COBB COUNTY SCHOOL DISTRICT

C•STEM

SCIENCE•TECHNOLOGY•ENGINEERING•MATHEMATICS

STEM Playbook Facilitation Guide

Use this resource to design the right play for your school or to support individual growth along the STEM Implementation Continuum

Where are you on the field? Not Sure

COBB COUNTY SCHOOL DISTRICT

C⚛S:T:E:M
SCIENCE•TECHNOLOGY•ENGINEERING•MATHEMATICS

STEM IMPLEMENTATION CONTINUUM

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Level 2

- Understanding of STEM
- Students do labs and experiments frequently
- Collaboration with a couple of teachers in the school regarding STEM
- Partnerships with community, business & higher education
- STEM Clubs – Science Olympiad, Robotics, Math Team
- Science Fair for interested students
- Students are engaging in engineering challenges (these are loosely or topically aligned to science or math standards)
  - Students build or construct items
  - Follow Engineering Design Process
  - Challenges lack rigor, contain elements of "fluff"
  - Limited data collection/revision

Level 1

- Awareness of STEM
- STEM learning is limited to a single class, course, or program
- Students "DO" Science
- Basic Math and Science integration
- Basic technology proficiency

Level 3

- Deep understanding of multiple aspects of STEM process
- Regular collaboration among teams of teachers on STEM
- Multiple STEM clubs/team and enrichment opportunities for students
- Most/All students do science fair
- Active & Sustained partnerships with a variety of community, business, &/or higher ed partners
- Students engage in rich science and math instruction which incorporate science practices and standards of mathematical practice.
- Current science & math standards are tightly aligned to singular STEM challenges that integrate science, math, and/or technology
  - Students design solutions to solve a problem
  - Follow engineering design process
  - Challenges are rigorous
  - Multiple trials to collect data to evaluate the designs
  - Redesign process based on data

Level 4

In addition to all of Stage 3:

- Teachers regularly collaborate to reflect on STEM practices and methods of improvement.
- STEM Challenges are:
  - Broader in scope and scale – building over an entire 9 weeks or semester or year
  - Require the application of multiple standards from each content area
  - Require students to:
    - be producers of digital media/resources/data
    - to argue from evidence
    - engage in deep data analysis
    - understand & articulate how the math and science they are learning are related to the real world
    - collaborate with community partners or people in STEM fields
    - communicate their findings with peers or the community
    - think critically at school and at home

← Apply for Cobb STEM Cert. → ← Apply for Cognia STEM or GA STEM Cert. →

Take The STEM
Self-Assessment Inventory

How do I gain the most from this playbook?

Once you determine your position on the field, select areas you want expand in. Choose 1 - 2 Look For plays to run.

Rigorous And Relevant Learning Culture	
Individual	**Facilitator**
Level 2 - Level 3 - Level 4	Level 2 - Level 3 - Level 4
STEM Learning Experiences and Outcomes	
Individual	**Facilitator**
Level 2 - Level 3 - Level 4	Level 2 - Level 3 - Level 4
Teacher Collaboration and Professional Learning	
Facilitator Level 2 - Level 3 - Level 4	
STEM Community Engagement	
Individual Level 2 - Level 3 - Level 4	

Rigorous And Relevant Learning Culture

1.2 Learners are intentionally provided unique STEM focused interdisciplinary instructional experiences aligned to relevant math and/or science standards.

Focus Questions:

What are some ways I enhance and deepen STEM learning experiences in my classroom?

Your Play:

❏ Raise awareness of what STEM looks like in classrooms.

❏ Explore Design Thinking and Problem Based Learning methodologies.

Resources:

Integrating STEM into the Elementary Classroom Educators share how literacy standards and strategies are incorporated and achieved through the use of STEM centers. (Video 6:11)
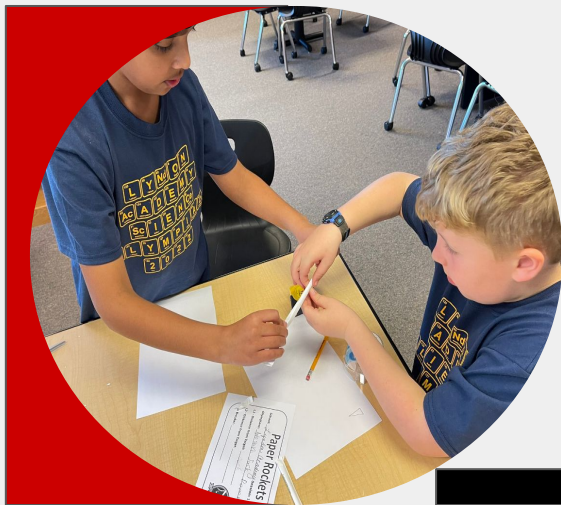
STEM and Project-Based Learning, a Perfect Pair Details journey and struggles of schools to integrate PBL and supporting non-science and math teachers. (Article)

My student hate STEM Challenges

Classroom Ideas:

Example STEM Activities, Center for Energy Workforce Development.

Guide to Effective STEM Classroom Design, AMS

1. Rigorous And Relevant Learning Culture

1.3 School/program engages in proactive strategies to recruit and support engagement from students traditionally underrepresented in STEM fields.

Focus Questions:

How can I expand opportunities for STEM to all students?

Your Play:

- ❏ Raise awareness of STEM opportunities in the school and district.

- ❏ Design a club with students and staff.

Resources:

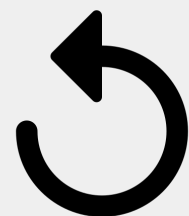[Mentorship: Investing In Future STEM Leaders](#)

Mentors speak about the importance of working with underrepresented minority students majoring in science, technology, engineering, and math. (Video 4:50)

Classroom Supports:

[10 Easy STEM Career Classroom Activities](#)

[How To Start A STEM Club](#)

[Guide to Effective STEM Classroom Design](#), AMS

1. Rigorous And Relevant Learning Culture

1.4 STEM educators serve as facilitators who provide guidance and support of rigorous student-centered learning experiences.

Focus Questions:

What are some ways I can bring broaden the reach of STEM beyond the walls of the school?

Your Play:

❏ Build relationships with community stakeholders who can supply real world challenges, serve as authentic audiences and content experts.

Resources:

Do Something Cool:

This is a video from the What School Can Be platform. See what happens when students are allowed the freedom to use their imagination in a way that utilizes their knowledge and skills. (Video 3:05)

Classroom Supports:

STEM Problems That Tackle Real-World Problems

5 Ways To Involve The Community In Your Classroom

1. Rigorous And Relevant Learning Culture

1.1 School/program has clearly established STEM culture of learning that is evident throughout the school/program.

Focus Questions: How can
I support others in deepening STEM to supports student learning?

Your Play:

❏ Provide professional learning opportunities connected to the Engineering Design Process

❏ Provide learning opportunities that can be utilized outside of formalized professional learning.

Resources:

[The Discover STEM Academy](#) demonstrates how STEM looks when it is integrated into the school's culture. (Video 4:19)

[Understanding the Engineering Design Process: Teachers Embracing Engineering Design](#) Provides an overview on the basics of the Engineering Design as compared to the scientific method. (Article)

Facilitation Ideas:

Consider using [FlipGrid in Professional Development](#). Read an article or watch a video from the playbook at the end of a meeting (i.e. PLC, staff meeting), pose a question, and have teachers reflect their ideas on FlipGrid.
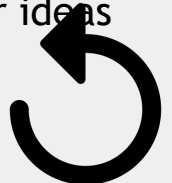
1. And Relevant Learning Culture

1.2 Learners are intentionally provided unique STEM focused interdisciplinary instructional experiences aligned to relevant math and/or science standards.

Focus Questions: How can help others broaden their understanding of STEM and ways it supports student learning?

Your Play:

- ❏ Facilitate and utilize CC PLCs to build collaborative teams. Continue reviewing the curriculum alignment of math and science standards utilizing data.

Resources:

Cross-Curricular Planning: Several authors share STEM planning templates with a focus on the integration of multiple disciplines. (Article)

4 Ways to use Assessment Data (Article)
Article details practical considerations on how to invest your time wisely when analyzing assessment data.

Facilitation Ideas:

A Change In Practice

After professional learning, teachers hold discussions around how data and questions are used to make changes.

1. Rigorous And Relevant Learning Culture

1.4 STEM educators serve as facilitators who provide guidance and support of rigorous student-centered learning experiences

Focus Questions: How can

support others in expanding their capacity develop and facilitate STEM experiences that create real world solutions that take time to construct.

Your Play:

❏ Support development of STEM Challenges Board in scope spanning and entire 9 weeks, semester, or a year.

Resources:

[Preparing and Supporting STEM Educators](#) Explore the researcher on the state of STEm Education for teachers and learn of recommend methods to support teacher growth.

[STEM Education: Strategies and Approaches for Teaching Research Paper](#) Learn about the teaching strategies that support a STEM Learning

Facilitation Ideas:

Lesson Plan Tuning:

Support teachers in effectively utilizing a protocol to support the creation and continued development of their STEM Challenges.

[Protocol](#)

2. STEM Learning Experiences and Outcomes

2.1 Learners work independently and collaboratively in an inquiry-based learning environment that encourages finding creative solutions to authentic (real-world) and complex problems using the engineering design process.

Focus Questions:

How can I create opportunities for students to utilize the engineering design process in a real world context incorporating community engagements?

Your Play:

❏ Design STEM experiences and challenges requiring students to build or construct items.

❏ Engage students in labs that have a real world connection.

Resources:

The Engineering Design Process created by NASA is one example of the structure that informs design-based STEM experiences for students of all ages. (Resource)

Teach About Robotics Learn how to begin utilizing the power of robots to support STEM Learning.

Classroom Supports:

Teaching The Engineering Design Process Excellent bank of resources and activities for putting the engineering design process into action.

Stem Sports
Bring Gaming Into The Classroom
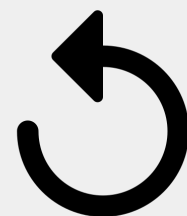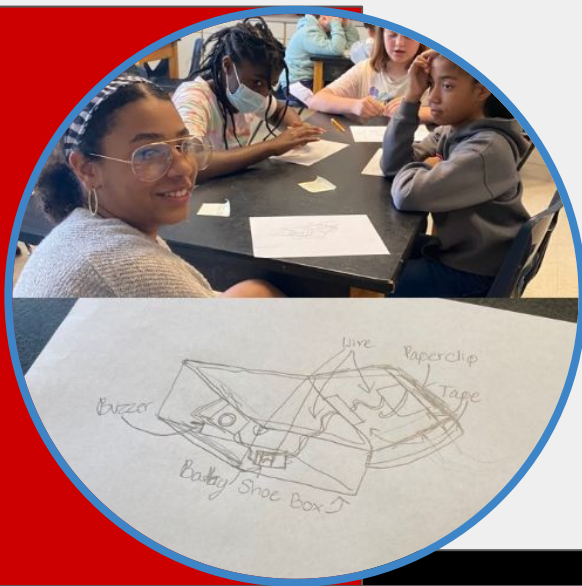
2. STEM Learning Experiences and Outcomes

2.2 Learners conduct investigative research to make claims, collect evidence, analyze data and communicate their findings using digital and non-digital resources.

Focus Questions:

How can I support students voice and choice in their demonstrations of learning?

Your Play:

❏ Utilize Digital Portfolios

## Resources:

10 Reason To Implement Student Portfolios: This article will support you if you are unsure about the benefits of digital portfolios or need to convince others to embrace the tool.

The Complete Guide To Digital Student Portfolios: Article takes the mystery out of the benefit of digital portfolios while at the same time providing a step by step guide to implementing them.

Classroom Supports:

Creating Digital Student Portfolios : Resource shares several platforms and tools to support creation of digital portfolios.
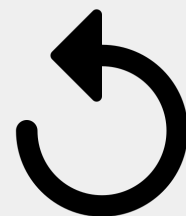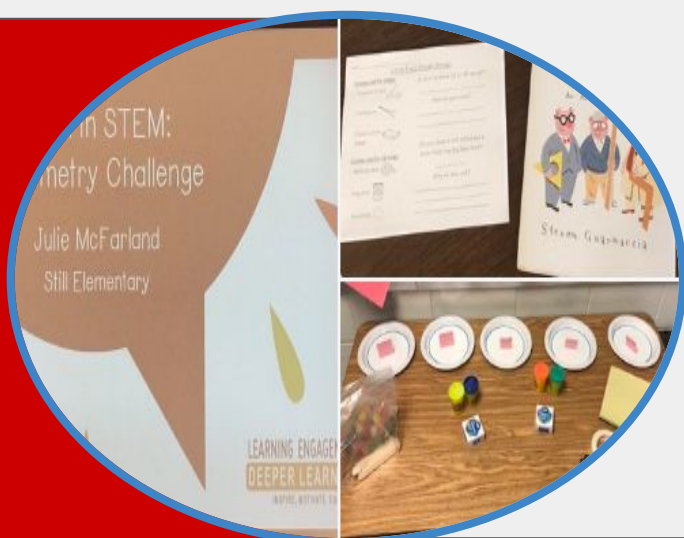
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Focus Questions:

How can I increase student capacity to self assess their learning?

Your Play:

❏ Create opportunities for student to assess others as well as their own STEM solutions.

Resources:

Assessing STEM : Supporting students ability to self assess requires you have a strong sense of the important aspects teachers should be evaluating. This article points out what areas are most critical in the process of STEM evaluation.

Classroom Supports:

Self Assessment Tools This resources shares several assessment tools for student and teacher that can be utilized to support multiple subject areas.

2. STEM Learning Experiences and Outcomes

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Focus Questions: How can I broaden my understanding if STEM and ways it supports student learning?

Your Play:

- ❏ STEM is visible through the school both virtually and the school.

- ❏ Explore Design Thinking and Projects and Problem Based learning methodologies.

- ❏ My classroom physical environment portrays STEM as the focus. .

Resources:

[Helping Teachers Learn about Inquiry](#)

[Example STEM Activities](#), Center for Energy Workforce Development.

Facilitation Ideas :

[Blooming Questions](#)

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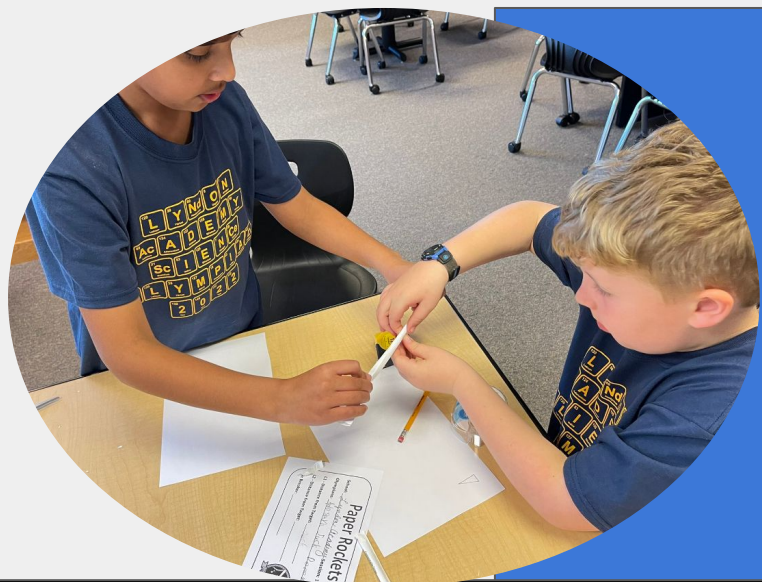## Focus Questions: How can I broaden my understanding if STEM and ways it supports student learning?

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Resources:

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Facilitation Ideas :

Choose an area of focus or one of the resources from the toolkit to share information about data and advertise upcoming PD. For more ideas, check out <u>PD on the Potty - Professional Learning as you find Relief</u> QR Codes work great for this.

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3. Teacher Collaboration and Professional Learning

3.1 STEM educators and leaders meet on a regular and frequent basis to plan, revise and improve learning experiences.

Focus Questions:

How can I support others and myself in developing the potential for increased student learning outcomes?

Your Play:

❏ Develop a cadence and agreed upon protocol for support educators growth in a safe and and non punitive setting.

Resources:

STEM Learning What You Need To Know
When Educators come together to refine their skills and improve student experiences it is critical they have a common understanding and shared understanding of what success looks like. This article provides a comprehensive breakdown of the components educators should rally around in their shared STEM learning and planning.

Facilitation Ideas :

Constructivist Tuning Protocol:

The protocol creates a safe way for educators to critically examine and receive feedback on shared goals for student outcomes based on STEM standards and expectations. Can be utilized across departments as well as grade level teams.

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3. Teacher Collaboration and Professional Learning

3.2 STEM educators and leaders participate in ongoing STEM-specific professional learning designed to improve content knowledge of STEM disciplines and practices.

Focus Questions: What type of learning experiences encourage educator participation and excitement to grow their learning of facilitation in a STEM classroom ?

Your Play:

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4. STEM Community Engagement

4.1 Multiple business, community and post-secondary partnerships are ongoing, intentionally connect to STEM learning experiences and promote awareness of STEM careers.

Focus Questions: How can build a solid network of community connections that support my STEM classroom?

Your Play:

- ❏ Invite professional to lead workshops.
- ❏ Provide field trips where students engage with experts.

Resources:

[5 Ways to Involve the Community in Your Classroom](): The power of real world learning and connections are made strong with support from the community. This article identifies unique ways to create pathways for their involvement.

Classroom Supports:

Field Trip Activity Sheets

4. STEM Community Engagement

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Focus Questions: What are some ways to bering expert into my classroom virtually?

Your Play:

- ❏ Host a virtual STEM Career Events.

- ❏ Provide multiple opportunities for students to explore STEM fields.

Resources:

16 Career Challenges Resources provides suggestions to support students in not only understanding more about careers in STEM but matching their personal interest to a specific area.

Classroom Supports :

Explore STEM Careers: A great video resources to support student awareness of careers in conservations, environmental policy, engineering and more. Consider creating your own video library. Create a platform to capture interviews from experts in the field.

4. STEM Community Engagement

4.1 Multiple business, community and post-secondary partnerships are ongoing, intentionally connect to STEM learning experiences and promote awareness of STEM careers.

Focus Questions: What are ways I can create opportunities for students to benefit from STEM outside of the classroom and understand how their STEM experiences will support them throughout their lives?

Your Play:

❏   Offer specific and explicit opportunities and experiences for students to reflect on the lifelong benefit of STEM learning.

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Resources:

STEM Education Helps Students Think Critically This article explain ways to support student in building their ability to use critical thinking to support their life's journey.

Hands On STEM Investigation: Resource shares activities student can complete at home and with parents. Providing opportunities to use STEM for fun help students develop the capacity to see application for STEM outside of something they do only for a grade.

Classroom Supports:

STEM Life Lessons: Great model for bringing an expert experience to students. Dr. Walensky explains how critical thinking and skills such as listing support her success in STEM. (Video 2:27)