THE STEM 2026 VISION

INNOVATIVE MEASURES OF LEARNING

- Academic improvements over time
- Developing critical thinking skills
- Collaboration and building necessary social skills
- Facility with core knowledge
- Hard work and tenacity
- Modeling authentic problems
- Learning by trial and error and individual exploration
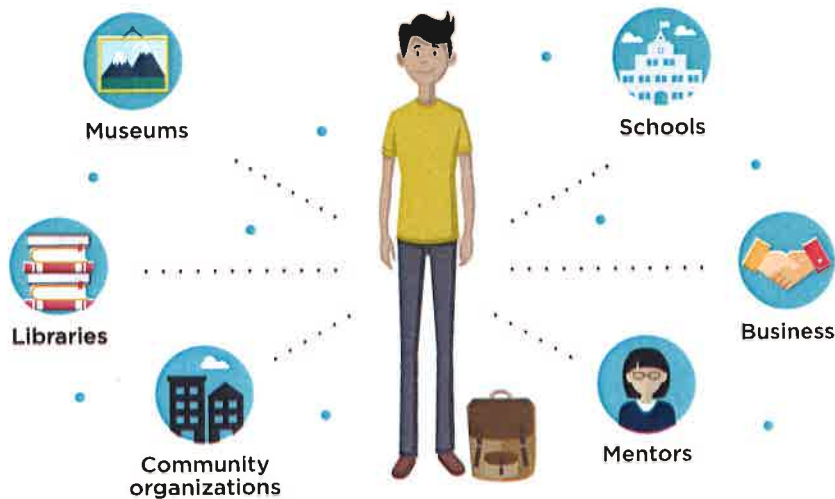
FLEXIBLE LEARNING SPACES

O2%
pH levels
Temp
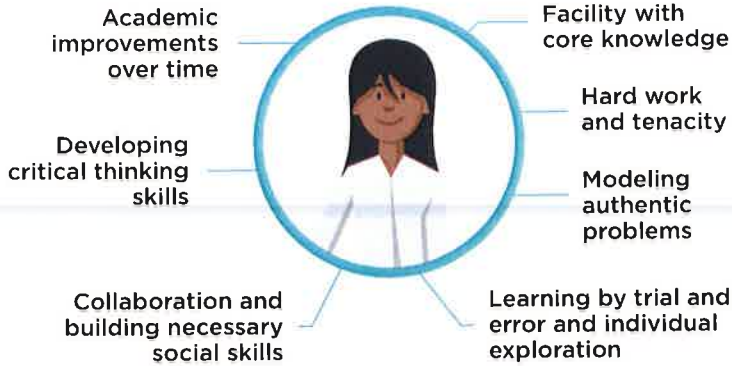
SOLVING RELEVANT GRAND CHALLENGES

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ACCESSIBLE ACTIVITIES THAT INVITE PLAY & RISK

ENGAGED & NETWORKED COMMUNITIES OF PRACTICE

- Museums
- Libraries
- Community organizations
- Schools
- Business
- Mentors

PROMOTING DIVERSITY

how to ensure the engagement and success of the full diversity of the nation's learners. In 2015, the Department, in collaboration with AIR, invited nearly 30 experts and thought leaders in STEM teaching and learning to participate in a series of discussion-based workshops to exchange ideas and develop recommendations for the future of STEM education. The project contributors were asked to draw from their own experiences, and their knowledge of the evidence behind examples of innovative and promising new approaches taking hold in communities across the nation.

This report summarizes the results of these workshop discussions and outlines what emerged from the experts' recommendations; namely, an aspirational vision (hereafter referred to as "STEM 2026") for STEM education to promote lifelong learning among all youth and in all communities. In recognition of the challenges to transforming STEM education on a large scale, the STEM 2026 vision presented in this report is meant only as starting point upon which key stakeholder groups, including policymakers, researchers, educators, and industry leaders, as well as the broader public, can build. The goal of this vision is not to establish a prescribed set of activities but to motivate actions, including the development of communities of practice (CoP), that help build a stronger evidence base for what STEM teaching and learning experiences work best in particular contexts and to serve diverse learners.

The remainder of this report describes in more detail the six interconnected components of STEM 2026, and the challenges and opportunities for innovation related to converting these components into widespread practice:

- **Engaged and networked communities of practice.** All schools, early learning programs, communities, and students engage in CoP that draw on the knowledge, tools, resources, and expertise needed to effectively engage in STEM teaching and learning experiences, in and outside of formal school settings. These collaborative networks of STEM learning foster the skills and growth mindsets among all students that lead to lifelong learning and opportunities for postsecondary and career success, while expanding access to rigorous STEM courses, including computer science.

- **Accessible learning activities that invite intentional play and risk.** STEM 2026 emphasizes the benefits of inviting intentional play into the learning process in P–12 and at the postsecondary level. Activities that are designed to incorporate intentional play are applicable at all levels of the education continuum. These activities offer low barriers to entry and encourage creative expression of ideas, while still engaging diverse students in complex and difficult content. In STEM-themed play, young people's desire to design and create motivates curiosity in STEM and fosters a sense of belonging as students learn from and with others, and are encouraged to think in divergent ways. Through the process of exploration and discovery, they see that STEM is everywhere, that they have something to contribute to the field, and they learn to take a team-based approach to tackling real-world problems and challenges.

- **Educational experiences that include interdisciplinary approaches to solving "grand challenges."** STEM education engages students of all ages in tackling grand challenges. Grand challenges are those that are not yet solved at the local community, national, or global levels. Grand challenges may include, for example, water conservation or improving water quality; better understanding the human brain to uncover new ways to prevent, treat, and cure brain disorders and injury; developing new technology-enabled systems for improving access to health care; addressing aging infrastructure; or making solar energy cost competitive and electric cars that are affordable (Office of Science and Technology Policy, n.d.). Tasking children and youth with a grand challenge helps them understand the relevance of

STEM to their lives and to see the value of STEM in addressing issues that better their own lives and the lives of others. Grand challenges also offer a platform for incorporating culturally relevant approaches and content into STEM instruction.

- **Flexible and inclusive learning spaces.** Learning spaces that offer teachers and students flexibility in structure, equipment, and access to materials, including spaces that are located in the classroom, in the natural world, makerspaces, and those that are augmented by virtual and technology-based platforms can enhance learners' STEM experiences. Diversifying when and where learning occurs promotes opportunities for culturally relevant pedagogies and activities by facilitating new modes of exploring STEM concepts and developing STEM skills. Flexible learning spaces are adaptable to the learning activity and invite creativity, collaboration, co-discovery, and experimentation in accessible and unintimidating instructor-guided environments.

- **Innovative and accessible measures of learning.** As President Obama has said, the nation needs to rethink its approach to testing to ensure that students are taking fewer, smarter, and better tests. Achievement and performance assessments, when approached thoughtfully, can play a role in assessing and measuring STEM learning at key milestones in students' education pathways. In addition, they play a role in identifying achievement gaps among groups of students, schools, districts, and geographic locations. At the same time, these types of tests should be carefully calibrated to ensure they are not redundant, do not take up too much classroom time, and are giving educators reliable unbiased information about student learning. In the STEM 2026 vision, there also is recognition of the value of more formative measures of learning that provide insight into the mindsets and habits associated with academic and postsecondary outcomes, including those that can be drawn from observations, evaluation of portfolios of student work, and student demonstrations and presentations.

- **Societal and cultural images and environments that promote diversity and opportunity in STEM.** In STEM 2026, how STEM is messaged to youth and their families is transformed. Research shows that repeated exposure to images, themes, and ideas affect people's beliefs, behaviors, and attitudes (Handelsman & Sakraney, 2015). In STEM 2026, popular media, toy developers, and retailers consider issues of racial, cultural, and gender diversity and identity in portrayals of STEM professionals and STEM-themed toys and games. These images counter historical biases that have prevented the full participation of certain groups of individuals in STEM education and career pathways. These portrayals include diverse pictures, descriptions, or images of what STEM work entails, including the array of jobs and activities that use STEM; and who is seen doing and leading STEM-related work. Communities and youth in all neighborhoods and geographic locations around the country are equally exposed to social and popular media outlets that focus on STEM, and a wide diversity of STEM-themed toys and games that are accessible and inclusive and effectively promote a belief among all students that they are empowered to understand and shape the world through the STEM disciplines.

The contributors to STEM 2026 acknowledge that developing and achieving a forward-thinking approach to STEM education is a complex and evolving task. The project team and contributors expect and trust that the STEM 2026 vision described here will be revised and refined as new knowledge, evidence, and experiences are gained in the process of achieving it.