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A Model of Success

The Model Institutions for Excellence Program's Decade of Leadership in STEM Education

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Abstract: The Model Institutions for Excellence (MIE) Grant, funded by the National Science Foundation and National Aeronautics and Space Administration, enhanced student pathways into science, technology, engineering, and math (STEM). It achieved these results through 10 years of sustained investment and collaborative leadership. Components of the MIE model included faculty development, laboratory renovation, student scholarships, intensified student services, and undergraduate research. This article describes the components of the MIE model in more detail and explains how its cycle of impact increased the capacity of the University of Texas at El Paso and Universidad Metropolitana to produce graduates in STEM.

Resumen: La Donación Modelo de Instituciones para la Excelencia (MIE), otorgada por la Fundación de Ciencia Nacional y la Aeronáutica y Administración del Espacio Nacional (NASA), incrementaron caminos para estudiantes de ciencia, tecnología, ingeniería, y matemáticas (STEM). Estos resultados fueron obtenidos a través de 10 años de inversión constante y liderazgo compartido. Componentes del modelo MIE incluyeron desarrollo de profesores, renovación de laboratorios, becas para estudiantes, intensificación de servicios para estudiantes, e investigación a nivel universitario. Este manuscrito describe los componentes del modelo MIE en detalle y explica como su ciclo de impacto incrementó la capacidad para producir graduados en STEM de la Universidad de Texas en El Paso y la Universidad Metropolitana.

Keywords: *Hispanic-serving institution; minority-serving institution; STEM; faculty development; physical infrastructure; curricular revision; National Science Foundation; student success; Hispanic students; Hispanics; Latino students*

Models of success for Latino achievement in the science, technology, engineering, and math (STEM) fields represent a broad array of strategies, points of entry, and funding mechanisms. In the past decade, many different approaches have been pursued. Yet, one small program involving just six institutions that has been a part of federal government policy for more than a decade provides numerous critical lessons that need to be better understood in order to advance the lessons learned at a much broader set of institutions. That program, known as the Model Institutions for Excellence (MIE) program, was established in 1994 by the National Science Foundation (NSF) and the National Aeronautical and Space Administration (NASA). Originally conceptualized by former NSF director Walter Massey, MIE seeks to fulfill these broad goals:

- To improve the quality of STEM education and undergraduate research;
- To promote overall institutional progress while emphasizing the development of STEM departments and programs;
- To create student-centered, accountable, performance-driven STEM education reform models;
- To increase the number of STEM baccalaureate degrees conferred and the percentage of STEM graduates enrolling in graduate school; and
- To disseminate best practice STEM models that can be replicated in institutions throughout America.

To achieve these goals, NSF and NASA used a grant proposal and review process to select six minority-serving institutions (MSIs) from a group of several dozen applicants. Those institutions needed to have a history of serving students of color well, and demonstrate the potential to graduate substantial numbers of students in the STEM fields. Those selected were Bowie State University (MD), the Oyate Consortium (composed of Oglala Lakota College, Sisseton-Wahpeton College, and Sitting Bull College) (SD), Spelman College (GA), Xavier University (LA), and two Hispanic-serving institutions—Universidad Metropolitana (UMET) (Puerto Rico) and the University of Texas at El Paso (UTEP).

This article examines the experience with MIE at the six participating institutions, focusing specifically on the lessons learned for Latino student achievement at UTEP and UMET. It also explores key issues that need to be considered at a policy level in taking this type of program to scale at a larger number of institutions.

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Why Use MIE as a Model?

At both UTEP and UMET, students have shown substantial increases in the number of Hispanic students enrolled in and graduating from STEM fields. UTEP has had particular success in the computer science and pre-engineering fields. For example, in the academic year of 1994-1995, enrollment in those fields increased by 88% and 55%, as compared with the year of 2004-2005. During that same period, the number of degrees conferred to underrepresented minorities in all STEM disciplines at UTEP was up by 21%.

At UMET, enrollment increased in computer science by 57% and in biology by 48%. Like UTEP, the number of degrees conferred to underrepresented minorities increased (given that UMET is 99% Hispanic, it should be noted that "underrepresented" means "underrepresented in the STEM fields"). Other outcomes from the MIE program at UMET include higher numbers of STEM faculty, students going on to STEM careers, and greater cooperation with K-12. (See the appendix for a group of tables that set more of the numerical context for Hispanics in STEM education.) Some of these positive results hinged upon the significant funding that each institution received—more than $10 million each at UTEP and UMET during the past decade. However, many of the strategies generated by their efforts can be employed using existing resources. Below, we consider the sets of MIE strategies model as a whole at all six MIE schools, and then emphasize the strategies employed at both UTEP and UMET.

The Aggregate MIE Model

Taken together, the MIE institutions employed a broad range of strategies to enhance STEM education. The range touched almost every area of institutional operation, from presidential leadership to building renovation. The following list shows the areas of the institutions affected by those strategies.

A. Physical infrastructure and capacity building

1. Classroom restructuring and new construction
2. STEM building—new construction and renovation
3. Lab construction and renovation
4. Computer purchasing
5. Research equipment purchasing

B. Undergraduate student outcomes

1. Graduation with STEM degrees
2. Enrollment in STEM graduate programs
3. Retention in STEM programs
4. Student research

C. Precollege student outcomes

1. Increase in enrollment in STEM from feeder schools
2. Improved alignment in expectations between K-12 and college

D. Faculty outcomes

1. Pedagogical changes
2. Curricular changes
3. Increased research production
4. Invigoration as professors

In addition, a key to understanding how MIE worked as a 10-year program is to understand that the impacts were not linear cause and effect chains with one beginning and one ending. Instead, the initial strategies and their consequential impacts were in fact cyclical. As strategies were generated by one institution, the results and lessons learned were shared with the other MIE institutions through their principal investigators. Those lessons learned would in turn inform the implementation of the strategy with the next incoming class or in the next academic year.

This cycle of impact can be described in five phases:

1. Investment
2. Distribution
3. Integration
4. Production
5. Reinvestment/Compounding

Each of these phases is depicted in Figure 1. The boxes of text show examples of the results generated during each phase. The arrows show the path of impact from one phase to the next. Following are short descriptions of each phase, along with examples.

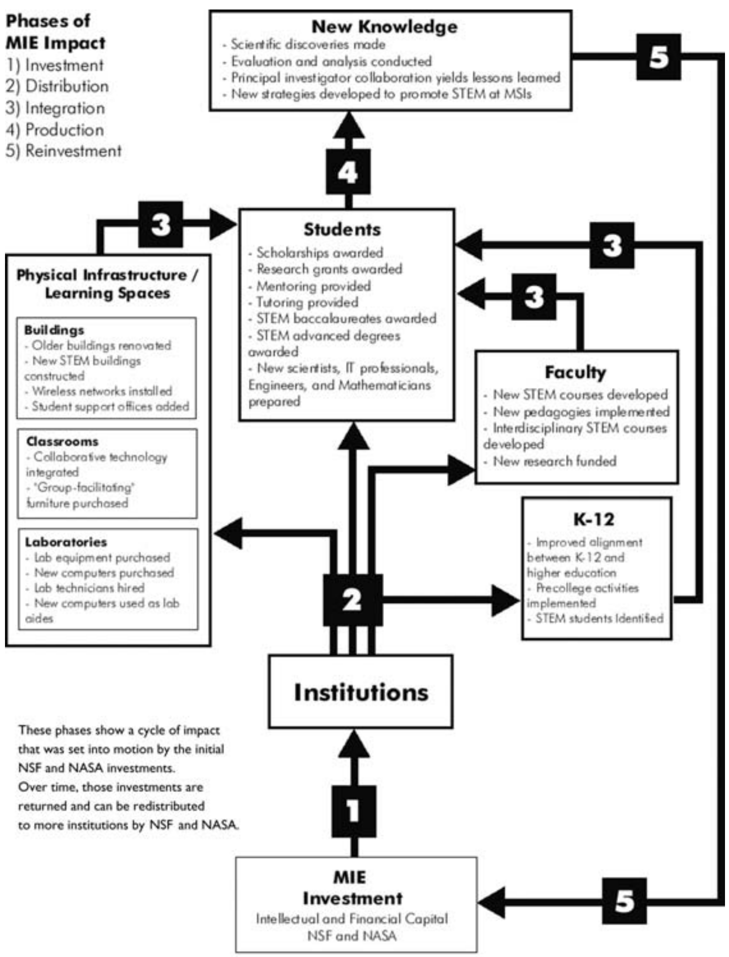
Phase 1: Investment

The investment phase begins when the MIE institutions receive intellectual or financial capital from NSF and NASA. It is important to note that NSF and NASA provided more than money to each institution. The feedback each institution received from NSF reviewers in their initial grants, the technical assistance they received at the launch of their grants, and the ongoing assistance they receive from NSF and NASA constituted an intellectual investment.

Also occurring in this phase is the reprioritization or reaffirmation of each institution's mission. Because each institution received significant investment from NSF, each also had to have conversations about institutional priorities. For instance, whereas UTEP had a long history of producing engineers, only recently has the institution emphasized the production of Hispanic engineers. At UMET, the institutional mission had to be broadened. They had previously been a teaching institution. But once they were selected by NSF, they began to transform into a major producer of Bachelor of Science degrees.

Spelman had a long history of producing African American women scientists, but the significant MIE investment meant balancing STEM priorities against their strong

Figure 1
Phases of MIE Impact



Note: MIE = Model Institutions for Excellence; MSI = minority-serving institution; NASA = National Aeronautical and Space Administration; NSF = National Science Foundation; STEM = science, technology, engineering, and math.

liberal arts tradition. Finally, at Oglala Lakota College, because its STEM-related facilities had previously been very limited, becoming an MIE institution also meant launching out on a new, broader mission.

Some institutions made their affirmations or reaffirmations as STEM producers by explicitly stating them on institutional Web sites. Others worked more quietly by changing lines in budgets and reallocating other resources. But in either context, the impact of the initial phase can be observed by looking at how the institution operated postinvestment.

One could argue that the change in an institution's direction is evidence alone of notable impact. But in addition, changes in relationships between the STEM and the liberal arts sides of institutions were also notable.

In two cases, there was a sense from faculty and deans that the "balance of influence" between the liberal arts and STEM sides had been upset with the new STEM investment and that the increased focus on STEM disciplines necessarily meant a diminished focus on liberal arts. To resolve such struggles, some of the strategies that were initially intended for STEM students were broadened to include liberal arts students (see the description of the Academic Centers for Engineers and Scientists at UTEP described below). Both sides would participate in the benefits of the new investment as a consequence.

Phase 2: Distribution

Once institutions receive investment from NSF and NASA, they use it to implement the strategies that comprise their broader goals. Following is an aggregate listing of those strategies.

Physical infrastructure and capacity building. Improvements to physical infrastructure could be categorized by several purposes. One of those purposes was to create learning spaces that facilitated new approaches to learning. To fulfill that purpose, two institutions purchased classroom and lab furniture that could be easily rearranged into group seating (a change from individual seating and lab stations). Changing the student orientation facilitated collaborative learning.

A second purpose was to provide more STEM-related student support. Each institution created support offices for MIE program staff. Several of the institutions also created tutoring centers. To fuse these ideas, UTEP created resource centers for students that combined new learning spaces with student support. Their Academic Centers for Engineers and Scientists were built to provide group study areas, wireless access, tutoring, meeting rooms for student organizations, internship and job market information, and other research events. They then decided to open these areas to students from liberal arts divisions also.

A third purpose was to provide the technological tools that students need to enhance their learning opportunities. Along with the wireless access the academic centers provided, other institutions also provided video conferencing and smart boards. Smart boards allow an individual to write text on a "whiteboard" in one classroom and have the text also appear in a remote location.

The even more robust upgrade of tools came with the laboratory upgrades that occurred. Each institution was able to create or improve lab facilities through the purchase of research equipment, lab stations, or computers to assist in the analyses of data. Such improvements were substantial at all the institutions, but perhaps they had the largest impact at Oglala Lakota. Before MIE funding, Oglala's STEM students didn't have science buildings but trailers. By 2005, the Oglala campus had built a science building, into which it added 11 new computer labs, 3 biochemistry labs, an EPA-certified analytical testing lab, and a remote sensing and GIS lab.

The last purpose that was met through the investment in physical infrastructure was to provide a home for MIE activities. Each institution either built or renovated its STEM buildings by leveraging MIE funds. To provide state-of-the-art laboratories and install new technological systems, state-of-the-art buildings had to be made available.

Faculty. The most general way to describe the MIE impact on faculty is that it provided a creative license. In some cases, it provided the opportunity for faculty to create new STEM courses. And with the release time that was worked into institutional budgets, faculty could take time away from teaching to infuse new ideas into existing courses. For example, several faculty members at one institution had been contemplating how to use a more collaborative style of teaching to encourage more participation from students. At another institution, the curriculum was opened up so that students had an opportunity to contribute to it and also help deliver the content.

Another example of the creativity exhibited by faculty was an interdisciplinary course created by two professors in biology and chemistry. Blending these two disciplines helped students to make stronger connections between each kind of science and thus enhance their understanding of both. When interviewed, the professors were excited by not only the opportunity to collaborate but also the opportunity to try new ways of teaching the same material.

Having creative license also allowed faculty in tribal colleges to increase the degree to which STEM curriculum reflected Native American perspectives. Because of the holistic worldview in many Native American traditions, teaching concepts that are detached from a natural context may yield weak learning outcomes. For example, teaching osmosis (the process of the absorption of liquid through an external layer) without teaching a context in which it occurs (such as photosynthesis, where water is absorbed through roots) would conflict with a holistic view. Instead, if instructors start from larger natural processes and explain the components of that process, they are more likely to succeed.

Finally, the distribution phase provided the opportunity to hire new faculty. Underrepresented faculty (African American, Asian/Pacific Islander, Hispanic, and Native American) increased by 29.8% between the academic years of 1994-1995 and 2001-2002 at seven of the MIE institutions (Systemic Research, 2003). That increase was more than 10 percentage points higher than the increase of all stem faculty (17.8%).

Student development. The impact on students from the distribution of the initial investment shows up in the scholarships that several institutions provided. Several students explained how the MIE scholarships they received kept them in school and able to maintain focus on completing their degrees. Otherwise, as each student asserted, they would have to work part-time. Their reflections were echoed across the institutions that offered scholarships—suggesting that keeping students on campus and/or engaged is positively related to retention.

K-12. Although most of the strategies that are funded during this phase involve on-campus activity, institutions have also employed a set of precollege activities. One campus has invited local K-12 teachers and students to view poster sessions held by undergraduates. Others have organized summer bridge programs to try to spark interest in STEM careers. These activities can help align expectations between K-12 and higher education. They can also expose STEM careers to students who may not otherwise be made aware of them, thus moving more students into the STEM pipeline.

Phase 3: Integration

The integration phase begins when student outcomes are realized. Once the strategies employed in the areas of faculty development, physical infrastructure construction and renovation, and precollege/K-12 activities are fully implemented, their aggregate impact on students can be observed. For instance, during the distribution phase, institutions were provided technology, equipment, and furniture intended to promote collaboration learning within classrooms and laboratories. It is during the integration phase when the collaboration actually takes place. Similarly, after several institutions used the distribution of resources to create new academic centers, students, faculty, and staff used them to integrate mentoring, tutoring, and group-learning sessions.

This phase also speaks to changes in STEM enrollment and graduation. Compared to nationwide enrollment and graduation, the numbers at MIE institutions were noticeably larger. Between academic years 1992-1993 and 1999-2000, nationwide enrollment in STEM majors increased by 9%. But at the MIE institutions, enrollment in STEM majors increased by 21%.

Likewise, the difference between the STEM degree total nationwide and that emerging from the MIE institutions is substantial. Between 1993-1994 and 2001-2002, the total number of STEM degrees conferred nationwide rose 19%, whereas they rose 46% at MIE institutions.

Also notable is the number of students going on from their undergraduate experiences to graduate programs. In just the 2000-2001 academic year, five MIE institutions saw 339 undergraduate degree recipients admitted to graduate programs. That total represents 45% of all MIE STEM graduates for that year. Moreover, 57% of the graduates from Bowie State and Spelman planned to begin their careers in STEM fields.

Phase 4: Production

Whereas the integration phase describes the preparation of new students, faculty, and other professionals to enter STEM fields, the production phase describes the results of their effort. The scientific discoveries, practical lessons learned from the

MIE program, strategies to develop STEM at other institutions, and the instructive evaluation categorize the new knowledge generated by those efforts.

New science. Although it once focused on majors related to teaching and learning, UMET now produces students pursuing research in fields such as "Large-Scale Antibiotic Misuse," "Food Microbiology," and atmospheric science. Meanwhile, the faculty at UMET has published in a wide range of topics, which include "Luminescent Nanometric Particles of Silicon as a Bacterial Probe" and "Comparative Study of the Growth Curves of (*E. coli*) Bacteria."

Evaluation and analysis. The American Institutes of Research conducted an impact study of the MIE program in early 2005. They compiled statistics that described characteristics of MIE institutions, such as the enrollment of and degrees earned by students of color in STEM fields. They reviewed national datasets to provide a backdrop for MIE characteristics. They mined periodic status reports and other material produced by MIE institutions. In addition, they conducted site visits to meet with MIE program participants representing all levels of each institution (that list includes presidents, faculty, students, graduates, staff, and principle investigators). Lastly, they convened a panel of experts in higher education policy and research to compose benchmarks against which to measure MIE practices and outcomes.

The American Institutes of Research found that during the 10 years of MIE's initial implementation, STEM degrees tended to be awarded faster than in historically black colleges or universities, Hispanic-serving institutions, or other non-MIE-award institutions. Extensive quantitative data were collected during the past 10 years by Systemic Research, Inc. Their "Fact Books" provide overall progress reports and key indicators against which various years of MIE implementation can be measured. They also provide explicit descriptions of each institution's model.

Strategies identified. As each institution gained a better sense of what was required to meet their broader objectives, they employed new strategies. This continual evolution of the program contributes to MIE's effectiveness. For instance, as mentioned earlier, UTEP made the infrastructure intended for STEM students available to liberal arts students throughout the campus once they determined it would facilitate on-campus relations between departments. Other strategies were not only folded into implementation the next year but also shared across institutions.

Lessons learned from the principal investigators. After 10 years, the principal investigators at the six MIE schools have learned many practical lessons about how to implement and sustain large projects. Among those lessons learned is that gaining faculty from the beginning of a project—while new financial resources are being allocated—is easier than doing it later. They've also learned how important it was for them as principal investigators to be champions for the "MIE cause" on campus. When other leadership was transient, and institutional priorities shifted, it was up to them to maintain their own programmatic mission in order to follow through with their objectives.

Phase 5: Reinvestment

The new knowledge generated by all those involved with MIE becomes the new intellectual capital that NSF and NASA can invest into a larger number of institutions. Through this dissemination grant and other convening activities, more and more institutions are learning from the strategies and lessons learned from 10 years of successful MIE implementation. The reinvestment phase describes the process of collecting the knowledge and making it available to others.

Strategies Specific to UMET and UTEP

In short, UMET strengthened STEM academic and administrative infrastructure while expanding outreach, student support services, and retention activities. Their primary focus has been on environmental sciences. UTEP expanded services for incoming STEM students; provided opportunities for research, mentoring, and professional development; rewarded innovative teachers; and enhanced university infrastructure. And whereas the financial investment made it possible to make the significant improvements to physical infrastructure, other strategies maximized existing resources. The following are a few more strategies not mentioned earlier.

UMET

Among the specific MIE components operating at UMET is a precollege Saturday academy for high school students interested in STEM. This academy strengthened UMET's connections with their local schools and exposed high school students to more possibilities.

Another component is the emphasis on student presentations. More than 100 UMET students have presented their research either on campus or abroad at national conferences. The students' experiences not only strengthened their grasp of their research but also helped them network with graduate research opportunities.

UTEP

In addition to the innovations in teaching and curricular fusion that UTEP employed, the university also developed an orientation program called CircLES. Like learning communities, CircLES assembles freshman students into small study groups. Those groups receive counseling and take courses together in clusters. They are formed by grouping students according to the results of their placement exams in selected disciplines. After implementing this program, more students have placed out of Developmental Math and more have been retained.

Policy Implications

MIE's impact on STEM education broadly at the six participating institutions has been impressive. The outcomes in terms of Latino achievement at UTEP and UMET merit special mention. And yet it is important to note that these outcomes were achieved in part due to systemic investment strategies that took place at each institution, using their own unique context, community, and student profile as the basis for designing and delivering a wide range of services. These strategies have important implications for policy development at institutions wishing to emulate the models of success seen through MIE. They include the following:

Implementation at MIE institutions was multifaceted and long-term.

Often, practitioners seek to increase student success by patching together a set of strategies that may or may not hold together. However, the MIE institutions took a comprehensive approach to increasing their STEM capacity and implemented a series of strategies during a 10-year period. During a longer period of time, there is a greater likelihood that the strategies can be institutionalized.

Substantial resources are invested in data gathering and analysis.

The investment that MIE institutions have put into data collection and analysis has paid dividends in several areas: It has provided the basis for claims of student and overall program success; it shows the MIE institutions where their greatest success has been in recruitment, retention, and graduation; and it highlights their areas of growth. It was because of the high failure rates of incoming math students that UTEP broke its math classes into modules and took advantage of the CircLES clusters to deliver math content to smaller study groups.

Students are encouraged to collaborate.

Retention literature continues to support academic engagement as particularly important for students of color. Between UMET and UTEP, both provided a substantial number of strategies to achieve such engagement. UMET's Summer Bridge program, science support center, and Summer Adventure program, or UTEP's CircLES, use of collaborative technology and furniture, and peer tutoring all bring students together to support success in STEM disciplines.

Context matters.

Not only did each of these institutions already have substantial numbers of Hispanic students, faculty, and administrators, the message promoting Hispanic student success is unambiguous. The message is conveyed on their Web sites and promoted by their presidents. Other institutions can provide a similarly consistent message by first looking in their own Web sites, practices, and populations and then bringing them in line with a more direct mission statement.

Other Hispanic-serving institutions or institutions with identifiable numbers of Hispanic students can achieve the success seen through the MIE experience. But it will take a long-term commitment and a cohesive vision. That commitment and vision will require government policy action as well. Whereas federal policy and its uncertainties make it difficult to project whether NSF, NASA, or other major agencies would support the expansion of the MIE model to other institutions, another government policy avenue is worth exploration—state policy. Although individual institutions have the greatest influence over the outcomes achieved, states can improve the context for success. For instance, they could take the roles that NSF and NASA generate or support the cycles of impact. They can also promote success by setting a fertile policy context for individual Hispanic-serving institutions. Finally, they can support success by considering state educational systems in total. Examples of efforts that could be undertaken by states include the following:

Fund multiyear-capacity building effort.

NSF and NASA funded the MIE institutions during a 10-year period because they knew that it would take time to build capacity. The buildings, lab equipment, and faculty positions that were provided with MIE funding took several years to put into place. If the funding streams had been cut off abruptly (as when state priorities change between administrations), the burden of completion would put large-scale projects in jeopardy. Thus, states may take a similar long-term view and invest in STEM education as an investment in success during several state-funding cycles, rather than as something that can be addressed in one legislative cycle or even during the tenure of single governor.

Set the context for research at MSIs.

Whereas virtually every state has a flagship university or institution that it favors to receive the bulk of research funding, this narrow strategy will require reexamination in light of the lessons learned through MIE and other initiatives. If states are serious about producing more students of color in STEM majors, they must also ensure that the MSIs in their state (if they do not receive adequate state funding otherwise) are allowed to pursue the funding they need to support research and STEM capacity on their campuses. This means rewriting state-funding formulas and performance-funding strategies that reward activities at a limited number of schools in favor of funding mechanisms that encourage broader investment in STEM capacity building. State leaders can also support MSIs by making it clear to their peer institutions within each state that they support the growth of research capacity within their MSIs.

Look at K-20 policy options.

Precollege programs and other K-12 relationship building was an effective component of MIE. States can expand those efforts by thinking about how future STEM students work their way through their educational systems. This means looking hard at the quality of teacher education in STEM for the early grades. It also means ensuring that the quality of STEM curricula is consistent across educational districts. In addition, it means looking at whether the criteria needed for completion of science courses in K-12 correlates with the entry requirements for college STEM students.

All of these issues can be addressed through sound policy at the state level. Some states like Maryland, Texas, and Georgia have formed K-16 consortia to address broader systemic issues. Others can simply provide the financial support for institutions like UTEP and UMET, which have begun partnerships with surrounding schools on their own.

Conclusion

The ardent faculty member, strong president with a clear vision, STEM chair with institutional support, committed state legislator with a seat on the appropriations committee, Congressional member with an earmark, student with passion, high school counselor with high expectations, and parent with unwavering support are all variables in a formula for success for Latino students in the STEM fields. Each variable can make a difference in the outcome, but together the results can be significant. The experience of MIE has demonstrated that broad strategies targeting multiple institutions and audiences for a decade or more represents a long-term investment strategy that can yield rich rewards. STEM education is not something that can be “fixed” or “managed” by one-shot, short-term approaches. Working with a broad constituency of institutional shareholders, colleges and universities can have dramatic impact on student success in the STEM fields. Such impacts not only matter to the individual institutions or communities that are served but more important, influence our capacity as a nation to be economically competitive, socially cohesive, and secure.

Appendix

Table 1
Number and Percentage of U.S. Citizen PhD Recipients, by Race/Ethnicity, United States 2000

Race/Ethnicity	Number	Percentage
Asian	1,407	5.2
Black	1,656	6.1
Hispanic	1,157	4.2
Native American	169	0.6
White	22,911	83.9
Total	27,300	100.0

Source: Hoffer et al. (2001), Table 9.

Table 2
Total Fall Enrollment by Level and Race/Ethnicity, United States 2000 (in thousands)

	Number	%
Total	5,312.3	100
White, non-Hispanic	10,462.1	68.3
Total minority	4,321.5	28.2
Black, non-Hispanic	1,730.3	11.3
Hispanic	1,461.8	9.5
Asian or Pacific Islander	978.2	6.4
American Indian/Alaskan Native	151.2	1.0
Nonresident alien	528.7	3.5
2-year		
Total	5,948.4	100
White, non-Hispanic	3,804.1	64.0
Total minority	2,055.4	34.6
Black, non-Hispanic	734.9	12.4
Hispanic	843.9	14.2
Asian or Pacific Islander	401.9	6.8
American Indian/Alaskan Native	74.7	1.3
Nonresident alien	89.0	1.5
4-year		
Total	9,363.9	100
White, non-Hispanic	6,658.0	71.1
Total minority	2,266.1	24.2
Black, non-Hispanic	995.4	10.6
Hispanic	617.9	6.6
Asian or Pacific Islander	576.3	6.2
American Indian/Alaskan Native	76.5	0.8

(continued)

Table 2 (continued)

	Number	%
Nonresident alien	439.7	4.7
Graduate		
Total	1,850.3	100
White, non-Hispanic	1,258.5	68.0
Total minority	359.4	19.4
Black, non-Hispanic	157.9	8.5
Hispanic	95.4	5.2
Asian or Pacific Islander	95.8	5.2
American Indian/Alaskan Native	10.3	0.6
Nonresident alien	232.3	12.6

Source: U.S. Department of Education (2002). Calculated from Integrated Postsecondary Education Data System, fall enrollment surveys.

Table 3
S&E and Non-S&E Associate's Degrees for All and Hispanic Degree Recipients, 1994 to 2001

	1994	1995	1996	1997	1998	2000	2001
All recipients	546,574	544,094	540,644	546,031	549,191	543,876	552,046
S&E	74,832	70,590	67,820	68,328	71,006	78,224	82,102
Non-S&E	471,742	473,504	472,824	477,703	478,185	465,652	469,944
Hispanic							
All fields	35,557	38,499	39,115	42,784	45,452	50,488	54,333
S&E	5,293	5,593	5,581	5,818	6,001	7,869	8,109
Non-S&E	30,264	32,906	33,534	36,966	39,451	42,619	46,224
Hispanic as a percentage of all degrees							
All fields	6.5%	7.1%	7.2%	7.8%	8.3%	9.3%	9.8%
S&E	7.1%	7.9%	8.2%	8.5%	8.5%	10.1%	9.9%
Non-S&E	6.4%	6.9%	7.1%	7.7%	8.3%	9.2%	9.8%

	Total	Hispanic
Increase in degrees from 1994 to 2000		
All fields	–0.5%	42.0%
S&E	4.5%	48.7%
Non-S&E	–1.3%	40.8%
Increase in population from 1994 to 2000[a]	6.6%	32.5%

a. Census population estimates and counts from www.census.gov.
Note: S&E = science and engineering.
Source: National Science Foundation (2004), Table C-2.

Table 4
S&E and Non-S&E Bachelor's Degrees for All and Hispanic Degree Recipients, 1994 to 2001

	1994	1995	1996	1997	1998	2000	2001
All fields	1,183,141	1,174,436	1,179,815	1,186,589	1,199,579	1,253,121	1,257,648
S&E	395,380	378,148	384,674	388,482	390,618	398,622	400,206
Non-S&E	787,761	796,288	795,141	798,107	808,961	854,499	857,442
Hispanic							
All fields	62,683	66,691	71,015	74,938	78,125	88,324	89,972
S&E	20,529	21,359	22,886	24,445	25,712	27,984	28,321
Non-S&E	42,154	45,332	48,129	50,493	52,413	60,340	61,651
Hispanic as a percentage of all degrees							
All fields	5.3%	5.7%	6.0%	6.3%	6.5%	7.0%	7.2%
S&E	5.2%	5.6%	5.9%	6.3%	6.6%	7.0%	7.1%
Non-S&E	5.4%	5.7%	6.1%	6.3%	6.5%	7.1%	7.2%

	Total	Hispanic
Increase in degrees from 1994 to 2000		
All fields	5.9%	40.9%
S&E	0.8%	36.3%
Non-S&E	8.5%	43.1%
Increase in population from 1994 to 2000[a]	6.6%	32.5%

a. Census population estimates and counts from www.census.gov.
Note: S&E = science and engineering.
Source: National Science Foundation (2004), Table C-6.

Table 5
S&E Bachelor's Degrees Awarded to Hispanics by Leading Institutions: 1997 to 2001

Academic Institution	Bachelor's Degrees
All institutions	106,462
University of Puerto Rico, Mayaguez campus	4,674
University of Puerto Rico, Rio Piedras campus	2,813
Florida International University	2,610
University of California–Los Angeles	2,232

(continued)

Table 5 (continued)

Academic Institution	Bachelor's Degrees
University of Texas at Austin	1,786
University of California–Berkeley	1,405
University of Texas–Pan American	1,314
San Diego State University	1,286
Universidad Politecnica de Puerto Rico	1,212
University of Texas at San Antonio	1,188
University of Florida	1,146
Pontificial Catholic University of Puerto Rico	1,135
University of Texas at El Paso	1,102
University of California–Davis	1,078
California State University–Los Angeles	1,076
University of California–Santa Barbara	1,075
Texas A&M University main campus	1,067
California State University–Northridge	1,049
Inter American U. of PR, San German campus	1,040
University of Arizona	1,023
Total for top 20 institutions listed above	31,311

Note: S&E = science and engineering. Data are not available for 1999.
Source: National Science Foundation (2004), Table 20.

Table 6
S&E and Non-S&E Master's Degrees for All and Hispanic Degree Recipients, 1994 to 2001

	1994	1995	1996	1997	1998	2000	2001
All fields	389,008	399,428	408,932	420,954	431,871	456,260	466,645
S&E	86,080	94,309	95,313	93,485	93,918	95,683	98,986
Non-S&E	302,928	305,119	313,619	327,469	337,953	360,577	367,659
Hispanic							
All fields	13,177	13,905	15,394	16,360	17,416	20,803	22,163
S&E	2,514	2,945	3,090	3,220	3,462	3,746	4,077
Non-S&E	10,663	10,960	12,304	13,140	13,954	17,057	18,086
Hispanic as a percentage of all degrees							
All fields	3.4%	3.5%	3.8%	3.9%	4.0%	4.6%	4.7%
S&E	2.9%	3.1%	3.2%	3.4%	3.7%	3.9%	4.1%
Non-S&E	3.5%	3.6%	3.9%	4.0%	4.1%	4.7%	4.9%

Table 6 (continued)

	Total	Hispanic
Increase in degrees from 1994 to 2000		
All fields	17.3%	57.9%
S&E	11.2%	49.0%
Non-S&E	19.0%	60.0%
Increase in population from 1994 to 2000[a]	6.6%	32.5%

a. Census population estimates and counts from www.census.gov.
Note: S&E = science and engineering.
Source: National Science Foundation (2004), Table E-3.

Table 7
S&E Doctoral Degrees for All and Hispanic Degree Recipients, 1994 to 2001[a]

	1994	1995	1996	1997	1998	2000	2001
All S&E fields	18,187	18,997	18,650	18,398	18,257	17,565	17,106
Hispanic	548	573	626	659	754	721	728
Hispanic as a percentage of all degrees	3.0%	3.0%	3.4%	3.6%	4.1%	4.1%	4.3%

	Total	Hispanic
Increase in S&E degrees from 1994 to 2000	–3.4%	31.6%
Increase in population from 1994 to 2000[b]	6.6%	32.5%

a. U.S. citizens and permanent residents.
b. Census population estimates and counts from www.census.gov.
Note: S&E = science and engineering.
Source: National Science Foundation (2004), Table F-6.

Table 8
Doctoral Degrees for All and Hispanic Degree Recipients in Engineering, Life Sciences, and Physical Sciences, Selected Years Between 1980-1981 and 2000-2001

	1980-81	1985-86	1990-91	1995-96	1997-98	1998-99	1999-00	2000-01
Total doctorates in engineering	2,528	3,376	5,214	6,305	5,919	5,337	5,330	5,502
Total Latino doctorates in engineering	26	69	133	185	223	156	171	213

(continued)

Table 8 (continued)

	1980-81	1985-86	1990-91	1995-96	1997-98	1998-99	1999-00	2000-01
Percentage Latino	1.0	2.1	2.6	2.9	3.8	2.9	3.2	3.9
Total doctorates in life sciences	5,461	5,734	6,933	8,255	8,540	8,126	8,529	8,296
Total Latino doctorates in life sciences	74	123	183	255	354	325	345	311
Percentage Latino	1.4	2.1	2.6	3.1	4.1	4.0	4.0	3.7
Total doctorates in physical sciences	3,208	3,679	4,441	4,632	4,639	4,389	4,168	4,138
Total Latino doctorates in physical sciences	41	76	127	128	111	124	157	137
Percentage Latino	1.3	2.1	2.9	2.8	2.4	2.8	3.8	3.3

Source: National Science Foundation (2004), Tables 300, 302, 303.

Table 9
S&E Doctoral Degrees for All and Hispanic Recipients by Gender, 1994 to 2001

	1994	1995	1996	1997	1998	1999	2000	2001
All S&E fields	18,187	18,997	18,650	18,398	18,257	17,565	17,106	16,262
Female	6,494	6,913	6,967	6,990	7,170	7,071	7,123	6,867
% Female	35.7	36.4	37.4	38.0	39.3	40.3	41.6	42.2
Male	11,692	12,082	11,683	11,392	11,069	10,494	9,981	9,395
Hispanic	548	573	626	659	754	721	728	669
Female	230	232	273	266	326	362	348	332
% Female	42.0	40.5	43.6	40.4	43.2	50.2	47.8	49.6
Male	318	341	353	393	428	359	379	337

Source: National Science Foundation (2004), Table F-11.

Table 10
Immigration Status of All and S&E Doctoral Degrees for All and Hispanic Recipients

	All Fields		All S&E	
	n	%	*n*	%
All races/ethnicities	40,744	100	25,509	100
U.S. citizen	26,907	66.0	14,999	58.8
Permanent resident	1,822	4.5	1,263	5.0
Temporary resident	9,780	24.0	7,925	31.1

Table 10 (continued)

	All Fields		All S&E	
	n	%	*n*	%
Hispanic	1,888	100	1,181	100
U.S. citizen	1,119	59.3	581	49.2
Permanent resident	143	7.6	88	7.5
Temporary resident	613	32.5	503	42.6

Source: National Science Foundation (2004), Table F-5.

Table 11
Projected Population of the United States by Race and Hispanic Origin: 2000 to 2050

Population or Percentage and Race or Hispanic Origin	2000	2010	2020	2030	2040	2050
Population total	282,125	308,936	335,805	363,584	391,946	419,854
White alone	228,548	244,995	260,629	275,731	289,690	302,626
Black alone	35,818	40,454	45,365	50,442	55,876	61,361
Asian alone	10,684	14,241	17,988	22,580	27,992	33,430
All other races[a]	7,075	9,246	11,822	14,831	18,388	22,437
Hispanic (of any race)	35,622	47,756	59,756	73,055	87,585	102,560
White alone, not Hispanic	195,729	201,112	205,936	209,176	210,331	210,283
Percentage of total population						
Total	100.0	100.0	100.0	100.0	100.0	100.0
White alone	81.0	79.3	77.6	75.8	73.9	72.1
Black alone	12.7	13.1	13.5	13.9	14.3	14.6
Asian alone	3.8	4.6	5.4	6.2	7.1	8.0
All other races[a]	2.5	3.0	3.5	4.1	4.7	5.3
Hispanic (of any race)	12.6	15.5	17.8	20.1	22.3	24.4
White alone, not Hispanic	69.4	65.1	61.3	57.5	53.7	50.1

a. Includes American Indian and Alaska Native alone, Native Hawaiian and Other Pacific Islander alone, and Two or More Races
Source: U.S. Census Bureau (2004).

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