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West Virginia University's Health Sciences and Technology Academy

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Abstract

This article describes the Health Sciences and Technology Academy, an outreach and engagement program by West Virginia University to encourage higher education faculty members and administrators, public school teachers, and community leaders to assume the responsibility of mentoring high school students. The primary goal is to increase the college-going rate among underrepresented students in West Virginia. Additional goals are to improve science and math skill acquisition, to empower communities through leadership development of their youth, and to increase the number of health care providers as well as the number of math and science educators in West Virginia's currently underserved communities.

Introduction

This article describes an outreach and engagement program by West Virginia University to encourage higher education faculty members and administrators, public school teachers, and community leaders to assume the responsibility of mentoring high school students. The program was awarded a 2010 Regional Outreach Scholarship/W. K. Kellogg Foundation Engagement Award.

West Virginia: Background

Home to 1.7 million people, West Virginia is noted for its mountains and diverse topography, its historically significant logging and coal mining industries, and its political and labor history. While known for its rural beauty, it is also home to some of the nation's most economically and educationally challenged communities.

West Virginia University: An Overview

Founded in 1867, West Virginia University is the flagship land-grant, doctoral-degree-granting research university in the state of West Virginia. It is one of only 11 schools in the country that are land-grant, doctoral research universities with a comprehensive medical school. West Virginia University's primary mission is to

engage undergraduate, graduate, and professional students in a challenging academic environment; excel in research, creativity, and innovation; foster diversity and an inclusive culture; advance international activity and global engagement; and enhance the well-being and the quality of life for the people of West Virginia. In 2011, the university was designated as a Carnegie Community Engaged Institution.

In 2010, the faculty members of West Virginia University were awarded $177.7 million in sponsored contracts and research grants. Examples of the university's research strengths include exploring new sources of energy, developing new anticancer and antidiabetes drugs, helping forensic investigators solve crimes, creating better materials for building bridges, and developing nanotechniques and nanotechnology. The university nurtures this research in order to build intellectual, social, and economic capacity for all of West Virginia.

West Virginia University's Health Sciences Technology Academy

The entire state of West Virginia is West Virginia University's community. To maintain vibrancy within West Virginia's communities, it became critical for community leaders and necessary for West Virginia University to form a partnership to improve the college-going rate of West Virginia high school students. In 1994, the university reached out to community leaders to develop the Health Sciences and Technology Academy partnership. The partnership's leaders recognized the need for local communities to embrace and support programs that prepare local youths for careers in health sciences, math, and science education. The Health Sciences and Technology Academy was initiated with the expectation that local youths, after receiving academic or professional degrees, would return to their local communities to help sustain the economy and improve the quality of life for local citizens.

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Overview of the Academy

The Health Sciences and Technology Academy (the Academy) aims to encourage higher education faculty members and administrators, public school teachers, and community leaders to assume the responsibility of mentoring high school students. The primary goal is to increase the college-going rate among underrepresented students in West Virginia. Additional goals are to improve science and math skill acquisition, to empower communities through leadership development of their youth, and to increase the number of health care providers as well as the number of math and science educators in West Virginia's currently underserved communities.

The Academy's participants. The Academy students are 32% African American, 56% financially disadvantaged, and 69% first in their families to go to college. The Academy began with 44 students and nine teachers from two counties. Since then, it has served approximately 800 ninth through twelfth grade underrepresented students per year. Students enter the Academy in the ninth grade and matriculate through the program successfully if they maintain a 3.0 or better GPA, attend 70% of the Academy functions, attend two summer campus experiences, complete 75 hours of community service, and adhere to all disciplinary policies.

The Academy's activities. The Academy prepares participants for college, professional schools, and careers in health, science, math, or technology. It brings underrepresented students and their teachers to campuses across West Virginia each summer for laboratory and classroom training and enrichment activities. It then provides the infrastructure and support for community-based Academy clubs. The clubs consist of local high school Academy students, mentored by teachers and community leaders. Each year, the students produce science-based research projects that focus on issues endemic to their local communities.

Summer activities. Students participate in four separate programs in a curriculum designed to equip them with skills and experiences suitable for a seamless entry into college, and to expose them to curriculum and experiences associated with careers in the health sciences, and teaching careers in math and science. Successful graduates are eligible for tuition and fee waivers to all State-supported colleges or universities, health professions schools, and many graduate schools.

Academic year activities. Led by high school teachers trained through the Health Sciences and Technology Academy, students participate in the Health Sciences and Technology Academy Club.

Through this afterschool cocurricular program, held during the academic year, students engage in scientific research projects relevant to their interests and community needs. Leadership skills, communication skills, teamwork, and Internet resource skills are woven into the experience, along with an expectation that each student will engage in at least 75 hours of community service.

High school teacher educational activities. The Academy provides professional in-service training to each Academy teacher (teachers from local communities). Teachers gain access to resources, professional associations, and computer technology and connectivity. The teachers integrate these resources into their classrooms as well as the Academy afterschool clubs. The Academy program/curriculum has enabled teachers to pursue a master's degree in secondary education with a science focus. To date, 25 teachers have gained a master's degree through the Health Sciences and Technology Academy.

The Academy's governing body. Citizens from local communities dominate the governing body known as the Health Sciences and Technology Academy Joint Governing Board. This body is made up of two representatives and one alternate from each of the 14 regional local governing boards (encompassing 26 West Virginia counties), and one ex officio member from each of the following: West Virginia Higher Education Policy Commission, West Virginia Board of Education, the health professions schools in the state, and the colleges and universities that host the summer camps. The Joint Governing Board is responsible for all policies and procedures, and decisions related to financial and budgetary, personnel, curriculum, recruitment and retention, and public relations issues.

The 14 Academy regions are governed through local governing boards responsible for communicating all appropriate matters to the Joint Governing Board for action and decision making; communicating these decisions to the appropriate Academy regional entity; and ensuring that all Academy policies and procedures are followed. The local governing boards consist of volunteers representing the community, local schools, local health care professions, parents of Academy students, and Academy students.

Under the governance structure established for the Health Sciences and Technology Academy, 51% of the governing members must be community volunteers. The success of the Academy rests in the communities' feelings of ownership and control, and the trust that is built through long-term partnerships among higher education, public education at the state and local levels, and rural communities.

West Virginia University's role in the partnership. Since the Academy began, West Virginia University has acted as the fiscal, legal, hiring, and policy agent for the program. The university houses the Academy's central administration, hosts and delivers several summer programs, and contracts (through requests for proposals) with other colleges and universities to provide additional summer programs for Academy high school teachers and students.

Faculty support. The West Virginia University Health Sciences and Technology Academy has a strong faculty base. Faculty members from the College of Human Resources and Education, West Virginia University Schools of Medicine, Dentistry, Pharmacy, and Nursing, the Allied Health Program, the College of Engineering, and the College of Arts and Sciences convene on a regular basis to propose and design curriculum and share content best practices. For example, faculty members from the College of Human Resources and Education have contributed in the domains of science education, nutrition and wellness, pedagogy, writing, leadership, multicultural understanding, and diversity. Faculty members from the Health Sciences Center developed and delivered curriculum on anatomy and wellness. Faculty members from Arts and Sciences contributed content expertise in the areas of math, biology, and science.

"The teacher professional development component also includes multicultural sensitivity and diversity training, self-esteem building, motivation enhancement, leadership development skills, and study skills in a multidisciplinary context. . . ."

Additionally, faculty members from those cooperating university departments provide a teacher professional development component that includes math and science content, and techniques and projects appropriate for high school students. The teacher professional development component also includes multicultural sensitivity and diversity training, self-esteem building, motivation enhancement, leadership development skills, and study skills in a multidisciplinary context with an emphasis on how to incorporate these skills in the teaching of math and science.

Student support. West Virginia University students (undergraduate and graduate) help Academy students transition to

college and provide engaging experiences. West Virginia University students serve as mentors. They have the responsibility of assisting the participants in goal setting and self-esteem building. They create living-learning communities during the summer program component. They also serve as tutors for college algebra, and as coaches for other academic content and special programs. Graduate students from Industrial Engineering work with a lead faculty member to develop assessment tools and to conduct independent evaluations of the Academy program.

Measuring the Impact of the Academy

The Academy project is large enough to employ an independent evaluation team. The team is based at West Virginia University, and includes faculty members and graduate students from Industrial Engineering as well as a lead faculty member, employed solely through the program. To prevent bias, the evaluation team does not occupy Academy facilities, nor is it involved in the Academy's daily program operations. The evaluation team does not attend any Academy functions or meetings unless the team is in an evaluation development, implementation, or reporting capacity. The evaluation team provides training and technical assistance, as necessary, to students, staff members, and partners to ensure integrity and adequacy of data capture and reporting.

A comprehensive logic model of the program's evaluation components has been developed and implemented to assess the summer camp programs; community science club experiences; teacher perceptions of resources provided by the program to enhance club projects and classroom activities; and facilitation of the networking of teachers, staff members, community, and university with students to carry out student research projects. Both formative and summative instruments are used to gather data, including survey instruments, questionnaires, interviews, observations, focus groups, and pre-post tests. The results are reviewed and changes are implemented to improve the Academy's activities.

Impact on the Youth Participants

Keeping track of the Academy's students and alumni has been difficult and highly dependent on the assistance of community members and local governing boards. Yearly, contact with student alumni is attempted by different methods, including telephoning students, parents, and grandparents; Facebook; and e-mail. Through the Academy's family network, contact with more than

94% of the students has been maintained. This ongoing contact has yielded 5 outcomes:

- improvement in the conditions for learning science for underrepresented students through community-based participatory science;
- an increase in the number of underrepresented students participating in science, technology, engineering, and math disciplines;
- an increase in the number of students remaining in West Virginia to work;
- an improvement in the retention of underrepresented students in high school; and
- an increase in the number of underrepresented students completing college.

The program's leadership has chosen two well-matched comparison groups to test for program effectiveness: (1) the entire graduating class of public high school students and/or public college-going students in West Virginia each year and (2) the Health Sciences and Technology Academy parents. Because the Academy students are negatively selected for college-going and health career choice at the ninth grade when they enter the program, the assumption is that without the Academy, these students would perform below the state averages and on par with their respective negatively selected populations. To access the statewide data, Health Sciences and Technology Academy has partnered with the West Virginia Office of the Chancellor for Higher Education. Comparisons are made between participant and nonparticipant student choices, academic success, and career selection for all high school graduates and/or college-going West Virginians within a given year. The partnership with the Office of the Chancellor for Higher Education has been invaluable in helping the Academy assess the success of its students relative to college-going West Virginians.

The Academy's underrepresented students obtain significantly higher ACT scores and high school grades than the general population of college-going students in West Virginia. The Academy students choose health, sciences, and technology majors at a much higher rate than the general West Virginia college-going population. Health Sciences and Technology Academy students are more likely than their counterparts to graduate from college within six years, and their college completion rate is higher than that of

most West Virginia students. Compared to West Virginia students at large, Health Sciences and Technology Academy students are significantly more educated, and they tend to choose Science, Technology, Engineering, and Mathematics (STEM) oriented majors and careers more often than their parents.

"The Academy students choose health, sciences, and technology majors at a much higher rate than the general West Virginia college-going population."

To date, the Academy program has graduated 1,405 students. The Academy graduate college-going rate is 95%, nearly twice that of the general West Virginia college-going rate of 57.5%. The students are able to succeed in college and graduate at higher rates than the general college-going population (93% versus 59%). They choose science and math careers at a higher rate (50%) than the general college population (38%). Of the approximately 450 Health Sciences and Technology Academy students who have had time to graduate from college, 330 have completed a four-year degree, 179 in health sciences majors (54%); 50 have completed a master's degree, 15 in health sciences majors (30%); 47 have completed a two-year degree (86% in health sciences); 15 have completed a Ph.D.; 8 have completed an M.D.; and one has completed a Doctor of Osteopathic Medicine degree. Of the remainder, 757 are still pursuing undergraduate degrees, 382 in health sciences majors (50%); 108 are pursuing graduate degrees, 60 in health sciences majors (56%); and two are pursuing a second bachelor's degree.

Economic Impact

Although West Virginia University founded Health Sciences and Technology Academy, the State of West Virginia recognizes the effectiveness of the Academy and funds Health Sciences and Technology Academy annually at about 75% of its costs. A study of the first 231 Health Sciences and Technology Academy graduates comparing their earning power to that of their highest earning parent revealed an increased earning power of approximately $26,000 annually. Because 92% of these students stay in West Virginia to work, this increased earning power is directly benefiting the communities. If this figure is multiplied by a 30-year career with the additional earning power, every dollar invested in the program by the State is returned in tax revenue to the State at a

rate of $2.60. The effort has garnered $11,887,425 in state funding, $3,781,850 in federal grants, $5,499,904 in foundation grants, and $544,344 in individual donations, for a total of $21,713,523 over the past 15 years. In addition, the cost of student loans to Academy students for higher education is significantly reduced by the tuition and fee waiver they are eligible for throughout undergraduate, health professions, and graduate school at West Virginia University and other colleges.

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Social Impact

Through Health Sciences and Technology Academy, West Virginia families who have never had educational opportunities have greater access to higher education. Health Sciences and Technology Academy leaders are afforded numerous otherwise unavailable opportunities for professional development though Health Sciences and Technology Academy board retreats and workshops. Teachers network with scientists and faculty members across the state in innovative ways. These collaborations help students acquire advanced skills in science and math while nurturing their interest in related careers. Faculty members are able to conduct research in authentic environments. As a result, community-based problems such as obesity are addressed locally. Above all, students are able to form learning communities with other students from counties across the state.

Impact on West Virginia Students

Most degree programs at West Virginia University include required service-learning activities. One service-learning venue for students is the Academy program, in which the university students serve as mentors to Academy program youths. Since 1994, more than 200 West Virginia University students have been trained as mentors. The training includes learning skills to connect to individual learners, and to deal with group dynamics and differences.

The Academy partnership has helped diversify the West Virginia University student body and has exposed West Virginia University students to a more diverse student population. Moreover, the

university's partnership with West Virginia communities has enhanced West Virginia University student understanding of community engagement.

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Impact on West Virginia Faculty Members

The Academy has had positive effects on West Virginia University faculty members. This partnership has helped faculty develop a curriculum appropriate for grades nine through twelve, as well as engage in action research that has enabled them to assess and improve their teaching. The Academy has also allowed faculty members to partner with public school teachers and develop projects that are suitable to community needs, leading to published research results. The Academy provides an organizational structure for faculty members from multiple disciplines to conduct community-based participatory research, which has resulted in numerous publications, some cowritten by community partners (see http://wv-hsta.org/Projects/Publications/ for all publications relating to the Academy).

Impact on West Virginia as a Whole

West Virginia University has gained national recognition for equity in access for minority students and is reaching many more financially disadvantaged students than it did prior to the Academy. This is being done in the face of a national climate of flagship institutions acting more like private institutions, catering to the financially and politically elite *(Haycock, Lynch, & Engle, 2010)*. Participating high school students are leading a war on obesity in the epicenter of the epidemic, and scientists cheer them on while publishing the results in peer-reviewed journals *(Bardwell, et al., 2009; Branch & Chester, 2009; Pancoska et al., 2009; Rye, O'Hara-Tompkins, Aleshire, & McClure, 2008; Zizzi, Rye, Vitullo, & O'Hara-Tompkins, 2009)*. The Academy has provided an organizational structure for scientists from multiple disciplines to do cutting-edge community-based participatory research. It has also provided an infrastructure that influences legislators and other policy makers in the state.

Sustaining the Health Sciences and Technology Academy

West Virginia University has nurtured the Academy since it was conceived in 1994. University support for the Academy includes time dedicated by an assistant vice president for Health Science for Social Justice, approximately 60 faculty members, 30 graduate students, and 10 undergraduate students. The university also provides central office facilities, teaching space, and financial support.

Health Sciences and Technology Academy began with funding from the Howard Hughes Medical Institute in 1994. It was totally grant funded with the help of the Kellogg Foundation, the Coca-Cola Foundation, and National Institutes of Health, and the National Center for Research Resources Science Education Partnership Award until 1998. Then, the West Virginia State Legislature began to help. Through the years, diversification of funding sources has been key to sustaining the Academy. Current funding sources include the State of West Virginia, National Institutes of Health, National Center for Research Resources Science Education Partnership Award, an RC4 infrastructure grant, Howard Hughes Medical Institute, West Virginia University, Marshall University, West Virginia State University, and private donations.

Conclusion

Four best practices have emerged from the implementation of the Academy partnership between West Virginia University and communities across the state: the governance model, the multi-faceted curriculum, the teacher professional development opportunities, and the holistic nature of the Academy's activities. These best practices may be helpful for other university-community partnerships.

The Governance Model

The Academy governance model has proven to be effective and beneficial for both the university and its community partners. West Virginia University took a bold step in developing and funding a program that would create a governing board with a large majority of voting members from outside the university. They chose to do this because, historically, community trust for university projects was low. The end result, though counterintuitive, has been successful: Give away power to gain influence. By entrusting decision-making to a group whose mission is in line with the university's mission, the university gains influence.

The Multifaceted Curriculum

The curriculum covered by the Academy program is multifaceted and tailored to meet participants' various needs. The curriculum includes diversity awareness, math and science content, leadership skills, self-esteem, writing, and wellness. Through its completeness and variety, the curriculum addresses participant needs, and effectively prepares participants for college and career decision-making.

The Teacher Professional Development Opportunities

The participating high school teachers benefit from Academy training activities. Subsequently, the teachers can effectively fulfill their teaching assignments.

The Holistic Nature of the Program

The review of several programs aimed at improving minority student participation in science, technology, engineering, and math fields *(Leggon & Pearson, 2009)* found that "the most effective and promising programs are based on a perspective that is holistic" *(p. 169)*. The holistic nature of West Virginia University's Heath Sciences and Technology Academy enhances the knowledge and technical skills of its participants; provides and sustains "a comprehensive web of financial, academic, professional, and social support"; facilitates the creation of networks for students, faculty members, community members, colleges, and universities; provides "extensive and intensive professional socialization"; tracks program participants, extensively and intensively; and provides "bridge experiences to facilitate transition from one education milestone to another" *(p. 169)*.

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