

St. Patrick's Day

STEM



Wind-powered Maze challenge

← **CREATED BY BROOKE BROWN**

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HOW TO USE

The following STEM/STEAM challenge is designed to be completed with partners or in small groups. You will need to allow 30-45 minutes for the full activity to be completed. Needed supplies are inexpensive and can be found in your classroom or at most craft stores.

Components

LESSON PLAN

- Overview
- Read Aloud Ideas
- Skills
- Supplies

STUDENT INSTRUCTIONS

QR CODE WEBSITES & VIDEOS

TEACHER ANCHOR CHART

STEM CHALLENGE: Wind-powered Maze

OVERVIEW: For this challenge, students will explore wind power and balanced/unbalanced forces by constructing a marble maze with obstacles. Students will have a variety of materials to choose from for their maze construction. This challenge serves as an excellent cooperative and creative activity for small groups. Some students may choose to make their maze more challenging by adding tricky turns, tunnels, bridges, dead ends, and additional obstacles. After their maze is constructed, students will take turns blowing through straws to push a marble through the maze. They will also rotate to try all other groups' mazes.

KEY SKILLS: Wind/Power/Renewable Energy/Pushes/Pulls, Balanced and Unbalanced Forces, Friction, Momentum

SUGGESTED READ ALOUDS: The Boy Who Harnessed the Wind by William Kamkwamba, Amazing 30 Things by Tina Jordan, Balanced and Unbalanced Forces by Jenna Wintlerberg

MATERIALS PER GROUP: marble, 1 straw per student

OPTIONS FOR MAZE CONSTRUCTION: linking cubes, base ten blocks, or wooden planks

LESSON PLAN

1. Activate students' prior knowledge by asking them to share what they already know about mazes. Discuss the different styles of mazes and where they are found in the world. Ask students to share what they already know about wind power and how it is used.
2. Share and discuss the videos on "Mazes and Wind Power."
3. Hold a class discussion, using the teacher chart and real world examples to guide student thinking. (You can project the chart on an interactive whiteboard or document camera.) Record their ideas on the teacher chart.
4. Introduce the STEM challenge and permitted materials.
5. Introduce and discuss key vocabulary cards related to the challenge.
6. Have students sketch/blueprint their designs on their recording sheets.
7. Distribute materials and allow students 15-20 minutes to construct their mazes, test them with wind power and marbles, and test other groups' mazes.
8. Hold a whole class closing discussion and reflection, allowing students to share their maze designs. Use the "Let's Reflect" poster to guide the discussion.

Wind-powered Maze

You've been asked to design a maze for your school playground.

Construct a model of a maze with an entrance, exit, and obstacles. Then use wind power to push a marble through the maze.

MATERIALS:

- MAZE OPTIONS: Linking cubes, base ten blocks, or wooden planks
- Marbles
- Straws (one per student)

EXPLORE MAZES & WIND POWER

MAZE MAKER

BALANCED & UNBALANCED FORCES

RENEWABLE ENERGY

WIND POWER

Wind-powered Maze

REAL WORLD EXAMPLES

What is similar? What is different?

Types of Wind Power

What Mazes Need

Balanced Forces

Unbalanced Forces

KEY VOCABULARY

WORDS TO KNOW

obstacle something that blocks one's way or hinders progress

friction surface resistance to motion

balanced force equal forces that cause no change in motion

unbalanced force unequal forces that cause a change in motion, such as speed or direction

K-2nd RECORDING SHEET

Wind-powered Maze Name: _____

MY BLUEPRINT

Draw a picture of your maze. Label the START and END.

Draw the OBSTACLES in your maze.

- 1
- 2
- 3

Did you use wind power to push your marble all the way through your maze?

YES NO

3rd-5th RECORDING SHEET

Wind-powered Maze Name: _____

BLUEPRINT

Label the ENTRANCE, EXIT, DEAD ENDS, and OBSTACLES.

List the OBSTACLES in your maze.

- 1
- 2
- 3

What examples of BALANCED force did you observe as your marble moved through the maze?

What examples of UNBALANCED force did you observe as your marble moved through the maze?

REFLECTION DISCUSSION QUESTIONS

LET'S REFLECT!

- What was most difficult about this challenge?
- How is wind power used to power things in our world?
- What are some other examples of renewable energy?
- What examples of balanced and unbalanced forces did you observe as you pushed your marble through the maze?
- How did friction affect the movement of your marble?
- How did momentum affect the movement of your marble?
- If we completed this challenge again, what would you do differently next time?

Optional Google Slides Notebook

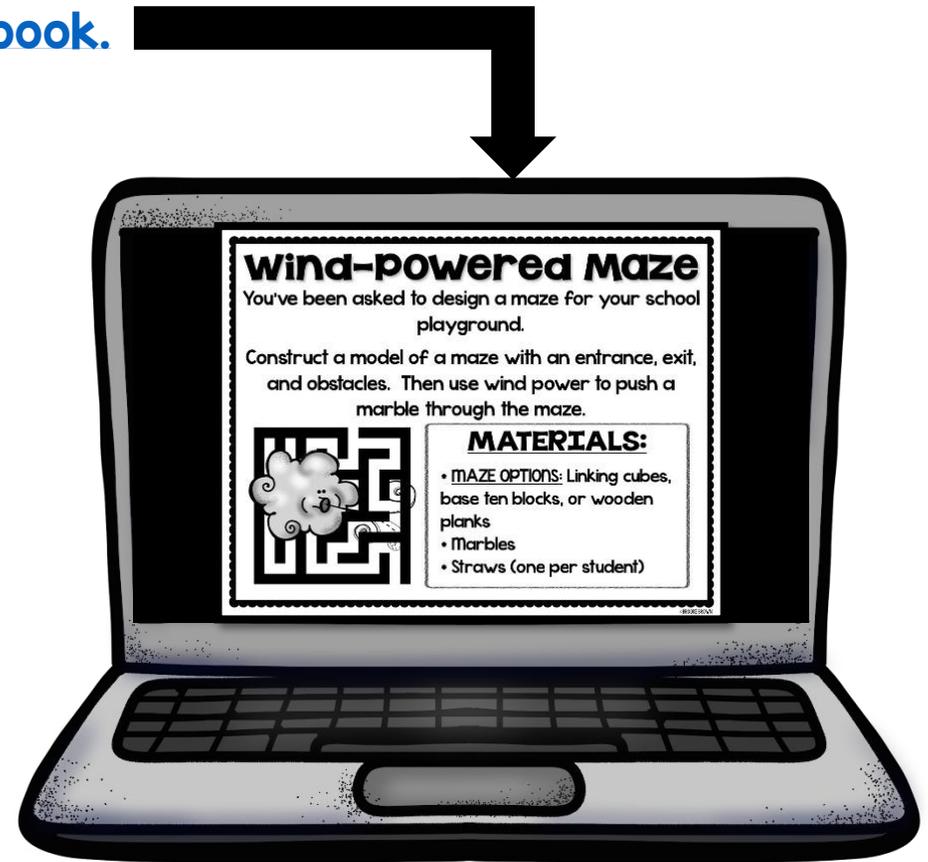
1. Download [Link for the Google Slides Notebook](#).
2. Sign into your Google Account.
3. **MAKE A COPY** of the notebook.

Each student will need their own Google account if they will be working on their own Digital Interactive notebook using Google Slides. If your students will be using iPads, they will also need to download the [Free Google Slides App](#) for the digital notebook to work properly.



Before you and your students begin editing/filling in your digital notebook, it is **VERY** important to first save a copy of the file on your own Google Drive, and then edit the copy. Your students will follow these same steps when you share the file with them.

YOU DO NOT WANT YOUR STUDENTS TO EDIT THE ORIGINAL FILE.



ASK



IMAGINE



**THE
ENGINEERING
DESIGN
PROCESS**

PLAN



CREATE



**REFLECT &
PRESENT**



**TEST &
IMPROVE**



SUPPLIES CHECKLIST

STEM CHALLENGE	ITEM	NUMBER PER GROUP	I HAVE IT
Wind-powered Maze	marbles	1	
	straws	1 per student	
	OPTIONS FOR MAZE CONSTRUCTION: linking cubes, base ten blocks, or wooden planks	large tubs for class to share	

STANDARDS ALIGNMENT

CHALLENGE	ENGINEERING	SCIENCE	MATH
Wind-powered Maze	<p>K-2-ETSI Engineering Design: K-2-ETSI-1, 3-5 ETSI-2, 3-5 ETSI-3</p> <p>3-5-ETSI Engineering Design: 3-5-ETSI-1, 3-5 ETSI-2, 3-5 ETSI-3</p>	<p>K-PS2 Motion and Stability: Forces and interactions</p> <p>3-PS2 Motion and Stability: Forces and Interactions</p> <p>3-ESS2 Earth's Systems</p> <p>4-PS3 Energy</p>	<p>MPI: Make sense of problems and persevere in solving them</p> <p>MP.2: Reason abstractly and quantitatively</p> <p>MP.4: Model with mathematics</p> <p>MP.5: Use appropriate tools strategically</p>

STEM CHALLENGE: Wind-powered Maze

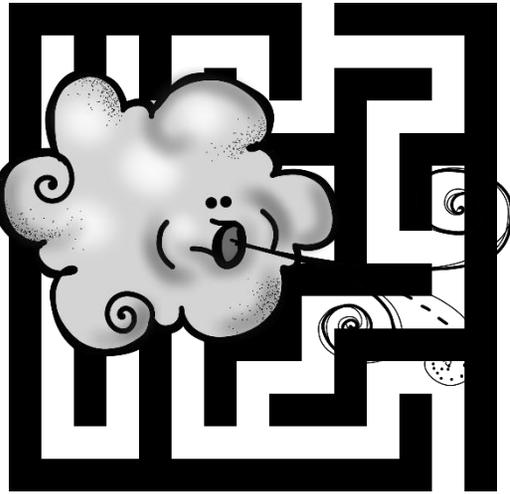
OVERVIEW: For this challenge, students will explore wind power and balanced/unbalanced forces by constructing a marble maze with obstacles. Students will have a variety of materials to choose from for their maze construction. This challenge serves as an excellent cooperative and creative activity for small groups. Some students may choose to make their maze more challenging by adding tricky turns, tunnels, bridges, dead ends, and additional obstacles. After their maze is constructed, students will take turns blowing through straws to push a marble through the maze. They will also rotate to try out other groups' mazes.

KEY SKILLS: Wind Power/Renewable Energy, Pushes/Pulls, Balanced and Unbalanced Forces, Friction, Momentum

SUGGESTED READ ALOUDS: [The Boy Who Harnessed the Wind by William Kamkwamba](#), [Amazing 3D Mazes by Russ Focus](#), [Balanced and Unbalanced Forces by Jenna Winterberg](#)

MATERIALS PER GROUP: marble, 1 straw per student

OPTIONS FOR MAZE CONSTRUCTION: linking cubes, base ten blocks, or wooden planks



LESSON PLAN

1. Activate students' prior knowledge by asking them to share what they already know about mazes. Discuss the different styles of mazes and where they are found in the world. Ask students to share what they already know about wind power and how it is useful.
2. Share and discuss the videos on "Explore Mazes and Wind Power:"
3. Hold a class discussion, using the teacher chart and real world examples to guide student thinking. (You can project the chart on an interactive whiteboard or document camera.) Record their ideas on the teacher chart.
4. Introduce the STEM challenge and permitted materials.
5. Introduce and discuss key vocabulary cards related to the challenge.
6. Have students sketch blueprints of their designs on their recording sheets.
7. Distribute materials and allow students 45-60 minutes to construct their mazes, test them with wind power and marbles, and test other groups' mazes.
8. Hold a whole class closing discussion and reflection, allowing students to share their maze designs. Use the "Let's Reflect" poster to guide the discussion.

Wind-powered Maze

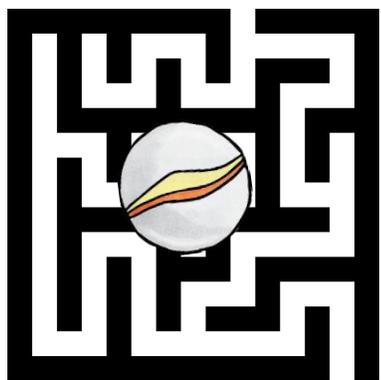
POSSIBLE PRODUCT
(for teacher reference only)



EXPLORE

MAZES & WIND POWER

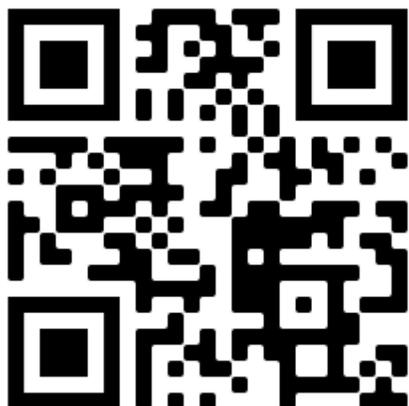
MAZE MAKER



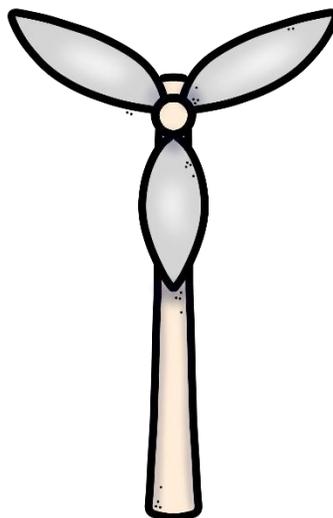
BALANCED & UNBALANCED FORCES



RENEWABLE ENERGY



WIND POWER



Wind-powered Maze

REAL WORLD EXAMPLES



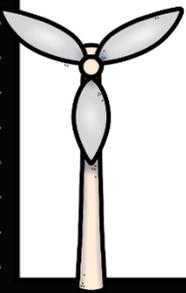
What is similar? What is different?

Types of Wind Power

What Mazes Need

Balanced Forces

Unbalanced Forces



Wind-powered Maze

You've been asked to design a maze for your school playground.

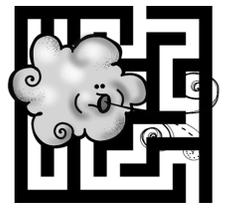
Construct a model of a maze with an entrance, exit, and obstacles. Then use wind power to push a marble through the maze.



MATERIALS:

- * MAZE OPTIONS: Linking cubes, base ten blocks, or wooden planks
- * Marbles
- * Straws (one per student)

WORDS TO KNOW



obstacle



something that
blocks one's
way or hinders
progress

friction

surface resistance to motion



balanced force



equal forces
that cause
no change in
motion

unbalanced force



unequal forces
that cause a
change in motion,
such as speed
or direction



Wind-powered Maze

Name: _____

BLUEPRINT

Label the ENTRANCE, EXIT,
DEAD ENDS, and OBSTACLES

List the OBSTACLES in your maze.

1

2

3

What examples of **BALANCED** force did you observe as your marble moved through the maze?

What examples of **UNBALANCED** force did you observe as your marble moved through the maze?

LET'S REFLECT!



- What was most difficult about this challenge?
- How is wind power used to power things in our world?
- What are some other examples of renewable energy?
- What examples of balanced and unbalanced forces did you observe as you pushed your marble through the maze?
- How did friction affect the movement of your marble?
- How did momentum affect the movement of your marble?
- If we completed this challenge again, what would you do differently next time?

STEM Challenge Assessment Rubric

Challenge: _____

Date: _____

Student Name: _____

3	2	1
Student followed all instructions for challenge.	Student followed some instructions for challenge.	Student did not follow instructions for challenge.
Student used best effort and perseverance on challenge.	Student used some effort and perseverance on challenge.	Student did not show effort or perseverance on challenge.
Student completed assigned blueprint and reflection sheet.	Student partially completed assigned blueprint and reflection sheet.	Student did not complete assigned blueprint and recording sheet.
Student showed accuracy in testing, calculating, and measuring.	Student showed some accuracy in testing, calculating, and measuring.	Student did not show accuracy in testing, calculating, or measuring.
Student fully cooperated with group members and contributed fairly.	Student partially cooperated with group members and contributed fairly.	Student struggled to cooperate with group members and/or failed to contribute.
Student fully participated in class discussions.	Student somewhat participated in class discussions.	Student did not participate in class discussions.

TOTAL POINTS: _____ /18

Comments: _____

STEM Challenge Assessment Rubric

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Date: _____

Student Name: _____

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TOTAL POINTS: _____ /18

Comments: _____

STEAM Challenge Assessment Rubric

Challenge: _____

Date: _____

Student Name: _____

3	2	1
Student followed all instructions for challenge.	Student followed some instructions for challenge.	Student did not follow instructions for challenge.
Student used best effort and perseverance on challenge.	Student used some effort and perseverance on challenge.	Student did not show effort or perseverance on challenge.
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TOTAL POINTS: _____ /18

Comments: _____



We Need **STEM** Supplies!

Dear Families,

We are learning all about Science, Technology, Engineering, and Math through STEM lessons, and we need your help! If you are able to donate any of the following supplies for our STEM Challenges, please detach and return the form below and send back to school with your child. We greatly appreciate your support and generosity!

We are in need of the following items by _____.

Thank you so much for helping to make our STEM lessons possible!
Please contact me at _____ with any questions.

Sincerely,

If you are able to donate, please detach and return the form below:

Parent Name(s): _____

Child's Name: _____

I am able to donate: _____



We Need

STEAM Supplies!



Dear Families,

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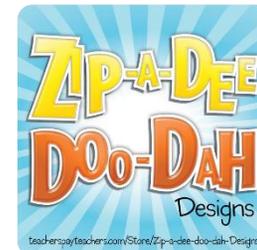
Child's Name: _____

I am able to donate: _____

credits

created by Brooke Brown

Thank you for your purchase!



<http://www.teacherspayteachers.com/Store/Zip-a-dee-doo-dah-Designs>