STEAM Challenges

Theme: STEAM activities foster critical thinking by empowering students to work together to solve design problems.

Concept: Design involves multiple steps.

1. Ask: define the problem
2. Imagine: Brainstorm all possible solutions
3. Plan: Design the solution
4. Create: Make a prototype
5. Improve: Improve the design

Outline:

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I. Preparation Before Activity (15 min.)

Read over this lesson plan and become familiar with the equipment in the kit provided by your liaison. There may not be time to complete all of the challenges within an activity; this is alright. Groups that complete challenges more quickly should be given additional challenges to complete.

Remember, the goals for STEAM Challenges are to work together and solve problems! Help the group by promoting a positive attitude and an open mind to the multiple ways a problem can be solved.

II. Introduction (15 min.)

A. Greeting, Grabbing, & Purpose. Greet and count the students after the Naturalist Program or at the designated time.

B. Names and Introductions. Tell the class a little bit about yourself and become familiar with each student. Explain that you will be leading the group and the other adult chaperones may be assisting at times.

C. Activity Description. This evening they will be completing a series of STEAM Challenges. STEAM stands for **S**cience, **T**echnology, **E**ngineering, **A**rt, & **M**ath. Each challenge will have at least one of these subjects, and many will have more than one. To complete these challenges successfully, they will need to work as a team in their group. The groups will rotate through the four different challenges, with about ten minutes at each station. Visit each station as you introduce the activity to the students, describing the goals for that specific station. Emphasize that the students will need to clean up their station before moving on to the next station.

D. Behavior Guidelines. Discuss clearly and specifically which behaviors you expect from your students during this activity. Emphasize the need for respect: for you, for each other, for ideas, for Eagle Bluff itself, and the equipment. Break the students into four groups and dismiss each group to a station after completing all instructions.

III. The Activities

I. Lego Creativity (***Choose one or all***)

A. Challenge A – Eagle Bluff Experiences

Allow students to creatively recreate (build) an activity they have had thus far at Eagle Bluff. This could be a raptor, TreeTops course, Oneota village, etc. This allows the connection between something they have already experienced, as well as allowing students the creativity to build something. Ask students to explain what they are building and how that experience was for them. Please only build on the provided Green platforms.

B. Challenge B – The Tallest Freestanding Structure
Instruct students they are going to be building the tallest structure possible, utilizing only the pieces they have in their specific kit. They cannot steal pieces from other kits. They can build stabilizers, bases, or anything else they deem that will help their structure stand up freely. Please have them build on the provided Green platforms.

C. Challenge C – Wheeled Structures
Instruct students they will now need to build something with the wheels provided in their kits. They cannot steal pieces from other kits. The objective is to build a wheeled structure that will go the furthest distance with the same amount of force applied to each wheeled structure. Adults should build a ramp with the provided green platforms, and instruct students they can only place (not push) their wheeled structures on the built ramp. This makes it a level playing field for all the wheeled structures.

II. Marble Pipeline (***Choose one or all***)

A. Challenge A – Tallest Structure
Allow students to creatively build the tallest free standing (without human contact) structure without the use of the bases in their kit. When the marble is placed in the structure, it cannot tip over. The marble should then drop into one of the green marble catchers provided in the kit.

B. Challenge B – Furthest launch off of ramp
Instruct students they are going to be building a structure that is going to launch the furthest into one of the green marble catchers provided. Whether they use the designated ramp or they configure something that launches the marble furthest is up to the students.

C. Challenge C – Longest continual maze with pieces provided
Instruct students they will now need to build a structure that contains the longest continual structure that a marble may travel. You may not steal pieces from other kits, but rather only utilize the pieces you have provided to you. Count how many pieces students have and how many they have connected as well. See how far they can get the marble to travel in the pipelines.

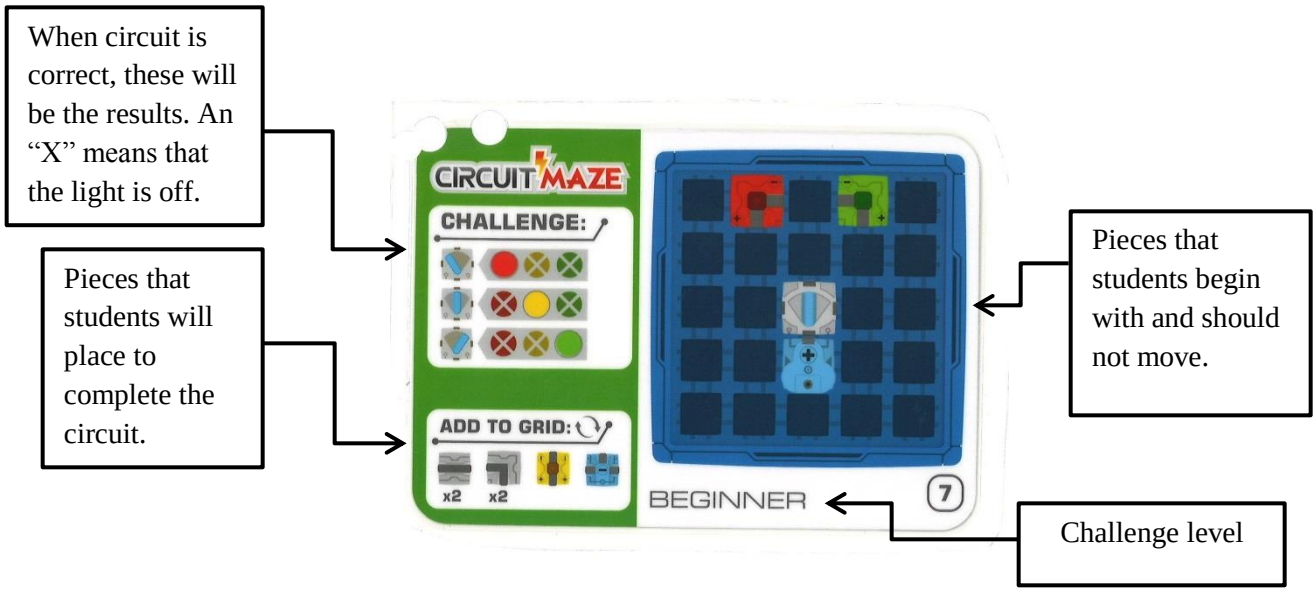
III. Circuit Puzzle

During this station, the student's goal will to be to complete a circuit puzzle. For each Challenge Card on the metal keyring, they must build a continuous metal strip pathway from the Start Token (+) to the Finish Token (-).The Challenge Cards also display which pieces must be included/excluded and lit/dim in their puzzle. The solution for each Challenge Card is on the reverse side.

Notes:

- Be sure that each Token is clipped securely into the Game Grid for best connectivity.

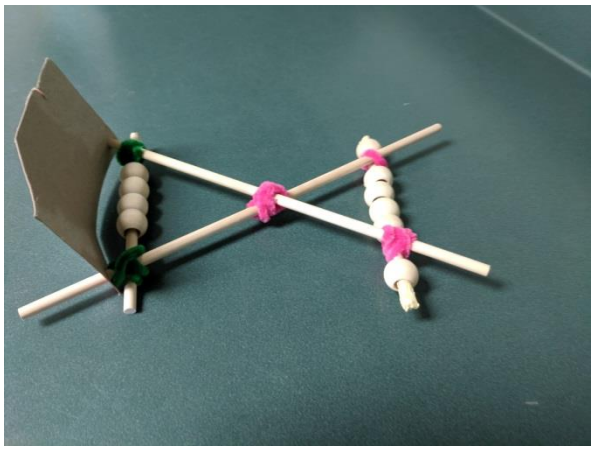
- Emphasize that students must be gentle with the wire connection between the Start Token (+) and Finish Token (-).

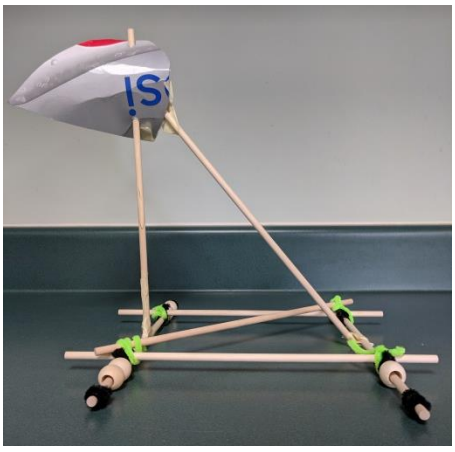


IV. Wind-Powered Car

During this station, the students will be designing a car that is propelled by the fan blowing on a cardboard sail. They can cut their cardboard sail into whatever shape they would like. The students should make any attachments between materials with the pipe cleaners, using the masking tape only to attach their cardboard sail. If a group finishes a design that is propelled by their fan, they may mark the floor with tape to indicate the distance travelled. They can then re-design their car to travel further than that mark.

Designs can vary widely. Here are a few examples of cars that could be made:





IV. Conclusion (5 min.)

Ask the students to review their successes and failures with their group. They may share which stations seemed particularly challenging or easy for them.

Explain that all the activities that they participated in today involved their group designing something, or thinking of an idea and then putting it into practice. Ask them if all of their designs were perfect the first time. Probably not, which is what all of the STEAM subjects are about! Whether solving a math problem, creating artwork, or engineering something new, often the first solution is not the best. It takes multiple attempts to create the best solution to a problem, and that is a good thing.

V. Clean Up (5 min.)

Have the students disassemble all of their supplies and return them to the correct folder. Take the batteries out of the Circuit Maze token. The cardboard from the Wind-Powered Car can be recycled, but the rest of the supplies should be returned to the folder. Make note of any broken/missing pieces and let your liaison know.

VI. Appendix

A. Equipment

- Lesson Plan
- Wind car folder
    - Dowels (10)
    - Wheels (8)
    - Pipe cleaners
    - Hole punch
    - Scissors
- Lego folder
- Green Lego base
- Circuit Maze folder
    - Challenge cards
    - Blue game grid
    - Red, green, & yellow tokens (1 each)
    - Gray tokens (14)
    - Start/Finish token
    - Screwdriver
    - Extra batteries (3)
- Marbles
- Marble Maze pieces
- Measuring Stick
- Not in Kit:
    - Wind car cardboard
    - Wind car fan