The Need for Minority High Schools with a STEM Focus

by Nilka Avilés, Ed.D.

The most important asset of a nation is its human capital. One symbol of a nation’s greatness in today’s world is vastly associated with its strength in science and engineering. The United States is seen as the cradle of knowledge for scientists and engineers around the world. Yet the President’s Council of Advisors on Science and Technology (PCAST) in 2010 revealed that the United States now lags behind other first world countries in science and technology education (2010). The study concluded that there is an urgent need to develop methods and affect systemic change to increase interest and preparation of students in science, technology, engineering and math (STEM) education in the United States.

The issue is of greater magnitude as we examine the achievement of special population students and those who have been traditionally underserved in STEM fields. A recent Carnegie Corporation funded report, Expanding Underrepresented Minority Participation – America’s Science and Technology Talent at the Crossroads, states that, although African Americans, Native Americans and Hispanics make up 28.5 percent of the population, only 9.1 percent are college educated in the science and engineering workforce (National Academy of Sciences, 2011). The study raises the need to increase minority access at the secondary and post-secondary levels. The report sparked more than 65 groups to commit support to the recommendation.

Schools are being challenged to focus on preparing students in the STEM areas and to flood our universities with U.S. born and resident students pursuing degrees in science and engineering. The Community Foundations of Texas, through the Texas High School Project in collaboration with the Texas Education Agency, is now supporting initiatives that create Early College High Schools (ECHS), which target underrepresented populations, particularly with a STEM focus. Research conducted by Avilés-Reyes (2007) shows how focusing educational opportunities through programs like the ECHS have increased academic achievement, motivation, post-secondary aspirations, college preparation and readiness. The design of the initiative was to help traditionally underserved and underrepresented students in higher education to matriculate and complete college degrees. More than 90 percent of the students who completed the four-year ECHS program in three public high schools enrolled in an institution of higher education.

“Success in school means having quality teachers, teachers who know their subject, who know effective instructional practices and who value their students. Unfortunately, many students – particularly those who are in poor schools or high-minority schools – do not have access to these teachers.”

– Dr. Maria “Cuca” Robledo Montecel, IDRA President and CEO
the necessary components, like partnerships, instructional materials, professional development, developing effective support systems for students and their families, mentoring, and partnerships as well as tangible assets.

The Goals 2000: Educate America Act and the No Child Left Behind Act focus on school accountability at the national level. As a result, federal funding was necessary to implement change. The American Recovery and Reinvestment Act established funding for STEM education. Further, NCLB in 2010 made federal monies available through Title I, Title II and Title IV. Other sources from the U.S. Department of Education include money from the Institute of Education Sciences. Funding for STEM education through the U.S. Department of Education now exceeds half a billion dollars. Monies were earmarked to build sustainable infrastructures aimed at improving STEM education in public schools.

Other federal agencies that contribute to STEM funding include NASA, the Departments of Commerce, Energy, Defense and Transportation and the Environmental Protection Agency. Foundations also are critical in raising monies to support new initiatives. Foundations, such as the Carnegie Foundation for the Advancement of Teaching, the W.K. Kellogg Foundation, the Bill and Melinda Gates Foundation and the Woodrow Wilson National Fellowship Foundation, are providing funding to support STEM initiatives.

Establishing Partnerships
A STEM focus in a school should include the local community by establishing partnerships with industries, hospitals, colleges and universities, and others who will benefit from and employ those who graduate in a STEM field. Having a strong and effective partnership between the STEM-focused school and a college can effect systemic change if teachers and professors view the working relationship as a win-win situation.

The PCAST in February 2012 revealed that most college professors are not taught pedagogy or the ways today’s students learn. Through a partnership between a public school and a university, professors can learn the art of teaching while teachers can learn how to guide their students in conducting effective and creative research in STEM areas. Further, professors can demonstrate what it takes to conduct research utilizing various techniques and become role models for the students.

STEM schools must have the ability to integrate with partners to develop internships where students receive hands-on instruction and formulate solutions to problems using collaborative methods. The process of shadowing a professional enables students to see into the realm of real life experience. This helps students develop social skills as well as giving them a first-hand look at how the professional world functions and how day-to-day operations are managed with critical thinking skills, analysis and decision making processes that impact performance outcomes.

Curricula and Teaching Quality
We must make available to teachers involved in STEM focused schools advanced graduate level courses that will improve their content knowledge and enhance their competency through support, collaboration among partnerships, community organizations, scientists, engineers and researchers to improve and provide high quality education. In addition, we need to provide professional development that targets innovative instructional approaches to engage and inspire students to learn about and seek careers in STEM fields.

Teachers also must be able to inspire learning through inquiry and Socratic questioning techniques. They need to be prepared with the most up-to-date methods of pedagogy, particularly relating to serving girls, minority students and English learners.

The classroom needs to become a student-centered learning environment that results in active learning that is project based. It is critical for the teacher to establish a relationship with each student and provide the link between school and community.

In addition, courses must be challenging for STEM students. They must require high expectations with a relevant and rigorous curriculum. Prerequisites must be established and adjusted as the program progresses.

With deliberate research-based action, schools can successfully increase the number of students who are prepared, proficient and inspired to pursue a career in the STEM fields.

Resources
President’s Council of Advisers on Science and Technology. Engage to Excel: Producing One Million Additional College Graduates with Degrees in Science, Technology, Engineering

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Diversifying the STEM Pool
Revisiting the Recruitment of Underrepresented Students in STEM Careers

by Paula Martin Johnson, M.A.

A report published in 2010 by the President’s Council of Advisors on Science and Technology (PCAST) suggests that the Administration concentrate its efforts on preparing and inspiring students to pursue college and career paths in the science, technology, engineering and math (STEM) fields to build a stronger foundation for the country’s economic future. The council’s two-pronged approach proposes to prepare students for rigorous study of STEM courses with relevant application and also to inspire a new crop of young U.S. scholars to pursue professions in these disciplines. The report identifies a variety of factors that contribute to the despairingly low percentages of STEM professionals in our country. Such components include the need for federal funding, shared standards, a research- and inquiry-based instructional approach, and systemic restructuring. The key ingredient to the entire equation however is the students involved.

In recent years, the United States has found itself slipping from prestigious first place into the middle or lower quartiles of the race between world leaders in the areas of math and science. Study after study is concluding that the proficiency level in STEM subjects of today’s youth across our nation is steadily declining. Moreover, the poor level of interest in STEM related fields by traditionally underrepresented populations continues to seriously limit their participation in well-paid, high-growth professions in the STEM workforce. As a result, potential income is prevented from flowing into these same communities.

There has been a common myth held by the general population of degreed individuals – especially teachers – as to the sequence of events that takes place once students have reached their junior or senior year of high school. The assumption is that students will inevitably choose a college, apply and take the necessary exams, be accepted, and subsequently choose a major course of study. After four years of hard work and persistence, they will graduate and begin their new well-paying job and thrive on the road to a highly rewarding life. This is, after all, what happened for many of us. There were no major struggles. It was expected.

Unfortunately, this is not the case for most of today’s students. We were the exception, not the rule. Students today face a new set of challenges just to finish high school. An alarmingly high number of elementary and secondary students are showing evidence of many gaps in learning that are detrimental not only to their hopes for college but also for their livelihoods.

So it begs the question, what was the magic ingredient that worked for so many of us in the past? Did we possess superhuman intelligence or mental abilities? How is it possible that so many minorities and women have achieved degrees to date, but so few when compared to their non-minority and male counterparts? The underrepresentation of minority groups and women in STEM areas denies our nation the full benefit of their talents and denies science and engineering the rich diversity of perspectives and inspiration that drive those fields.

Research is leading toward a definitive factor in the minimal attraction of traditionally non-represented students into STEM areas of study: relevance. Studies are repeatedly showing that it is not necessarily a case of aptitude, but of desire, that is keeping so many of our potential engineers, scientists, mathematical innovators and technology experts to enter the arena of STEM studies and pursue careers in these fields. The widespread conclusions being drawn are that we are doing a poor job both in relating the amazing opportunities that these professions can provide and in exposing minority students and girls to the possibilities they have of attaining them.

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For more information about the IDRA South Central Collaborative for Equity or to request technical assistance, contact us at 210-444-1710 or contact@idra.org.

Additional resources are available online at http://www.idra.org/South_Central_Collaborative_for_Equity/
funded by the U.S. Department of Education.
Focus: Teaching Quality

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significantly predict if a student would be a likely candidate for a STEM career. Maltese & Tai asked students a series of questions to indicate how strongly they agreed with statements surrounding the usefulness of mathematics, how comfortable they were with asking questions in class, and if math was a class they looked forward to attending (2010). These questions along with performance on standardized tests in the areas of math, science and reading, and the type of job they desired to have by age 30 were used as variables in predicting their pursuit of STEM related degrees. Maltese & Tai attribute the interconnectedness of classroom experiences, student interest and persistence in a student’s aspiration of completing a degree in STEM.

Students have a tendency to only focus on their immediate surroundings. Therefore, if they have friends and relatives in particular occupations, they are going to become familiar with routines, conversations and lifestyles associated with them. Their interest may be further piqued if it is a topic of study in one of their classes.

Preparation and a lack of exposure and role models can further impair a young learner’s decision to strive for a career in the STEM environment. Tonya Groover, a graduate computer science student at the University of Pittsburgh declares, “If you never experienced technology, and technology does not influence your lifestyle in any way, shape or form, it’s going to be unlikely you’re going to grow up and want to be the person who develops technology that informs other people’s lives” (Chute, 2009). Many students do not yet have a strong family history of attending college. Many more see STEM professions as beyond their reach.

At the end of the day, we must do a better job of ensuring that traditionally underrepresented youth, including girls, become engaged in STEM related courses. For this to happen, schools must: (1) be deliberate in their efforts to recruit more students and make STEM courses more accessible to minority students and girls; (2) expand extracurricular activities to include more STEM related projects; (3) increase out-of-class opportunities, such as after school, Saturday and summer programs, for students to become more proficient in math and science; (4) increase the engagement of parents and community members in promoting a STEM focused effort; (5) increase the number of teachers who are culturally and linguistically proficient to work with different student groups; (6) seek the involvement of universities, non-profit organizations and the private sector to collaborate by become actively involved in the schools’ STEM related efforts; and (7) provide greater opportunities to increase students’ interest and desire to become engaged in STEM related activities.

Most students only experience such encounters through outreach programs and other extracurricular forums. We have to catch and keep their attention while we have them in our classrooms! Teachers need more training and professional development to feed the curiosity of these future scientists and engineers. More collaboration between school districts and college faculty could cultivate a thriving pool of diverse learners eager to answer the call for new leaders in the STEM revolution.

Resources
President’s Council of Advisors on Science and Technology.

Minority Women in Science – Forging the Way
by Keiko E. Suda, Oanh H. Maroney, M.A., Bradley Scott, M.A., and María Aurora Yánez, M.A.

This student workbook and teacher guide set is a great student-centered tool to support equity in math and science education. It is an innovative resource that can be used with all students – girls and boys – to help break down gender stereotypes about scientists.

- Profiles of seven minority women scientists who have surmounted barriers to forge the way for themselves and future scientists
- Science lessons for the classroom that cover such topics as acid/base chemistry, earth science, wildlife and environmental science, and biology
- Life skills lessons for the classroom that cover topics such as getting college information from the school counselor, identifying a support system, reaching goals, knowing self-worth, having community pride, overcoming stereotypes, and linking hobbies with career choices.

Available from IDRA. Student Workbook $15, Teacher’s Guide $25, plus shipping
Student Workbook: ISBN 1-878550-67-3; Paperback; 94 Pages; Revised 2010
Teacher’s Guide: ISBN 1-878550-68-3; Paperback; 94 Pages; Revised 2010

Paula Martin Johnson, M.A. is a education associate in IDRA Field Services. Comments and questions may be directed to her via e-mail at comment@idra.org.

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President’s Council of Advisors on Science and Technology.

President’s Council of Advisors on Science and Technology.

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Professional Development in the 21st Century – Nine Structures for Coaching and Mentoring

by Juanita C. García, Ph.D.

A successful professional development program in the 21st century relies on teachers learning from each other to problem solve collaboratively, using technology devices to build their knowledge base, receiving coaching and mentoring services from model teachers, and being deeply involved in reflection and action. This article is the first in a series that will focus on these critical elements, beginning with coaching and mentoring.

Since the early 1980s, the pioneers of coaching and mentoring, Joyce & Showers, have been investigating the theory that peer coaching could be used to increase classroom implementation of training sessions. They believed that teachers who had training followed by coaching would have a higher transfer of learning rate than teachers with training only. Those early studies showed that “teachers who had a coaching relationship practiced new skills and strategies more frequently and applied them more appropriately than did their counterparts who worked alone.” (1996)

After extensive research, four principles for creating peer coaching groups have emerged as a guide for schools. The four are as follows.

• Teachers make a commitment to engage with and be part of a peer coaching team and to follow an established set of rules as a prerequisite to success.

• Successful schools have teachers who collaboratively pursue a shared vision and goals.

• Successful schools depend on members of “a village” to guide the nurturing, mentoring, coaching and supporting successful teachers in a classroom.

• Teachers plan, develop, observe and assess impact on teacher change in practice and the results on achievement of the various student groups represented in the classroom.

Today, coaching and mentoring are terms that are used interchangeably by many educators. Both take time and cannot be mastered in a one-day staff development session or in a couple of classroom demonstrations. They require a long-term commitment.

A Shared Vision

Imagine a room full of pre-kindergarten through high school teachers creating a vision for their district’s bilingual/ESL program. They have just been given directions to envision the ideal to make lasting instructional changes in their schools. They have a choice of expressing their visions in a variety of modalities: verbal, visual or musical. The richness of using several different modalities strengthens the visioning process. Each team creatively presents their vision, and then similarities and commonalities are analyzed until all agree on a vision statement.

Such a shared vision brings people together to create change when the statement is forward-thinking and visionary so that it inspires and when it is concrete enough to see and hear the future. With a well-defined vision statement and goals to be accomplished, the team now knows the direction it will take.

The Process: Nine Vital Structures

IDRA’s coaching and mentoring professional development model follows the guiding principles above as we work with teachers and their students. Our approach builds on teachers’ natural strengths, reflecting on what works and builds partnerships for success. As professional development for school teachers evolves in this 21st century, our model has a special focus on teaching practices that work in classrooms with diverse student populations, particularly low-income and minority students and students with special needs. To be effective over time, IDRA’s model stands on the following nine vital structures (IDRA, 2011).

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Focus: Teaching Quality

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- **Developing a trusting relationship with teachers** – Teachers must see the coach as someone who can “walk the talk.” The coach must have credible classroom experience, knowledge of second language acquisition and how to work with diverse student populations. A key focus is to develop teachers’ self-efficacy.

- **Creating a collaborative working plan** – Mutual expectations for student achievement are discussed, roles and responsibilities established, and venues for communication set up. It needs a “whatever it takes” attitude for communicating. Coaches must find out what methods of communication work best for each of the teachers they are working with, like emails, texts, phone calls, Ning social networking sites, etc.

- **Sharing classroom and teaching expectations** – The coach and the team develop a mutual understanding of the observation protocol of quality teaching, that is, teachers must know they can have a profound impact on their students’ lives. They must know that the best teachers believe in their students and challenge and inspire them. They must respect and value their students’ backgrounds and strengths, incorporating them daily in profound ways into the classroom.

- **Observing teachers in their classrooms** – A first observation takes place to provide a snapshot of the teacher’s lesson delivery, classroom set up and needs. An optional second observation can be conducted for a progress check, and a final observation at the end of the process measures progress. It is very important that teachers trust the coach and that they don’t see him or her as a stand-in administrator who is there to evaluate them.

- **Lesson modeling** – The lessons incorporate instructional strategies that are based on research, especially research on what works for culturally and linguistically diverse learners. Teachers follow a lesson reflection form that is based on student motivation, cooperative grouping, language skills, higher order thinking and comprehensible input. Activities for students are performance based and are used as ways to gather information on how the students are progressing in language development.

- **Reflecting and debriefing** – Time is given to the observers to tell the coach what they noticed, what worked or didn’t, and how confident they feel to implement the strategies themselves. This is critical for celebrating successes, assessing problems and finding solutions.

- **Co-planning with other teachers** – The principal’s support is central to success by providing teachers sufficient time and resources to plan powerful dynamic lessons.

- **Co-teaching** – The coached teachers then become mentors to other teachers. Both collaborate in delivering instruction. Mentoring provides an opportunity for them to develop their own leadership skills and supports them in mastering instructional strategies.

- **Collaborative accountability** – Teachers and administrators discover new ideas and engage in continuous improvement throughout their careers.

Teachers learn by doing, reading, reflecting and collaborating with other teachers as well as by looking closely at students and their work and sharing what they see. IDRA’s coaching and mentoring professional development model can provide learners with moral support and concrete assistance. It can make teaching more public, less private and individualistic. All teachers then share responsibility for the learning of all students and spend time together on professional issues.

As a result, teachers are better equipped to meet high expectations of the school and the community, and to address linguistic and cultural characteristics of their student population. Learning never stops. It is a career-long process of developing teaching quality that ultimately leads to improved student academic performance.

**Resources**

IDRA. Focusing on Language and Academic Instructional Renewal (FLAIR), project materials (San Antonio, Texas: Intercultural Development Research Association, 2010).


Juana C. García, Ph.D., is an education associate at IDRA Field Services. Comments and questions may be directed to her via e-mail at comment@idra.org.
How the Coca-Cola Valued Youth Program Has Helped Me

It all began five months ago. I was sitting in my class doing what I usually do. All of a sudden, Mrs. Moreno said, “Isaac one of your electives is now V.Y.P.” Then I asked, “What’s that?” Mrs. Moreno told me, “You will be working with little kids at the elementary.” I said, “No.” I have two nephews, and they bother me. Mrs. Moreno insisted by saying, “Give it a try.” “Ok, Mrs. Moreno,” I said. When I got home, I began to think about it some more, and this is when I decided to join it. I could not sleep that night, I was so excited! I could not wait to start my new experience.

As I was sitting on the bus on my way to the elementary school, I began to feel super nervous because I didn’t know anyone, and I have only been in the United States for two years and was afraid my English wasn’t that good. As soon as we got to the elementary school, I asked Mrs. Cuevas what I needed to do. She told me, “You need to help the students and work super hard.” “Ok,” I said. When I entered in the classroom, all the pre-kinder students looked at me like I was an alien. This made me feel even more nervous. I was thinking, “Crazy kids! This is going to be boring!”

Then, the Mrs. Cuevas assigned a little tiny guy as my student for the year. His name is Josue*. Mrs. Cuevas started talking with the student, then I started working with my student. At first, he misbehaved a lot! I got upset often because the little guy didn’t want to do his work. Then, it was time to go back to the school. When I got to my house, my nephew started to remind me of the little student. I went to bed early because I was getting upset with my nephew and was exhausted from school.

I went to school the next day feeling very worried because I was thinking about what might happen with the little student that day.

When, I went to the elementary school, I told my student that, if he did his work, everything was going to be easy. My student asked me, “Is that true?” “Yeah,” I said, “If only you do your work.” “Hmm, Ok,” he said. I started feeling better because my student seemed to understand, and he started behaving. Every day, the little guy got better at his schoolwork and began to look forward for me to go to help him. I also began to like teaching him. I even took him a present for Christmas and missed helping him with his schoolwork during the vacation.

As the days passed by, my nephews didn’t bother me as much anymore. I was learning to control my temper. I started looking forward to going to the elementary school to help the little guy. I no longer felt nervous or upset. I know I could help this student be a better student.

The future of my student is more important than anything else. I want my student be the number one in everything. Now, my student is better at school than before. I feel so excited every day when I go to school because my student is learning a lot, and I learned how to be calmer with kids, my family and my friends. I feel I have grown in many ways. I am very grateful to the Coca-Cola Valued Youth Program for giving me this opportunity. I am now more helpful, understanding, responsible and patient.

I know now that I can help my family and others who need money. I don’t want to go back to the way things were before. I only want to become even better at helping others. I signed up to help a student with his schoolwork, but in the end he helped me become a better person.

*name changed for privacy

For more information on the Coca-Cola Valued Youth Program contact IDRA at 210-444-1710 or contact@idra.org or visit www.idra.org/Coca-Cola_Valued_Youth_Program.htm.
Focus: Teaching Quality

“Teaching quality includes the ability of a teacher to teach the students who are in his or her classroom, not the students he or she would like to have. But many teachers are ill-equipped to educate poor or minority students.”

– Dr. María “Cuca” Robledo Montecel, IDRA President and CEO

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