PK-20 STEM Education Program Planning Guide

Intended Audience: Leadership

Purpose of the tool: The PK-20 STEM Education Program Planning Guide is one of the four tools designed to help schools plan their STEM program with the indicators of a high-quality STEM program. The planning document will help leadership break down each indicator, by providing guiding questions to help facilitate discussions with the district/campus design team and assists with setting goals for the program. The planning document could be filled out by an individual in the district or as a campus group including your STEM stakeholders. The Program Planning Guide can be used to develop a new program or growing an existing program.

The Texas Education Agency has developed the STEM Framework that provides an overview of the components needed in a high-quality STEM program. There are four tools to assist a district in developing a local STEM program that is aligned to the high-quality indicators identified by the state. The STEM tools are designed to help a district identify areas of need, identify the STEM model that best aligns with programming, help develop the structure and program design, and how to sustain programming long term.

STEP 1

Look at the STEM Framework

Review the definition of STEM, state level objectives, strategies to success, K-12 STEM education models, research-based instructional methods, and high-quality indicators

STEP 2

Complete the STEM Needs Assessment

Identify needs and gaps in STEM programming

STEP 3

Complete the STEM Model Identification Guide

Identify the STEM model best aligned to the district

STEP 4

Complete the STEM Program Planning Guide

Use the STEM Program Identification Guide as a reference when planning the district's future STEM program. The STEM Continuum Sample Experiences can be used to help generate ideas.

STEP 5

Complete the Sustainability Assessment Tool

Identify appropriate sustainability component assets and/or needs

Example					
High-Quality Indicators	**Current STEM Program Components**	**Goal Toward Growth and Timeline**	**Inputs: (Financial, Human, Other Resources)**	**Expected Outcome**	**Artifact(s) to Measure Progress**
STEM Program is offered for all students on campus	We offer STEM during a robotics elective. We have two classes serving 50 students.	We would like to integrate a STEM integrated approach in our science classrooms so all students will experience this instructional approach by next school year.	This year we will: • Train our science teachers in PBL and the engineering design process • Redo the schedule to accommodate common planning periods	• Increase STEM fluency skills in all students • Increase interest in our district's STEM pathway • Increase student understanding of science concepts leading to an increase in science test scores	• Teacher observation and reflections about student growth in STEM fluency skills • # of students selecting the STEM endorsement in 8th grade • 8th grade Science STAAR scores • 6th and 7th grade district assessment scores

Domain 1 Equity and Access					
High-Quality Indicators	**Current STEM Program Components**	**Goal Toward Growth and Timeline**	**Inputs: (Financial, Human, Other Resources)**	**Expected Outcome**	**Artifact(s) to Measure Progress**
1.1 STEM instruction is offered for all students on campus					

Equity and Access:

- Who has access to STEM programming curriculum, activities, and events?
- If there is a STEM activity, course, club, or event that cannot include all students, what is the process of deciding who gets to participate? Who is involved in these decisions? What criteria is the decision based on? Are the criteria equitable?
- What advocacy efforts are employed in order to ensure equity and access to high-quality teachers/staff resources such as technology, and other needs for your district's/school's STEM program?

Domain 2 School Climate and Culture					
High-Quality Indicators	**Current STEM Program Components**	**Goal Toward Growth and Timeline**	**Inputs: (Financial, Human, Other Resources)**	Expected Outcome	Artifact(s) to Measure Progress
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					

Professional Development:

- What is the current capacity of teachers/staff regarding STEM subject content knowledge and pedagogical content knowledge (i.e. science, technology, engineering, math, and computer science)?
- What is the current capacity of teachers/staff regarding integrated STEM pedagogy and assessment (e.g. content integration, inquiry, project/problem-based learning (PBL), design thinking, authentic learning/assessment, modeling instruction, etc.)?
- What are the professional development needs based on our STEM program goals and the current capacity of leaders, teachers, and staff?
- What types of professional development are teachers/staff interested in? What are the best methods of professional development for our context and budget? (e.g. face-to-face workshops, conferences, webinars/videos, social media resources/professional learning networks (PLNs), professional learning communities (PLCs), communities of practice sessions, immersion experiences, action-research, lesson studies, professional organization membership, etc.)
- Does our professional development plan take into consideration best practices in professional development such as focused content, active learning, coherence or alignment of content, goals, and activities, sustained duration, and collective participation?
- How will we know if the professional development is positively impacting STEM teaching and learning and to what extent?

School Climate and Culture:

- Is our district/school climate conducive for a curricular transformation of this nature?
- What actions are we taking as leaders to develop and maintain a STEM culture/mindset in the organization?
- Are teacher and staff needs being attended to?
- Are student needs being attended to?
- Does the community support our school? In what ways?
- Is our school inviting for students, families, and other community stakeholders?

School Structure:

- What is the structural capacity of our school building(s) and grounds…Are there appropriate spaces in the school for STEM-related activities and projects? (e.g. collaborative and flexible spaces for integrated STEM teaching and learning, outdoor spaces, storage space for tools and materials, storage spaces for long-term projects, display/exhibition areas, spaces for teacher collaboration and planning, etc.)
- Does our current master schedule take into consideration STEM teaching and learning needs? (e.g. teacher planning time, cross-curricular instruction or co-teaching opportunities, experiential learning opportunities for students, if applicable, etc.)
- Is there opportunity for before/after-school and summer STEM programming/activities?

Domain 3 STEM Program Design and Timeline					
High-Quality Indicators	**Current STEM Program Components**	**Goal Toward Growth and Timeline**	**Inputs: (Financial, Human, Other Resources)**	**Expected Outcome**	**Artifact(s) to Measure Progress**
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 pathway 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 courses)					
3.4 STEM program has a strategic plan including STEM integrated instruction aligned to the TEKS and offered regularly throughout the year					

STEM Program Design:

- What is our district/school needs based on data?
- What do our stakeholders (school community/larger community) want for the school?
- What data resources do we have access to? Do we need to gather additional data?
- Is integrated STEM teaching and learning currently included in the school's vision, mission, and goals?
- What is the STEM education model that the school is going to implement? Do we have a working logic model/program framework?
- How are stakeholders involved in the development of the school's STEM education program?
- How are the STEM framework components being communicated to stakeholders?

Resources:

- What financial resources are we currently utilizing for STEM teaching and learning? Are there any additional funding sources that can and need to be acquired?
- What grants are available to districts/schools for STEM teaching and learning? Who can assist us with grant writing and grant management if funded?
- What is the human capital capacity of our organization? Who can we utilize as resources in the district/school? Who else do we need?
- What technology, equipment, and materials do teachers and students have access to?
- What are resources will be needed based on short-term and long-term goals?
- Have we included funds in our budget for consumable materials (for design and PBL projects) and replenishment of these materials?
- Have we included funds in our budget for maintaining STEM technology and equipment?
- Who is/will be responsible for STEM technology, equipment, and materials purchasing and storage/use?
- Is there a safety plan in place for utilizing STEM equipment (e.g. makerspace tools)?

Timeline: (Short and Long-Term)

- What is the school's short-term action plan based on our STEM education goals?
- What is our long-term action plan based on our STEM education goals?
- How are stakeholders involved in the development of the action plans? Who should be involved in the development of the action plans?
- What are our check-points?

Domain 4 Curricular Aspects of the STEM Program					
Quality Indicators	**Current STEM Program Components**	**Goal Toward Growth and Timeline**	**Inputs: (Financial, Human, Other Resources)**	**Expected Outcome**	**Artifact(s) to Measure Progress**
4.1 STEM Project/Problem-Based Learning (PBL) and/or Design-Based Challenges are aligned to grade level TEKS					
4.2 Project/Problem-Based Learning or Design-Based Challenges have integrated content across STEM fields					
4.3 STEM classroom experiences include career exploration and authentic real-world activities/projects					
4.4 Opportunities to develop STEM Fluency Skills: communication, collaboration, creativity, critical thinking, and resilience					
4.5 Opportunities to develop the technical skills of the engineering process and computational thinking					

Quality Indicators	Current STEM Program Components	Goal Toward Growth and Timeline	Inputs: (Financial, Human, Other Resources)	Expected Outcome	Artifact(s) to Measure Progress
4.6 Experiences are vertically aligned to TEKS throughout the district/campus (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					

Curricular Aspects of the STEM Program:

- Do all students have access to STEM curricular activities?
- To what extent do STEM learning activities involve authentic real-world connections?
- To what extent do STEM learning experiences develop STEM fluency skills?
- Does the STEM curricular programming include design thinking and computation thinking?
- To what extent do STEM learning experience along with TEKS?
- To what extent do STEM learning experiences integrate content across multiple content areas?
- How are students demonstrating STEM content/skill mastery?
- To what extent do students have opportunities for authentic STEM workforce interactions and/or immersive STEM learning experiences (e.g. field trips, virtual skype sessions with STEM professionals, guest speakers, internships, shadowing experiences, volunteering/service opportunities, elective courses, etc.)
- To what extent does the curricular aspects of the STEM program vertically align from one grade/grade-band (PK-20) to another?

Assessment and Evaluation Data Gathering:

- What district/school data do we already have access to that can be used to assess STEM program needs?
- Based on the STEM Toolkit rubrics and assessment tools, what program components need to be addressed? What program components are going well?
- What artifacts do we have that provide evidence of success?

Domain 5 Stakeholder Engagement					
Quality Indicators	**Current STEM Program Components**	**Goal Toward Growth and Timeline**	**Inputs: (Financial, Human, Other Resources)**	**Expected Outcome**	**Artifact(s) to Measure Progress**
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 mentorships, internships, practicums					
5.3 STEM Work-Based Learning experiences, to increase 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					

Stakeholder Roles:

- What is the capacity of the human capital in the district or school community?
- Who are the current leaders? Who are potential leaders? Is there a STEM instructional coach and/or STEM teacher leader(s) that can provide direct support to teachers during implementation?
- How are/will families be included in STEM teaching and learning activities?
- What community partners does the school currently have? What other potential partners exist in the local area? Are these partners providing STEM experiences for students (field trips, work-based learning, speakers, etc…)?
- How can the district/school better utilize stakeholders' expertise?
- To what extent are guidance counselors assisting with STEM pipeline options? How are guidance counselors informing district personnel of students' aspirations so they can be placed in authentic work-based learning experiences?

Domain 6 Communication/Marketing Strategies					
Quality Indicators	**Current STEM Program Components**	**Goal Toward Growth and Timeline**	**Inputs: (Financial, Human, Other Resources)**	**Expected Outcome**	**Artifact(s) to Measure Progress**
6.1 Marketing mechanisms to communicate the STEM plan across district, community and workforce					

Communication/Marketing Strategies:

- In what ways are we communicating our STEM education programming plans with our stakeholders – administration, teachers, staff, families, students, the greater school community, local community, higher education/industry partners?
- To what degree is our communication successful?
- Who is responsible for the communications being implemented?
- What other communication strategies can we use to share information regarding STEM Education plans, activities, and successes?
- How is the STEM program being perceived by the stakeholders/public? What additional branding or marketing needs do we have?