STEM Best Practices Across Disciplines

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The common reactions to "STEM"

What is STEM? Science, Technology, Engineering and Mathematics

- STEM is an approach to teaching that's larger than its constituent parts

- STEM removes the traditional barriers erected between the four disciplines, by **<u>integrating</u>** the four subjects into one cohesive curriculum

(Thematic Learning can be STEM)

Why STEM?

STEM prepares students for life, regardless of the profession they choose to follow.

STEM Teaches students how to think critically and how to solve problems — skills that can be used throughout life.

Why STEM?

Focuses on:

- Critical thinking
- Problem solving ability development
- Leadership/teamwork development
- Ethics and responsibility
- Invention, imagination, and ingenuity
- Communication skill development

STEM Misconceptions

1. "STEM is a whole new curriculum"

2. "STEM is an addition to your curriculum"

3. "STEM means you have to teach Science, Technology, Engineering and Math on top of your subject area"

STEM Across Core Content Areas

Math – An emphasis on problem solving and critical thinking as related to real world situations.

Science – Provide opportunities for discovery and inquiry through experimentation and projects.

Social Studies / History – Study historical research, documents, and artifacts to learn about cultures of the past.

English – Connect reading and writing to authentic real world applications through essays, collaborative discussions, and a variety of literary genres.

Science Examples

S- Anything within the discipline

T- Tools or apparatuses used for experiments/labs

E- Creating models or prototypes

M- International System of Units

Math Examples

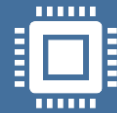S- Investigating problems (*Word problems)

T- Calculators

E- Creating math sentences or algebraic equations

M- Anything within the discipline

Social Studies Examples

S- Investigating history, or analyzing the past

T- History of certain technologies (Model-T)

E- Construction of societies

M- Timelines (Wow I feel old moments)

S- Anything in which they must do research

T- Types of communication used

E- Construction of essays or stories

M- Sequence of events, creating graphic organizers, word counts

*English Language Arts is the GLUE that holds it ALL together

English Languages Arts Examples

Best Practices

Planning

Project-Based Assessments

Leveraging Technology

Planning

- STEM Design Process
- Concept Wheels / Maps
- Identify connections (Utilize grade-level teachers)
- Let the students in on your plan, it is about them. Learn about your students.

Our S.T.E.M. Design Process

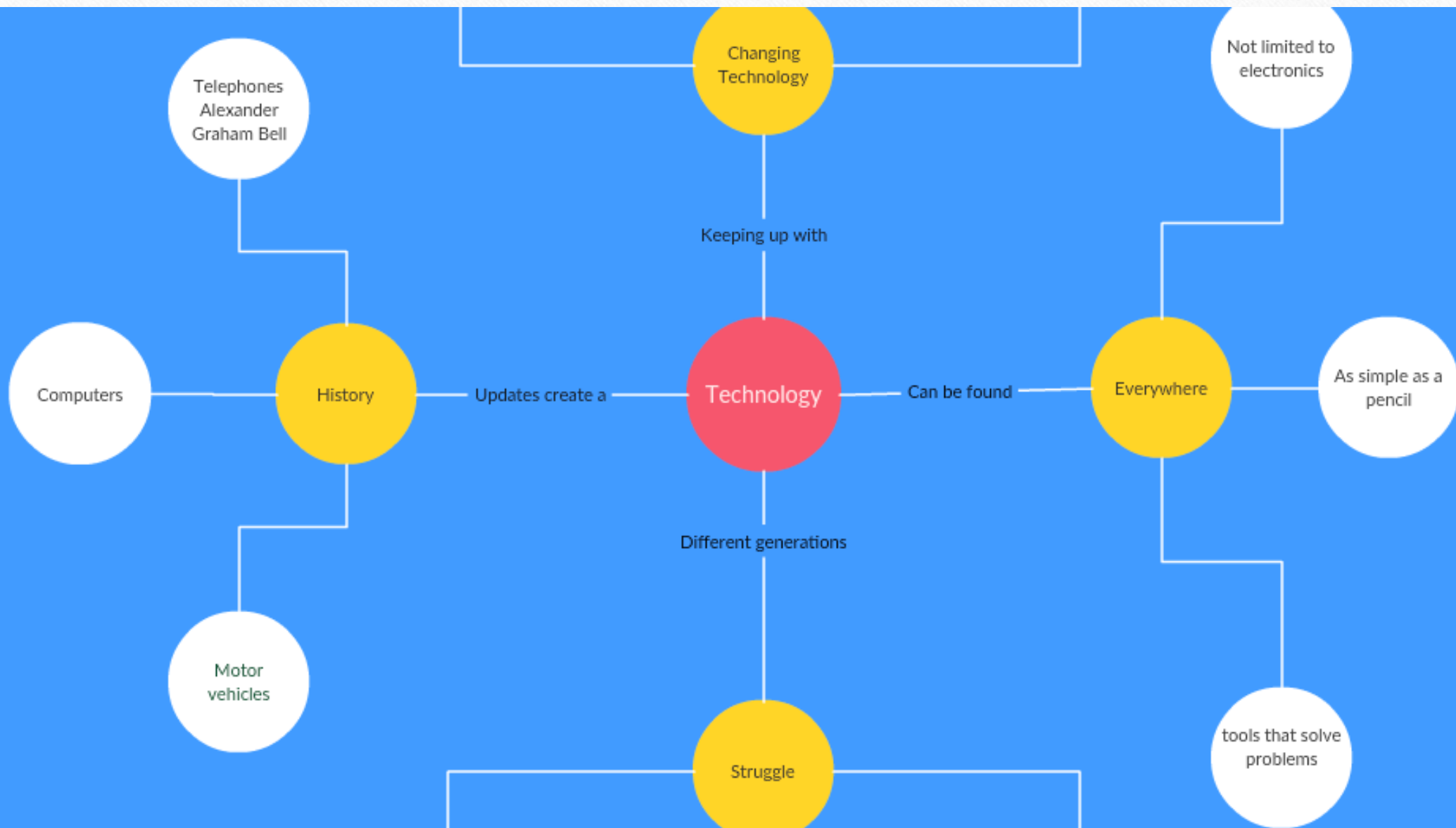## What does S.T.E.M. look like in this class today?

	8th	9th
Goal	• Begin with the End in Mind We will Understand the structure of an Atom.	Newton's Laws of motion will help us Win Carnival games and "Fly" Carpets.
Ask	• What is the problem? We Can't See Atoms!	Carnival games are rigged. Carpets can't Fly.
Imagine	• Brainstorm Draw a model of a atom to distinguish parts.	Synergize and think Win-Win.
Plan	• Select a Promising Solution Build models of atoms to gain a better understanding.	Build our version of Carnival games and magic carpets to help us study their motions.
Create	• Plan in Action Build models using random materials.	Design a blue print and build accordingly.
Improve	• Redesign as Needed use notes to Label parts.	Revisit the blue print and adjust as needed.
Communicate	• Share your findings Present to classmates.	Let our classmates test our prototypes

COHEA

Technology

- Changing Technology — Keeping up with — Technology
  - Not limited to electronics
- History — Updates create a — Technology
  - Telephones Alexander Graham Bell
  - Computers
  - Motor vehicles
- Technology — Can be found — Everywhere
  - As simple as a pencil
  - tools that solve problems
- Technology — Different generations — Struggle

Science:
- Research the different types of technology
- Survey classmates on technologies they use
- Plan, design and create a new form of technology

Social Studies:
- Discuss the history of different technologies and future advancements
- Investigate technologies used in other countries

Focus Subject:
Keeping up with changing Technology

Language Arts:
- Investigate new technologies
- Write reviews on new technologies
- Communicate new findings through a presentation

Project-Based Assessments

Provide Situations

Pose problems and combine problem solving with project-based learning across disciplines

Real-world problem-solving is the essence of STEM lessons. (Example: ESOL students learning new vocabulary and applying it to everyday life.)

Project-Based Assessments

Solving real-world problems causes students to use/expand higher-order thinking skills.

→

Identifying creative, real-world problems for students is the essence of STEM teaching. Example: Ask students how a problem can relate to a specific career.

→

Let the students control the assessment, Let them own their learning

→

(Authentic Learning)

Leveraging Technology

Use technology in new and innovative ways.

- Technology should supplement the book, not replace it.

Technology does not necessarily mean "electronics."

- Even a pencil is considered technology

Activity 1

- Set up in Groups of 5

- Materials – Pens/Pencils and Paper

15 Minutes

Create a Code Red

Emergency Action Plan

Be sure to include precise instructions and or diagrams

Code Red Emergency Action Plan

Science?

Technology?

Engineering?

Mathematics?

Social Studies?

English Language Arts?

Lab Report Template

Heading
Date
Student Name
Class Period

Lab Title:
The topic of the Lab we are in the process of completing.

Purpose: Why are we doing this lab?

Background information: Any and all prior knowledge or information you may have about the topic of our lab. Must be written in paragraph form. Should include extensive information.

Hypothesis: A prediction or educated guess on the results of the lab we are working on. Must be in an "If, then, because" format. **Ex: "If a person tosses a ball into the air, it will then fall back toward the earth, because of the earth's gravitational pull."**

Materials: List the materials we used for the Lab.

Independent Variable: State the change or manipulation you are causing

Dependent Variable: State what happens as a result of the changes you made

Constant: State what parts of the lab are purposely kept the same or uniform throughout

Control: Explain which variable is not receiving any type of change or manipulation. Used to make comparisons

Procedures: Everything you do from beginning to end. Must be listed as numbered steps. Include Safety procedures.

Data/Charts: Organize your data into a chart.

This is an EXAMPLE	Trial 1	Trial 2	Trial 3
Object 1			
Object 2			
Object 3			

Graphs: Show your statistics in a graph(s) you may have used. **(Circle graphs, Bar graphs, Line plots.)** If you do not use a graph you must state that a graph was not necessary.

Results: Explain the results of each trial conducted during the Lab.

Analysis: Explain why you think the results occurred. Was your hypothesis supported? If not, what can be done so that the results of the Lab support your hypothesis. (Never change your hypothesis.)

Conclusion: Just as in writing, your conclusion should be a complete summary of the entire lab. Should be written in paragraph format.

This Lab Report is NOT an outline. Do not use bulleted writing. All sections which include writing must be written in paragraph/essay format

Students complete a lab report for every lab assignment and project

Activity 2 – Cloud in a Jar

S WATER CYCLE

T RECORDING DATA

E CREATING A MODEL

M MEASUREMENT & TIME
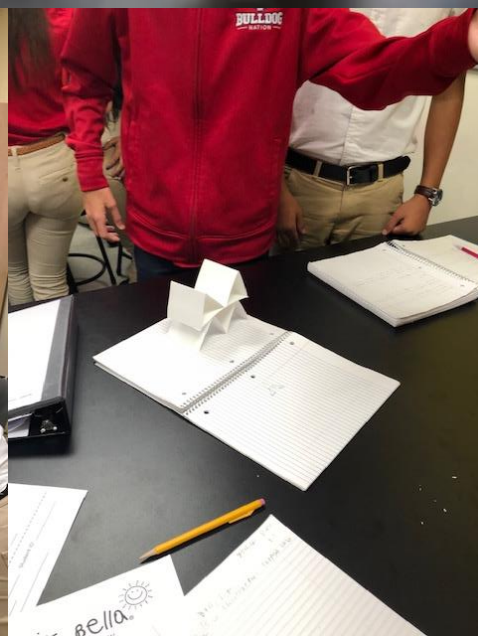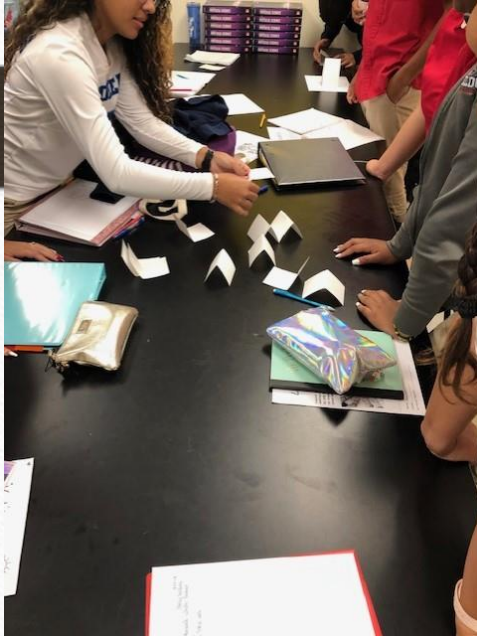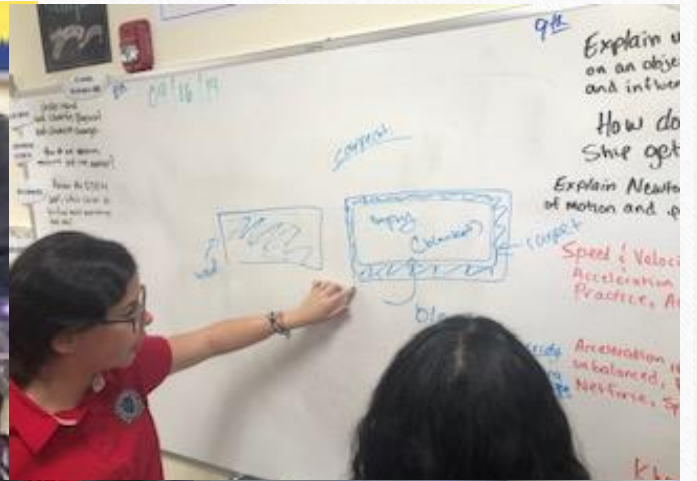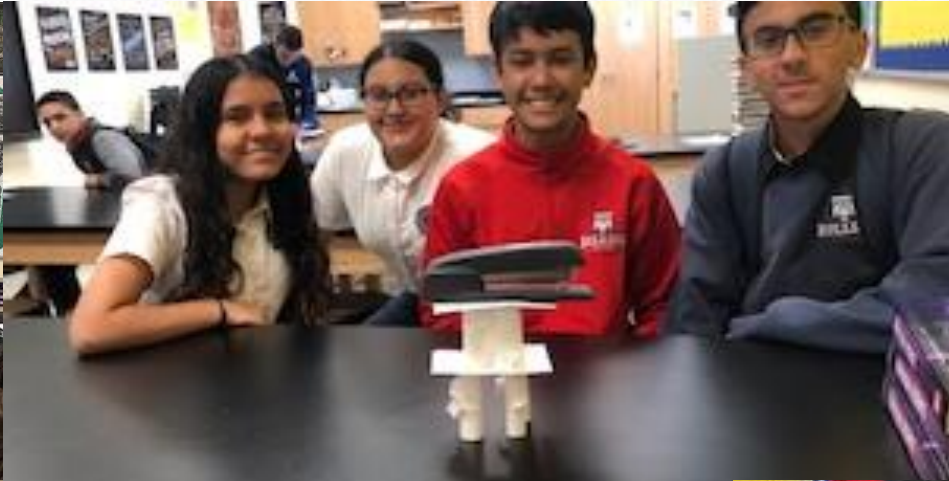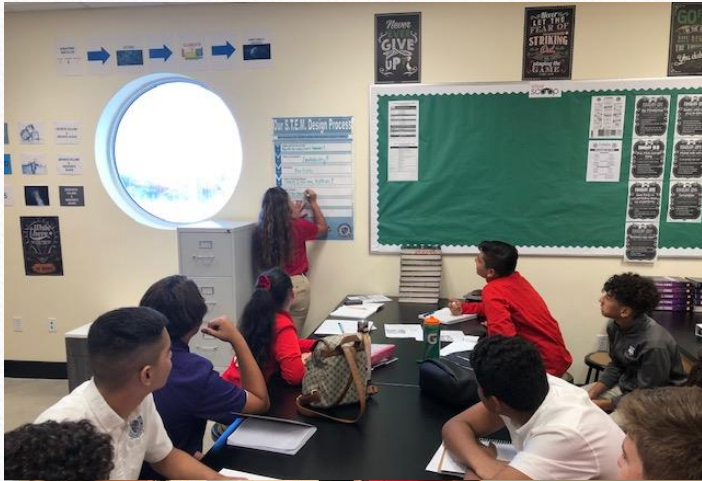
Students in Action
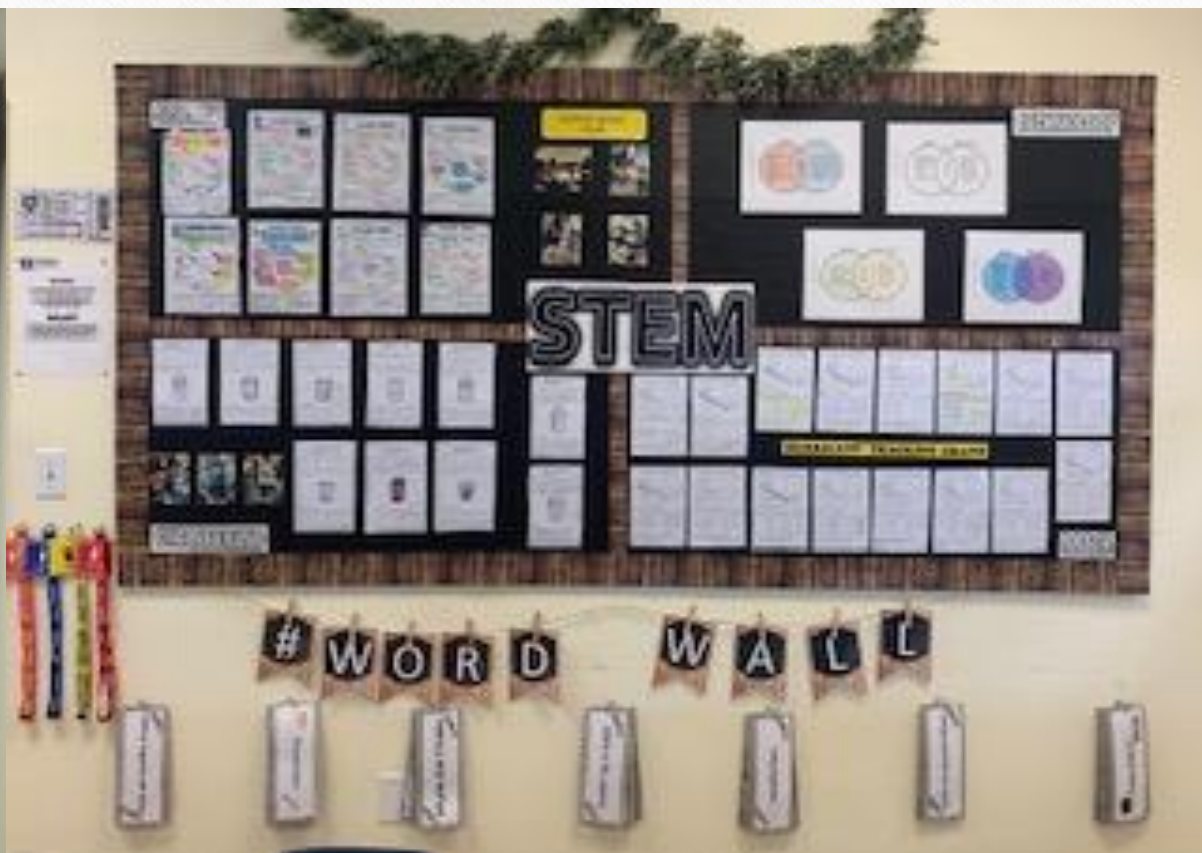
Everyday Tidbits

- Emphasize STEM Careers

- Set Reminders: It's about the students

- Have daily conversations with different groups of students

- Practice

- Reflect, Reflect, Reflect on lessons, outcomes and personal performances

Thank YOU!

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