**Building a Model of Collaboration Between Historically Black and Historically White Universities**

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# Building a Model of Collaboration Between Historically Black and Historically White Universities:

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Abstract

Despite increases over the last two decades in the degrees awarded to underrepresented students in science, technology, engineering, and mathematics (STEM) disciplines, enhancing diversity in these disciplines remains a significant challenge. This paper describes a strategic approach to this challenge—the development of a collaborative partnership model between two universities: the historically black Elizabeth City State University and the historically white University of New Hampshire. The partnership, a type of learning organization built on a mutually-agreed upon set of principles, strives to enhance opportunities for underrepresented students to pursue careers in STEM disciplines, specifically those in Earth system science and remote sensing. In examining the partnership, six promising practices have helped advance the partnership. These practices include institutional commitment and faculty engagement, establishing mutual respect and shared time commitment, identifying an engaged leader, engaging critical change agents, initiating difficult dialogues, and preparing for growth and evolution. In reality, these practices overlap and integrate with the partnership principles, forming the foundation for an effective working partnership.

## INTRODUCTION

Federal efforts to promote participation of underrepresented students in the science, technology, engineering, and mathematics (STEM) disciplines in higher education in the United States (U.S.) have been in effect for several decades. The Science and Engineering Equal Opportunities Act of 1980 aimed to create equal opportunity in the STEM disciplines by promoting the full use of human resources in science and engineering. Federal agency programs such as the National Science Foundation (NSF) Alliance for Graduate Education and the Professoriate (NSF, 2004a), NSF Opportunities for Enhancing Diversity in the Geosciences (NSF, 2004b), and the National Aeronautics and Space Administration (NASA) Minority University Research and Education Program (NASA, 2007), among many others, have helped broaden the diversity of student participation in the STEM disciplines. Professional science organizations, such as the American Geophysical Union (AGU), also have called for broadened opportunities for underrepresented students to conduct research in STEM disciplines, noting that ―failure to improve diversity could have important ramifications for the economic, social, and scientific health of our fields.‖ (AGU, 2002)

However, despite increases over the last two decades in the number of undergraduate and graduate degrees in science and engineering fields awarded to underrepresented students (i.e., African Americans, Hispanic Americans, Native Americans, and Pacific Islanders), significant under-representation persists in these disciplines (National Science Board, 2006). For example, while the number of African Americans and Hispanic Americans who completed bachelor's degrees in STEM

disciplines in 2004 was 8.8 percent, and 7.6 percent respectively (NSF, 2006), this is 4 - 5 percent below their overall representation in the total U.S. population (e.g., African American 12.7 percent; Hispanic American 12.5 percent for the year 2000) (U.S. Census Bureau, 2004). Doctoral degree attainment in these disciplines is of significantly more concern. According to this same NSF report, African Americans and Hispanic Americans represent only 4.8 percent and 4.5 percent respectively of the 2004 STEM doctoral degree recipients, noting ―there is a narrowing of participation as educational level increases, with a significant drop off in Ph.D. attainment by members of racial and ethnic minority groups‖ (NSF, 2006). Further, while a few notable nonprofit and educational organizations (Educational Testing Service, ETS, 2007; Coleman, Palmer, & Holland and Knight LLP, 2004; and ACT, 2006) continue to raise serious concerns about the nation's growing educational disparity, it remains clear that, ―The U.S. continues to suffer from a longstanding under-representation of minorities among science, mathematics, and engineering doctorates. This untapped talent has serious consequences for the nation's ability to compete in a world economy driven by technological advances, as well as for a large segment of the nation's citizens who suffer loss of opportunity‖ (NSF 2004a,) . In addition, a recent report (NSF, 2006,) concludes that while some progress has been made in broadening participation by underrepresented students in STEM disciplines, this progress has been ―disappointingly modest.‖

The U.S. Census Bureau (2004) estimates that by year 2050, African Americans, Asian Americans, and Hispanic Americans will comprise approximately 50 percent of

the total U.S. population. These estimates indicate a significant decline in the relative white population from about 70 percent in 2000 to just above 50 percent in 2050 and 40 percent in 2100 (U.S. Census Bureau, 2007). The demographic shifts, coupled with significant under-representation of some groups in the STEM disciplines, are described as two key elements of America's Perfect Storm (ETS, 2007). Lacking new policies and directions that alter this ―perfect storm,‖ ETS (2007) posits that the future competitiveness of the nation is at stake. Further, to respond to what the National Academy of Sciences (NAS, 2007) describes in Rising Above the Gathering Storm: Energizing and Employing America For a Brighter Economic Future as an urgent national need to ―bolster U.S. competitiveness‖ and ―ensure that the United States is the premier place in the world for innovation,‖ it is imperative that all U.S. citizens are engaged, particularly those groups currently underrepresented in the STEM disciplines. (NAS, 2007)

By developing a range of new strategic approaches and opportunities that attract, promote, and expand currently underrepresented student participation in the STEM disciplines, universities can enhance research and scholarship in these areas that are critically important to the U.S. economy and the nation's security and competitiveness. This proposal describes one such approach—the development of a model of collaboration between Elizabeth City State University (ECSU), a historically black university in North Carolina, and the University of New Hampshire (UNH), a historically white university in New Hampshire.

**The Elizabeth City State University-University of New Hampshire Model of Collaboration**

ECSU and UNH partnered to develop a model of collaboration to broaden and extend the pipeline of underrepresented students interested in pursuing careers in STEM disciplines and to support these students in their educational pursuit. The model is based on a set of partnership principles by which demographically diverse institutions in geographically different regions of the nation collaborate to expand scientific knowledge, enhance educational opportunities, and over time, ultimately create a more diverse workforce.

ECSU is primarily a teaching-focused institution in coastal northeastern North Carolina with approximately 160 faculty members in four schools enrolling about 2,800 students. Roughly 70 percent of ECSU students are African American. UNH is a land-, sea-, and space-grant, community engaged research institution on New Hampshire's seacoast with more than 900 faculty enrolling approximately 14,500 students. Roughly 94 percent of UNH students are white. While considerably different in size, institutional priorities, location, and racial composition of the faculty and student body, each institution has specifically defined and complementary strengths in Earth system science and remote sensing. ECSU excels in undergraduate education and student mentoring, while UNH excels in research and graduate education.

Over the last seven years, ECSU and UNH have developed a multifaceted approach to advancing diversity in the STEM disciplines by building and nurturing the partnership. Critical elements of the partnership include mutual benefit, submission of

grant proposals to federal agencies, interactions with program officers in federal agencies, and the engagement of students in authentic, hands-on research projects. The success of the collaboration can be measured in a variety of ways including:

- four federally funded grants resulting in approximately $5 million in awards to date with more than 25 faculty directly involved, and with growing numbers of undergraduate STEM students and science and mathematics public school teachers affected;
- the participation of ECSU undergraduate students in the UNH Undergraduate Research Conference (one of the largest URC's in the nation), the UNH Research & Discover Program sponsored by NASA & UNH;UNH and ECSU undergraduate summer research programs where students and faculty participate on both campuses—a part of various grant programs sponsored by NSF;
- ECSU and UNH faculty working on and hosting meetings on each other's campuses multiple times each year over many years; enhanced UNH faculty interest in recruiting underrepresented students to UNH for graduate school; new involvement of UNH faculty members in campus visits to other minority serving institutions;
- new relationship building with other historically black institutions (besides ECSU) to increase opportunities for graduate student recruitment to UNH. These efforts have resulted in the recruitment of 9 STEM graduate students in the last 2 years;
- the signing of an official ―Memorandum of Understanding‖ at NASA's Goddard Space Flight Center with university leaders, faculty, staff, students, and program

officers and officials from federal agencies such as NASA, NSF, and the National Oceanic & Atmospheric Administration (NOAA) in attendance;

- the creation of two undergraduate scholarships for ECSU students to enable them to pursue degrees in the STEM disciplines and experience a set of opportunities at both ECSU and UNH designed to prepare them for graduate education and careers in science;
- joint faculty and student presentations at the American Geophysical Union meetings (Wake et al., 2005; Mitchell, 2006; Hurtt et.al, 2006; Williams et al., 2007; Williams et. al, 2009) and other venues including the MSI Technical Assistance Conference, American Association of Geographers, NASA, and the IEEE International Geoscience and Remote Sensing Society Symposium.

**PARTNERSHIP PRINCIPLES AND THEORETICAL MODEL**

Crucial to the success of this work is the development of a strong and effective collaborative partnership. Mattessich, Murray-Close and Monsey (2001) define a collaborative partnership as ―a mutually beneficial and well-defined relationship entered into by two or more organizations to achieve common goals.‖ The relationship includes a commitment to mutual relationships and goals, a jointly-developed structure and shared responsibility, mutual authority and accountability for success, and sharing resources and rewards. Gray (1989) and Briggs (2001) both observe that collaborative partnerships are most successful when all members share and advance a common vision. Accordingly, from these definitions and the body of literature in this area, ECSU

and UNH developed a set of ―partnership principles‖ that are foundational to all ECSU-UNH collaborative efforts. The principles can be stated this way: mutual benefit so that each partner can achieve goals, agreeing on a clearly articulated vision so future strategic goals are clear, sharing responsibility and authority so each are accountable for success, and sharing financial resources based on specific work undertaken so rewards are clear and fair. While the partnership principles were established early on, the promising practices were identified as the partnership evolved, as a result of collaborative learning by key members of the partnership at each institution. The partnership principles that guide the ECSU-UNH relationship, in concert with the promising practices that guide implementation of day-to-day work, can serve as a model for others who seek to collaborate across institutional, regional, and disciplinary boundaries to increase the participation of underrepresented students in the STEM disciplines.

To more fully understand the six promising practices and the ECSU-UNH partnership model, a conceptual framework borrowed from theories and constructs described in the business research literature is instructive, including theories about learning organizations and knowledge generating companies (Bickel et al., 2002; Garvin, 1993; Preskill and Torres, 1999; Leithwood et al., 1999; Nonaka and Takeuchi, 1995; Bruffee, 1993; Senge, 1990). These theoretical models can help explain how the ESCU-UNH partnership initially developed, why and how it functions, and the nature of its challenges. Key elements of these models will be discussed below and integrated into the promising practices.

Teaching and student learning is a core function of universities, however, faculty and administrators often do not feel fully integrated into universities as a part of a broader learning community—what Senge (1990) aptly coined as a ―learning organization.‖ Models of learning organizations provide a relevant conceptual framework for universities, other institutions and university collaborations, such as the ECSU-UNH partnership. The learning organization concept can specifically help partnerships realize their promise as a community that generates new knowledge and contributes to innovation. Bickel et al. (2002) suggest that a learning organization is ―committed to inquiry, exhibits fluid information exchange across organizational boundaries (external and internal), possesses knowledge management systems that facilitate collective learning, and demonstrates strategic as well as tactical decision-making based upon what is being learned.‖ Further they note there are four elements of learning organizations——culture, structure, practices, and leadership.‖

Preskill & Torres (1999) note that high functioning learning organizations have cultures and practices that welcome inquiry and challenge the status quo, and that learning from mistakes is critical to their advancement. Moreover, collaborative learning and cooperation each are central to the culture, as are sharing new information across boundaries, building trust, and openness about challenges and difficulties (Bickel et al., 2002). The ECSU-UNH partnership is a kind of learning organization that functions as a community of scholars with a shared vision and goals. Transparency, trust, sharing information, and resources are all critical to ongoing work, interactions, and forward momentum (Garvin, 2000). To keep the ECSU-UNH learning organization

moving forward, faculty commitment and an administrative leader are required. This leader must be someone who is willing, capable, and properly positioned within the institution to advance and transform the community. Nonaka and Takeuchi (1995) describe a type of transformational leader—they call a "middle-up-down-manager" that is central to a high functioning learning organization. This middle-up-down manager serves as a "catalyst-communicator-team leader" crossing boundaries between "what is and what should be." Further, this individual "leads by example" and fosters progress through collaboration and respect for all members rather than simply ordering or demanding compliance. (Bickel et al., 2002).

**IMPLEMENTING THE PARTNERHIPS PRINCIPLES: PROMISING PRACTICES**

Applying the partnership principles has not always been easy. Being in an effective learning organization, negotiating a common vision and goals, and sharing responsibility, authority and accountability, financial resources, and rewards have been challenging at times. Critically important to the success of the collaboration have been six promising practices that characterize this learning community. These practices were identified and agreed to by key partners from each campus as interactions evolved over time and are as follows: 1. institutional commitment and faculty engagement, 2. establishing mutual respect and shared time commitment, 3. identifying an engaged leader, 4. engaging critical change agents, 5. initiating difficult dialogues, and 6. preparing for growth and evolution. These practices overlap in many ways; their synergy and integration form the basis of the partnership as described below.

*Institutional Commitment and Faculty Engagement*

Institutional commitment forms the foundation of the collaboration and was developed differently at each institution. Originally, ECSU and UNH partnered at the faculty-to-faculty level. After responding to invitations from UNH, ECSU science and mathematics faculty recognized that partnering with UNH science, mathematics and engineering faculty would provide opportunities for collaborative research and education projects. This recognition formed the foundation of the initial ECSU interest and subsequent partnership. Several ECSU faculty members joined or initiated grant proposal writing efforts with UNH faculty. After participating in several face-to-face meetings with a UNH administrative leader, the provost and then dean of ECSU's School of Mathematics, Science, and Technology gave his support to faculty. The dean also encouraged partnership proposals to further joint-funding efforts. The potential to develop a partnership that sought to enhance student support, develop new curricula, and expand research training was highly consistent with the ECSU mission and attractive to senior administrators.

In 2002, UNH adopted an academic plan (UNH, 2002) guided by a renewed sense of the institution's land-grant mission, a growing desire to be an ―engaged institution,‖ changing societal demographics, and the national imperative to advance student academic participation in the STEM disciplines. Diversity became an institutional priority, exemplified by the hiring in 2005 of the first Chief Diversity Officer. This new position signaled a key change for UNH in anticipation of a future that would include additional institutional change. Diversity in the STEM disciplines

also was established as an area of emphasis for the newly-endowed (2001) Joan and James Leitzel Center for Mathematics, Science, and Engineering Education. Thus, the partnership launched in 2002 between ECSU and UNH was an excellent way to translate UNH's commitment to diversity into reality. The UNH Senior Vice Provost for Engagement and Academic Outreach working closely with key faculty members and the Leitzel Center provided administrative leadership for UNH's participation.

Much of the day-to-day effort required for writing collaborative research and education proposals was shouldered by faculty. The UNH faculty, typically scientists, mathematicians, and science and mathematics educators, were attracted by the team interactions and the opportunity to partner with ECSU faculty whose strengths lay in undergraduate education and mentoring. This integrated approach of institutional commitment and transformative leadership (Leithwood et al., 1999) with faculty engagement and commitment has proven invaluable, particularly with the hard work required to create, nurture, and sustain the partnership.

*Establishing Mutual Respect, Mutual Benefit and Shared Time Commitment*

Partnerships such as the one described here take years to develop. Mutual respect and mutual benefit have been fundamental to the working interactions. This has evolved over time and is a key characteristic of the learning community. The partnership's potential grew because, progressively, the partners identified complementary research and education interests and strengths. For example, ECSU excels in mentoring and promoting undergraduate education and in student research in

remote sensing through its Center of Excellence in Remote Sensing Education and Research, while the UNH Institute for the Study of Earth, Oceans, and Space leads university efforts in externally-funded research in the STEM disciplines. Further, the UNH Leitzel Center developed a strategic focus to create STEM educational partnerships and became the primary UNH home for the partnership. This initial interest in collaborating was further enhanced by a common vision for STEM education and research which included a desire to broaden the STEM pipeline for underrepresented students (particularly African American students) by pursuing federally-funded opportunities. Preskill and Torres (1999) suggest that successful learning communities build on the intellectual strengths and potential of members; just such a progression is crucial to this partnership.

Prior to the early proposal writing stage of the partnership, ECSU and UNH spent 18 months exploring common interests between individual faculty members in each of the institutions. This initial period, which included multiple visits and face-to-face interactions on both campuses, was critical. The duration and range of discussions allowed lines of communication and mutual understanding to be established before any significant financial resources became at stake and before there was any need to deliver on specific grant objectives. This time of building collaborations was essential, and was instrumental to the establishment of the partnership's culture and norms, including the assumptions and beliefs about what was important, the roles and strengths of community members, and the rules by which the community would operate (Garvin, 2000). Without this inceptive investment, the solid foundation upon which the

partnership now relies would not have been developed.

*Identifying an Engaged Leader*

A designated administrator who provides visionary leadership, while also attending to an array of partnership details is essential to the ECSU-UNH collaboration. In 2002, the current UNH Senior Vice Provost for Engagement and Academic Outreach, a social scientist, volunteered for this role because of her interest, commitment and experience in engaging others in cross-institutional, strategic partnerships. She is responsible for the University of New Hampshire's engagement mission and to institutionalize these responsibilities, she took action to assure that the responsibilities became a formal part of the UNH position description for the Senior Vice Provost.

The critical characteristics of an individual described here as the ―engaged leader‖ are similar to what Nonaka and Takeuchi (1995) describe as the ―middle-up-down manager.‖ They note that such an individual is a strategic leader who serves as a ―bridge‖ and ―strategic knot‖ that works effectively across and among top tier (e.g., Provost, President, Dean) and first tier (e.g., faculty, center directors) individuals. Nonaka and Takeuchi (1995) further describe this individual as a ―catalyst,‖ ―effective communicator‖ and ―team builder‖ who provides ―middle-up-down‖ leadership while engaging others and asserting quite authority rather than ordering change. Like Nonaka & Takeuchi (1995), we also view the engaged leader as a catalyst for institutional change and transformation (Leithwood et al. 1999). Greenleaf (1996) characterizes similar qualities in that of servant leadership, and Block (1993) describes such an individual as a type of ―steward‖ whereby leaders focus on serving others. In

addition, such an individual must seek to familiarize herself with the strengths and interests of each of the primary faculty collaborators. Finally, it is critical that this middle-up-down leader identify and work closely with one key faculty leader on each campus to help sustain and spread these leadership qualities to adequately prepare others to step into this role.

*Engaging Critical Change Agents ("Angels in the Outfield")*

In a successful partnership, it is important to identify and engage critical change agents who move the relationship forward. In this partnership, the principal critical change agents have been a highly motivated and dedicated set of faculty and administrators from both universities. But partnerships need change agents on multiple levels, both internally and externally, to be successful. The ECSU-UNH partnership has benefited enormously from an external set of individuals now known as ―Angels in the Outfield,‖ after those in the 1994 film of the same name (Dear, 1994), who continue to provide important behind-the-scenes support and counsel. Individuals such as Dr. Ambrose Jearld from NOAA, and Dr. Anngienetta Johnson, Dr. Carl Person, and Mr. James Harrington from NASA, have served as critical partnership supporters.

*Initiating Difficult Dialogues*

Even with genuine mutual respect and numerous successes, the team has had to initiate difficult dialogues--conversations that team members would have preferred to avoid, but were essential to achieving success. Difficult dialogues identify the problem,

discuss multiple perspectives, encourage careful listening rather than defensive reaction, foster respect when disagreeing, and commit to reaching a resolution. The desire to advance the partnership, rather than simply win a disagreement, frames the most successful of these difficult dialogues. Few team members enjoy these conversations, and some feel more prepared than others to initiate such discussions. Consequently, when the need arises, the person most prepared given the nature of the concern should lead the discussion, and perhaps, practice how best to respectfully and honestly engage in the dialogue before the conversation takes place.

One difficult dialogue occurred during the development of the first funded NASA proposal, Inspiring the Next Generation of Earth Explorers (described later in more detail). This difficult dialogue transpired because the primary goal for UNH faculty was to engage large numbers of underrepresented students in the program, while for ECSU faculty the goal was to financially support and closely mentor a few students. These two issues – impacting the greatest number of students versus providing financial support and close mentoring to a few – set the stage for competition for the limited financial resources to be requested in the proposal. This resulted in significant back and forth among the faculty and involvement of the engaged leader in a few group and individual discussions. Because of the prior established trust and what Preskill and Torres (1999) describe as culture and practices that welcome questioning and learning from mistakes, ultimately a compromise was reached that made the proposal stronger. This was a watershed moment, the successful conclusion of which helped advance the partnership.

*Preparing for Growth and Evolution*

Successful partnerships grow and mature over time and become more sophisticated in their ability to meet the changing composition of members. Key partnership principles should be revisited in an ongoing and strategic manner to ensure that time and changing circumstances do not negatively impact the partnership. Members must be flexible and find creative solutions to potential problems to survive the inevitable growing pains of a successful enterprise. Strong personal ties that now exist between individual members of this partnership facilitate the growth and evolution of the collaboration, but new members are engaged periodically to ensure that the collaboration is more robust than a particular small set of faculty.

**PARTNERSHIP IN ACTION**

The core activity of the partnership has been developing and implementing collaborative projects that enhance the common research and educational goals and expertise of the partner institutions. Central to this has been the preparation and submission of project proposals to a variety of federal agencies, including NSF, NASA, and NOAA. Teams with representatives from both institutions have developed the proposals, from planning to submission. Between March 2004 and June 2006, collaborative efforts resulted in the submission of eight proposals to federal agencies (Table 1). The four funded projects are described briefly below.

*Watershed Watch: Monitoring the Merrimack and Pasquotank Drainage Basins as a STEM Undergraduate Recruitment and Retention Tool (Funded by NSF)*

Watershed Watch was the first program jointly implemented by ECSU and UNH. The overall goal of project is to increase STEM recruitment rates at UNH and ECSU by engaging students at in authentic, hands-on research of societal-relevant scientific problems. Entry-level undergraduates recruited from UNH, ECSU, and local community colleges learn STEM disciplines via use of geospatial technologies in an integrated, multidisciplinary study of the terrestrial, aquatic, and social components of watersheds. The program consists of two key components: 1) an intensive, technology-rich summer research institute held between freshman and sophomore years that is led and mentored by STEM faculty from UNH and ECSU; and 2) a weekly semester-long seminar in which student research teams design and implements either a research project or an educational outreach project.

*Inspiring the Next Generation of Earth Explorers through Remote Sensing Studies: Remote Sensing Explorers (NextGen) [Funded by NASA]*

NextGen was designed to create and disseminate new curricula in Earth System Science and Remote Sensing across multiple HBCUs. Specifically, the project was to sponsor summer workshops for 36 faculty members from 15 Historically Black Colleges and Universities (HBCUs) where they would be trained to implement two new research-based Earth system science courses at their home institutions. ECSU faculty agreed to provide models of successful student research mentoring within and outside

the two-course structure, while UNH faculty planned to develop and deliver the summer curriculum. In addition, students enrolled in the two courses at the participating HBCUs were encouraged to apply for new research training activities and summer internships under the direct supervision of the program's summer participating faculty. This program was to impact directly more than 1,700 students at 15 historically black institutions. Unfortunately, budget reductions at NASA resulted in suspension of the last two years of this three-year grant award. The ECSU-UNH team quickly revisited the original proposal, met with NASA program administrators, and developed a new strategy.

*Northeast Alliance for Graduate Education and the Professoriate (Funded by NSF)*

The overall goal of the Northeast Alliance project is to increase diversity in STEM doctoral programs through a variety of activities focused on graduate student recruitment, retention, and mentoring. The project concentrates on establishing an aggressive recruiting program for prospective underrepresented students nationally with a particular focus on several of ECSU's partner institutions. Participation in this effort has enabled UNH faculty to learn from ECSU faculty who have expertise and proven success in mentoring African American students. The project also has created new avenues by which ECSU and other HBCU students may connect to research programs at UNH.

*UNH GEO-Teach: Transforming Earth System Science Education* ***(Funded by NSF)***

By implementing a comprehensive plan to transform geoscience education at the middle and high school levels, the UNH GEO-Teach project addresses the need for highly-qualified teachers in the geosciences. Built as a partnership between UNH, ECSU, Dillard University, and Pennsylvania State University, the program bolsters existing preparation programs for pre-service teachers to include mentoring and networking with in-service teachers as well as research experiences in Earth system science. With GEO-Teach support, Earth science graduate and undergraduate students participate in summer enrichment institutes with teachers and continue to build relationships with the teachers during subsequent academic years. The Geo-Teach grant is the most recent and largest award secured through the efforts of the partnership and, in contrast to the others, has broader institutional participation (beyond ECSU and UNH) and includes more varied students, faculty, and public school teachers.

## CONCLUSION

Elizabeth City State University and the University of New Hampshire have conceived and nurtured a strategic partnership to collaborate on externally-funded research and education programs and projects to expand scientific knowledge, enhance educational opportunities, and broaden diversity in the STEM disciplines that can serve as a model for other diverse institutions in geographically different regions of the country. To date, this model's success relies primarily upon the enthusiastic commitment of a range of faculty and students engaged in learning and discovery, the

ongoing, tangible support of administrative leaders at both institutions, and project funding from federal agencies. The partnership is a learning organization with a cross-institutional community of scholars who jointly established a set of partnership principles (mutual benefit, shared responsibility, mutual authority and accountability for success, and shared resources and rewards) which is foundational to this collaboration. A further examination of the partnership also reveals six broad promising practices that serve as a guide for day-to-day interactions, encourage innovation and novel approaches, support ongoing growth and evolution and serve as the glue that holds the partnership together. In reality, these practices overlap in many ways; their synergy and integration form the basis of a complex working partnership.

What has been learned? One idea inherent in the partnership is that collaboration can lead to transformational change and innovation within institutions and among individual participants. .However, genuine collaboration and change require commitment, time, active faculty participation and leadership; UNH and ECSU have made this commitment. Like a marriage, the partnership also requires considerable attention to ensure growth. Further, as difficulties arise, they must be addressed in order to advance the work of the partnership.

Being a part of a diverse learning community also can lead to transformation and change among individual members and the institutions they serve. Transformational change in a diverse learning community also requires and attracts a particular kind of members: those who are future oriented, optimistic, patient and have faith that real change is possible. It is crucial that these change agents represent the institution broadly

and include institutional leaders, faculty, external supporters, and students willing to risk learning in unfamiliar territory. To sustain successful diverse learning communities and collaborations, it is also critical to establish a clear reward structure that encourages the entrepreneurial spirit of faculty. Ideally, these rewards reduce other time commitments and provide financial incentives, but could include the intrinsic satisfaction of working with a team of colleagues who share a common vision. Sustaining the collaboration also depends upon careful and detailed external evaluation. Before this occurs, partners must agree to a set of well-defined goals (beyond the broad goals presented in this paper) and metrics with which to measure partnership progress and specific program outcomes. Finally, successful collaborations, such as the one described here, attract human and financial resources and spark the interest of others.

To date, the UNH-ECSU partnership has secured more than $5 million in federal agency grant awards, has involved more than 25 faculty members, and has had an impact on more than 150 students and a growing number of public school science teachers. As a relatively new learning organization, the partnership has had a positive impact on UNH and ECSU faculty and has served as a catalyst for new UNH faculty interest in recruiting underrepresented STEM graduate students. The partnership also has enhanced and elevated recruitment efforts by the UNH Graduate School by catalyzing new, more diverse institutional connections. As a result, new partnerships with other HBCU's have been formed that should enhance student recruitment in the future.

The UNH-ECSU learning community is relatively new, and with the results representing fewer than two years of actual program implementation, it can be expected to grow. To improve the model in the future, a variety of formative and summative evaluations of specific programs and of the partnership model itself are underway to identify strengths, opportunities for improvement and specifically how such a model might translate to other universities. Ultimately, the best evidence of the partnership's merits will be an increased diversity of individuals studying and working in the fields of science, technology, engineering, and mathematics.

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Table 1. STATUS OF COLLABORATIVE ECSU-UNH PROPOSAL S SUBMITTED AND GRANTS AWARDED FROM 2004 TO PRESENT

| Date | Agency | Proposal Title | Status |
|---|---|---|---|
| Mar 2004 | NSF | Watershed Watch | $1 Million |
| July 2004 | NSF | NE Alliance for Graduate Education & the Professoriate | $650,000 |
| Sept 2004 | NASA | Next Generation – Remote Sensing Explorers | $583,000 |
| Oct 2004 | NSF | Mentoring Students in Earth Systems Science Research | Not Funded |
| Apr 2005 | DHS | New England Center for Emergency Preparedness | Not Funded |
| May 2005 | NOAA | Priming the Pipeline | Not Funded |
| Apr 2006 | NOAA | Collaborative Marine Research Center | Not Funded |
| May 2006 | NSF | Transforming Earth System Science Education | $3 Million |
| Sept 2009 | NSF | Partnerships for International Research & Education | Under review |

NSF = National Science Foundation; NASA = National Aeronautics and Space Administration; DHS = Department of Homeland Security; NOAA = National Oceanic and Atmospheric Administration.