A STEM Call to Action

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With the rapid advances in technology and the plethora of changes in society that involve new, life-changing inventions, education has had to attempt to keep pace. Technology and engineering must become a part of the "new basic" in our next generation of general education for all students. Societal members are being made aware of advances in thinking that allows human ingenuity and technology to be used in the solution of problems facing our world today.

Take this opportunity to gain a better understanding of the need for STEM education and its critical role in creating a technologically literate society in which individuals use their thinking skills to fulfill human wants and needs. The rationale for the "T" and "E" has been specifically addressed in order to gain support for these subjects as part of the overall STEM effort. Technology and engineering have proven to be critical components in solving societal problems. Alone, science and mathematics fall short of allowing students to truly implement the knowledge necessary to make a better society.

The following are ways that the concerned citizen can help make such an education a reality. Join dedicated and engaged colleagues from across the country who strive to make a difference in an education for the next generation.

Parents

Don't settle for less than the best education for your child at any age level. If your child likes to make or create and seems technologically inclined in any way, have him or her explore these courses. Technology and engineering are for students who envision themselves as architects, high-tech workers, technicians, and more. These experiences or courses are not limited only to future engineers! Technology and engineering can and should be taught from the earliest grades through the university level. Knowledge about science and mathematics alone does not provide the full experience necessary to make an inventor or creator. The teaching solution does not have to be an expensive facility with constant upgrades that are a burden on a school's finances. Examine your options; seek information about programs already making a difference in communities across the United States; request that your administrators become informed about opportunities to make technology and engineering a meaningful

We must count on technology and engineering teachers and their students' imaginations to help us meet the needs of the 21st Century.

part of a STEM education. A technology and engineering education is a sound investment for all students, but currently gets very little support.

School Administrators/ Boards of Education

Our school leaders have a legal responsibility to assure that a curriculum prepares students to live effectively in today's technological society. However, more is needed. Such an education creates opportunities for the student who wants to explore STEM options, enabling them to design, invent, and innovate. School leaders are the curriculum leaders who can help in the search for quality education, not just buying change, but making informed decisions about an education with a unique mindset, one that is technological in nature. Let your school leaders know of your interest in having a strong technology and engineering curriculum. Help guide them toward knowing more about such programs.

Governmental Agencies

Sustained support for technology and engineering has come from state and national agencies such as the National Science Foundation (NSF) and the National Aeronautics and Space Administration (NASA). There still remains, however, a need for departments of education at both the state and national levels to become more involved and gain a deeper understanding of this type of education.

If STEM education is to be notably effective, it has to become more than the science and mathematics education of the past. Agency personnel must understand that technology provides much more than the delivery of instruction and that it has a content base of its own—focusing on technological literacy. To date, there has been little evidence of understanding by departments of education of how technology and engineering are different and yet crucial in strengthening science and mathematics education. More of the same education as in the past is not the answer. Supporting an education that promotes knowledge and understandings about technological literacy is the answer to having a stronger STEM program. All concerned citizens should assist these agencies in fully understanding technology and engineering programs. Until they do, little progress

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will be made towards funding that will truly make technology and engineering equal STEM subjects.

Legislative Bodies

While legislators do not determine curriculum content for the public school, they can express to school leaders their interest in having stronger technology and engineering programs as a part of a STEM education. Few elected officials have an adequate background that would allow them to fully understand the issues related to a strong program. They must be made aware of the many opportunities to provide a technological education—and that teaching the "S" and "M" of STEM alone shortchanges students of the full benefits of a STEM education.

At the same time, legislators should be encouraged to advance STEM legislation in such a way that STEM subjects thrive in our schools—including legislation promoting more technology and engineering teachers, greater professional development, and an emphasis on ending technology and engineering teacher shortages. The shortage of qualified STEM teachers will make the job of education in creating a 21st Century Workforce more difficult. As a country, we need to act now to make our educational system STEM strong. As community leaders, we must make our concerns known.

Corporate Leaders

Corporate leaders can play many key roles in promoting technology and engineering education. They can become major advocates for the type of thinking that supports inventive thinking—learning to use design as a process in creating, and expressing the need for an education to prepare a technological worker. Their influence in both state and national legislation can bring attention to the need for informed workers with a background appropriate for tomorrow's technological world. Educators should be working with corporate leaders to utilize their resources with boards of education and on advisory groups. At the same time, corporate leaders should take advantage of every opportunity to advocate for the type of worker needed in their industries. These back-and-forth relationships provide student educational opportunities, prepared corporate employees, and an informed citizenry that can make better-informed decisions about technological issues that face our society.

Summary

The teachers who have provided the preceding program descriptions do not know all of the challenges that lie ahead for themselves or their students. Their current programs are in transition towards ideals that they are pursuing with an emphasis on technology and engineering within STEM. Even with this emphasis, science and mathematics are a key part of their teaching. These are veteran teachers who have had their share of failures and successes in both the classroom and the laboratories that they manage. They continue to explore new ideas and various areas of research and developed materials to become outstanding educators in tune with the leadership of the profession.

There are many teachers throughout the United States and in other countries who are experiencing the same type of excitement that captures one's ability to design, create, and innovate. These programs have many different titles that include technology, innovation, design, and engineering in one form or another. Therefore, we are seeing the spawning of an important subject area that can do much to prepare next-generation workers capable of using their talents in many ways to advance our fast moving, highly technological society.

The mission of such programs must be to increase understanding of technological literacy and design among all people. A strong STEM program is a curriculum thrust that works toward the mission by presenting the insight, providing the drive and communication, and questioning the efficiency of methods and approaches while delivering material of significance to people who will be experiencing sophisticated technology for the rest of their lives.

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