

Increasing Participation, Student Engagement, Quality, and Capacity: **STEM Legislative Action by the 113th Congress**

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In recent years, educators and policymakers have paid increasingly greater attention to science, technology, engineering, and mathematics (STEM) education and its role in bolstering the country's economic competitiveness in the global market. Advocates for improving and expanding STEM programs say they provide students with real-world skills and prepare them to be successful in a multitude of professional capacities (Eberle, 2010). Further, they maintain that strengthening the national science and engineering workforce will strengthen national security (Gonzalez, 2012).

STEM advocates point to the performance of American students on standardized tests, which falls below the global standard (Gonzalez, 2012). Lagging behind international competitors could have an adverse effect on the American workforce that results in an increased need for foreign outsourcing or moving operations entirely to another country (U.S. Congress Joint Economic Committee, 2012).

Therefore, policymakers and the federal government have taken an interest in promoting STEM and ensuring the nation's future as a global leader in the field. Several pieces of legislation have been proposed in recent years to bring STEM to the forefront of the U.S. education agenda. This brief will summarize legislative actions carried out by the 113th Congress thus far as well as the status of these bills (all proposed legislation can be found at Govtrack.us).

Legislative Action

To foster greater STEM expertise in the U.S., current legislation has focused on promoting the participation of underrepresented populations in STEM, enhancing the quality of professionals teaching STEM subjects, and promoting STEM-related activities to engage students of all ages.

Targeting Underrepresented Populations

Providing more opportunities for all underrepresented populations to work in STEM fields could be a major step toward achieving greater national economic success and security, and greater social equality.

Studies conducted by economists at the University of Chicago and Stanford University estimate 15–20 percent of national productivity has come from minorities going into professions previously inaccessible to them (Cadwalader & Koster, 2013). Even so, women and minorities still make up a small percentage of workers at the highest levels in STEM professions; therefore, increasing the proportion of underrepresented workers in STEM professions could lead to significant national economic progress and success (Cadwalader & Koster, 2013).

In addition, STEM professions offer women the opportunity to not only be on the cutting edge of innovation but also earn 33 percent more than women in non-STEM professions. Salary discrepancies between men and women in STEM professions are less than in non-STEM professions (Office of Science and Technology Policy [OSTP], 2013a).

Women's economic and political empowerment is a crucial component for fostering international peace, sustaining international security, promoting economic success, and reinforcing government accountability (Office of the Press Secretary [OPS], 2012). Supporters of STEM assert that these professions can provide women with the economic security, social equality, and the political clout to influence these outcomes (Cadwalader & Koster, 2013; OPS, 2012; OPS, 2013a).

To promote participation by underrepresented populations, the following legislation has recently been proposed.

- **Women and Minorities in STEM Booster Act of 2013 (S. 288)** promotes a diversified workforce and strives to minimize the disparity of women and minorities in STEM professions.
- **STEM Opportunities Act of 2013 (H.R. 1358)** establishes a collaborative effort between the National Science Foundation (NSF) and the Office of Science and Technology Policy (OSTP) to ensure STEM educators and employers are maximizing the STEM talent pool by minimizing biases based on gender, race, or ethnicity.

- **STEM Jobs Act of 2013 (S. 303)** and **STEM Visa Act of 2013 (H.R. 459)** seek to amend the Immigration and Nationality Act by eliminating the Diversity Immigrant Visa Program¹ and allowing instead up to 55,000 visas per fiscal year to be made available to foreign persons who hold a doctorate degree in a STEM subject from an American institution.
- **Border Security, Economy Opportunity, and Immigration Modernization Act (S. 744)** also seeks to reform immigration by requiring employers hiring foreign STEM professionals to pay an additional fee for green card applications. Resulting funds from this fee will then be dispersed to states to fund STEM education programs.

These pieces of legislation all aim to increase the participation of chronically underrepresented populations in STEM by forming partnerships with relevant governmental agencies², universities, and other non-governmental STEM advocacy groups³. Grants would be awarded to promote the participation of women and minorities, and through these partnerships, activities such as online workshops, mentoring programs, internships for undergraduate and graduate STEM majors, and outreach programs will be established to increase the participation of all populations.

These policies also focus on monitoring and evaluating STEM partnerships and their activities by conducting surveys to routinely collect data on the demographics of STEM education programs and the STEM workforce. Summaries of this data will be made available to all stakeholders so that the strengths and weaknesses of these efforts to increase the participation of underrepresented populations can be evaluated and shared.

As of June 2013, these pieces of legislation have been assigned to a House or Senate committee for consideration⁴.

Recruiting and Retaining High-Quality STEM Teachers

Having more STEM professionals and more STEM programs is not enough: It takes a network of highly effective teachers and leaders who ensure high-quality STEM instruction for the long-term success of students.

High-quality instruction in STEM subjects is critical in the effectiveness of STEM education programs (Connor, 2013; Sheehy, 2013). In STEM instruction, more hands-on, less traditional teaching methods are perhaps more important than in other fields. Instruction including project-based learning, critical thinking, and collaboration is important in engaging students with STEM content (Connor, 2013).

Highly effective teachers further engage students by partnering with local businesses and other organizations to give students a glimpse at future STEM opportunities and allow them to practice real-world problem-solving techniques (Connor, 2013; Sheehy, 2013).

Well-trained teachers who have comprehensive knowledge in the field they are teaching is vitally important to quality. President Obama, in his commitment to bolstering the country's STEM programs, has set a goal of training 100,000 highly effective STEM teachers by 2020. These high-quality teachers will have a significant impact on the quality of STEM professionals produced in the next decade and in the future (OSTP, 2013b; Sheehy, 2013).

The 113th Congress is incentivizing highly effective teachers to choose STEM subjects by focusing on greater recognition, more easily accessible resources, and monetary incentives, as revealed by the following pieces of legislation recently proposed (Connor, 2013; Sheehy, 2013; OSTP, 2013b).

- **Elementary Educator STEM Content Coach Act (H.R. 1090)** establishes a program that provides professional development opportunities to elementary educators so that they may gain comprehensive knowledge in STEM subjects, resulting in more highly effective STEM classroom instruction.
- **STEM Masters Teacher Corps Act of 2013 (S. 358)** establishes a program that evaluates, recognizes, and rewards outstanding STEM teachers. The attention paid to the profession will potentially attract and retain more effective STEM teachers by offering them monetary bonuses, additional resources, and instructional leadership roles. This Corps will also be used as an informative resource in the development of future STEM education policy.
- **National STEM Education Tax Incentive for Teachers Act of 2013 (H.R. 118)** aims to amend the Internal Revenue Code of 1986 allowing eligible teachers to receive a credit against the tax imposed by the tuition for undergraduate education programs.

As of June 2013, each of these bills has been assigned to a committee in the House or Senate for consideration⁵.

¹ The Diversity Immigrant Visa Program is a congressionally mandated lottery system for obtaining green cards (USA.gov, 2013).

² National Science Foundation, Office of Science and Technology Policy, the Institute of Education Sciences (IES), the Department of Education.

³ American Assn. of Blacks in Energy, Black Data Processing Associates, MAES, Latinos in Science & Engineering, National Organization for the Professional Advancement of Black Chemists & Chemical Engineers, National Society of Black Engineers-Alumni Extension, National Society of Black Physicists, National Technical Assn., Society for Advancement of Chicanos & Native Americans in Science, Society of Hispanic Professional Engineers, National Action Council for Minorities in Engineering, American Indian Science & Engineering Society, The National GEM Consortium, National Assn. of Black Geoscientists, Institute for Broadening Participation, National Society of Hispanic Physicists, Hispanic Heritage Foundation, Hispanic Youth Institute, Excelencia in Education, Asian Pacific Islander, American Assn. of Colleges & Universities, National Congress of American Indians, Great Minds in STEM, and the National Biotechnology & Pharmaceutical Assn. (National Organization of Minority Architects, 2013).

⁴ Assigned committees include: Senate Commerce, Science and Transportation Committee; Senate Judiciary Committee; the House Education and the Workforce Committee; and the House Science, Space and Technology Committee.

⁵ Assigned committees include: Senate Health, Education, Labor, and Pensions Committee; and the House Ways and Means Committee.

Engaging Students of All Ages

Advocates such as the STEM Education Coalition have identified early exposure as a key component to promoting STEM subjects and encouraging students to pursue STEM-related studies and professions (STEM Education Coalition, 2013). In addition to fostering later interest in STEM, exposing and engaging students in STEM subjects at a young age has been shown to promote academic growth and develop early critical thinking and reasoning skills (Department of Early Education and Care, 2012).

Furthermore, in a 2010 poll of female and minority STEM professionals, 77 percent reported that underrepresented populations are chronically missing from the STEM workforce because they are not being exposed to STEM and are not encouraged to pursue STEM studies at an early age (Bayer Corporation, 2010). Engaging students of all ages can further mitigate the issue of underrepresented populations in the STEM workforce.

The following pieces of legislation attempt to increase STEM exposure to students of all ages.

- **Stepping Up to STEM Act (H.R. 1089)** establishes the Office of STEM Education within the Department of Education and compels the Secretary of Education to award grants to STEM organizations or initiatives to increase student achievement in elementary and secondary schools.
- **Project Ready STEM Act (H.R. 1343)** aims to amend the Elementary and Secondary Education Act (ESEA) by allowing the Secretary of Education to award grants to promote STEM-based projects in schools, afterschool programs, and summer and weekend programs.
- **STEM Education for Global Economy Act of 2013 (S. 854)** aims to improve the academic performance of American students in STEM subjects and to promote greater career and college readiness. This will be achieved by engaging students in STEM activities at a young age, promoting improved STEM instructional methods in elementary and secondary grades, establishing STEM-themed afterschool programs and recruiting and training highly effective teachers.

These pieces of legislation provide the resources, mentors, and incentives needed to comprehensively expose students to STEM subjects and to keep them engaged throughout their academic careers. In addition to engaging more students of all ages in STEM, these policies aim to close the achievement gap that exists within the U.S. as well as the achievement gap between American students and their international counterparts.

As of June 2013, each of these bills has been assigned to a committee in the House or Senate for consideration⁶.

Response to Legislative Actions

The STEM-related bills proposed by the 113th Congress aim to increase participation in STEM fields, enhance quality of STEM programs, and promote best practices in STEM education and industry. Additionally, these policies attempt to minimize the skills gap, ensuring there are enough skilled workers for the anticipated increase in the number of STEM job opportunities in the U.S. (OPS, 2013a).

Educators, policymakers, the administration, and other STEM stakeholders have all demonstrated their support of efforts to enhance STEM instruction, increase STEM accessibility, and promote STEM professions by participating in activities and establishing initiatives to achieve these goals. Advocates see these measures as steps toward securing the country's position as a leader in the global economy as well as a leader in innovation and research (Cadwalader & Koster, 2013; Eberle, 2010; Gonzalez, 2012; OSTP, 2013a).

STEM-related amendments to immigration laws have received the most opposition, including from the White House (Nelson, 2013). The administration supports allowing skilled immigrants to enter and work in the U.S.; however, it does not support STEM professionals being allowed in at the cost of other immigrants who do not work in the STEM field. The president has expressed concerns about any plans to end the Diversity Immigrant Visa Program and has noted that these amendments do not promote comprehensive immigration reform (Nelson, 2013).

Other critics of these amendments have voiced concerns about Americans missing opportunities due to an influx of foreign professionals (Popvox, 2013). These critics assert that the American workforce will suffer most from policies encouraging international employees to come to the U.S., and that American workers should be the focus of efforts to improve STEM education and workforce capacities (Afterschool Alliance, 2013; Popvox, 2013).

Supporters of STEM-related immigration bills note, however, that there are benefits to be gained from a diverse STEM workforce. Many point to the fact that immigrants have been responsible for helping start some of the country's most successful technological enterprises, such as Google and Yahoo (Gruenwald, 2012). Others have stated that promoting the participation of minorities and underrepresented populations in STEM fields would extend to promoting the participation of immigrant workers as well (Cadwalader & Koster, 2013; Gruenwald, 2012).

⁶ Assigned committees include House Ways and Means Committee and the House Education and the Workforce committee.

Questions for Policymakers and Educators to Consider

Policy Issue	Questions for Policymakers to Consider
Increasing the participation of underrepresented populations in STEM fields	<ol style="list-style-type: none"> 1. What outreach activities are being conducted to engage more women and minorities and to expose them to STEM opportunities? 2. What are the attitudes surrounding the participation of women and minorities in the STEM workforce? 3. How might these attitudes inhibit or support the participation of underrepresented populations?
Recruiting and training highly effective STEM teachers	<ol style="list-style-type: none"> 1. What professional development opportunities are available for STEM education instructors? 2. What are the incentives for teachers to pursue careers teaching STEM subjects? 3. What are proven best practices of STEM instruction? How are these best practices disseminated? 4. What are the current weaknesses of STEM educators? How can these be improved?
Engaging students of all ages in STEM subjects	<ol style="list-style-type: none"> 1. What activities are being implemented to engage students? What outcomes have been measured as a result of these activities? 2. What are the incentives for students to pursue STEM fields? How are these incentives promoted? 3. What are best practices in STEM education programs? How are these best practices being shared? 4. Are standards articulated for STEM education programs? How will performance be measured and evaluated?
Promoting and retaining a domestic and international STEM workforce	<ol style="list-style-type: none"> 1. What does the data say about the demographics of the STEM workforce? 2. What are the current capacities of the STEM workforce? How can these capacities be enhanced? 3. What are the benefits for recruiting and hiring international STEM employees? What are the disadvantages? 4. What policy will determine who enters the country and how long they will stay?

Recommendations

Focus on STEM instruction and workforce capacities

- Facilitate mentoring opportunities for students and adults looking to enter STEM professions
- Provide professional training to STEM instructors so they can be effective role models
- Demonstrate how classroom instruction translates to real-world occupations
- Make students aware of the possibilities
- Engage with industry leaders to define, recruit, train, and hire workers with necessary skills

Recruit, train, hire, and retain highly effective STEM educators

- Provide professional development opportunities that allow educators to stay up-to-date with best practices and proven instructional methods
- Provide incentives for teachers to pursue STEM subjects
- Provide accessible and up-to-date resources
- Create a network for STEM educators to share best practices, project ideas, and classroom models

Increase outreach activities for all ages

- Provide opportunities for students to be exposed to STEM and to engage in STEM activities such as in-school and afterschool education programs, mentorship opportunities, and internships
- Motivate or provide incentives for high school students, undergraduates, and graduates to pursue STEM majors
- Widely promote STEM opportunities to students and encourage them to observe the career paths of STEM role models

Maintain positive perception of the STEM field and STEM professionals

- Ensure the facts about STEM professions are widely disseminated
- Identify stereotypes that may be keeping minorities away from STEM occupations and troubleshoot ways to dispel those stereotypes
- Identify negative perceptions of STEM professionals and promote characteristics that defy them
- Highlight the many career opportunities available in a variety of disciplines for STEM professionals

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