STEM*ing* the TEACHER SHORTAGE TIDE

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INTRODUCTION

The United States and our global partners are facing numerous complex challenges as we enter the second decade of the 21st century. Amid the economic and political upheavals, the United States is continuing to face a critical shortage of Science, Technology, Engineering and Math (STEM) candidates to pursue careers in these fields as well as candidates with these backgrounds to teach in our nation's P-12 schools. We need to seriously consider the importance of focusing our educator recruitment, preparation, and retention efforts on STEM candidates. Without a concerted effort to capitalize on the STEM potential, we will continue to short-change our schools and students.

In 2000, the number of foreign students studying physical sciences and engineering in U.S. graduate schools surpassed, for the first time, the number of U.S. students. [1]

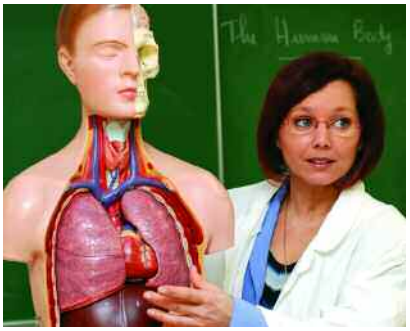
We welcome our neighbors from across the world, and their contributions enhance our educational programs. They also remind us of our position in the global marketplace and help to promote the value of educational programs for our American students.

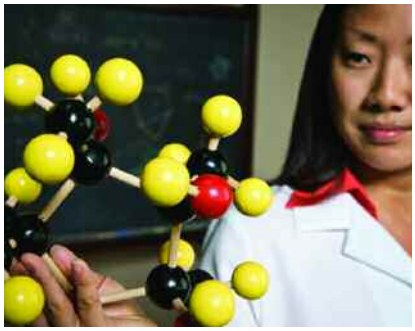
Research studies validate the importance of having strong, well-prepared, and educated teachers in STEM subjects. This is of critical importance as our society is adopting to the technological world and, at the same time, experiencing an increase in the need for more advanced human sciences. To be able to address society's needs, we need P-12 teachers who can rise to this challenge.

The quality of P-12 mathematics and science teaching is the single most important factor in improving student mathematics and science achievement.[2]

It is time we embrace the importance of quality teaching as the basis for American education.

Evidence supporting the need for quality STEM teachers is based on the 2007 study by the Business-Higher Education Forum that projects "our nation will need more than 280,000 new mathematics and science teachers by 2015."[3] We are facing this need today. For example, the Clark County (Nevada) School District, the nation's fifth largest, currently is seeking 70 secondary math and almost 80 secondary science teachers for the 2009-2010 school year. Attracting, preparing, and retaining quality STEM teachers is a major challenge that requires a collective effort to respond to our needs.





STEM ACHIEVEMENT IN OUR NATION'S SCHOOLS

The current need for qualified math and science teachers is reflected in the following statistics: 29% of our nation's fourth grade students, 29% of eighth grade students, and 18% of 12th grade students perform at or above the proficient level in science.[4] A preponderance of evidence has been gathered over the past 15 years that indicates our educational system has been sliding. Just 23% of 12th grade students scored at or above the proficient level in math on the 2005 National Assessment of Educational Progress (NAEP).[5] Reasons for these bleak achievement statistics are related to several factors. One issue relates to the point that in 2002, about 70% of high-minority middle school mathematics classes were taught by teachers who had not majored or minored in mathematics.[6] This challenge is compounded by the fact that "low-income students are assigned out-of-field teachers in mathematics at more than twice the rate of their more affluent peers."[7]

Numerous studies suggest that the problem of effective and qualified teachers exists, in part, in our inability to provide sufficient numbers of applicants whose backgrounds are strong in STEM fields. Over the past 30 years, schools have struggled in the face of a changing society, changing career aspirations (especially for women), and a changing economic and social climate. These changes have overshadowed our ability to provide a continuously solid teacher workforce.

> *The status quo simply isn't working when it comes to supplying the teacher applicant pool with enough good candidates, particularly in subjects at the high school level such as math, chemistry and physics.*[8]

Additional evidence exists to support this point. "For example, each year public and private universities in North Carolina produce 4,000 new teachers, yet each year 9,000 teachers across the state leave the classroom."[9] Furthermore "in a period of four years, the sixteen-campus University of North Carolina system produced only three high school physics teachers."[10] This profile is mirrored in many states across the nation, especially in those where school districts have seen population increases while also experiencing decreases in STEM teacher candidates.

MEETING THE NEEDS THROUGH AN UNTAPPED POPULATION

With the economic forecast continuing to challenge our nation's growth in business and industry, opportunities for redressing the critical teacher shortage may be on the horizon. In a recent survey of college-educated adults, the Woodrow Wilson National Fellowship Foundation found that "42% of 24-to-60-year-olds would consider switching to a career in teaching."[11] Unlike traditional teacher preparation programs that train 20-30 year olds whose career paths are initially defined by the teaching profession, many school districts have developed alternative routes to certification and licensure. These include efforts to recruit individuals with backgrounds in STEM with the local community typically serving as the pool for these individuals. According to the Alliance for Excellent Education, in New York state "72% of teachers take jobs within forty miles of their hometowns, and 34% of new teachers take their first job in the school district in which they attended high school."[12]

Of late, many individuals are seeking career changes because of downturns in their current employment or retirement that is no longer meeting their personal or financial needs. For many

of these individuals, second-career possibilities include roles in which they 'give back' to their communities through teaching.

A 2005 study of attitudes about work among Americans between the ages of 50 and 70 reported that 53% planned on second careers, and 50% were interested in taking jobs that help improve the quality of life in their communities.[13]

Many potential STEM candidates possess majors and graduate degrees in STEM fields, and their backgrounds bring 'real life' experiences to the teaching arena.

WE NEED EACH OTHER

The point is simple: If we don't have teachers qualified to teach STEM subjects, we won't have individuals qualified to seek professional careers in STEM fields. We believe an innovative and mutually beneficial solution to meeting the needs of business and the needs of education rests with developing a partnership between three entities: corporations, university and education providers, and school districts.

In the past, university and colleges were the primary teacher preparers; however, this is no longer the case. Since the 1980s, when the movement toward alternative routes to teacher preparation began to surface, only eight states reported plans to consider this option. Today, all 50 states are involved in alternative route preparation.

In 2005-06, approximately one third of the teachers prepared for America's schools participated in innovative and alternative teacher preparation programs. In 2008-09, that number is estimated to be nearly 50%.[14]

Organizations like the National Association for Alternative Certification (NAAC) have led the charge to support strong alternative routes to teacher licensure, and this organization is at the forefront of changing how the teaching pool is recruited, selected, and prepared. NAAC provides support for educational providers that include universities and colleges, school-districts, and private and proprietary programs. Nationally-sponsored programs also exist. Teach for America states its mission is to: "build the movement to eliminate educational inequity by enlisting our nation's most promising future leaders in the effort."[15] A similar program is The Woodrow Wilson Teaching Fellowship Program. A third national program is the U.S. Department of Education's Transition to Teaching Program that targets high-needs teacher preparation, much of it focused on recruiting and retaining STEM teachers. The wide rangeof opportunities is linked to the growing need for teachers and the need to provide accessible options.

One characteristic that is unique to alternative routes to certification is the collaboration between businesses, school districts, and educational providers. These unique opportunities are especially well-suited for career-changers and mature adults wanting to help address educational equity through joining the teaching ranks. The success of this effort reinforces that we need each other. Business benefits because it may anticipate employees who enter the workforce with aptitudes and knowledge in math and science that have been shaped by qualified and committed subject-matter experts.

Universities and education providers benefit because a pool of quality candidates exists. These individuals enter teacher preparation with well-defined understandings of their subject matter. Schools benefit because they are able to recruit teacher candidates who enter the teaching profession with career experiences in STEM fields and who typically have strong academic backgrounds in STEM subjects.

ACTION STEPS TO STEM THE TIDE

Building partnerships requires commitment, diligence and a willingness to foster a true collaborative. Any one of the three partners may initiate the collaborative across the three partners: corporations, universities or educational providers, and school districts. Regardless of the interaction between agencies, common features that apply to all collaborations include adherence to state licensure requirements and agreements on recruitment, selection, and preparation of teacher candidates. It is not uncommon for partnerships to exist between two of the three entities, although many partnerships are formed among three. Common features among the partners suggest:

- A person or group within the entity must be a driving force to initiate the project.
- Consensus within the organization is necessary so that the collaboration has value and its purposes will be sustained.
- The project is to be built around the needs of all stakeholders, especially the candidates and the classrooms to which they will be assigned.
- At the onset of the project, all evaluation protocols must be established and processes defined.

In establishing the partnership, four perspectives need to be explored. The initial discussion includes shared roles between corporations, university or educational partners, and school districts. It is critical to develop an overarching framework that identifies the roles of the developing partnerships.

- All partners must commit to a common vision based in creating avenues for their constituents to succeed.
- Each of the partners involved must identify and involve key players who will serve as advocates and facilitators within their organizations and the community.
- Open communication must be established to keep all partners continually apprised of the growth, progress, and developing problems of the collaboration.
- Financial resources in the partnership must be identified and agreed upon as primary support for the collaboration.

A second requirement in establishing an effective partnership relates to developing plans of action to support the collaborative efforts. The following points guide the effective partnership as it is building its relationships.

- The partnership must plan methods to build consensus, as it establishes a common commitment, goals, and procedures.
- There must be time for joint planning of the course of action as this allows for sharing of individual perspectives to meet the needs of each partner and to form a collective whole.
- Each partner should create internal documents, describing its roles and responsibilities as well as the project scope, target STEM professionals, criteria for recruitment and selection of program candidates, timelines, and interim and final evaluation protocols.

- Internal documents of current successful partnerships should be reviewed for ideas, and their creators viewed as potential mentors for the project.

Finally, once the partnership has established its guidelines and the collaboration is fully functioning, concepts to sustain the partnership must be considered.

- The stakeholders who are not directly involved in the creation of the partnership must continue to be kept informed. All stakeholders must be reminded on a regular basis of the partnership's vision and reason to exist, the plans for implementation, and the progress being made in the implementation process.
- The planning documents must be regularly subject to evaluation and revision based upon results of the partnership efforts.
- There must be focused efforts on institutionalizing the process to ensure the work is not personality dependent or driven. The faces may change, but the work must continue.

The importance of building an overarching framework, of discussing developing plans to action to support the collaboration, and in establishing criteria to sustain the partnership are critical to its success. These are shared roles and those shared agreements are highly significant in maintaining the health of the partnership.

CONCLUSIONS

The key concept that runs through this report is the unquestioned need for quality STEM teachers to prepare our nation's youth for success in our changing society. It is also to support education to prepare individuals to succeed in careers in STEM fields, and to provide options for America's transitioning workforce.

Innovative teacher preparation programs are evolving to meet the challenges of providing opportunities for career-changers or those seeking alternatives to traditional teacher preparation programs. These options help to support possibilities for successful collaborations that exist across three entities: corporations, universities and education providers, and school districts. These partnerships may have a major impact in accommodating the need for effective STEM teachers to build interest and passion in STEM careers. Simply, a concerted effort to find effective STEM teachers builds a foundation for a stronger America.

The discussion of the frameworks involved in initiating, developing and sustaining partnerships are basic considerations. As potential partners begin discussions and build the foundation for their collaboration, insights provided in this document are based on solid research and experiences. Common goals and commitments *can* drive positive change by uniting corporations, universities and education providers, and school districts to address the projected shortage in STEM teachers.

In short, we need each other.

ENDNOTES

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