IEEE-USA POSITION STATEMENT

K-12 STEM Education

Adopted by the IEEE-USA
Board of Directors (26 April 2018)

IEEE-USA supports federal and state-based efforts to enhance K-12 science, technology, engineering and mathematics (STEM) education, and particularly with programs and initiatives that seek to infuse engineering and computer science concepts into K-12 education curriculum and learning experiences.

By introducing engineering design concepts, computing, and practical applications in America's schools, especially its middle and high schools, we have the potential to improve student learning and achievement in science and mathematics, increase student interest in engineering and computer related careers and boost students' basic technological literacy. This, in turn, will help to ensure that U.S. schools are graduating students with the potential to succeed in an increasingly sophisticated, technologically driven world, meet America's high-tech workforce needs, and create innovations that will drive the economy and solve the grand challenges that confront our nation and the global community. STEM literacy is also essential to ensuring citizens can understand and engage effectively in public governance of the increasingly complex technical matters that underpin almost all aspects of modern society.

For these reasons, IEEE-USA supports the "Three-Dimensional instruction" concept outlined by the National Academies' report, A Framework for K-12 Science Education,[1] which calls for the use of science and engineering practices to actively engage students in science learning, the integration of these practices with disciplinary core ideas and crosscutting concepts, and a teaching focus on explaining phenomena and/or designing solutions to problems.

As a key to success in the Digital Age, IEEE-USA believes it is essential that every school offers students meaningful access to instruction in computer science and software coding beginning at the primary level. We support the efforts of organizations seeking to advance computer science education at the K-12 level and applaud the U.S. states that have adopted computer science educational standards to date. Exposure to engineering and computer

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[1] National Research Council (NRC), *A Framework for K–12 Science Education: Practices, Crosscutting Concepts, and Core Ideas.* (Washington, DC: National Academies Press, 2012). Accessible at:
https://www.nap.edu/catalog/13165/a-framework-for-k-12-science-education-practices-crosscutting-concepts

science will not only open a host of career options to students, but also help them navigate an increasingly technologically complicated world.

IEEE-USA also believes that a special emphasis is needed to help encourage and prepare women and under-represented minorities for careers in science and technology so that the composition of our national S&T professional workforce is representative of our society as a whole. This requires not only making sure that quality learning opportunities for K-12 science, math, computing and engineering are available to all students, but will also require the active presence of role models and mentors, opportunities for hands-on experience and real world STEM exposures, and proactive encouragement from parents and educators.

Ultimately, K-12 education is conducted and administered at the state and local level. We encourage all states to consider and adopt as appropriate the educational practices set forth in the National Academies' Framework report and in the Next Generation Science Standards developed by a consortium of states in partnership with the National Research Council, the National Science Teachers Association, and other informed organizations. We also urge Congress to encourage and assist states to establish K-12 educational standards and curriculum requirements, while giving states the flexibility to enhance their K-12 STEM education capabilities in a manner consistent with their needs and appropriate to the communities they serve.

IEEE-USA also endorses the following specific programs and initiatives:

- State initiatives to adopt engineering curricular standards and programs, including STEM magnet schools, pre-engineering tracks, after school programs and student preparation partnerships between secondary schools and engineering institutions.

- State-based efforts to adopt and implement education standards that incorporate engineering principles into science and math courses.

- The Robert Noyce Teacher Scholarship Program administered by the National Science Foundation, which encourages and compensates talented science, technology, engineering, and mathematics majors and professionals to become K-12 mathematics and science teachers

- Federal legislation that supports research into best practices and promising innovations in K-12 engineering and computer science education and/or that would allow states to leverage existing federal K-12 education funding resources to support STEM-related education, such as:

    o Allowing states to award grants using federal Title II funding to support professional development of K-12 STEM teachers and instructional materials for STEM education,

- ○ Expanding the federal Math and Science Partnership (MSP) program to encompass all STEM subjects, including engineering and computer science

This statement was developed by the IEEE-USA Government Relations Council, and represents the considered judgment of a group of U.S. IEEE members with expertise in the subject field. IEEE-USA advances the public good and promotes the careers and public policy interests of the more than 180,000 engineering, computing and allied professionals who are U.S. members of the IEEE. The positions taken by IEEE-USA do not necessarily reflect the views of IEEE, or its other organizational units.