Texas STEM Education Framework

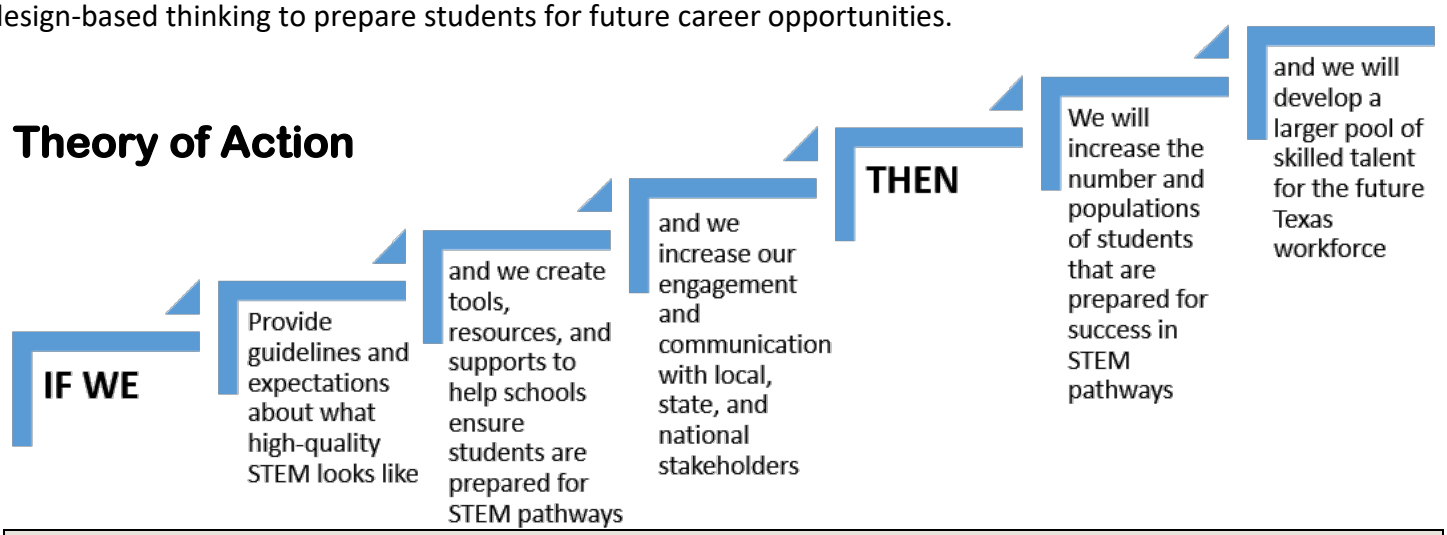
What is the STEM Education Framework?

The STEM Framework provides stakeholders with the Texas STEM definition, the TEA's theory of action, state level objectives, strategies to success, the STEM implementation models, researched based methods of instruction, and high-quality STEM indicators. Stakeholders will use this framework as a guiding document when creating their customized STEM programs. The STEM framework is intended to be used alongside other STEM tools from the toolkit.

Definition

STEM (Science, Technology, Engineering, and Mathematics) education is a method of hands-on teaching and learning where students learn to apply academic content by creatively solving real-world problems with innovative design-based thinking to prepare students for future career opportunities.

Theory of Action



State Level Objectives	Strategies to Success
• Meet the demand of future STEM careers in Texas	• Provide a coordinated uniform approach to PK-20 STEM Education programming for all students
• Increase the number of students who enter STEM careers or STEM postsecondary programs	• Expand opportunities for students to enter STEM pathways that vertically align to postsecondary programs
• Increase local STEM engagement between informal and formal education	• Develop the Texas EcosySTEM, a statewide network focused on increasing STEM opportunities to students both in and outside the classroom
• Increase the number of students who graduate with a STEM Endorsement	• Increase the number of STEM pathways leading to a STEM endorsement
• Develop STEM Fluency Skills and career awareness students graduate ready for STEM pathways to college and future careers	• Increase access and opportunities for all students to participate in PK-20 career awareness, exploration, and capstone work-based learning experiences aligned to STEM occupation
• Decrease the equity gaps in students enrolling and succeeding in STEM courses and advanced academic courses that are needed for STEM pathways	• Embed STEM Fluency Skills and design challenges into core academic classes so all students would have the opportunity to learn STEM integrated thinking

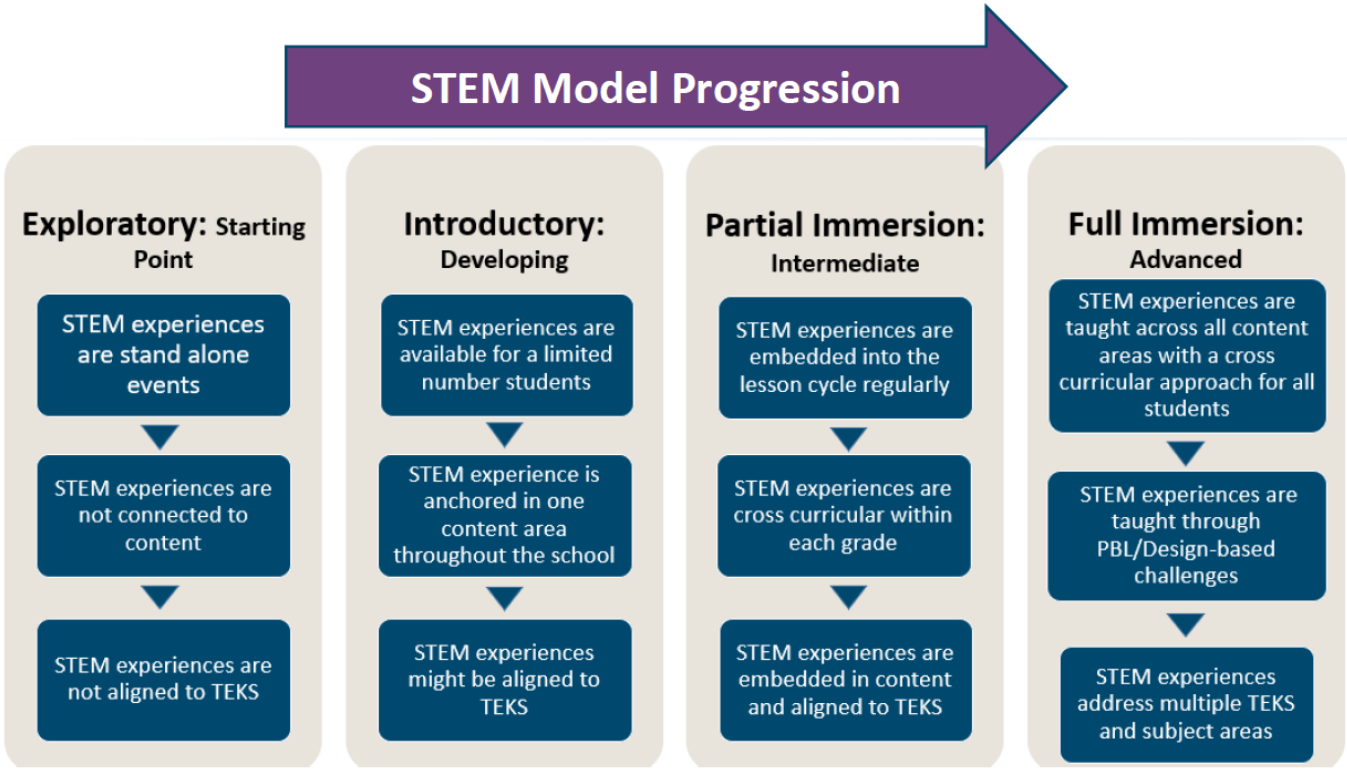
1. Choose your model:

The TEA created a ***Model Identification Tool*** to assist districts in identifying the model to which they are most aligned and to set goals for moving toward their targeted STEM model.

K-12 STEM Education Models

The STEM Education Framework is structured to be flexible throughout the state, but all models should be equitable for all students including special populations.

- **Exploratory Model**- Students periodically experience STEM through standalone events offered by the school or the community
- **Introductory Model**- Students engage in STEM experiences tied to content periodically through the school year
- **Partial Immersion Model**- Students experience academic content through integrated STEM activities regularly throughout the year
- **Full Immersion Model**- Students learn academic content exclusively through cross curricular STEM experiences



2. Choose your method of instruction:

The TEA will provide professional development in both research-based instructional methods.

K-12 STEM Education Methods of Instruction

Districts will decide how STEM experiences are delivered to students. These nationally researched instructional methods for STEM education are used in STEM programs across the nation.

- **Project/Problem Based Learning (PBL)**- Students gain knowledge and skills by working on authentic projects that are engaging, address a complex question, problem, or challenge
- **Design-Based Challenges**- Students apply content knowledge to design a product or process that solves a real-world problem using the Engineering Design Process

3. Use high-quality indicators for STEM program components:

The TEA has developed a ***PK-20 STEM Education Program Planning Guide*** to assist in breaking down each high-quality indicator and setting goals for local STEM education programming. There are additional tools listed for each domain that align to and support the high-quality indicators.

High-Quality STEM Education Indicators
Domain 1 Equity of Programming **Supporting Tools for this Section:** *PK 20 STEM Fidelity of Implementation, High Quality STEM Model Identification Guide*
1.1 STEM Instruction is offered for all students on campus
Domain 2 School Climate and Culture **Supporting Tools for this Section:** *PK 20 STEM Fidelity of Implementation, Sustainability Tool, STEM Program Planning Guide, STEM Teaching and Learning Progression, Teacher and Student Surveys*
2.1 Professional development on integrated STEM content, resources, and instructional methods provided for all staff
2.2 Professional development to build a STEM culture and growth mindset in the organization provided for all staff
Domain 3 Program Design **Supporting Tools for this Section:** *PK 20 STEM Fidelity of Implementation, Leadership Roles and Responsibilities, Sustainability Tool, STEM Needs Assessment, and STEM Program Planning Guide*
3.1 Leadership team made up of STEM stakeholders including school board, community, higher education, business and industry to ensure a successful academic and career pipeline
3.2 Students' PK-20 learning pathways is aligned to STEM careers and postsecondary STEM degree plan
3.3 STEM pathways include academic and technical skills to prepare students for STEM careers. (For example, engineering students have both CTE courses and high-level math and science course)
3.4 STEM program has a strategic plan including STEM integrated instruction aligned to the TEKS and offered regularly throughout the year
Domain 4 Curricular Aspects of the STEM Program **Supporting Tools for this Section:** *PK 20 STEM Fidelity of Implementation, High Quality STEM Model Identification Guide, STEM Teaching and Learning Progression, Integration Strategies and Integration Graphic Organizer, STEM Curricular Planning and Implementation Reflection for Teachers, Texas EcosySTEM Continuum of Sample Experiences, STEM Fluency Skills Rubric, STEM Program Planning Guide, STEM Walk Through Tool*
4.1 STEM Project/Problem-Based Learning and/or Design-Based Challenges are aligned to grade level TEKS
4.2 STEM Project/Problem-Based Learning or Design-Based Challenges have integrated content across STEM fields
4.3 STEM classroom experiences that include career exploration and authentic real-world activities/projects
4.4 Opportunities to develop STEM Fluency Skills: communication, collaboration, creativity, critical thinking, resilience, promptness, time management, adaptable, innovative
4.5 Opportunities to develop the technical skills of the engineering process and computational thinking
4.6 Experiences are vertically aligned throughout the district/campus and to postsecondary (PK-20)
4.7 Experiences are horizontally aligned to TEKS throughout the grade level (cross curricular)
4.8 Student mastery is demonstrated through a variety of assessment methods including formative, summative, and performance-based measures
Domain 5 Stakeholder Engagement **Supporting Tools for this Section:** *PK 20 STEM Fidelity of Implementation, Sustainability Tool, STEM Program Planning Guide,* High *Quality STEM Model Identification Guide, Texas EcosySTEM Continuum of Sample Experiences, Family STEM Engagement Ideas, Ecosystem Engagement Checklist, Family Survey, STEM Fluency Rubric, STEM Event Planning Tool*
5.1 Connections to effective in and out-of-school STEM programs
5.2 Stakeholder partnerships for students that expand classroom learning to include capstone experiences (including virtual) like like mentorships, internships, practicums
5.3 STEM Work-Based Learning experiences to increases interest and abilities in careers requiring STEM skills
5.4 Stakeholder partnerships for teachers that connect their academic content to STEM careers through externships and research experiences
5.5 STEM family engagement events/experiences hosted by the district/campus
Domain 6 Communication/Marketing Strategies **Supporting Tools for this Section:** *PK 20 STEM Fidelity of Implementation,* Sustainability *Tool, STEM Program Planning Guide, High Quality STEM Model Identification Guide*
6.1 Marketing mechanisms to communicate the STEM plan across district, community and workforce