by Michael G. Gibbs

The Future of the US Economy

Science, technology, engineering, and math are essential for workforce development.

During these challenging economic times there are layoffs within numerous professions, banks are in need of a federal bailout, the American automotive industry is on the verge of collapse, and we are experiencing an overall decline in manufacturing business. According to CNNMoney.com, during the final week of January 2009, a total of 200,000 jobs were cut in addition to the 2.6 million jobs lost in 2008. All this occurs while one sector within our economy is continuing to grow — jobs in the technological workforce in the science, technology, engineering, and math (STEM) fields. These are high-tech jobs for a high-tech economy.

While there will always be a demand for economic- and financial-sector jobs, the future workforce will come from the jobs within the STEM sector. The US Department of Labor, in their report for Employment and Training Administration by Jobs for the Future (2007), states:

STEM fields have become increasingly central to US economic competitiveness and growth. Long-term strategies to maintain and increase living standards and promote opportunity will require coordinated efforts among public, private, and not-for-profit entities to promote innovation and to prepare an adequate supply of qualified workers for employment in STEM fields.

American pre-eminence in STEM will not be secured or extended without concerted effort and investment. Trends in K-12 and higher education science and math preparation, coupled with demographic and labor supply trends, point to a serious challenge: our nation needs to increase the supply and quality of "knowledge workers" whose specialized skills enable them to work productively within the STEM industries and occupations. It will not be sufficient to target baccalaureate and advanced degree holders in STEM fields. Our nation's economic future depends upon improving the pipeline into the STEM fields for sub-baccalaureate students as well as BA and advanced degree holders, for youth moving toward employment and adults already in the workforce, for those already employed in STEM fields and those who would like to change careers to secure better employment and earnings.

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The Need is There

Our country's positioning in the global economy depends on the future of the STEM workforce and how we position ourselves, and our educational system, in order to deal with this growing demand.

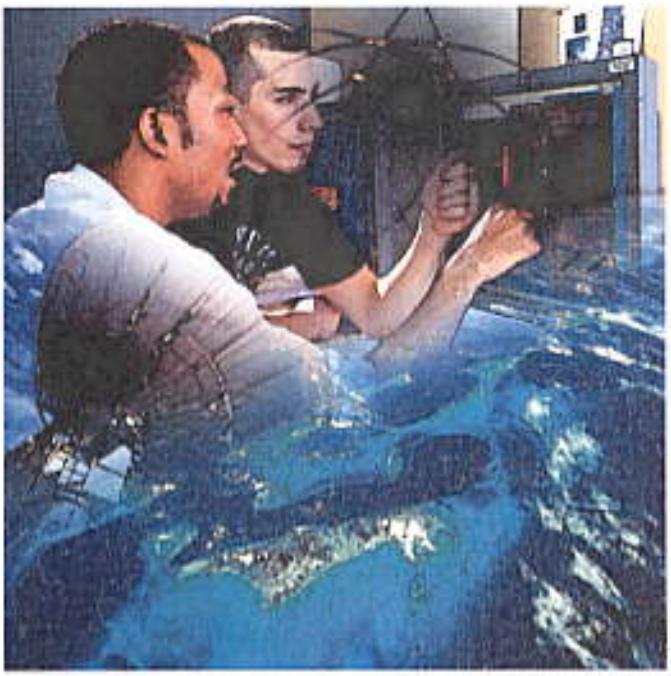
The Massachusetts Department of Education, in their 2007 education research brief, indicated that jobs in the STEM field "are the backbone of the Massachusetts economy," comprising about 13% of the state's jobs. The report goes on to say that, "one-third of its gross state product is related to STEM." These jobs are high paying and continue to increase even during the current economic downturn.

Another example is from New York's 2009 State of the State address. In it Governor David Paterson indicated that while the nation may be on the brink of a depression, he believes New York is in the position to compete for jobs and that his focus is to bring high-tech jobs to upstate New York.

In addition to these two accounts, an online report from FastCompany.com indicates that we are experiencing a changing job market and that individuals will need to acquire the skills necessary to meet this new demand. These jobs are in areas such as nursing and medical services; computing and engineering; education; and "green" jobs. But do we have the ability to meet both the current and future demand?

In a 2008 study, the Interagency Aerospace Revitalization Task Force indicated that the lack of US students with strong skills in STEM subjects, along with a retiring aerospace workforce, could cause a catastrophic shortage of skilled workers within this segment of the US workforce. But does this hold true?

How will this segment of our workforce develop in the future? According to a summer 2008 Converge staff article, "STEM and Workforce Development Legislation," six states — California, Texas, Florida, New York, Virginia, and Illinois — accounted for 40% of nationwide STEM-related occupations in 2005. Meanwhile the Colorado Workforce Development Council expects to see a 20% growth rate in STEM occupations between 2005 and 2015.



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What's Being Done?

With this expected need within the US workforce, institutions of higher education are developing programs to position themselves to answer the call.

- Daniel Webster College takes the lead in responding to the shortage of graduates in the STEM disciplines. They indicate that being "nimble and flexible," they can quickly respond to national issues that affect the STEM disciplines.
- The University of Hawai'i at Mānoa, through an online Facebook survey, is undertaking a study to determine how well STEM school programs and activities have prepared Hawai'i's students for careers in these fields.
- In 2007 the University of Massachusetts convened a 27 member council of senior individuals from state government, business, K-12 education, and higher education to advise the state Board of Higher Education and the state government on STEM programs, policy, and workforce development to encourage students to pursue careers in the STEM fields.
- In 2008 Harrisburg, Pennsylvania, saw the beginning of construction of a new 16-story academic building in the downtown area that created the first STEM non-profit university, the Harrisburg University of Science and Technology, to meet its own current and future workforce needs.

These are just a few of many examples from coast-to-coast where institutions of higher education are focusing on STEM education and workforce development.

In a unique partnership between higher education and the government, Capitol College — through the Space Operations Institute (SOI) in partnership with NASA — provides hands-on internship opportunities for undergraduate students. Students majoring in astronautical engineering can focus on specialized classes in spacecraft and propulsion, orbital dynamics, and remote sensing. The heart of the SOI program is controlling an $800 million satellite, which helps scientists obtain global-warming data and study ultraviolet radiation from ozone depletion.

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Not only does Capitol College provide direct learning opportunities for undergraduate students via the SOI, Capitol takes the discussion to the next step through the Innovation and Leadership Institute. The Institute offers specialized programs to build and develop the technical and social skills needed by students to succeed in technology entrepreneurship and leadership careers. Through the integration of Capitol's two academic divisions — Engineering, Computer Science and Technology; and Business and Information Management — collaborative programs are created that provide students the necessary skills to be leaders in a technology-based global economy.

Leadership skills at Capitol College are also learned indirectly. The recent presentation by Mark Sykes, Director of the Planetary Science Institute, on "Dawn, New Horizons and the Great Planet Debate," gave students an insight into the science, personalities, and politics behind the debate on what constitutes a planet.

Next Steps

With these examples of the need within our workforce, and higher education answering the call, where do we move from here — especially during these difficult economic times? Our future does not necessarily lie with the labor-intense workforce that dominated prior to the turn of the century. As others have written before, our future is knowledge-based and is probably based within the STEM fields. There are numerous examples of the need for STEM workforce development and how higher education is providing learning opportunities for its students.

The federal government recently agreed to an economic stimulus package in an attempt to not only provide for our troubled economy, but also to assist key sectors of industry. Within the area of education, a summary by the Associated Press indicates that the funding has a primary goal of helping current K-12 teachers retain their jobs. The AP story continues by stating:

> *Nearly 600,000 jobs in elementary and secondary schools could be eliminated by state budget cuts over the next three years, according to a study released...by the University of Washington. Fewer teachers mean higher class sizes, something that districts are scrambling to prevent.*

The stimulus sets up a $54 billion fund to help prevent or restore state budget cuts, of which $39 billion must go toward kindergarten through 12th grade (and higher) education. In addition, about $8 billion of the fund could be used for other priorities, including modernization and renovation of schools and colleges, though how much is unclear, because Congress decided not to specify a dollar figure.

A contrary view of the future of the STEM workforce comes from an American Physical Society 2008 article by Ron Hiram. Titled "STEM Workforce Discussion Needs More Data, Analysis," it

states that the current STEM workforce represents only about 5% of the nation's total workforce and that there is a widespread belief among policy makers, leaders in business, and leaders in higher education that the STEM focus has "a disproportionately high impact on the nation."

Funding for STEM

But where is the funding for STEM education? Should we rely on the government to lead the way? No.

In December 2008, the Bayer Corporation held a national forum (the second in the past three years) on the STEM subject. The purpose was to encourage and assist business executives from the various STEM industries — biotechnology, information technology, engineering, and beyond — to become involved and support STEM educational programs. By supporting STEM education, the business community hopes to build a national STEM pipeline for our nation's future workforce.

The conference was titled "Bridging the Diversity Gap: Introducing STEM Industries to K-12 Best Practice Programs." Included was a report on a survey by Bayer, which found agreement among the Fortune 1000 companies that they have a responsibility to support pre-college STEM-based education programs. These programs are especially important, according to the report, in developing the next generation of innovators, especially those who traditionally are underrepresented in the STEM field.

Another funding example comes from the Motorola Foundation. In December 2008, they announced their Innovation Generation Grants program for 2009. It provides funding to support programs for pre-K to 12 students and is designed to advance the STEM field. The Motorola grant's focus is on programs that serve underrepresented groups in STEM careers. In 2008, the foundation provided $4 million in grant funding in the US and plans to award $5 million in 2009.

These are just two examples of corporate funding — available for STEM education and future workforce development — that support our future workforce and hence our nation's future. Other foundations, corporations, and governmental sources (including NASA) continue to actively support the efforts of engaging students of all ages in the STEM field.

Our Future: STEM

Organizations such as the Astronomical Society of the Pacific (ASP) provide resources, training, and a national network to enable the intermediate communicators, who focus on STEM workforce development, to advance the field. The ASP engages scientists, educators, enthusiasts, and the public to advance science and science literacy by increasing the understanding and appreciation of astronomy.

Funding provided by organizations such as Bayer and Motorola allows institutions of higher education (such as Capitol College) and nonprofits (such as the ASP), working separately or in partnerships, to advance the field and provide the necessary educational opportunities, resources, and environment to support STEM education for our nation's future workforce. ■

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