their admission and success in science and engineering careers in college. However, because of their age, it is too early to expect the students to be committed to making final decisions related to their careers or to be definitive in deciding future careers. Nonetheless, the project staff is confident that the participants (1) have been made aware of the wide range of career opportunities in science and engineering, (2) have been made aware that they have the ability to pursue careers in these areas, and (3) were very motivated to enroll in upper level science and math courses in high school so as to keep the option of choosing science and engineering careers open.

Recommendations for Succeeding Summer Camps

1. The simulations and interactive videotape modules in science and math, the science experiments utilizing the computer as a data collection device, and the robotics activities which the majority of the students found challenging and interesting, will be retained.

2. More activities that enable the students to apply or see practical applications of the fundamentals of robotics were requested by the students. This can be done with additional funding.

3. Each year students who apply to the program continue to be more proficient with the use of the computer since some of them are exposed to it at school, at home or other environments.The staff will find out at the beginning of each session the entering competencies of the students to avoid duplication and provide them immediately at the beginning of the program with more complicated or advanced activities that will enhance their knowledge and skills.

## C. SCIENCE FACILITY IMPROVEMENT

A variety of hand-on experiences and problem solving activities have been added to physical science programs at the FAMU Laboratory School as a result of the addition of glassware, chemicals and other consummable supplies that were purchased through grant monies.

## PROJECT IMPACT AND FUTURE PLANS

The project materials have significantly improved the science education program at the FAMU Laboratory School. The evaluation data provide evidence that the materials produced provide many enriching experiences to the students that are not available to them in a normal classroom setting. The students have generally found the project materials to be very interesting, effective and challenging instructional materials. The materials are individualized with built-in multiple tracking and they promote independent

thought and work so much so that students generally have a feeling of self-satisfaction for having taught themselves the concepts.

This project has also provided the FAMU Laboratory School with an avenue for fulfilling its primary mission. The FAMU Laboratory School, along with three other laboratory schools in Florida, are charged by the Florida Board of Regents with the primary mission of research, development and dissemination aimed towards the priority needs in learning, instruction and other pressing education needs. The project materials are making the FAMU Laboratory School highly visible in the state of Florida.

The project materials are stand-alone, transportable and cost-effective. They were field-tested with chemistry, physics, trigonometry and physical science students and talented 8th - 11th grade students. They can be used by science and math teachers throughout Florida and the nation in their classrooms provided they have the necessary equipment to implement them. The materials can also be used during Saturday academies, summer camps and after-school programs.

The project materials will continue to be implemented in the science classrooms at the FAMU Laboratory School during the school year. With additional funding, the TYPSE summer camps will continue to be provided to talented minority students. Continued funding will be necessary in order to incorporate program improvements and expansions into the TYPSE program and to continue the development of courseware materials in science and mathematics.

APPENDIX

PROJECT TYPSE

FAMU DEVELOPMENTAL RESEARCH SCHOOL
FLORIDA A&M UNIVERSITY
TALLAHASSEE, FLORIDA

STUDENT PROGRAM EVALUATION

THE PURPOSE OF THE STUDENT PROGRAM EVALUATION IS TO DETERMINE YOUR ATTITUDES AND OPINIONS ABOUT HOW WELL PROJECT TYPSE IS ACCOMPLISHING ITS GOALS AND HOW WELL IT IS MEETING THE NEEDS OF THE STUDENTS PARTICIPATING IN THE PROGRAM. THIS EVALUATION WILL HELP US DECIDE IF THERE IS A NEED TO MAKE CHANGES IN THE PROGRAM THAT WILL RESULT IN GREATER BENEFITS TO THE STUDENTS. PLEASE ANSWER HONESTLY SO THAT WE MAY FULLY UNDERSTAND YOUR FEELINGS ABOUT PROJECT TYPSE. DO NOT WRITE YOUR NAME ON THIS QUESTIONAIRE.

GRADE LEVEL_____
SEX: MALE _____FEMALE_____
DATE _____, 19___

PLEASE TURN TO THE NEXT PAGE

PART ONE

PLEASE INDICATE YOUR FEELING BY CIRCLING THE NUMBER ON THE SCALE WHICH BEST DESCRIBES YOUR FEELINGS. "VERY SUCCESSFUL" IS THE HIGHEST RATING YOU CAN GIVE AND "NOT AT ALL SUCCESSFUL" IS THE LOWEST RATING YOU CAN GIVE.

| IN YOUR OPINION HOW SUCCESSFUL WAS PROJECT TYPSE IN ACHIEVING THE FOLLOWING: | NOT AT ALL SUCCESSFUL | | SOMEWHAT SUCCESSFUL | | VERY SUCCESSFUL |
|---|---|---|---|---|---|
| 1. EXPLORING MINORITY CONBUTIONS TO THE PHYSICAL SCIENCES, ENGINEERING AND SCIENCE EDUCATION..... | 1<br>4% | 2<br>14% | 3<br>61% | 4<br>21% | 5 |
| 2. CHANCE TO INTERACT WITH MINORITY PROFESSIONALS IN THE PHYSICAL SCIENCES, ENGINEERING, AND SCIENCE EDUCATION..... | 1<br>3.5% | 2<br>3.5% | 3<br>25% | 4<br>25% | 5<br>43% |
| 3. INTRODUCING YOU TO THE VARIOUS FIELDS OF THE PHYSICAL SCIENCES, ENGINEERING AND SCIENCE EDUCATION..... | 1<br>7% | 2 | 3<br>4% | 4<br>32% | 5<br>57% |
| 4. INCREASING YOUR INTEREST IN A CAREER IDN THE PHYSICAL SCIENCES, ENGINEERING AND SCIENCE EDUCATION..... | 1<br>4% | 2 | 3<br>24% | 4<br>18% | 5<br>54% |
| 5. INCREASING THE AWARENESS OF CAREER OPPORTUNITIES FOR MINORITIES IN THE PHYSICAL SCIENCES, ENGINEERING AND SCIENCE EDUCATION..... | 1<br>4% | 2<br>11% | 3<br>24% | 4<br>29% | 5<br>32% |
| 6. MOTIVATING YOU TO FURTHER EXPLORE YOUR INTEREST IN THE PHYSICAL SCIENCES, ENGINEERING, AND SCIENCE EDUCATION..... | 1 | 2<br>7% | 3<br>26% | 4<br>30% | 5<br>36% |
| 7. PROVIDING YOU WITH INFORMATION ABOUT THE WORK PHYSICAL SCIENTISTS, ENGINEERS AND SCIENCE EDUCATORS DO..... | 1 | 2<br>4% | 3<br>18% | 4<br>32% | 5<br>46% |
| 8. ASSESSING YOUR ABILITY FOR THE PHYSICAL SCIENCES, ENGINEERING AND SCIENCE EDUCATION..... | 1 | 2<br>4% | 3<br>28% | 4<br>32% | 5<br>36% |

| | NOT AT ALL SUCCESSFUL | | SOMEWHAT SUCCESSFUL | | VERY SUCCESSFUL |
|---|---|---|---|---|---|
| 9. INCREASING YOUR KNOWLEDGE OF THE ACADEMIC PREPARATION NECESSARY FOR A CAREER IN THE PHYSICAL SCIENCES, ENGINEERING AND SCIENCE EDUCATION..... | 1<br>4% | 2 | 3<br>13% | 4<br>54% | 5<br>29% |
| 10. OPPORTUNITY TO INTERACT WITH OTHER MINORITY STUDENTS INTERESTED IN THE PHYSICAL SCIENCES, ENGINEERING AND SCIENCE EDUCATION..... | 1<br>3.5% | 2<br>3.5% | 3<br>32% | 4<br>18% | 5<br>43% |
| 11. IMPROVING YOUR ABILITY TO THINK AND REASON..... | 1 | 2<br>7% | 3<br>29% | 4<br>32% | 5<br>32% |
| 12. PROVIDING YOU WITH CHALLENGING AND EXCITING LEARNING ACTIVITIES..... | 1 | 2<br>1% | 3<br>21% | 4<br>29% | 5<br>46% |
| 13. HELPING YOU GAIN SELF-CONFIDENCE..... | 1<br>3.5% | 2<br>3.5% | 3<br>25% | 4<br>36% | 5<br>32% |
| 14. INCREASING YOUR MOTIVATION TO ATTEND COLLEGE..... | 1 | 2<br>4% | 3<br>14% | 4<br>18% | 5<br>64% |
| 15. OBJECTIVES FOR EACH MODULE IS CLEARLY STATED..... | 1 | 2<br>4% | 3<br>28% | 4<br>54% | 5<br>14% |

PART TWO

PLEASE CIRCLE THE NUMBER ON THE SCALE WHICH BEST DESCRIBES YOUR FEELINGS. "EXCELLENT" IS THE HIGHEST RATING YOU CAN GIVE AND "VERY POOR" IS THE LOWEST RATING YOU CAN GIVE.

| | VERY POOR | POOR | AVERAGE | GOOD | EXCELLENT |
|---|---|---|---|---|---|
| 1. HOW WOULD YOU RATE PROJECT TYPSE? | 1<br>3.5% | 2<br>3.5% | 3<br>7% | 4<br>50% | 5<br>36% |
| 2. HOW WOULD YOU RATE THE ORIENTATION? | 1<br>3.5% | 2<br>3.5% | 3<br>18% | 4<br>50% | 5<br>25% |
| 3. HOW WOULD YOU RATE THE PROJECT TYPSE STAFF? | 1 | 2 | 3<br>7% | 4<br>54% | 5<br>36% |
| 4. HOW WOULD YOU RATE YOUR PROJECT TYPSE INSTRUCTORS? | 1 | 2 | 3<br>11% | 4<br>43% | 5<br>46% |
| 5. HOW WOULD YOU RATE YOUR KNOWLEDGE OF THE PHYSICAL SCIENCES AND ENGINEERING? | 1 | 2 | 3<br>14% | 4<br>68% | 5<br>18% |
| 6. HOW WOULD YOU RATE YOUR ABILITY TO UNDERSTAND THE MODULES USED IN THE PROJECT TYPSE PROGRAM? | 1 | 2 | 3<br>36% | 4<br>57% | 5<br>7% |
| 7. HOW WOULD YOU RATE YOUR UNDERSTANDING OF PROJECT TYPSE GOALS & OBJECTIVES? | 1 | 2<br>3% | 3<br>29% | 4<br>50% | 5<br>18% |
| 8. HOW WOULD YOU RATE YOUR INTEREST IN A CAREER IN THE PHYSICAL SCIENCES, ENGINEERING AND SCIENCE EDUCATION? | 1 | 2<br>7% | 3<br>11% | 4<br>44% | 5<br>38% |
| 9. HOW WOULD YOU RATE YOUR INTEREST IN PARTICIPATING IN PROJECT TYPSE NEXT YEAR? (not for eleventh graders) | 1<br>11% | 2 | 3<br>15% | 4<br>37% | 5<br>57% |
| 10. HOW WOULD YOU RATE YOUR ATTENDANCE IN YOUR PROJECT TYPSE PROGRAM? | 1 | 2 | 3<br>11% | 4<br>32% | 5<br>57% |
| 11. HOW WOULD YOU RATE YOUR PUNCTUALITY, THAT IS, GETTING TO CLASS ON TIME? | 1<br>3.5% | 2 | 3<br>..7% | 4<br>28.5% | 5<br>61% |
| 12. HOW WOULD YOU RATE THE OPPORTUNITIES FOR MINORITIES IN THE PHYSICAL SCIENCES, ENGINEERING AND SCIENCE EDUCATION | 1 | 2<br>7% | 3<br>14% | 4<br>50% | 5<br>29% |

PART THREE

PLEASE CIRCLE THE NUMBER ON THE SCALE WHICH BEST DESCRIBES YOUR FEELINGS. "EXCELLENT" IS THE HIGHEST RATING YOU CAN GIVE AND "VERY POOR" IS THE LOWEST RATING YOU CAN GIVE.

HOW WOULD YOU RATE YOUR INSTRUCTORS?

| | VERY POOR | POOR | AVERAGE | GOOD | EXCELLENT |
|---|---|---|---|---|---|
| 1. WILLINGNESS TO HELP STUDENTS UNDERSTAND COURSE MATERIAL..... | 1 | 2 | 3<br>30% | 4<br>7% | 5<br>63% |
| 2. ENCOURAGES STUDENTS TO THINK AND EXPRESS THEMSELVES..... | 1 | 2<br>4% | 3<br>21% | 4<br>14% | 5<br>61% |
| 3. USES CLASS TIME WELL..... | 1 | 2 | 3<br>29% | 4<br>25% | 5<br>46% |
| 4. KNOWS WHEN STUDENTS DO NOT UNDERSTAND COURSE MATERIAL..... | 1<br>3.5% | 2<br>3.5% | 3<br>32% | 4<br>18% | 5<br>43% |
| 5. STARTS CLASS ON TIME..... | 1 | 2 | 3<br>22% | 4<br>14% | 5<br>64% |
| 6. KNOWLEDGE OF COURSE MATERIAL... | 1 | 2 | 3<br>25% | 4<br>11% | 5<br>64% |
| 7. RELATES WELL TO STUDENTS..... | 1 | 2 | 3<br>22% | 4<br>30% | 5<br>48% |
| 8. ENCOURAGES STUDENTS TO ASK QUESTIONS..... | 1 | 2<br>4% | 3<br>28% | 4<br>7% | 5<br>61% |
| 9. MAINTAINS ORDER AND DISCIPLINE IN THE CLASSROOM..... | 1<br>4% | 2 | 3<br>25% | 4<br>21% | 5<br>50% |

PART FOUR

PLEASE ANSWER EACH QUESTION FULLY.

1. What is the purpose of PROJECT TYPSE?

   All of the participants were able to state the purpose and objectives of Project TYPSE.

2. Did PROJECT TYPSE meet your expectations? 77% yes 23% no
   Why or why not?

   Please see Results & Interpretation of Results for a listing reasons.

3. What did you like most about PROJECT TYPSE?

   Please see Results & Interpretation of Results for the listing.

4. What did you like least about PROJECT TYPSE?

   Please see Results & Interpretation of Results for the listing.

5. Would you recommend PROJECT TYPSE to a classroom? 72% yes 28% no
   Why or why not?

   Please see Results & Interpretation of Results for reasons.

6. What suggestions or recommendations do you have for improving PROJECT TYPSE?

   Please see Results & Interpretation of Results for reasons.

PART FIVE : PLEASE PLACE AN "X" IN THE BOX THAT BEST DESCRIBES YOUR FEELINGS.

1. What are your educational expectations?

11% high school
3.5% some college or associate degree
3.5% bachelors degree
11% masters degree
28% Ph.D.
43% professional degree (lawyer, dentist, etc.)

2. What are your feelings about college?

96% definitely go to college
4% probably go to college
___ not sure
___ probably not go to college
___ definitely not go to college

3. What is your career goal? (Check one)

25% I would like to be a scientist
29% I would like to be an engineer
3% I would like to be a mathematician
7% I would like to be a doctor or dentist
11% I would like to be a lawyer
18% Other:_____
7% I am not sure what I want to be

4. What are your feelings about the physical sciences?

14% definitely plan to be a scientist
11% probably will become a scientist
36% not sure
36% probably will not become a scientist
3% definitely will not become a scientist

5. What are your feelings about engineering?

21% definitely plan to be an engineer
18% probably will become an engineer
29% not sure
21% probably will not become an engineer
11% definitely will not become an engineer
What field of engineering do you plan to pursue?____ _____

6. What are your feelings about science teaching?

0% definitely plan to be a science teacher
3% probably will become a science teacher
14% not sure
33% probably will not become a science teacher
50% definitely will not become a science teacher

PART SIX

PLEASE ANSWER EACH ITEM:

1. Are you (check one): 41% male 59% female

2. What is your ethnic background? (check one)

   96% Black ___Hispanic 6% Asian Other:_____

3. 1986-87 grade in

| | A | B | C | D | E | F |
|---|---|---|---|---|---|---|
| A. mathematics | 32% | 68% | | | | |
| B. science | 54% | 46% | | | | |

4. What extracurricular activities did you participate in this school year? Please list thing you did in and out of school.

   A. _____

   B. _____

   C. _____

   D. _____

   E. _____

5. Do you plan to participate in PROJECT TYPSE next summer? (not for eleventh graders)

   64% yes 36% no If no, why not?

Those who answered no gave the following reasons:

I want to participate in the MITE program.

I will be applying for the Program of Excellence.

I might be going to summer school.

Other plans,