Ready, Set, Build!
From Class to Competition

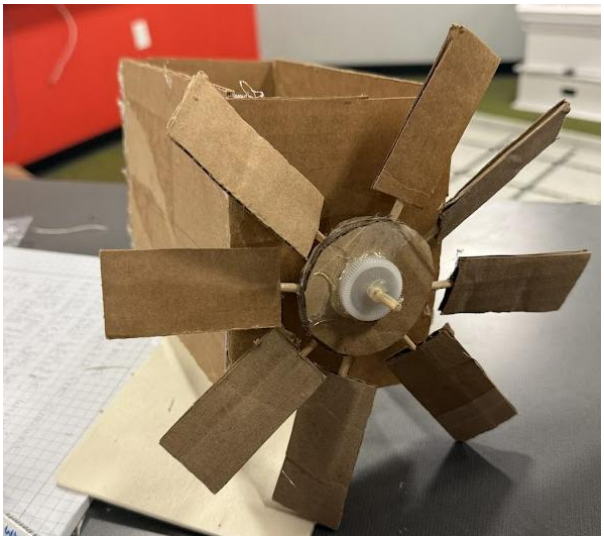


Marica Mitchell
maricamitchell@dadeschools.net
Miami Lakes Educational Center
5780 NW 158th Street
Miami Lakes, FL 33014

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Goals and Objectives



The purpose of "Ready Set Build!" is to bridge classroom learning and real-world STEM application for students in grades 6–12. The curriculum immerses learners in the engineering design process, guiding them from brainstorming and planning through prototyping, testing, and iterative improvement. As students tackle classroom engineering projects and progress to competitive STEM events, they actively apply mathematical reasoning, scientific principles, and problem-solving skills to develop innovative solutions using accessible, affordable materials.

This curriculum emphasizes not only technical mastery but also the development of key life skills. Through collaborative project work, students build resilience, learning to troubleshoot and persevere even when faced with setbacks or design flaws. Teamwork and leadership are prioritized as students form groups, assign roles, communicate ideas, and navigate decision-making together, mirroring the dynamics of real-world engineering and competition environments.

By participating in authentic engineering challenges and preparing for robotics, engineering, and STEM competitions, students gain vital experience in presenting their work to audiences ranging from classmates to community stakeholders and competition judges. These opportunities help them develop effective communication and documentation skills, as well as the confidence to share and defend their designs. Throughout the process, "Ready Set Build!" nurtures STEM identity, ensuring each student recognizes their capacity as a creator, innovator, and leader in science, technology, engineering, and mathematics.

Florida Standards

- MA.6.AR.3.5 – Solve mathematical and real-world problems involving ratios, rates, unit rates.
- MA.7.GR.1.3 – Explore proportional relationships in geometric contexts.
- MA.912.AR.3.1 – Use mathematical models for analysis.
- SC.6.E.7.9 – Atmosphere's role in protecting life and insulation.
- SC.912.N.1.1 – Define problems, design experiments, analyze scientific data.
- ETS1.A/B – Define engineering problems; develop systematic solutions.

Course Overview



Ready Set Build introduces engineering and STEM competition for grades 6–12 through hands-on design tasks and iterative prototyping.

Key concepts include:

- Engineering Design Process (Spark → Shape → Ship framework)
- Mathematical modeling and scientific analysis
- Iterative testing and improvement
- Collaboration and leadership
- Competition preparation and presentation

Students brainstorm real-world problems, localize them, and develop prototypes within budget and time constraints. Community and industry partnerships are encouraged to expand learning opportunities.

Lesson Plan & Overview

Pre-Lesson Activities:

- Survey: Student passions and interests (Spark)
- Collaborative brainstorming (Idea Chain, Gallery Walk)
- Localize the Problem: Adapt global challenges to classroom scale

Sample Lesson Components:

- Define the challenge: (e.g., build a simple device from regular materials – eg. Water bottle racecar)
- Mathematical modeling: Calculate dimensions, performance metrics, apply ratios
- Prototyping: Build, test, and refine designs
- Data collection: Analyze performance and iterate
- Presentation: Prepare for STEM Night or competition showcase

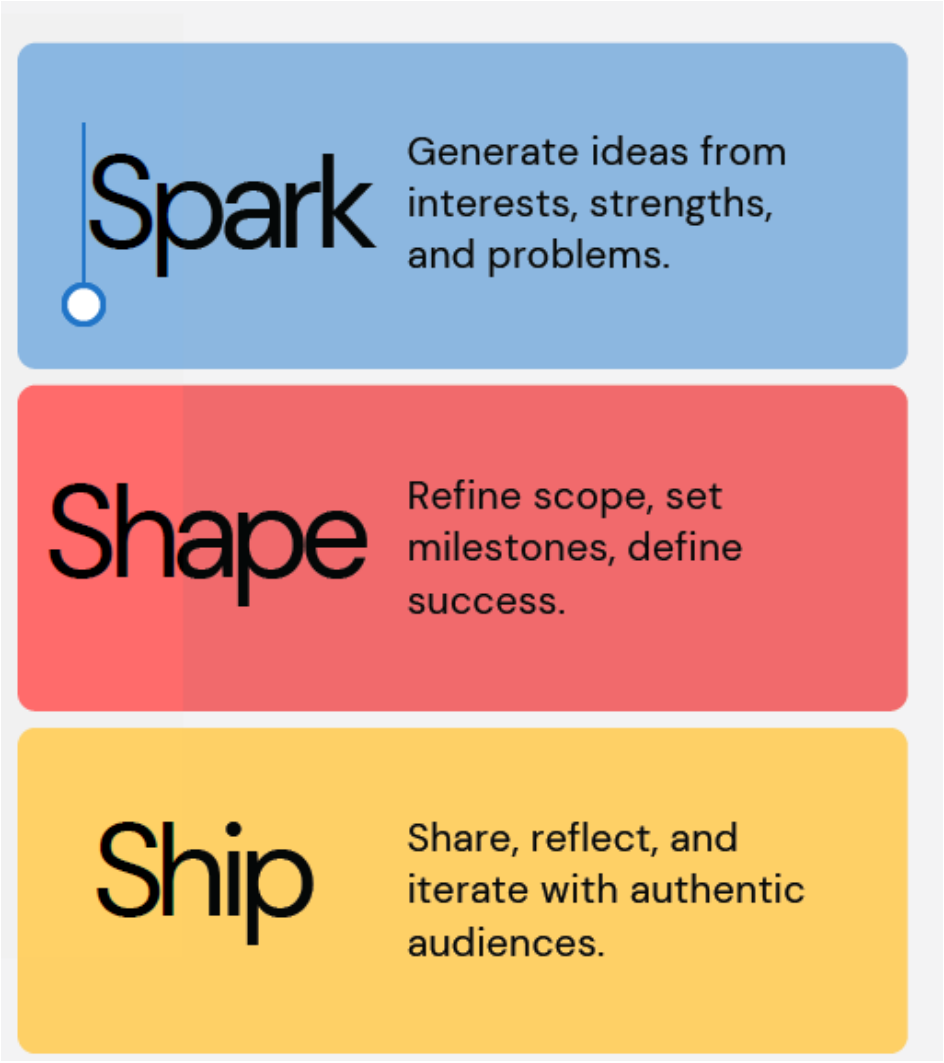
Resources & Materials

Budget: $300–$400

- Cardboard, foam board, wood dowels
- Hot glue guns and glue sticks
- Rubber bands, string, fasteners
- Measuring tools (rulers, tape measures)
- Small motors or basic robotics kits (optional, scalable for grade)
- Digital tools for design and data collection (free platforms)

SAMPLE FRAMEWORK

The SPARK → SHAPE → SHIP framework helps turn ideas into action. First, SPARK is about finding what excites you or a problem you care about. Next, SHAPE is about making that idea clear, doable, and focused. Finally, SHIP is about creating something real that others can see, use, or experience. In short: dream it, plan it, and deliver it.



Step-by-Step Procedure

1. **Spark: Idea Generation**
    - Use passion surveys and quickfire prompts to surface project ideas for grades 6–12.
    - Apply Idea Chain and Gallery Walk for collaborative brainstorming.
2. **Shape: Narrow & Plan**
    - Localize the challenge using the "Localize the Problem" worksheet.
    - Apply age-appropriate constraints (time, budget, materials).
    - Set milestones and define team roles.
3. **Ship: Build & Share**
    - Prototype and test in class, iterating with feedback.
    - Prepare presentations (posters, demos, STEM Night, science fair).
    - Reflect and iterate based on peer/community input.
4. **Community Engagement**
    - Connect with local STEM partners, colleges, and industry mentors for support and outreach.

Brainstorm Worksheets



Engineering Challenge (Spark Stage)

Name: _____ Date: _____ Class: _____

1. What is a problem you see in your school or community?

   _____
   _____
   _____
   _____

2. What could you build, design, or improve to help solve this problem?

   _____
   _____
   _____
   _____

3. List materials you already have or could get easily:

   _____
   _____
   _____
   _____

4. Who will benefit from your project?

   _____
   _____
   _____
   _____

5. Sketch your first idea!

Localize the Problem (Shape Stage)



Name: _____ Date: _____ Class: _____

Write your big idea:

Reframe it for your local context:

- Global level: _____
- Regional level: _____
- Local level: _____
- Community level: _____

Pick a constraint:
☐ Time (Can this be done in 1–2 weeks?)
☐ Materials (Classroom supplies only?)
☐ Stakeholders (Who helps or uses it?)

Draft your challenge statement:
How does [specific factor] affect [subject] at [place], and what solution could improve it?

Build, Test & Improve (Ship Stage) – Engineering Notebook

Name: _____ Date: _____ Class: _____

Build:
What are your team member names and roles?

_____
_____
_____
_____

Describe your prototype:

Test:
Test results/data (distance, speed, success, etc.):

What worked well?

What needs improvement?

Iterate:
What will you change for your next test?

Competition Prep & Presentation

Name: _____ Date: _____ Class: _____

What are the competition rules or criteria?

How does your design meet the requirements?

Create a poster or slide to show your process and results.

Practice explaining your solution to classmates or judges.

Balloon Powered Car Project

Project Rules:

- All cars must be made of recycled/ repurposed materials
- All cars must have at least 3 wheels
- All cars must remain on the ground
- All cars should travel in a straight line
- All cars will use only one 9-inch balloon to power it
- Car should be capable of traveling at least 4 meters

You may not use any of the following: wheels from toy cars, Legos or any items already used for wheels; store bought kits will not be allowed. Use of any of these prohibited items will result in a 0% for the project.

Winning cars will be displayed for all to see and will be characterized in two categories:
1. Fastest Car (in first 4 meters)
2. Farthest Distance Traveled

Material and Procedure Plans – Completed in the Engineering Notebook:
Team Members and Role
Team Norms
Sketch and Design
Step by step build
Changes and Technical Difficulties
Testing Trials data collection recording sheet
Trials 1-3 Average Speed Average Distance Results Conclusions

After completion of the Balloon Car Project, you will write a reflective engineering report on the project. You will describe your knowledge of Newton's Laws in relation with your car build and use vocabulary words from the list provided to you in the report you write.

Three Phases of this project
1. Planning, building process, testing and re-engineering (Must be documented in the Engineering notebook).
2. Competition and Data gathering
3. Report photo journaling is encouraged. You can use photos and/or drawings to show your materials, building process and reengineering.

Sample STEAM Lesson for Designation

Link to step-by-step lesson plan – Middle School

https://www.sciencebuddies.org/teacher-resources/lesson-plans/balloon-car

Link to step-by-step lesson plan – High School

https://www.scribd.com/document/517456131/BALLOONCARPROJECTKinematicsForcesNGSS-1

SAMPLE STEAM 5.0 Lesson Plan Template

STEAM 1.0 (Science)	STEAM 2.0 (Technology)	STEAM 3.0 (Engineering)	STEAM 4.0 (Arts)	STEAM 5.0 (Mathematics)
Standard **Domain & Descriptor** **Description** Students will complete a worksheet.	*No standard required* Students will use Canva to create a presentation that details their engineering process, trials, and overall findings of the **Balloon Racecar**. Must include Font: Headings, Subheading and body text. Graphics: Minimum 2 visuals per slide (e.g., photos, icons, charts, or diagrams). Graphics must be clear, high-resolution, and aligned with the text. Use consistent visual styles and themes across slides for a professional look.	*No standard required* **Students will build a balloon racecar and follow the Engineering Design Process:** 1. Problem/Goal: Design a balloon car prototype that averages 20 cm/s over four trial runs. 2. Planning: Brainstorm materials, sketch a blueprint, and note changes during testing. 3. Prototyping: Build the balloon car based on the design to meet the goal. 4. Testing: Measure the time to travel 25 cm and calculate the average speed over four trials. 5. Redesign/Improve: Iterate on the design to achieve or improve the target speed. 6. Communicate Findings: Reflect and present findings using Canva.	**VA.68.F.1.1 Use** non-traditional thinking and various techniques to create two, three-, and/or four dimensional artworks. **Description** Students will sketch blueprints of initial balloon car concept. Students will also sketch to document changes made to various iterations of their car. Sketches should be detailed and include technical design information needed build prototypes.	**Standard** **Domain & Descriptor** **Description** Students will complete a worksheet.

References

Spark, shape, ship framework was provided from the Society of Science Research Teachers conference in Washington D.C. Conference https://www.societyforscience.org/stem-outreach-programs/middle-school-research-teachers-conference .