BUILDING A COMMUNITY OF MINORITY SCHOLARS IN SCIENCE, TECHNOLOGY, ENGINEERING AND MATHEMATICS

David L. Ferguson, Distinguished Service Professor
Technology and Society, and Applied Mathematics
Director, Center for Inclusive Education
Stony Brook University

These remarks are based on the Archie Lacey Presentation that I had the honor of giving for the Science Education Section of the New York Academy of Sciences on Friday, February 6, 2004. That talk, and these remarks, are personal reflections on two decades of efforts at Stony Brook University—several in collaboration with colleagues throughout New York State—in addressing issues of access and success for underrepresented minority students in science, technology, engineering and mathematics (STEM). I applaud the Academy for using this venue to highlight diversity of people and cultures as central to its own mission: "to advance understanding of science and technology by focusing on science across disciplines and nations and by building bridges between society and science." I challenge the Academy to facilitate even greater engagement of its members in the national effort of human resource development, especially as it relates to fostering inclusivity in STEM culture, education and careers. Science, technology, engineering, and mathematics are in the image of their creators. Product designs reflect experiences, needs and desires of the designers. Hence, workforce needs ought not to be interpreted in the restricted sense of supplying workers for a dominant culture, but rather in the broader context of transforming work, ideas and products so that they better reflect the immense diversity of our nation and the world. I appreciate the Academy's engagement in this effort.

Over the last two decades, and dramatically over the last decade, Stony Brook University has come a long way in engaging underrepresented minority students in STEM programs, disciplines and careers. As director and co-director of several state and federal programs aimed at enhancing the participation of minority students in STEM, I am fortunate to have been a part of this amazing transformation. It is from this personal perspective that I will try to give a sense of where we were, the journey so far, and the immense challenges that lie ahead.

My remarks are glimpses of two decades of efforts to help underrepresented minority students achieve in undergraduate programs in STEM at Stony Brook. When I arrived at Stony Brook University in 1981—just having completed my Ph.D. at the University of California, Berkeley—I had learned a lot about what students can do when they are challenged and adequately supported. My work at the University of California, Berkeley, with MacArthur Fellow Uri Treisman (formerly of Berkeley, but at the University of Texas at Austin since the late 1980s), fostered my own paradigm shift from teacher-centered to learner-centered environments. I saw, firsthand, the amazing role of collaborative problem solving activities, fueled by very challenging calculus problems, in bringing underrepresented minority students from academic disasters to the front ranks of Berkeley's calculus courses. These issues of collaboration and challenge in the context

of a supportive learning environment have had a strong impact on my own thinking about learning and teaching in general, and more specifically on my thinking about helping minority students to excel in STEM disciplines.

My early days at Stony Brook were a mix of frustration and excitement. The frustration resulted from my observation of the immense fragmentation in the existing efforts to help minority students achieve in undergraduate programs in STEM. Numerous individual stories from students confirmed the feeling that I and others had about the ineffectiveness of existing approaches in helping these students to achieve and combat extreme feelings of isolation. In the face of much frustration during the first year, there were some bright spots. First, two Black students approached me and asked if we could form at Stony Brook a local chapter of the National Society of Black Engineers (NSBE). Sometime later, several Latino students approached me with interest in forming a local chapter of the Society of Hispanic Professional Engineers (SHPE). In the absence of strong academic support services, these organizations went a long way towards helping students form a sense of community, and a long way toward combating much of the isolation. When Stony Brook students attended the national meetings of NSBE and SHPE, it was a "spiritual" experience—never before had these students seen so many other minorities engaged in STEM programs and careers. The second ray of hope that I saw in those early days was the interest of faculty and staff in the Department of Technology and Society to which I belonged. Several years before I had arrived at Stony Brook, several faculty and staff members had developed, under support from the Sloan Foundation, the National Coordinating Center for Curriculum Development (NCCCD). The NCCCD project had led to the design of numerous applied science and applied mathematics modules to be used in schools with high-minority populations. Thousands of copies of the modules were distributed throughout the country and dozens of workshops were conducted in New York State and around the country. This provided the initial niche for other programs to evolve to address the needs of the minority undergraduate students at Stony Brook.

Enhancing the engagement and academic performance of underrepresented minority students in STEM at Stony Brook was a non-trivial challenge. Although the student societies (NSBE and SHPE) did a lot to combat students' feelings of isolation, they did little to offer the kind of sustained support that so many of the students needed in order to succeed in STEM majors at Stony Brook. A boost to our efforts at Stony Brook, and more broadly to others throughout New York State, was New York State's initiation of the Collegiate Science and Technology Entry Program (CSTEP) and the Science and Technology Entry Program (STEP). These programs, directed at college students (CSTEP) and pre-college students (STEP), impacted the academic performance of minority students. In the late 1980s, we were able to show that students' participation in a variety of CSTEP services, including problem-solving workshops in mathematics and science, impacted their performance in these courses. It is through these programs, at the college and pre-college levels, that we began to build a community that would become one that excels in STEM.

In the 1990's, Stony Brook saw a proliferation of programs that helped to build success models for underrepresented minority students in STEM. One such project was the

Research Careers for Minority Scholars (RCMS) Program, funded by the National Science Foundation and co-directed by myself and Alan Tucker, Distinguished Teaching Professor of Applied Mathematics and Statistics at Stony Brook. That project, as reported in both a 1993 talk that I gave at Harvard University and the Newsletter of the Calculus Consortium Based at Harvard University, had a phenomenal impact on students. Of the eighteen underrepresented minority students in the RCMS problem-solving workshop, half of the students received a grade of "A" in the first semester calculus course. A third of the students received "A's" in second semester calculus. All of the students continued onto second-year mathematics courses. A few semesters later, Professor Tucker commented to me that, "In my upper division combinatorics class, I have fifteen underrepresented minority students in the group of sixty students, and the minority students are doing quite well." Several key components were emphasized in the supportive learning environment in which the students engaged:

- **Discourse.** "Discourse" refers to a reflective interchange between two or more parties. One of the parties might be a computer program that allows the student to investigate the properties of a class of functions as the values of the parameters are changed. On the other hand, all of the parties might be students engaged in cooperative verbal interchange that probes various potential solutions to challenging problems. In either case, the student is striving for sense-making, a notion that is fundamental to understanding mathematical concepts, solving problems, and doing mathematical arguments (proofs). I believe that discourse is fundamental to meaningful learning. A teacher's explanations have limitations. When knowledge is complex, there is too much to tell. You can't tell it all. If you could tell it all, nobody would hang around to listen.
- **Open-ended Problems.** I am using "open-ended" here to refer to two types of problems. One type of problem has specifications that are sufficiently general to give rise to many (possibly infinitely many) valid solutions. For example, "construct a function whose first derivative is always positive and whose second derivative is always negative." A second type of open-ended problem is a problem that is yet unsolved. Let me say that when students are given flexible control over the vocabulary and ideas of a discipline, they will begin to ask hard questions. Some of these questions are not resolved, and some may even baffle the teacher. Some problems may be solved but in such a way that only a glimpse of the method used can be conveyed to students in a freshman course. Some problems may not be solved at all. Can we agree that all of this is okay?
- **Applications.** Multiple representations (geometrical, numerical, and algebraic) may be useful in helping students to understand mathematical ideas. In addition to using multiple representations, I encourage the use of applications to situate mathematics in communities of practice.
- **Sustained Effort.** What ever happened to the story line in calculus and other areas of mathematics? Is there a story to be told? Can each student tell a personal story of the course's major ideas? Sustained work on meaningful projects may be one way to allow students to synthesize knowledge and hence frame their own stories.

- **Challenge.** I like to give students challenging problems. Problems should be sufficiently rich and call on students to utilize a variety of resources: other students, other books, and the computer (or graphing calculator).
- **Emphasis on Excellence.** Students are capable of much more than they can imagine. A key aim of teaching is to elevate expectations and support the student as she/he recalibrates and meets the new challenges.
- **Social Support.** Education, especially much of STEM education, has an impoverishment of social support. Education neglects the tremendous influence of the social realm on cognitive performance.
- **Mentoring.** Through the problem-solving groups, lots of excellent mentoring occurs. Mentoring is the highest form of teaching. Not all teaching is mentoring, but all mentoring, if it is truly mentoring, is teaching!
- **Success Behaviors.** What does it take to be successful as a STEM major? Small-group settings provide an excellent opportunity to explore with students what it means and takes to be an academically strong student in STEM disciplines. Of course, many of the effective behaviors are important outside of STEM. We want students to develop this "reflective practice," a kind of self-monitoring of their behaviors in relationship to their goals and objectives.
- **Student Leadership.** A major goal of any educational venture should be to empower students to take control of their academic, social, and personal lives. Both within and outside of class, it is important to support the development of student leadership. Such student leaders can become partners with us in breaking new ground in student services and raising the bar of excellence.
- **Enjoyment.** Learning should be fun. In the context of the cooperative problem-solving groups, some of that fun is derived from being a part of a supportive learning environment. Another part, a new sensation for many students, is derived from the sheer excitement of understanding and doing mathematics.

The aim of all of this is a kind of cognitive, social and personal growth that extends beyond the narrow confines of courses and curricula into the broader realm of purposeful and productive student behaviors.

RCMS and related programs demonstrated that when students were sufficiently motivated and placed into appropriate mathematics courses, we could help them succeed, even excel, in mathematics. Albeit successful at many levels, the RCMS-type approach, as implemented in our program, had some limitations: 1) It hinged very much on having scholarship support to get the level of commitment necessary to engage students in the intensive problem-solving workshops, and 2) While it built a strong community of high-achieving minority students, the approach did not fully engage the students in the immense resources (human and material) of our major research-intensive University. Already, we were looking for new directions that would foster this type of broader engagement.

The Women in Science and Engineering (WISE) Program at Stony Brook was one of the earlier models that demonstrated the impact of a community that empowers women to engage the immense resources of the University. While teaching during one semester in

the 1990's, I was fascinated by the level of engagement of a group of women who sat on the front row in the lecture. They were clearly the better prepared students in the course. In addition to asking probing questions, they provided the energy and dynamism that helped to set the pace for the course. In a casual conversation, I mentioned this situation to Dr. Wendy Katkin, director of WISE. Immediately, she started to laugh, and quickly added that she had placed this group of WISE students into my calculus course. Later, I learned how the WISE program empowered a group of Stony Brook's undergraduate women to engage the immense resources of the University from their first day on campus. I discovered that these WISE women, from freshman year through graduation, were engaged in research projects and leadership-building activities, including mentoring. WISE was a model for demonstrating the value of a community that empowers over a community that isolates and marginalizes.

In the mid-1990s, there were already signs that a new kind of approach to engaging underrepresented minority students was on the horizon. That approach was about engaging minority students in a much broader context of educational innovation. Here was a continuation of the notions of "community that empowers" and "education that engages and challenges all students." One of Stony Brook's shining stars in this new movement was Dr. David Bynum, Professor of Biochemistry and Director of a path-breaking educational effort called Long Island Group Advancing Science Education (LIGASE). LIGASE's educational programs, from grade school through graduate school, are flourishing. In a recent annual report on LIGASE, Dr. Bynum commented on the impact of LIGASE on undergraduates:

"As a result of our work, undergraduates supported by LIGASE have co-authored over 100 abstracts and publications. For a decade almost 200 students a year have enrolled in our advanced laboratory-based 'Techniques in Molecular and Cellular Biology' course, learning state-of-the-art techniques. Last spring we offered our new 'Molecular Immunology' course for majors. This fall we are offering two new courses, 'Introduction to Biotechnology' for non-majors and 'Bioinformatics and Structural Biology' for majors….
We have received three Minority Access to Research Careers (MARC) awards from the National Institutes of Health (NIH), totaling over two million dollars and we are now supported through 2007. We just completed the sixth year of our MARC program and to date 58 students have received MARC fellowships. All have either received their undergraduate degree or are still in school. The majority of these students who have graduated are applying or are enrolled in Ph.D. and M.D./Ph.D. programs in some of the country's best universities, including three students at Harvard and others at Cornell, New York University, North Carolina, University of California – Irvine, California Institute of Technology, Albert Einstein, Kansas State, Ohio State and Stony Brook."

The engagement of the highest level of Stony Brook's administration in helping to foster educational innovation, in general, and diversity in education, in particular, has been important for the success of our efforts to engage underrepresented minority students. Dr. Shirley Strum Kenny, President at Stony Brook University, chaired the Boyer Commission on Educating Undergraduates in the Research University. The Commission,

as reflected in its 1995 report, found that "the research universities have too often failed, and continue to fail, their undergraduate populations." Changing the situation would require "radical reconstruction." The committee's subsequent report, *Reinventing Undergraduate Education: A Blueprint for America's Universities*, issued in 1998, offered a new vision for undergraduate education and ten recommendations for achieving it. In her paper on "Minority Learning Communities and the Boyer Commission's Vision," Dr. Wendy Katkin, Director of the Reinvention Center at Stony Brook, comments on the 1998 report and its relationship to educating traditionally underrepresented groups.

"Four of the Commission's ten recommendations are particularly relevant to the undergraduate education of students from traditionally underrepresented groups, and I would like to focus on them.

1. *Make research-based learning the standard.* "Learning is based on discovery guided by mentoring rather than on the transmission of information. Inherent in inquiry-based learning is an element of reciprocity: faculty can learn from students as students are learning from faculty."

   This recommendation requires a profound change in the way undergraduate teaching has been structured, which is based on listening, transcribing, absorbing, and repeating. Using the approach that faculty use in their own research, it involves students actively participating in the act of discovery through increasingly complex inquiry-based experiences. By the fourth year, they should be engaging in meaningful research.

2. *Construct an inquiry-based freshman year.* "The first year of a university experience needs to provide a new stimulation for intellectual growth and a firm grounding in inquiry-based learning and communication of information and ideas." The freshman year is the crucial year because it marks an important social and academic transition in students' lives. It serves as the bridge from high school to the more open and more independent world of the research university. The focal point should be a small seminar taught by experienced faculty that will deal with topics that "will stimulate and open intellectual horizons and allow opportunities for learning by inquiry in a collaborative environment."

3. *Build on the freshman foundation.* The freshman experience must be consolidated by extending its principles into the following years. Careful attention must be paid to advising and mentoring. Special efforts need to be made to integrate new transfer students into the research experience with special seminars or courses comparable to the freshman seminar.

4. *Cultivate a sense of community.* Research universities are often large and impersonal institutions. They need to foster communities of learners and

> "create a sense of place to help students develop small communities within the larger whole."
>
> The diversity—by race, ethnicity, nationality, age, socioeconomic status, academic backgrounds, interests and goals—rather than being problematic, is "a critical element in building community values." It gives research universities a "richness of texture unavailable in most American communities." "Students enhance the texture of their learning by listening and interacting with faculty and students from different ethnic and cultural backgrounds." "When students work in collaborative projects, they can benefit from the range of experiences and perspectives that different backgrounds provide."

Dr. Katkin goes on to comment that as universities have tried to create small social and academic communities, they have often turned to existing programs for minority students and women for their models. In reflecting on an array of Stony Brook programs, Dr. Katkin comments: The most innovative and exciting programs pre-Boyer report were programs like RCMS, AMP, Howard Hughes, and Women in Science and Engineering programs – all designed to serve as communities that would provide academic and social support to their constituents. Stony Brook's WISE program, established in 1993, is a good example. It should be emphasized that WISE incorporates all the elements deemed critical by the Boyer Commission and by advocates of "reinvention." These elements include: research-based teaching and learning experiences from the first year on, an inquiry-based first-year seminar, curricular and co-curricular activities that build on first-year learning, a supportive and long-term mentoring system involving both faculty and advanced undergraduates, an emphasis on collaboration and team approaches, the commitment and involvement of faculty, and a strong sense of community that extends beyond the undergraduates to include Stony Brook graduate students and scientists and women scientists from Brookhaven and Cold Spring Harbor Laboratories, and private sector firms.

President Kenny has led the way in advancing opportunities for underrepresented minority students and professionals. She is the principal investigator for the NSF-supported SUNY Louis Stokes Alliance for Minority Participation (LSAMP) Program. The mission of this program is to increase the number of underrepresented minority students who get bachelors degree in STEM fields and increase the number that continue into Ph. D. programs in STEM. Several years ago, President Kenny launched a minority faculty recruitment initiative that has already begun to increase the number of minority faculty at Stony Brook. This faculty initiative has been augmented with the appointment of four Turner postdoctoral faculty trainees drawn from recent African American, Hispanic/Latino, and Native American Indian Ph.D. graduates who are involved in teaching and in research, and mentored in both areas during the three-year traineeship.

Provost Robert McGrath is the principal investigator on the NSF-supported SUNY Alliance for Graduate Education and the Professoriate (AGEP). The mission of this program is to increase the number of underrepresented minority students pursuing

doctoral degrees and academic careers in STEM fields. The services and activities of AGEP are designed to facilitate the following:

- increasing interest in graduate study and enhancing recruitment of doctoral students through targeted outreach activities, summer research internship opportunities at the University Centers (Albany, Binghamton, Buffalo and Stony Brook) and Brookhaven Lab, and identifying and reducing barriers to admissions into graduate programs.
- improving retention of doctoral students through monitoring and interventions, increasing faculty awareness of diversity issues, supporting professional development activities, and community building among graduate students.
- increasing the number of students entering the professoriate through effective mentoring and by providing resources on professional development activities and links to postdoctoral and faculty opportunities.

Dr. Lawrence Martin, Dean of the Graduate School at Stony Brook is a strong advocate and co-worker in our efforts to increase minority participation in STEM, especially as it relates to graduate school awareness, and recruitment and retention of graduate students. He promoted the concept of a Center for Inclusive Education (CIE) and advocated for space for this Center—now a reality in the Frank Melville, Jr. Memorial Library on the Stony Brook campus. More recently, he has helped to obtained funding to support the myriad of activities for which the Center is engaged.

Not only do we have an engaged administration, we have many engaged and forward-looking faculty members who are partners in our efforts to enhance the participation of underrepresented students in STEM. *First*, dozens of faculty members from throughout Stony Brook's STEM fields have made special efforts to engage students in their cutting-edge research. *Secondly*, there is a growing group of Stony Brook faculty who are emerging as not only campus leaders but regional and national leaders in creating innovative learning environments for first-year STEM students. Examples of exemplary work in this area are (a) the collaborative problem-solving and technology-supported problem-solving and student-learning assessments of David Hanson and Troy Wolfskill in the Chemistry Department, and (b) the inquiry-based critical thinking approach to Biological Sciences of William Collins and Joan Miyazaki. These efforts are helping all students learn better. *Thirdly*, individual faculty and faculty committees are more engaged in the recruitment and retention of underrepresented minority students in their STEM fields. The AGEP Program has played a major role in building this new level of faculty engagement. Not only is AGEP enhancing opportunities for underrepresented minority students, it is raising questions, doing assessments, and developing plans that have the promise of helping all graduate students in Stony Brook's STEM fields.

The success that we have achieved in advancing the participation of underrepresented minority students in STEM would not have been possible without the collaboration of many people. These include administrators, faculty across the STEM disciplines, staff, students, and a host of people from business/industry, national labs, and other agencies. It is this effort to engage students in this immense network of powerful resources that guides our new view of program planning. Recently, our program staff reconceptualized

the kind of services that we offer to underrepresented minority students in our Louis Stokes Alliance for Minority Participation (LSAMP) Program. That new conceptualization seeks to build a strong community that can engage the immense resources at Stony Brook and beyond. The specific four-year academic program for undergraduates is outlined below:

First Year Program: Success 101
The aim of the first-year required courses and seminars is to expose students to a full range of academic survival skills.

1st Semester required seminar/course, Learning to Learn and Becoming a Master Student, for all first-year CSTEP and LSAMP students. Book: Becoming a Master Student, Houghton Mifflin. (SUNY New Paltz uses Your College Experience: Strategies for Success, Concise Media; SUNY Oswego uses Essential Study Skills by Linda Wong and Striving for Excellence by Browne and Keeley.)
Topics to be covered: Time Management, Organizational Strategies, Note-taking Skills, Specific Learning Strategies for Science, Math, and Engineering Courses (Concept Mapping), Test Preparation, Memory Techniques, Understanding Course Expectations, Reading Skills, Coping with Deadlines and Pressures to Succeed, Using the Library, Maintaining Physical and Mental Health, Sleep and its Impact on Learning, Using Professors as a Resource, Sitting in the Front versus Sitting in the Back, and Choosing a Major.

2nd Semester required seminar/course is to be track specific and will continue to build on the techniques taught during the first semester.
Track for engineering majors. Book: Studying Engineering, Legal Books
Track for Health Science and Pre-med majors. Book: TBN
Track for science majors. Book: TBN

Sophomore Year Program: Research 101
The aim of the sophomore year required seminar/course is to provide all students with foundation skills in research.

1st Semester required seminar/course in research. Book: The Craft of Research, University of Chicago Press.
Topics to be covered: What is Research, Applying for Summer Research Placements, Research Techniques, Effective Poster Presentations, Presenting at Conferences, Effective Communication Skills, Finding a Research Placement.

2nd Semester required seminar/course in research continues with an emphasis on a student research project.

Junior Year Program
Junior year programming will be done on a seminar basis. The aim of the junior year program is to have students start thinking about their post-baccalaureate plans.

1st Semester topics to be covered: Working Job Fairs and Graduate Awareness Events (Showcasing your Talents), Resume Writing, Effective Cover Letters and Personal Statements, Thinking about Graduate School, What Makes an Attractive Candidate for Graduate School and/or Employment, Asking for Recommendation Letters.

2nd Semester programs: GRE, MCAT, and LSAT workshops for students going on to graduate school; for students seeking employment, an independent study project researching potential employers.

Senior Year Program
The aim of the senior year seminars is to polish student applications and help prepare students for life after graduation.

1st Semester programming will, for the most part, revolve around individual meetings with the students and reviewing their plans and applications (graduate school and/or employment) and support materials.
Topics to be covered: Applying to Graduate School, Applying to Medical School, and Applying for Employment.

2nd Semester programming will cover life planning and survival skills.
Topics to be covered: Financial Planning, Saving for the Future, Debt Management, What is Insurance, Mortgages, and Setting up House.

At its most fundamental level, this paper is about community—meaning of community, building community, evolution of community, charting the direction of community, evolution of multiple communities, and relations among communities for the purpose of synergy and interrogation. It is through this dynamic process that old ways of doing business are challenged, and opportunities arise for doing exciting things that can impact the learning of all students. At Stony Brook University, we are making some progress, but many challenges remain. I would like to highlight five areas that strike me as being the most critical if we are to make great strides in the participation of underrepresented minorities in STEM disciplines:

- We must build stronger partnerships/collaborations, both within and outside of academia. The sheer immensity of the resources—human and material—that are needed for the task at hand is daunting. Yes, there is a need for increased funding to support our efforts, but there is also a desperate need for the leveraging of the tremendous STEM infrastructure for the purpose of human resource development.
- We must enhance our scholarship on both ways of engaging underrepresented groups in STEM disciplines and careers and ways of interrogating STEM disciplines and the workforce so as to build systems that are more responsive to the needs of a diversity of people and cultures.
- We need to build stronger infrastructures and networks that will support the efforts of people and groups who want to contribute to our broad mission while at the same time acting locally to enhance access and success of students.

- We must create powerful learning environments that are built on theories that have been informed by and interrogated by a diversity of communities of practice.
- We must do all of the above with full knowledge of and full participation in the many socio-political contexts—local, state and national—that will impact what we do and how we do it.

Two years ago, Stony Brook University initiated a Center for Inclusive Education to address the above issues within it own campus environment. Already we are engaging a number of parties in the discussions. Now, we propose to build on and expand on existing efforts in order to form a National Center for Inclusive STEM Education that will provide innovative ways for new and existing programs to achieve access for underrepresented students and to prevent fragmentation and duplication of ideas and services. Our Center will provide a highly visible national forum to promote program successes and to advocate for the change necessary to eliminate barriers that are impeding the success of underrepresented minority students in STEM disciplines.

Vision

The following goals and objectives outline the vision for the National Center.

1. **To act as a major agent of change that improves access and success of underrepresented undergraduate and graduate students by:**
    - Publicizing existing programs and networks
    - Building new networks
    - Providing support to staff in existing programs
    - Identifying and publicizing barriers to success and advocating for needed change to eliminate these barriers
    - Working on pedagogy and course restructuring issues that impede success and access
2. **To increase scholarship about key areas affecting underrepresented minority students in STEM disciplines by:**
    - Collection and dissemination of current scholarship
    - Identification and promotion of areas that need scholarship
    - Identification and collection of current relevant data and setting up systems for data collection in key areas where data is not available
3. **To provide services that improve and enhance existing programs by:**
    - Helping existing programs work together more effectively
    - Advocating for issues that emerge on regional and national levels
    - Developing activities that promote program development, help with program implementation, and support current programs
    - Acting as an information clearing house that will develop and disseminate information about best practices, publicize key events, etc.
    - Putting together a network of experts on key areas. This group will help in advocacy, program design, identification of areas in need of scholarship, and dissemination of best practices
    - Providing active technical support for programs and new grant applications

4. **To make the Center for Inclusive Education national in scope by:**
    - Hosting events that publicize the activities and goals of the CIE
    - Finding out if there are other models that can be adapted for the National CIE
    - Identification and involvement of national leaders on enhancing the participation of underrepresented groups in STEM
    - Looking at other mission statements from organizations that are relevant to this effort
    - Looking at the possibility of promoting partnerships with other groups to provide expertise to the Center

When confronted with difficult tasks, a colleague of mine often says, "It is but a simple test of our will to do." The Center for Inclusive Education challenges individuals and groups in every field, and at every level, to engage their minds and hearts in a national effort of human resource development. Perhaps, it will be a test of our collective "will to do."

The presentation on which these remarks are based is in the context of Black History Month. May I close with a couple of tributes. Dr. Martin Luther King's call was a call to a new level of community — one that bridges people and cultures, and extended over eternity.

I will end with Langston Hughes' "Dreams."

Dreams
by Langston Hughes

Hold onto dreams
For if dreams die
Life is like a broken-winged bird
That cannot fly.

Hold fast to dreams
For when dreams go
Life is a barren field
Frozen with snow.

Acknowledgements

In my years at Stony Brook University, I have had the good fortune of working with some amazing people. They have challenged me to think in new ways and reminded me that "this is just the beginning." In writing this paper, I have borrowed liberally from their ideas and program materials. I consider it a privilege to be their colleague and friend.

Tyrone Bennett	Assistant to the Director, STEP and CSTEP
Professor David Bynum	Professor of Biochemistry, Director of LIGASE
Romayne Dickinson	Administrative Assistant, SUNY LSAMP
Lucy Gluck	Project Administrator, SUNY LSAMP and SUNY AGEP
Dorys-Marie Johnson	Co-Director, STEP and CSTEP
Wendy Katkin	Director, Reinvention Center
Professor Thomas Liao	Distinguished Teaching Professor of Technology and Society, Co-Director, STEP, Co-P.I., Math, Science and Technology Partnership
Nina Maung	Program Coordinator, SUNY AGEP
Mary Miller	Administrative Assistant, STEP and CSTEP
Kathryne Piazzola	Program Assistant, SUNY AGEP
Paul Siegel	Stony Brook Coordinator, SUNY LSAMP
Edith Steinfeld	Designer and Coordinator of Undergraduate/High School Mentor Program

Contact Information:

David L. Ferguson
Distinguished Service Professor and Chair
Department of Technology and Society
College of Engineering and Applied Sciences
Stony Brook University
Stony Brook, NY 11794-3760

E-mail: David.Ferguson@stonybrook.edu
Department Website: www.stonybrook.edu/est
Phone: (631) 632-8763