



Lawrence King, Editor

Special points of interest:

- Change in STEM Degrees Awarded

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STEM NEWS

SPECIAL EDITION THE STATE OF STEM EDUCATION

Since our launch in 2012 our readership has grown to over 15,000 STEM professionals, organizations, and educators across the nation, Canada, Australia, and Europe. Our objective is sharing information with stakeholders on noteworthy factors and trends influencing STEM educational opportunity for under-represented minorities and women.

In this Special Edition of STEM NEWS, we are sharing the perspectives and feedback we have received from a diverse group of professionals on the **STATE of STEM EDUCATION**.

Since 1974, I have been engaged with a number of special individuals and organizations that make up the community of technical professionals, educators, and others with concern for science education. The expertise represented in this august body of knowledge and experience has at times caused me wonder and amazement that our broader business and education community along with the children in our schools across America had so little knowledge of the continuing contributions to our economy, national security, and overall general welfare that was due to the intellectual capacity and commitment to achievement of the men and women who use their scientific, engineering, and business capabilities to make a difference for all of us.

So I reached out to the individuals and groups that I have come to know and respect to ask them for their thoughts on the state and the future for STEM education as it relates to them and to the children in our schools that have grown and will grow increasingly Black and Brown.

What is reflected in this Special Edition is the collection of what they have shared.

Lawrence King, Editor

As a junior high school teacher, I see a lot of worrying about the State of STEM. The better schools and teachers find some way to implement open-ended projects, information about STEM Careers, and maybe even some real pbl. However, most students are still woefully unprepared for the rigors of the STEM discipline in high school, and are discouraged from applying to STEM programs in college.

There seem to be two extremes going on in elementary STEM education, either students are not exposed at all, or students are exposed in a way that gives them excitement but no skills. For example, showing kids a 3-D printer or beginning a robotics class is great, but it doesn't help students know how they can do that on their own. Students need a solid curriculum of science, math, coding, engineering, and real-life problem-solving in order to develop the foundation for growth in STEM fields. We have to teach concepts from the ground up without skipping steps, and focus on the content just as much as we focus on the fun. Partner with AdvanceSTEM.com to ensure real STEM education doesn't get lost in the hoopla.

Gittel Grant, President and Curriculum Developer at STEM Advancement Inc.

Percentage Change in STEM Degrees Conferred by Colleges and Universities

As the discussion around the importance of increasing the numbers and share of under-represented students earning degrees and entering our STEM related workforce continues, it is sobering to look at what is coming down the education pipeline.

	Baccalaureate		Graduate	
	1989 - 90	2014 - 15	1989 - 90	2014 - 15
African American/ Black				
STEM	16%	12%	6%	6%
Asian American				
STEM	38%	31%	31%	18%
Hispanic				
STEM	18%	15%	10%	9%
Native American				
STEM	15%	14%	7%	6%
White				
STEM	17%	17%	13%	10%
International Students				
STEM	36%	26%	45%	46%

Note that declines in percentages are relative to the larger overall numbers of degrees conferred. We should be girded up for the long haul and not get caught up in intellectual, philosophical, social, and political back and forth between various approaches to addressing this problem. The solutions that make sense are those that contribute best to building a workforce to strengthen our global competitiveness for a strong economy.

Source: **Diverse Issues in Higher Education, Aug. 2016**

I have an innovative idea for STEM education in the city of Detroit. I want to convert an old school bus into a mobile tech lab, and teach high school students in Detroit to code.

The idea is to create an immersive learning experience. Students on The Tech Bus will learn to function as software development engineers by completing various coding tasks in an Agile environment. By introducing these traditionally underserved students to these concepts at an earlier point in their respective academic and professional journeys, I hope to equip them with the tools they need to make informed decisions regarding their educational and career aspirations.

The Tech Bus is still currently under development, but presenting the idea at this summer's HackTheCD Cultural Innovation Conference in Seattle got the ball rolling. Since then, The Tech Bus has been featured in Michigan Stateside Radio (radio interview), The Metro Times, Black Enterprise, and numerous other blogs and publications. I am currently competing in the Social Venture Partners Fast Pitch competition in Seattle, as well as presenting at Seattle Maker Faire on Sunday September 18, 2016.

For more info, or to get involved, please see www.aspiretechbus.com or email thomas@aspiretechbus.com.

Thomas Philips, Aspire Consulting and Engineering

State of STEM Education

The 21st century has ushered in a new age, the technology era and projections indicate that the majority of future employment in the U.S. will require knowledge in science, technology, engineering and mathematics. These disciplines require critical thinking and problem solving skills to solve real world issues. In order to prepare youth for a STEM economy we must provide authentic STEM opportunities that permit students to acquire information via exploration in an educational environment that supports collaborative discovery.

Many underrepresented populations are at risk of benefiting from STEM employment because they lack the resources and connections that can assist with preparation. Moreover, traditional STEM pedagogical practices have been ineffective in stimulating and motivating the interests of students. Science in particular can be abstract and if not presented in a manner that is digestible, will lose the intrigue of learners. The trend is to advance student learning outcomes in STEM via constructive engagement. There are engaging methods that if implemented characteristically will stimulate and motivate interest in STEM content. However, to positively impact STEM instruction, traditional practices should incorporate innovative relevant hands on activities that complement curriculum so that students can better grasp the prescribed information.

Gladys Delancey-Bolding, Biology Lab Supervisor/Biology Instructor—COO BioLogue Laboratorium

Importance of STEM Education in Under Served Communities

STEM education is quintessential. It is not optional as some people make it out to be. One of the worst kept secrets in the United States is the fact that Asians, especially Indians and Chinese, are doing very well in STEM while African Americans and Hispanics have been lagging far behind. It is also a fact that even the affluent Americans, the traditionally privileged white majority, have been faring poorly. At a time when some countries have gone overboard with their focus on STEM subjects, Americans have been rather dismissive in signifying the same. Under serve communities like African Americans must not only endorse STEM education but ensure that it becomes a norm of sorts. STEM has been in the backseat in many developed countries and the US is not alone. The UK too has a very discouraging track record of STEM education in the last two decades. It is no wonder why the premium technological and teaching jobs are being grabbed by Asians mostly and then continental Europeans.

Let us first understand the significance of STEM education.

- STEM education is the most significant contributor to cognitive development. Kids of under serve communities are often overwhelmed with complicated subjects. There is a reason why a staggering number of kids in under serve communities go to high school but don't go to college or drop out. Those who go to college don't pursue a higher degree at a university. As the going gets tough, the kids of under serve communities tend to back off and quit. That is primarily because they are slow learners, don't like complicated or demanding subjects and would rather take an easy way out, even if that means a lifetime of average incomes and ordinary livelihood.
- STEM education harnesses the true potential of the human mind. It challenges the brain to think, to find solutions to existing and new problems, to outthink others and to perfect one's reasoning skills, aptitude and one must make logical sense of everything one learns. This level of cognitive development is not possible with humanities or even commerce. Only STEM education through primary, middle and high school will ensure the level of analytical thinking and skills that the modern world requires.
- For rewarding careers, STEM education is the foundation. Around the world, millions of people if not billions switch from STEM to commerce and humanities or fine arts and many other specializations. It is not possible to make the same switch from commerce, humanities, fine arts or other specializations to STEM. Being trained in STEM and being good at it will enable under serve communities to switch disciplines, to further their careers in fields they can excel and find their true calling. Without STEM as the foundation, the luxury of choice is not even born.



Melvin Hayes, CEO – UpWorld Inc.

I have comments but it's only in regards to the response from kids and parents with STEM. If you bring a STEM program that is engaging and fun kids will come back for more! I have had the pleasure in engaging STEM this summer and the response from parents and kids are positive. The high school kids I have engage are taking STEM degrees and careers as an option. I love engaging kids into the STEM world.

Dr. Lavonia Smith, DLS Education & STEM Services

Larry, I appreciate your on-going emphasis on STEM education and in many ways you were ahead of the crowd that has now joined their voices with yours.

Sincerely, Emily Lembeck, Superintendent—Marietta City Schools



“The fact that teachers are not really prepared in terms of STEM is one important issue that hinders elementary STEM progress. Administrators do not see it as necessary due in part to the significant amount of testing in Math and ELA areas. Integration has gone by the wayside in elementary and we need to get it back so teachers can integrate science and social studies into ELA and math. Writing and reading are paramount to understanding, but students have to be engaged and interested in the topic for it to be successful.”

Shirley Disseler, Assistant Professor at High Point University

More of the State of STEM Education

“Three big barriers Teachers and their preparation...Many are science averse because of their own damaging school experiences, and pre-services programs do little to change that. Standardized testing that focuses on math and language arts and impacts teacher job security. Lack administrative understanding that science is best learned by doing.”

Joseph J. Bellina, Ph.D., Retired Professor of Physics and Agent of Educational Change

“It is great to see like minded individuals passionate about STEM Education and how it impacts our youth! . If I were to add to this discussion group, it would be to focus on developing the students' purpose and problem solving ability. School is not just about exposing students to "hot trends" but to allow them to develop their sense of purpose in society.

I think it is also critical that not only are students ex-posed to a variety of career options, but educators should be exposed as well to shift their paradigms and understand fully how science and technology is inte-grated into EVERYDAY of our life. It's not just a class taken for 45min-1 hour each day. Science and Technology is a way of thinking. A means to provide a better quality of life for all.”

Bejanae Kareem, Ed.S. ,Principal Consultant/Founder at Bk International Education Consultancy

“TIME to teach STEM is the biggest barrier. In New York State, the implementation of the Common Cores in ELA and Math as well as the teacher accountability program (*called APPR*) combined with exemplar ELA modules provided by the state education department (many districts have adopted these and they do not integrate best practice science instruction) have cre-ated the perfect storm that squeezes opportunities for STEM right out of the door - or at least into afterschool or summer programming.”



Mary Thomas, ESP Assistant Director at Monroe 2-Orleans BOCES

“As a middle school science teacher, I can attest to the issues surrounding the amount of time spent in the elementary school classroom dedicated to science. At the beginning of the year my students took a pre-assessment to measure their previous knowledge of science coming into the school year. I was shocked by the results as many students did not have the foundational understandings that should be expected.

I think that teaching on student interest and natural curiosity of science in the elementary school will create a generation of scientifically literate and driven students.”

Katie Ethridge, Educator at Phoenix Academy Inc. NC Charter School



STATE of STEM Education

The state of STEM education is abysmal for the inclusion of African American and other underrepresented youth in many regions of this nation. STEM outreach efforts continue to lag in recruitment goals with poor strategies in funding after-school programs to include minorities. This is evident in the attendance profiles of STEM activities around the country including the major STEM based events like the FIRST Lego League Robotics Competition and the National Model Rocketry Competitions.

According to the FIRST Lego League statement, “the demand for science, technology, engineering, and math (STEM) professionals is growing rapidly while at the same time inequities and gaps in education and afterschool programming are preventing certain youth from having access to engaging STEM opportunities. Ensuring that underrepresented and underserved students are exposed to hands-on STEM learning experiences and educated about future career opportunities that are available to them in these fields is vital.”

To ensure greater access and reduce inequalities, FIRST began making adjustments to implement a more inclusive policy to provide funds directly into underrepresented communities through a FIRST STEM Equity Community Innovation Grant. Unfortunately, it’s been our experience that corporations and foundations continue to claim in their corporate responsibility policies that underrepresented youth are a high priority, and they want to partner with minority communities and organizations to include these youths to fulfill their STEM based mission. However, their actions continue to be contrary to their policy statements as documented in the corporate giving section of their IRS Form 990.

Inequities transcend far beyond the exclusion of underrepresented youth participation in existing STEM programs, but also in the process of making corporate grant awards to qualified minority organizations in communities with the most experienced in working with underrepresented youth. Corporate funding committees are staffed with mostly nonminority representation as STEM grants continued to be awarded to the established nonprofits who rarely outreach into underrepresented neighborhoods.

The consequences of these factors are the continuation of perpetual exclusion as STEM learning activities continue to evolve further out of reach.

These are the challenges to bringing STEM Education into the underrepresented communities with the most need.

Eric Green, Director STEM TECH Neighborhood Academy



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Looking to the Future of STEM Education

A bold but achievable vision for STEM education over the next decade will embody high-quality, culturally relevant STEM learning experiences for every child in our public and private schools. These students must have access to all areas of learning and possess a sense of belonging through their participation in lifelong STEM learning pathways that extend across all education settings. This means, schools, science centers, education collaborative with higher education and the corporate community need to exist to degrees greater than they do today.

These interdependent relationships and partnerships can feature networked communities, educational experiences that include interdisciplinary approaches to solving challenges that have origin in the culture and values of places and communities where people live, work, and play.

The agility of learning spaces that enable students to take risk in problem solving and that are equipped with technology innovations will benefit both our teachers as well as those in their classrooms. Measures of learning will need to move beyond dependency solely on test performance and incorporate approaches that values each student’s learning style whether auditory, visual, or kinesthetic. Lastly, since our school populations like society are becoming more diverse, the teaching corps and the old assumptions of who can do science must accommodate the cultures of those in the classroom on how math and science will be taught.