The Houston LSAMP: A Model for the Nation

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The Houston alliance first received funding in 2000. Each year since then we have served as external evaluators of this effort, producing a report each year. While we have not hesitated to be critical in these reviews, on balance we have found that Houston has created a world-class alliance.

In this policy brief, we want to present solid data about the productivity of this alliance and to report our findings about the strategies that led to this success.

America cannot reform STEM education, or education more generally, if programs don't apply the most rigorous quality standards. We cannot know for certain that pedagogical innovations truly are helping students unless we perform hard-nosed assessments. Far too often, sweeping changes are implemented in our schools or colleges, often at great cost, without careful monitoring or evaluation. This is a nontrivial problem. STEM education is too important to the nation's vital interests to be left to chance, good will, and anecdotal recollections.

During this period, this consortium of Houston's colleges and universities has demonstrated how to both increase achievement levels and close the majority/minority gap. The institutions have included The University of Houston, Texas Southern University, the University of Houston Downtown, Texas State University, Rice University, Houston Community College, the University of Houston at Victoria, and San Jacinto Community College.

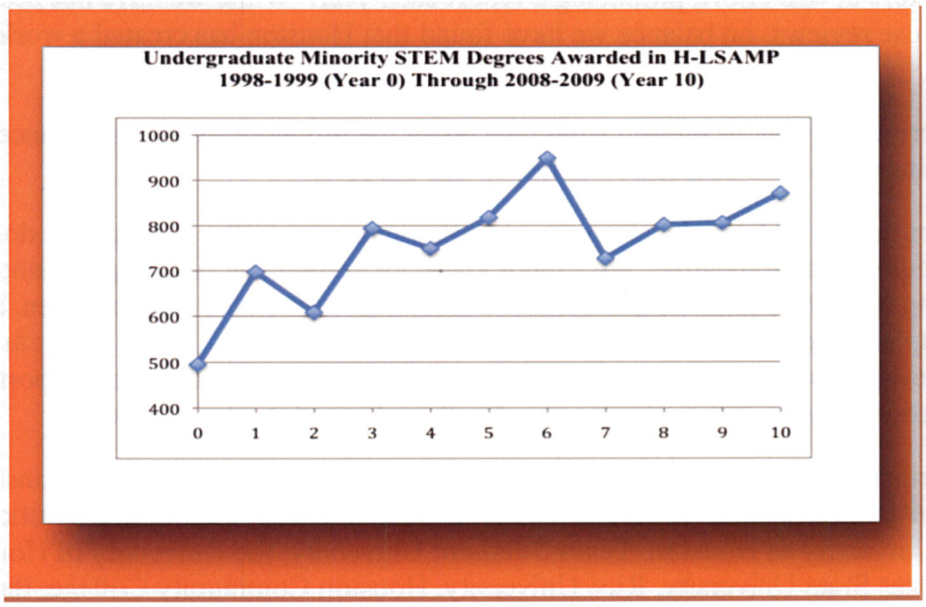
ABOUT EVALUATION RESEARCH. Our work in Houston has combined *Formative or Process Evaluation,* i.e., examining the ongoing implementation of the funded activities and providing periodic feedback to the directors of the effort, with *Summative or Outcome Evaluation,* providing information on whether measurable objectives have been achieved.

Each Federal program or project should have explicit goals which can be translated into measurable objectives. It is astounding how many well-intentioned individuals work hard to lead organizations every day yet cannot articulate clearly what the goals of the organization are. Statements such as "improving the quality of science education in undergraduate colleges" are not specific enough.

Clarity and specificity in measuring abstract constructs are critical. For example, there are unclear and inconsistent definitions of "underrepresented minority students" in the field and in the literature, e.g., how are Pacific Islanders classified? Defining what constitutes or defines a university can vary. Is the University of Maryland defined and measured as all campuses combined, or College Park only, or by each campus separately? Disciplines can be categorized differently by different funding programs and institutions, e.g., is astronomy listed independently or combined with physics?

QUANTITATIVE OUTCOME DATA FOR HOUSTON. In 1999 this consortium set the goal of doubling the number of students of color who achieve bachelor's degrees in STEM disciplines in five years, and they came close to doing it. It's an astounding record. The question is, how did they do it and what can we learn from that?

The NSF expects each LSAMP consortium to substantially increase the number of underrepresented minority students obtaining bachelor's degrees in the first five years, and it then expects each alliance to sustain this higher level of productivity during the next five years. Figure 1 presents degree data for the Houston alliance from the baseline year to 2010.



The number of STEM bachelor's degrees awarded by alliance institutions in the baseline year and the five subsequent years was: 495, 697, 608, 794, 749, and 818.

The graph of minority STEM bachelor's degrees in the first five years shown in Figure 1 reflects two patterns, one overlaid on the other. First, there is a steady increase in the number of degrees awarded over time. Second, there is a "picket fence" effect, in which alternate years are either higher or lower. We have seen this picket fence effect in other STEM degree data. The pattern of alternating higher and lower productivity seems real and may have to do with the availability of required advanced courses for STEM majors.

Assuming a linear increase at the rate of 20% per year, the total number of minority STEM degrees necessary for doubling in the five year period was 3,960. The actual number awarded was 3,666, or 92.6% of the expected number.

Presenting outcome statistics alone is insufficient. The outcome data should be compared to the baseline data to demonstrate value-added trends. Ideally, such growth or value-added changes, i.e., pre- to post-intervention, should be compared with national trends.

As you can see, these universities in Houston have demonstrated that the achievement gap can be closed in a short period of time. How does this compare with the national growth rate? When

we retrieved data from the US Department of Education and made a longitudinal comparison, we found that the growth in degrees awarded to the Houston minority students in science and engineering was *double* that of the national growth rate of STEM degrees awarded to underrepresented minority students.

During this same period (1998-99 to 2003-2004), the total number of Bachelor's degrees awarded to African-American students in STEM disciplines increased from 14,212 to 18,887, a growth rate of 32.9 %, while Bachelor's degrees awarded to Hispanic students increased from 9,892 to 13,262, a growth rate of 34.1 % (US Department of Education, *Digest of Education Statistics*, 2001 Table 270 and 2005 Table 262). Again, while these national numbers are encouraging, the Houston LSAMP rate of growth was essentially twice that of the national average.

Every alliance encounters barriers and setbacks. For example, the program at Texas State University accelerated rapidly under the dynamic leadership of Dean Stan Israel. Following Dr. Israel's sudden death, the program entered a rocky period. More recently, under new leadership at the college level and at the program level, the program once again is growing and is receiving strong support from the administration.

Beyond presenting hard data to document the success of the Houston LSAMP, we want to discuss what we have learned about why this alliance was so productive. How have the universities in Houston accomplished this remarkable growth?

They have used four strategies. Any other college or university can apply these strategies:

1. Extensive recruitment,
2. Constant mentoring,
3. Creating a peer culture of student support aimed at academic excellence, and
4. Engaging the community colleges and tapping the tremendous talent of people, often from poverty, who begin their college education at a community college.

Try for a moment to look at these strategies from the student's point of view. It's difficult for many of us who have completed college to remember what it was like to be beginning college, let alone for those of us who are white to appreciate the barriers facing a student of color, or for a middle-class person to appreciate the barriers facing a student from poverty. To those students, to use the words of an old hymn, it must seem that the college education that lies ahead is a combination of dangers, toils, and snares.

RECRUITMENT. One of the institutions in the Houston alliance, the University of Houston-Downtown (UHD), is located in a poor neighborhood, with many high school students who assume that a college education is out of their reach. Dr. Richard Alo' leads an effort to reach out to those students and make them realize that both college and a STEM career can be possible for them. He and his UHD staff have connected with the students as early as the seventh grade to present these possibilities. They have been creative in their communication and outreach, even employing a social worker as part of this effort.

We interviewed a student who grew up in a poor neighborhood, went to the local high school, and didn't think he was college material. He was persuaded to apply to two institutions. One

turned him down. The University of Houston-Downtown accepted him and gave him financial support through the LSAMP Program to study computer science. When he got to college, he did outstanding work, and he decided he was more interested in mathematics--abstract mathematics, the mathematics of cryptography. When we interviewed him, he was a senior. He had been a prizewinner at a multi-state regional academic conference for undergraduates. He had just turned down a very lucrative offer from a federal agency specializing in intelligence work--on philosophical grounds. He had his choice of graduate schools. But all he really wanted to talk about was the mathematics of encryption and decoding. This is one brief snapshot of a highly talented individual whose college education was made possible by this program.

MENTORING. At Texas Southern University, Dr. Bobby Wilson is the driving force behind the excellence of the instructional program in the sciences. He expects the best from his students. He and the LSAMP staff and faculty are all committed to extensive mentoring of students.

Dr. Wilson is a distinguished chemist who previously was an NSF program officer. He holds the Shell Oil Endowed Chair of Environmental Toxicology and is the L. Lloyd Woods Distinguished Professor of Chemistry. He served many years as university provost, and for a lengthy period as acting president of Texas Southern, yet he still found time to give undergraduates focused individual attention. His commitment to teaching and mentoring started at a young age. While a doctoral student at Michigan State University, he received a chemistry department Excellence in Teaching citation in 1975.

Dr. Wilson is a visible presence in his lab. He constantly banters with students, communicating high expectations, joking with them, and motivating them. They can see his commitment to research and to excellence in academic science on a daily basis.

In the past ten years, 24 African American students in the United States received doctorates in environmental toxicology; 9 of these students—nearly forty percent nationwide—were mentored by Dr. Wilson. In February, 2012, he received the AAAS Lifetime Achievement Award for outstanding mentoring.

Another influential presence on the Texas Southern campus is Michelle Tolbert, the university's LSAMP program director. Dr. Wilson recruited Tolbert from the business sector, and she has brought executive efficiency to coordinating and directing the LSAMP program. She is devoted to the success of every student and she brings boundless energy to this task. There are over a hundred LSAMP scholars at Texas Southern, but they receive constant guidance and mentoring. They turn to Dr. Wilson, Ms. Tolbert, and committed faculty members. For example, mathematics professor Dr. Willie Taylor, can be found tutoring students who are struggling with mathematics just about every day, all day—including weekends. In addition to the immense contribution Dr. Taylor makes to Texas Southern students, we have observed that students from other Houston universities often quietly come over to Texas Southern for his help in learning and understanding mathematical concepts.

At Texas State University, LSAMP Director Susan Romanella guides, supports, and mentors each cohort of LSAMP scholars. Dr. Salina Vasquez-Mireles was a key person in the early success of the LSAMP mentoring activities. In 2002 and 2005 she won the Presidential Award for Excellence in Teaching in the College of Science, and she has been nominated twice for the Mariel M. Muir Excellence in Mentoring Award. She is also an extraordinary role model for

young Latino men and women and for students from disadvantaged backgrounds. She takes this role seriously.

CREATING A SUPPORTIVE PEER CULTURE. The University of Houston-Central sets aside four or five dedicated rooms where the students in the LSAMP program gather. It's a social experience, but it's all geared toward academic excellence. They don't just sit there and talk about the World Series. They are relaxed, but they're all working towards doing extra problems, towards excelling. Dr. John Hardy had the vision for this program more than fifteen years ago. With support from the college and university administration, and with the tireless efforts of Dr. Sylvia Foster, this program became a national model for universities who are committed to creating a supportive peer culture that impacts academic achievement.

COMMUNITY COLLEGES. There is a tremendous pool of untapped talent at community colleges. Many people can't afford to go to college when they're 18 years old; then, when they later go to college, they often have staggering financial responsibilities and few financial resources. They often begin part-time at a community college. But, many of those students could become outstanding scientists and engineers. The Houston alliance has been working on articulation programs to facilitate the transition of these students from the two-year environment to a university. Our observation is that creating effective transition policies and supportive procedures for students moving from community college to the local four-year institution is one of the most important challenges facing higher education today.

In this policy brief we have emphasized the first five years of NSF funding, the years of substantial growth. We should note that the alliance now is moving students into graduate school and focuses on the Bridge to the Doctorate program, under the leadership of Executive Director Craig Cassidy.

Dvesharronne Moore is a shining example. This spring she will complete her Ph.D. in cardiovascular chemistry at Texas A&M University. She then will pursue a medical degree at Johns Hopkins University. Prior to enrolling in Texas Southern University, she had attended DeBakey High School in Houston. This young woman is an amazing role model, who, by dint of her example, can show high school students—who may be uncertain as to whether they are college material or whether they can major in STEM—the kinds of career achievements that are possible for a student who enrolls as an LSAMP scholar.

The early leaders of this Houston grant (Dr. Richard Alo' of UHD; Dr. John Bear of UH; Dr. Richard Tapia of Rice and Dr. Bobby Wilson of TSU), the dedicated faculty and staff, and the high achieving students have shown the rest of the nation how to compete in a globalized "flat world." We hope other American colleges and universities listen to their message.

David E. Drew holds the Platt Chair at the Claremont (CA) Graduate University. His book, STEM the Tide: Reforming Science, Technology, Engineering, and Math Education in America was published in October by the Johns Hopkins University Press.

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