

## To STEM and Beyond



## New Educational Frontiers: To STEM and Beyond!

Never before has the American education system been so diverse. Though there are a plethora of pedagogies and schools for parents and students to choose from, the scene is dominated by a few popular educational styles, including some acronyms you may have heard but not be entirely familiar with. Below, we break down the differences and similarities between STEM, STEAM, STREAM and Maker learning environments and discuss the role of technology in each.

### STEM

Science, Technology, Engineering and Math, or STEM schools, integrate the four subjects into a cohesive learning model based on real-world applications. In STEM schools, the focus is on learning as a collaborative, project-based and hands-on process. Problem solving and critical thinking are at the core of STEM schools. Students are encouraged to develop and test their own theories, rather than memorize information handed down by their teachers.

Whether graphing a trajectory or exploring robotics software, technology is essential to much STEM curriculum. Students learn to use and master technologies that will benefit them later on in STEM careers, which is highly beneficial as [jobs in STEM fields have grown three times as fast](#) as those in non-STEM fields since 2005. Helping STEM schools keep up with students' technological needs is the \$3.1 billion invested by the Obama Administration in [federal programs on STEM](#) education. This and other funding enables schools to supply students with [1:1 \(one device for each student\) mobile devices](#) and other software and hardware products for students to investigate.

## STEAM

In 2012, the 43rd season of Sesame Street was [brought to viewers by the letters S-T-E-A-M](#), heralding a nationwide interest in STEAM as an evolution of STEM. Proponents of STEAM (Science, Technology, Engineering, the Arts and Mathematics) schools suggest that STEM misses several crucial components that equip students for our rapidly changing world. STEAM schools place Art and Design at the center of the STEM approach and focus on the ingenuity they say is missing from STEM programs.

STEAM students are encouraged to apply what they learn in the four STEM modalities (science, technology, engineering and math) and connect it with arts practices and design principles to truly create and innovate. For example, instruction in a STEAM school might involve two or more standards from science, technology, engineering, math or the arts to be taught and assessed in and through one another. As Sesame Street put it, highlighting the A in STEAM shows young viewers how important STEM knowledge is for careers in the arts as well.

STEAM schools also incorporate the use of technology in a similar manner to STEM schools, though perhaps with more of a focus on design software and related technologies. [Interactive tablets](#) may make more of an appearance in STEAM schools as students incorporate sketching and design with engineering.

Still unclear about how the Arts fit in STEM? Many educators and education leaders are also still playing with the combination too. Famed educational psychologist [Dr. Howard Gardner put it best](#), "I don't have strong views about whether arts should become a part of STEM or be self-standing. What is important is every human being deserves to learn about the arts and humanities, just as each person should be cognizant of the sciences."

## Makerspace

The Maker movement focuses on transforming students' learning experience in schools and places an emphasis on creation and creativity through *doing*. By tinkering, experimenting, playing and collaborating, students design products and processes of their own.

Makerspaces may be physical or virtual or both. With the undeniable role technology will play in tomorrow's world, the ideal space would incorporate a wide range of tools, activities and materials. Digital fabrication and robotics may happily coexist alongside cardboard construction and woodworking (well, maybe not right next to each other). As you can imagine, a makerspace classroom may look like many places we have seen - a woodshop, a computer lab, a science lab, or an art room - and yet nothing like anything we've seen as creators work to incorporate all of these elements into one space for kids.

## STREAM

STREAM schools build on the STEAM model by adding a Reading and Writing (R) component to the curriculum. Whether STEM, STEAM or otherwise, every program relies on the ability of students to read and comprehend what they are reading. If STEM and STEAM schools aim to best prepare students for 21st century high-tech jobs, reading and writing cannot be ignored. It has been suggested that we read now more than ever due to the advent and frequent use of emailing, texting, social media, etc.

The importance of literacy should not be downplayed as it is a vital component of science, engineering and technology and future professionals' ability to communicate about their work. While this new twist on STEM has not been explored as much as the aforementioned programs, STREAM will likely find its place in the educational arena.

One thing is evident about the future of these educational approaches: the clear cut lines between programs that once existed are now blurred in many schools as subject integration erases barriers and brings experiential learning - not the content - to the forefront.