STEM Misconceptions

There are many myths surrounding STEM education. The myths below have been identified as perceived barriers for educators as well as students in Texas. This document will support educators with information that can debunk myths and move STEM instruction forward in districts across Texas.

Misconceptions	Truth
Misconception One **STEM lessons need to represent science, technology, engineering, and mathematics equally.**	In STEM education, science, technology, engineering, and mathematics are not chunks of content taught independently. The disciplines do not need to be equally distributed in a lesson plan but should include problems that students are solving. STEM is cross curricular in nature and integrates both STEM and non-stem disciplines. STEM education provides the thinking skills and problem-solving processes to make natural connections among ideas and raise the rigor of student learning.
Misconception Two **STEM lessons must include a challenge that requires students to use a full project/problem-based or engineering design approach.**	Full STEM challenge experiences often include a challenging problem or question, phenomena, sustained inquiry, authenticity, student voice and choice, reflection, critique, revision, and public product. However, not every STEM-inspired lesson has to have a robust challenge. It is better to start small and gradually integrate the STEM strategies, such as inquiry-based learning, project/problem-based learning (PBL), the engineering design process (EDP), and computational thinking (CT), into lessons.
Misconception Three **STEM education starts in high school with Career Technical Education.**	To prepare students for STEM careers, schools cannot wait until high school or post-secondary education to capture student interest. STEM instruction should begin as early as Pre-Kindergarten. STEM instruction can provide scaffolded learning experiences throughout elementary that prepare students for post-secondary success in college, careers, and the military. If students do not pursue careers in STEM, the STEM fluency skills (communication, collaboration, creativity, critical thinking, resilience, promptness, time management, adaptability, and innovation) are still transferrable to other careers and aspects of life.
Misconception Four **STEM is only for upper elementary and above.**	STEM thinking is valued in both education and real-world application. If STEM education begins in upper elementary school, learners will have missed a prime opportunity to make a difference in their cognitive development. STEM education should begin in early grades when children start to form their ideas about who they want to be when they grow up. Very young children are willing to take on new challenges because they have not yet learned to fear failure. Children are more accepting of discovery learning and seeking solutions rather than finding correct answers. In Pre-Kindergarten and kindergarten, STEM activities can help students build the knowledge, skills, self-confidence, and growth mindset they need to progress in school and life.

Misconception Five **STEM requires costly materials and dedicated learning spaces.**	STEM instruction relies on curricular planning and lesson design, not on costly materials, equipment, and dedicated learning spaces. STEM education is a way of thinking and doing that places students at the heart of learning. STEM instruction is dependent on integrating strategies such as inquiry-based learning, project/problem-based learning (PBL), the Engineering Design Process (EDP), and computational thinking (CT) to solve problems. These learning experiences can be achieved with existing classroom supplies or minimal investment in any learning space.
Misconception Six **There is no time in the school day to add STEM.**	Time is always a primary concern for teachers. However, STEM instruction does not require changing to new instructional material; STEM education requires a different way of implementing current instructional materials. STEM education is not changing what is taught but rather how teachers teach and how students learn. STEM strategies, such as inquiry-based learning, project-based learning (PBL), the Engineering Design Process (EDP), and computational thinking (CT), are the threads that connect the curriculum ideas and provide students with a higher-level learning experience.
Misconception Seven: **STEM is a course or a program.**	STEM is not a course or a program, and STEM is not a content area, even though its acronym denotes science, technology, engineering, and mathematics. STEM education is more than doing hands-on projects using tech tools and equipment. Instead, STEM education provides common strategies to enable students to expand their thinking about how to learn. STEM instruction allows students to apply their knowledge, skills, and processes in the designated content areas. STEM teaching and learning strategies can be integrated at all levels and subjects.
Misconception Eight: **Only high-achieving students in math and science should pursue STEM.**	STEM education is for all students. Every student should be provided with access to high-quality STEM instructional opportunities that allow them to join the innovation economy, have the tools to solve society's toughest challenges, and be active citizens in our increasingly technological world. Students have diverse skills and experiences that can be capitalized upon and developed through STEM education.

STEM Misconceptions Research

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