STEMpreneurship

Jerome McQueen, PE[1]

[1]Affiliation not available

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CONCEPT

STEMpreneurship is a three-phased STEM program that introduces students to basic STEM concepts through assembling STEM kits, then coming up with their own conceptual design through the engineering design process, then lastly exposure to entrepreneurship and teaching them how to enter their product design into the business marketplace. The culmination of STEMpreneurship is the "Shark Tank-like" competition where the students present their product design to would-be investors attempting to obtain funding for their design.

Discalimer: This program can be lengthen and modified into a 6,8, or 12 week program.

OVERALL PROGRAM OBJECTIVES

- Students will learn the following **science** concepts by assembling STEM kits:
    1. Basic electric circuits;
    2. Solar Energy;
    3. Air propulsion;
    4. Structures; and
    5. Wind Energy.
- Students will learn to design their own product through the **engineering** design process;
- Students will learn basic entrepreneurship and business skills;
- Students will use **mathematics** to develop their investor pitch to would-be investors;
- Students will learn to use **technology** to develop their product design and presentation;
- Students will learn to collaborate in a team environment to develop the presentations to would-be investors.
- Students will learn to connect STEM concepts to real-world applications.

LESSON 1: STEM CONCEPTS

Suggested Time: 55 Minutes (Per STEM Kit)

OVERVIEW

Students will learn various STEM concepts such as electric circuits, solar energy, air propulsion, structures, and wind energy by assembling STEM kits provided by AcaSTEMics, LLC. Each session is for one STEM

kit. The following STEM kits correspond to the following STEM concept:

1. Basic electric circuits - Table Top Lamp
2. Solar Energy - Solar Fan
3. Air Propulsion - Twin Engine Electric Plane
4. Structures - Marshmallow Building
5. Wind Energy - Wind Turbine

The Lesson

PART 1: STEM KIT ASSEMBLY (40 MINUTES, per kit)

1. STEM Kits are distributed to the students.

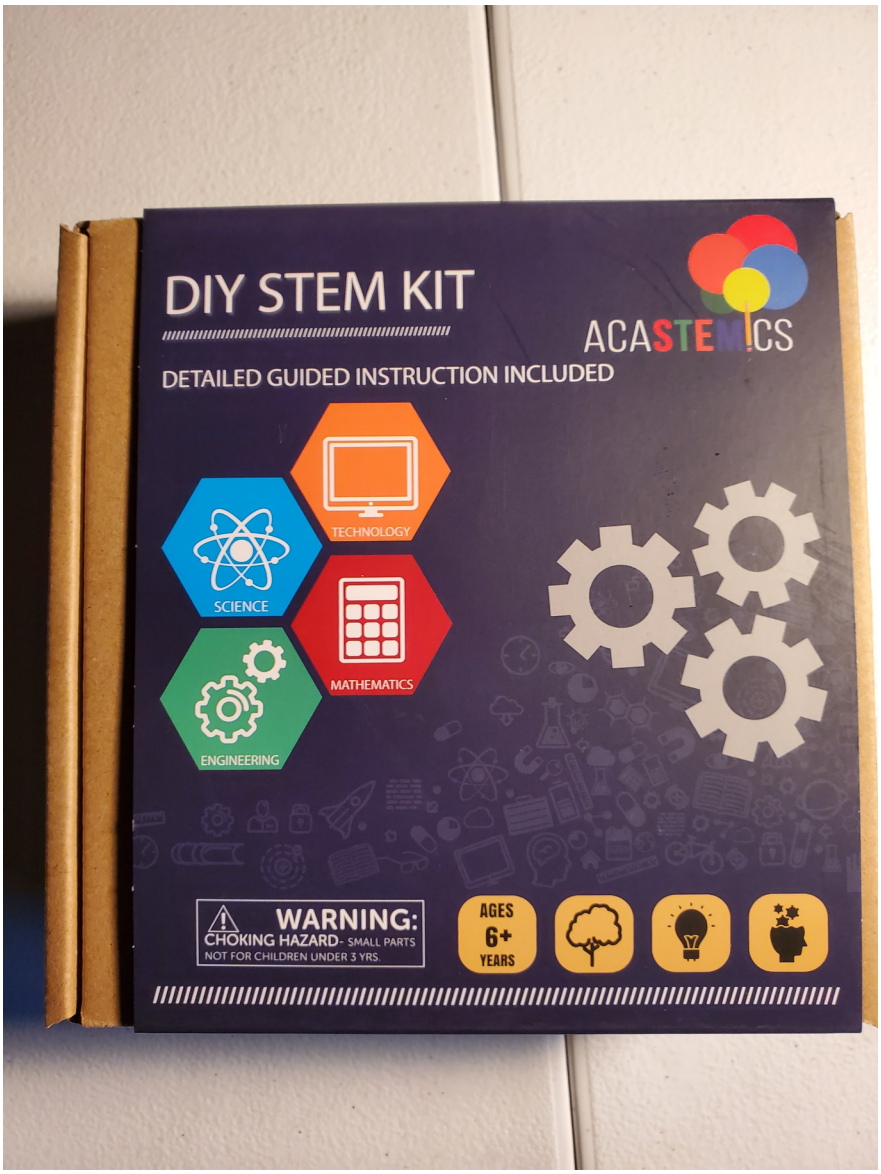

Figure 1: STEM Kit box (6" x 6" x 2")

2. The students will open the STEM kit box to take a look at the components of the kit.

Figure 2: Components of the kit when the student opens the STEM kit box.

3. The session leader shows the student a completed STEM kit to start the students to visualize and ponder how the components of the kit will end up like the completed kit you are showing them.

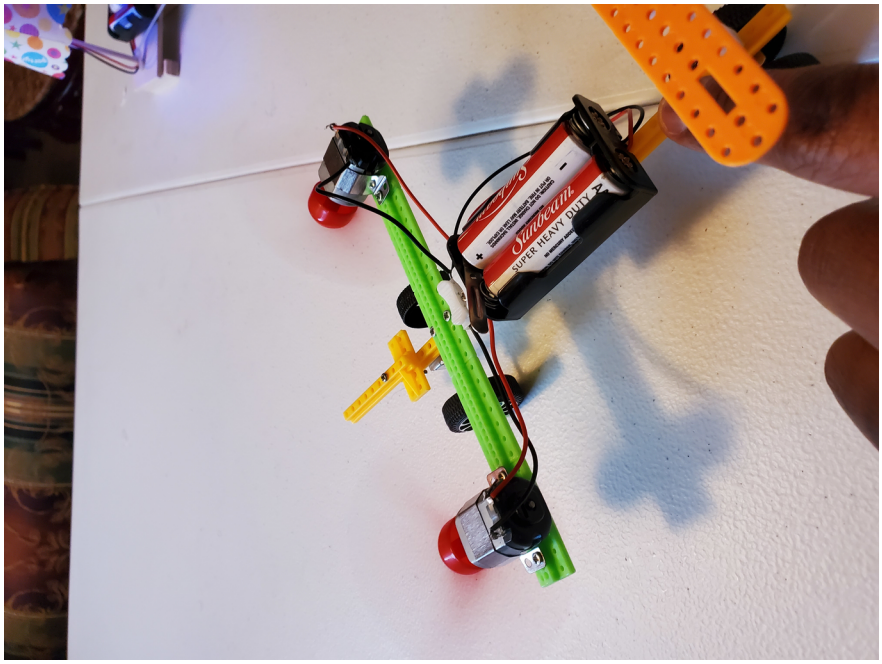

Figure 3: Twin Engine Electric Plane - Air Propulsion

Figure 4: Table-top Lamp - Basic Electric Circuits

4. The session leader picks a separate student to read each instruction that teaches how to put the STEM kit together. (By reading the directions, then having the students do what the instructions say develops following direction skills).

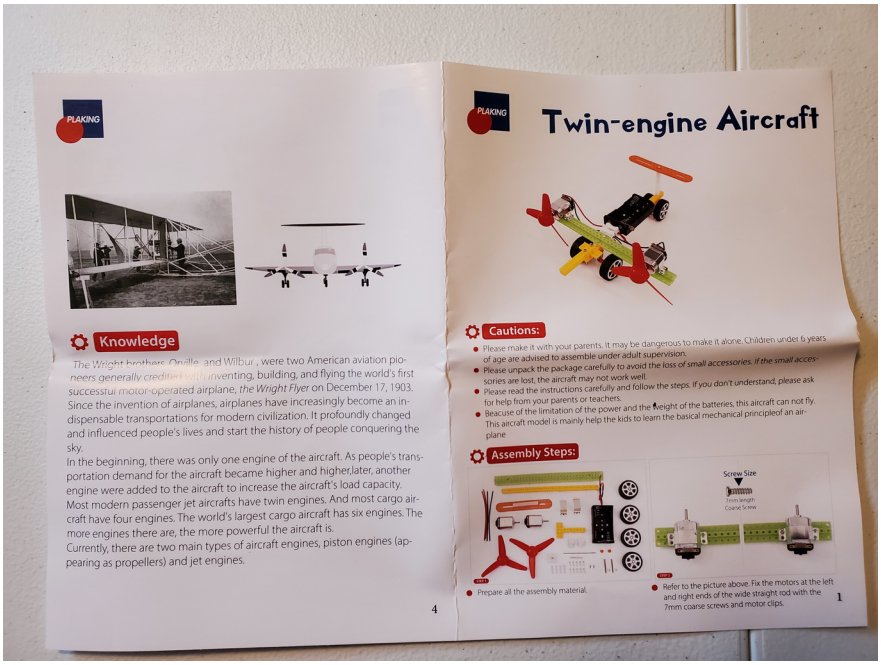

Figure 5: Detailed Instructions (Front Page)

Figure 6: Detailed Instructions (Back Page)

5. The session leads the session and the students follow the directions as read by their peers until the STEM kit is complete.

Figure 7: Photo of a student assembling the STEM kit.

Examples of the completed STEM kit are found in Step 2 of the Lesson.

PART 2: CONNECTING THE STEM CONCEPT TO A REAL-WORLD APPLICATION (10-15 MINUTES)

Each STEM kit teaches a STEM concept. Each STEM concept must be connected to a real-world application so that the STEM concept learned during the session has some relevance with the student to assist with retention of what was learned. The following STEM Kits teaches the corresponding STEM concept along with the YouTube Video that further illustrates the real-world application:

STEM KIT	STEM CONCEPT	YOUTUBE VIDEO
Table-top Lamp	Basic Electric Circuits	Flow of Electricity through a circuit (8/27/18)
Solar Fan	Solar Energy	How Do Solar Panels Work (1/5/16)
Twin Engine Plane	Air Propulsion	Jet Engine, How it works? (1/11/15)
Marshmallow Bldg. Principles	Structures	How to Demonstrate Engineering
Wind Turbine	Wind-generated Energy	How Do Wind Turbines Work? (8/9/18)

Lesson Assessment

After the video is played, the session leader leads a short discussion of what was learned during the session of assembling the STEM kit and watching the video. The discussion is initiated by asking the question, "What did you learn today from assembling the kit and/or watching the video?" Assess how engaging the students are with the discussion and how much facts they contribute to the discussion.

LESSON 2: THE ENGINEERING DESIGN PROCESS

Suggested Time: 120 - 240 Minutes

OVERVIEW

Students will introduced to the Engineering Design Process and use this process to engineer their own product design. Using the science concepts learned from assembling kits as a foundation, the students are encouraged to think of a product or process that will solve a problem or improve upon an existing product.

The Lesson

1. Play the following or any combination of the following YouTube Videos to the students to introduce the students to the engineering design process and to give them the framework on how to start their own product design:

- The Engineering Design Process: A Taco Party (4/12/17)
- The Engineering Process: Crash Course Kids #12.2 (5/29/15)
- The Engineering Design Process (6/8/20)

- Solve Problems: Be an Engineer (11/16/15)

2. Divide the class into groups of 4 to 5 students per group.

3. Each group is to begin a discussion centered around what problem they would like to solve or what product could be improved.

4. Once a problem that they would like to solve has been agreed upon, have them to brainstorm a prototype of the product that would solve the problem.

5. Using one of the following free 3D CAD (computer-aid design) software a prototype can be conceptualized in the computer:

- LeoCAD
- K-3D
- 3D Slash
- Wings3D

6. After the prototype has been developed, use the remaining steps of the engineering design process to vet the effectiveness of the prototype using the other groups in the class as testers and focus group research. Then if re-design is needed, go back through the engineering design process until a product has been defined for full effectiveness to solve the original problem identified.

Lesson Assessment

This lesson is assessed on how well each group member can articulate and/or demonstrate how their group used the engineering design process to develop their product.

LESSON 3: ENTREPRENEURSHIP

Suggested Time: 120 - 240 Minutes

OVERVIEW

After the prototype has been conceptualized and fully vetted, the students are tasked with calculating production and labor costs, sales price and sales projections. Using the unit costs and sales projections, the groups will calculate a market valuation of their design and collaborate on a sales pitch/presentation to would-be investors requesting start-up funds for a percentage of the business.

The Lesson

1. Play the following YouTube Videos to introduce entrepreneurship and a sales pitch to investors to give the students a vision of how entrepreneurship works:

- Time Magazine for Kids - Kidpreneurs (Kid Entreprenuers) (11/8/12);
- Shark Tank Your Life: Kid-Preneurs Edition
- Kidpreneurs on an all new Shark tank (2/14/13)

2. Student groups will research to calculate the material costs and labor costs to start production of their prototype. The material and labor costs are dependent upon the following, but are not limited to:

- type of materials (i.e., plastics, steel, ceramics, etc.);

- high tech components;
- where materials come from;
- labor costs;
- marketing costs;
- shipping costs;
- any other costs that's needed to enter your design into the marketplace.

3. Student groups will research to develop a sales projection for their design.

4. Student groups will calculate company valuation of their design.

5. Graph business calculations such break-even analysis, profit margins, etc.

5. Students groups will collaborate to develop and communicate a sales pitch to an investor panel requesting start-up funds for a percentage of the calculated company valuation.

Lesson Assessment

The assessment of this lesson is documented by the judges' (would-be investors') scoresheet from the presentation. Judge criteria are based on understanding of the business analysis and the delivery of the sales pitch,