FINAL REPORT

FOR NASA's

TECHNICAL EXPERIENCE

FOR

SELECT STUDENTS PROGRAM

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PURPOSE OF THE NTESS PROJECT

To provide college students with disabilities majoring in technical fields a challenging career-oriented work experience which would lead to further employment at the Goddard Space Flight Center.

ADMINISTRATIVE PROCESS

Student/Participant Recruitment and Selection

Participants sought

The type of participants sought were students with severe and profound disabilities with 2.8 or higher grade point averages (GPA) from Gallaudet University and Historically Black Colleges and Universities (HBCUs) who are majoring in mathematics, physics, computer science and electrical or mechanical engineering. We were seeking to enlist four students from Gallaudet and four from other Universities. The recruiting brochure is also in Braille, and the recruiting video-tape is voiced, captioned, and signed.

Actual Participants

Institutions represented
Eight students with severe disabilities participated: two were from Oregon State University, one from University of Maryland at Eastern Shore, one from Rochester Institute of Technology, and four from Gallaudet University.

Ethnicity
Three students were Hispanic, one was Asian-American, one was Africian-American and three were caucasian.

Gender
Six of the eight participants were men and two were women.

Disability status
All students had severe disabilities. Two participants had complete paralysis due to spinal cord injuries. They were wheelchair users and had partial use of their hands and fingers. Five participants were deaf. One participant was both hearing and vision impaired.

Academic standing
Seven of the eight participants had GPAs of 3.00 or higher. The one participant who had a GPA lower than 3.00 was chosen based on her references, the degree of the disability and/or underrepresented minorities. Five participants are seniors, one is a junior, one is a sophomore and one is a graduate student.

Majors
Two participants had double majors: one was majoring in Computer Science and Mathematics and one listed his major as Chemical and Mechanical Engineering. One participant was majoring in Computer Information Science. One participant was majoring in Computer Science. One was majoring in Physics. One was majoring in Mathematics. Two were majoring in Engineering: one in Mechanical Engineering, and one in Electrical Engineering.

Mechanisms used

* A Project Coordinator was hired who had previous experience as a faculty sponsor and as an academic coordinator with NTESS students. As a faculty member of the Department of Mathematics and Computer Science at Gallaudet, she had some knowledge of the academic subjects as well as experience directing learning objectives, holding group and individual meetings, evaluating learning and awarding academic credits.

* A Center for Career Programs (CCP) Coordinator was assigned who worked with the technical/scientific majors from Gallaudet.

* At Gallaudet, the CCP Coordinator identified eligible students. Other students were identified by contacting HBCUs and other colleges and universities to establish contacts with programs for students with disabilities and/or with mathematics and science departments. Brochures and letters were forwarded to the colleges' and universities' mathematics and science departments as well as programs for students with disabilities.

Rationale for making participation mandatory/voluntary?

N/A, this is a voluntary program. There is no way to design it otherwise, as it involves students from a number of colleges and universities.

Outcomes and explanations/recommendations

We were successful in identifying four deaf students from Gallaudet who had strong academic background in their majors. Four students with severe disabilities from other universities were identified and enlisted. Twenty-two students from Gallaudet and other colleges/universities applied and ten were selected for phone and/or personal interviews.

Identification of students with disabilities at HBCUs remains difficult. Offices offering services to students with disabilities are not well established at the HBCUs with the exception of University of the District of Columbia, Howard University, and Coppin State College. Even with the considerable time needed to identify all the possible offices and programs where contact with students with disabilities in technical areas is likely, such as technical academic departments, co-op programs, and other special interest programs, identification of qualified, students with disabilities is unsatisfactory. Since the number of students meeting the program requirements is small, early recruitment efforts are essential. Recruitment efforts began earlier this year, using the contacts established this year and the last two years, as well as members in several professional organizations, such as the National Capital Association of Cooperative Education (NCACE) and the local chapter of AHSSPPE (Association on Handicapped Student Service Programs in Post Secondary Education). Identification of qualified applicants improves each year.

Scheduling

Eight students were selected and their resumes, reference letters, applications and transcripts were sent to Goddard at least one month before the program started. Of the eight students, seven were placed with a mentor and/or supervisor at NASA at least a month before the program started. As recommended from last year's NASA NTESS final report, the deaf students from Gallaudet visited Goddard and met their mentors at least two weeks before the program started.

An NTESS orientation was scheduled the day before the summer internship started. All eight interns attended this orientation meeting at the Seven Springs Village Complex in College Park, Md. In addition, two staff members from the Equal Opportunity Programs' office, one staff member from the Center for Career Office, and two sign language interpreters attended this meeting.

An 1 ½ hour visual gestural workshop was conducted on June 3, 1995, by a professional staff member from the Gallaudet's Department of Sign Communication and a faculty member from the Department of ASL at the Catonville Community College. More than 70 summer interns and a large number of coordinators and mentors attended this workshop. It was well received and educational.

Supplies

The necessary supplies and advertising brochures were quickly obtained. The time allotted for the various activities during the summer and sequencing of the events were satisfactory.

Facilities, Accessibility, and Transportation

Goddard Facilities

The facilities were acceptable, although the interns generally shared minimal space with other interns and/or employees. All students had access to computers. All students had access to the electronic mail system at Goddard. Telecommunication Devices for the Deaf(TDDs) were provided for the hearing impaired students and their mentors by the Equal Opportunity Programs' office (EOP) at Goddard. Visual phone signalers were provided for the hearing impaired students. The computer lab and offices were accessible to the wheelchair users. Sign language interpreters were also provided for various intern-mentor meetings as well as division and/or section meetings.

Housing Facilities

For the duration of the project, all students lived locally. Five students lived at the Seven Springs Village Complex along with the other summer NASA interns. One student lived in an accessible apartment at the University of Maryland's College Park campus. Two students lived in the local area and did not require the housing accommodations provided by Seven Springs.

Transportation

Seven Springs is located less than 12 minutes from Goddard Space Flight Center. A wheelchair accessible van provided by Goddard Space Flight Center was employed for this purpose.

Staff and Administrators

The Project Director and proposal author is the Director of the Center of Career Programs (formerly the Experiential Programs Off Campus). It was her responsibility to hire the staff, oversee the project, develop recruiting materials, oversee budget, analyze the results, and review the final report. She hired individuals for the following positions:

* A Project Coordinator to recruit, interview and select participants, handle the academic and logistic aspects of the program, make contact with HBCU administrators, hold weekly group and individual meetings with the student interns, make contacts with the mentors and the staff members of the EOP office at Goddard, hire interpreters for meetings and the closing ceremony program, direct students' learning objectives, handle evaluations and award academic credits, and perform daily trouble shooting and problem solving.

* A CCP Coordinator to recruit, interview and select students from Gallaudet University, provide guidance and counseling support to the four Gallaudet participants as needed.

* Secretarial assistance: to type forms including Personnel Action Forms, evaluations, letters, and various mailings. Order supplies, prepare bi-weekly payroll for student participants and staff and assist on the budget.

* Interpreters were requested and scheduled as needed.

The staff size was adequate to carry out the aims of the project. The Director met and/or made contact via the campus electronic mail system with the project coordinator an average of four to five hours weekly.

Collaboration

As a result of the project, NASA and Gallaudet collaborated in the following ways over the summer:

* All summer programs collaborated for a culminating awards picnic.

* All students and their mentors had access to electronic mail via the Gallaudet VAX and/or Goddard's VAX.

Site visits developed

* One field trip and various lectures, seminars, and meetings were arranged by Goddard for the project participants.

Your institution's involvement

Gallaudet University was involved in the project as follows:

Gallaudet Interpreting Services provided interpreters when needed.

The student participants, staff members of the NTESS project, and employees of Goddard were able to utilize the electronic mail system.

The University provided space, phones, desk, equipment, and initial supplies for the Project Director, CCP Coordinator, Program Coordinator, and Secretarial Assistants.

Gallaudet's accounting department cut the checks and paid the students on a bi-weekly basis and handled other grant transactions.

CURRICULUM AND MATERIALS PLANNING

How were subject areas decided upon?

Participants recruited by the CCP and Project Coordinator offered varied technical skills and, through contact with EOP Specialists at Goddard, were matched to positions accordingly. After participants were matched with positions, review of the placements, meetings with supervisors/mentors and initial group meetings with participants enabled the Project Coordinator to determine common needs for instruction. Individual training needs of participants were determined by the supervisors who planned the task assignments.

To meet academic credit requirements, additional learning objectives and strategies were planned by the four Gallaudet participants and by the participants who enrolled as Special Visiting Students at Gallaudet: the two Oregon State University participants. The students were provided guidelines by CCP staff and required to develop "Learning Contracts" which met the approval of their supervisors and the Project Coordinator. They

identified their learning objectives, strategies to achieve these objectives, how they would be evaluated, and any additional readings and assignments that would be required. The Project coordinator met with students individually and as a group to develop the Learning Contracts. Bi-weekly meetings of the Project Coordinator with the supervisors/mentors, and weekly meetings with the students provided additional feedback on training gaps. One student from Rochester Institute of Technology received academic credit from his school for his participation in NTESS.

Goddard personnel developed a series of Seminars which addressed topics of interest for all summer program participants.

Who developed and/or selected the materials? Was there any use and documentation of educational software which proved effective for targeted populations?

The Project Director selected the materials for the initial supervisor workshop given to Goddard staff, mentors and/or supervisors. Many of the materials used were developed by Gallaudet University's Center for Career Programs.

Initial meetings of participants and mentors with the Project Coordinator identified FORTRAN and C++ training as the only common training needed. The students were able to learn on their own from written manuals and by working with their mentors on the job. The deaf students were unable to use the FORTRAN videotapes provided by the ITC, because they are not captioned.

All student participants received on site orientation and initial training by their supervisors before tasks were assigned. Standard NASA/Goddard training materials were used.

Goddard personnel also developed the materials used in the Summer Program Seminars.

How were they developed/selected and why were they considered especially appropriate for this population?

Materials used by supervisors for individualized training of participants were selected by Goddard personnel. These materials were primarily standard manuals and NASA specifications typically used by other Goddard employees. Because they were in printed form, the deaf participants could also make use of them.

Written instructions were supplemented by interpreted sessions between deaf participants and their supervisors.

Unique features (e.g. low cost) or evidence of unusual effectiveness.

Electronic Mail newsletters The Project coordinator developed a weekly VAX newsletter to keep all participants up to date on activities, lectures, and meetings.

Non-Work Related Activities The NTESS participants socialized with each other, with other program participants and with Goddard employees. A baseball game at the Orioles' Camden Yard, field trips to Potomac Mills, White House, Washington Monument, Viet Nam Wall, Baltimore National Zoo, Children's Hospital, lunch and dinner outings were arranged by the program coordinator and participants.

PARTICIPANT/PROJECT MONITORING AND EVALUATION

Project Evaluation

The Project Coordinator had on-going meetings (personal contact and/or electronic mail correspondence) with the students and their supervisors/mentors. Students completed a "self evaluation" form near the end of the program on which they provided feedback about their experiences. The coordinator also participated in the Goddard orientation, and assisted students in developing appropriate learning contracts. The coordinator also met with the Project Director, as needed, to provide an overview of program activities and any problems needing attention.

Additional monitoring was accomplished through the assignment of Goddard mentors to participants.

The monitoring identified problems and training needs, and provided helpful subjective information.

Evaluation Plan

Evaluation was primarily accomplished through consistent monitoring of the program by the project administrators, review of participant responses on their self-evaluation instrument and the responses on the mentor's evaluation of his/her student intern.

Methods agreed to and employed by the supervisors and the project coordinator included review of materials the students developed, observation and critique of all student presentations and critique of students ability to complete assigned tasks and meet deadlines.

Instruments Used

Four out of eight participants completed the Student Self Evaluation Form near the program's end. Five mentors completed the Mentor's Evaluation of the Program Student Intern.

SERVICE DELIVERY

No diagnostic tests were used to screen candidates. Participants were selected from the small pool of qualified applicants available at the time, as identified by the CCP and Project Coordinators.

The Project Coordinator and the CCP coordinator determined the participants' strengths and weaknesses through interviews of the students, reviews of their academic records and, when possible, interviews with school personnel familiar with their qualifications. The coordinator collaborated with Goddard's EOP specialist before final selections were made. The participants' background information was provided to the EOP Specialists who, subsequently, matched the participants with appropriate Goddard sites. The placements were made by the Equal Opportunity Specialist who was responsible for the overall summer programs at Goddard.

Monitoring by the Project Coordinator then occurred throughout the project to identify participants' personal or technical weaknesses needing to be addressed. The monitoring included informal meetings and visits to work sites to determine, among other things, any technical or interpersonal problems the students were experiencing. In addition, the CCP coordinator met with the Gallaudet students occasionally to monitor their progress, and also visited the students and their supervisors on-site.

Instructional

The Project coordinator met individually with mentors for specific orientation needs. Training materials on successfully integrating students with disabilities into a professional work environment were distributed.

Participants received group orientations from the Project Coordinator and NASA officials. The students also received individual orientation and training from their mentors and supervisors prior to being assigned tasks. As needed, written manuals and other NASA specifications were provided so that the students could learn the systems and programs needed to perform their job duties. Printed instruction was supplemented by instruction through other means such as electronic mail system and/or occasional use of an interpreter for the deaf participants. Additional information was offered through seminars provided by Goddard.

The mentors individually tutored and advised participants to address their technical questions and help them better understand how their tasks contributed to NASA's overall research efforts.

Site Visits

All summer program participants were provided an orientation and a number of seminars on topics of interest. All of these seminars were conducted by Goddard personnel and interpreted for the deaf participants.

Review of survey answers by the participants revealed that the tours/colloquium provided students with, among other things, information related to their task assignments. The tours/colloquium also offered opportunities for participants to mingle with other Goddard professionals. Through these interactions, students learned more about the value of the research NASA was conducting and how their efforts contributed to it.

Counseling/Advising

The Project Coordinator met on an ongoing basis with participants and their supervisors/mentors. Special focus was placed on issues concerning communication such as assertiveness and interacting effectively with co-workers and co-participants. Participants who experienced difficulties related to communication breakdowns were offered guidance on resolving their problems. The Project Coordinator regularly met with the participants and their supervisors to determine the success of their problem solving and to provide additional guidance, as needed.

A series of seminars were arranged which offered

additional information to participants about career options and requirements. The project administrators also encouraged participants to interact with Goddard personnel to gain information about career options at NASA.

Study Skills

This project's focus was more the hands-on learning of skills and completion of assigned projects than the development of study skills. The participants were, of course, required to study materials and manuals in order to complete task assignments but study time was built into the regular work day. Several students mentioned learning from Goddard managers what additional specific courses they needed to take to be more competitive applicants for positions at NASA.

Through seminars and other conversations with Goddard staff, all participants received information about career opportunities at NASA facilities across the nation. A presentation by the Goddard Personnel Office provided the students with additional insight about the various ways by which they might qualify for other NASA placements (Co-op, Schedule A, Schedule B, Stay-in-School or other Summer programs).

Other Service Delivery

The following activities have occurred as a result of the project. They have contributed to NASA/Goddard's recognition and the potential expansion of the project:

-- During the recruitment process for this project, the Project Coordinator, the CCP Coordinator and the Project Director established a network of contacts with officials from Gallaudet University, historically black colleges and universities and from universities and colleges with recognized enrollment of students with disabilities.

-- The success of this project and examples of student participants' accomplishments have been used by Gallaudet faculty in advising other Gallaudet students about career opportunities and skill requirements.

SUMMARY OF PARTICIPANTS' COMMENTS

Demographic Data

All participants had severe disabilities. Two participants had complete paralysis due to spinal cord injury. They were wheelchair users and had partical use of their hands and fingers. Five participants were deaf. One participant was both hearing and vision impaired. Two students were female and six were male. One participant was Asian American, three were Hispanic, one was Africian-American, and three caucasian.

Accommodations

Five students lived at Seven Springs Village in College Park. Transportation was provided by GSFC. Telecommunication Devices for the Deaf (TDDs) and phone signalers were provided by Goddard's Equal Employment office for students, and their mentors. Interpreters were provided for the project coordinator and the eight student presentation. Goddard funded interpreters for seminars sponsored by the EEO office and other codes. Participants agreed that accommodations were made available as needed.

Position Assignments

All eight participants were very satisfied with their assignments. All had challenging work and good supervision.

Academic Gains

Students benefitted from the program academically and agreed that their experiences improved their academic skills. Six students received Gallaudet credits for their internship at Goddard. All of the participants felt that the program helped them to decide to continue in their career choice and that the program made their course work more meaningful.

Project's Monitoring

Participants agreed the project's monitoring of their performance helped them better understand their strengths and weaknesses.

Project Coordinator

Participants agreed that the Project Coordinator prepared them well for their experience and guided them through their summer internships well. All of the participants felt the support and guidance of the Coordinator minimized the problems that could have adversely affected their performance. Participants receiving Gallaudet credit felt comfortable with the Project Coordinator. The Project coordinator provided support and guidance in developing learning goals and strategies, was available for discussion and provided feedback and advice.

Educational/Career Goals

Seven participants were in Bachelor degree programs. Two participants have double majors. Their majors include physics (1), chemistry (1), engineering (3), mathematics (2), and computer science (3). One participant is in a Master's degree program in Computer Science. All participants felt their NASA experience helped confirm their choice of an academic major.

Two students were interested in participating in future NASA summer programs and/or in a Co-op appointment.

Best Features of the Program

All participants agreed that the Goddard environment, and the technical training and experience they received was the best feature. Participants felt the opportunity to meet and develop professional relationships was very important. In addition, the seven NTESS participants who lived at Seven Spring Village, commented that they were able to socialize with other GSFC summer interns who also lived there.

Weakest Features of the Project

The late placement of students continues to be an issue. Early placements would allow for time to accommodate for adaptive equipment in the work place. Early notification of student background and program start dates would allow mentors and supervisors to better plan assignments. Early placement would also allow the Project Coordinator time to provide an orientation meeting to supervisors, mentors and/or co-workers prior to students starting date. Goddard personnel would be able to voice their needs and concerns regarding disability accommodations. An

orientation on deafness could follow and workshops related to visual gestural communication and survival signing could be offered.

Personal Growth

All students felt they benefitted from the program academically, professionally and personally.

Expectations

All participants expected to get along with their supervisors, mentors and co-workers and felt that they did. They were also treated with positive attitudes, accepted and responded to positively by all. All participants expected to benefit academically, personally and professionally. All students felt that they benefitted in all three areas. **The students had high expectations for their NTESS experience and on the final survey they agreed that the experience met and in some ways exceeded their expectations.**

Prior Concerns

The participants had no concerns before beginning their assignments at Goddard, other than the placement itself. Some of the interns were concerned about the types of projects they were expected to work on during the internship and whether they were related to their academic major(s).

NASA/Project Orientation

The participants were provided a general orientation about NASA programs. All participants were satisfied with the general orientation to Goddard. All participants were provided with an orientation to their work sites and they were satisfied. All eight interns deemed their orientations excellent and three felt that their duties were clearly defined. Participants felt the NTESS orientation meeting provided sufficient orientation to CCP's expectations and goals for the program.

Relationships with Other Employees

Students had no problems with Goddard employees, with the Project Coordinator or with each other. Those supervisors, mentors and co-workers working with the hearing impaired participants showed an interest in communicating via sign language.

All students found their supervisors available to discuss questions and problems and welcomed ideas and comments. They provided constructive feedback and information. All agreed that their co-workers were friendly and helpful. The participants felt comfortable interacting with and initiating conversation with supervisors, mentors and co-workers.

STRATEGIES FOR IMPROVING THE NTESS PROGRAM

Recruitment of Student Participants

-- Design and schedule information meetings at targeted schools working with directors of co-op programs and programs assisting students with disabilities and appropriate academic programs.

-- Advertise the program at appropriate professional organizations.

-- Begin recruitment process at Gallaudet during the Fall semester and have applicants selected by early March so that assignments can be made and supervisors, mentors and co-workers appropriately oriented. Begin recruitment process at other colleges and universities by late November.

-- Arrange interviews with potential participants and NASA mentors and supervisors whenever feasible.

Training/Orientation to Supervisors and Personnel from EOP

-- Provide orientation meeting to supervisors/mentors just prior to students starting date. Explain goals, expectations, training programs, evaluation, and hear their needs and concerns regarding disability accommodations

-- Follow up with orientation on deafness for all supervisors/mentors/CCP staff personnel

-- Offer visual gestural communication workshops and survival signing sessions

-- Provide hook-ups to the electronic mail system via Goddard's mainframe Vax Computer system

Student Training

-- Identify supervisors/mentors by April, allowing time to prepare for their student workers

Accommodations

-- Provide transportation stipend for students from out of D.C. area

-- Ensure that all participants have access to, and understanding of the electronic mail system. This would be particularly beneficial to the deaf students.

SUMMARY OF THE FINDINGS OF THE EMPLOYER'S EVALUATION INSTRUMENT

Students involved:

Clark Brooke (CB)
Jimmie Dixon (JD)
Marlene Johnson (MJ)
Gustavo Limon (GL)
Monica Ortiz (MO)
William Dan Powell (WP)
Leamon Raasch (LR)
Apurva Varia (AV)

Task Description

All participants were required to draw on their computer background and/or acquire computer skills on the job.

CB, from Lakewood, Colorado, is a senior at Gallaudet University majoring in Mathematics. He was placed in the Laboratory for Hyrospheric Processes of the Microwave Sensors Branch in the Earth Sciences Directorate. He used Fortran 77 in developing computer programs to compute and plot several approximations of the backscattering and absorption for particles composed of water and ice. Various mixing formulas were used to obtain the dielectric constant of melting hydrometers.

JD, from Chicago, Illinois, is a senior at Gallaudet University with a double major in Mathematics and Computer Science. He was placed with the Space Physics Data Facility of the Space Sciences Directorate. He read materials and research papers about the magnetosphere and then made a computerized visual movie to present to the K-12 students and general public.

MJ, from Silver Spring, Maryland, is a senior at Gallaudet University working on her second B.A. degree in Physics. She was placed in the Cosmology Data Analysis Center of the Space Sciences Directorate.

GL, from Salisbury, Maryland, is a first year graduate student at the University of Maryland at Eastern Shore. He is majoring in Computer Science. He was also placed in the Laboratory for Hyrospheric Processes. He gained experience by completing challenging projects. Some of these projects were learning html, installing satellite tracking software, working with a digital signal processing board, and creating a database utilizing FoxPro.

MO, from Houston, Texas, is a senior at Gallaudet University. Her major is Computer Information Systems. She worked at the Quality Assurance Software Development Section of the Computer Services Branch. She learned how to work in an office environment, used PC/MAC applications, learned MS ACCESS and PowerPoint and modified a database program.

WP, from Corvallis, Oregon, is a sophomore at Oregon State University with a double major: Chemical and Mechanical Engineering. His internship was with the Mechanical Systems Analysis Section of the Systems Analysis Branch in the Engineering Directorate.

LR, from Cottage Grove, Oregon, is currently a junior at Rochester Institute of Technology majoring in Electrical Engineering. He was placed in the Cryogenics Technology Section of the Space Technology Division. His summer projects were three-folded: calculated approximate cool-down time for a cryogenic test; wrote a pre-test report for an upcoming cryogenic test; and designed capacitor plates for capacitance measuring test.

AV, from Texas, is a senior at Rochester Institute of Technology majoring in Mechanical Engineering. He was placed in the Electronic Packaging and Processes Branch of the Assurance Technologies Division. He assisted in the completion of two projects undertaken by the Assurance Technologies (AT) Lab. He performed testing on mechanical and electrical parts to be used in flight projects.

SUMMARY: All students were expected to perform a wide range of highly technical computer-related tasks. Each performed unique and varied tasks.

All students handled communication problems well and interacted well with their supervisors, mentors and co-workers. They interacted assertively, adapted to the personalities of others and initiated conversations with others. All students responded to feedback and guidance positively. The participants were lauded for their hard-working and enthusiastic attitudes.

Supervisors/mentors were especially impressed with the students' positive attitudes and their willingness to learn.

Communication

Overall communication was not a major concern. Communication with deaf students was done in a combination of sign language, speech and writing. Supervisors and

mentors also communicated via the computer electronic mail system. By the end of the ten week experience, all supervisors and mentors working with deaf students felt comfortable communicating with them.

SUMMARY: Student adaptability and positive attitudes and the supervisors', mentors' and co-workers' desire and efforts with communication via e-mail resulted in smooth communication.