ACTIVITY SUMMARY

Students will be working as game designers to create an interactive maze game. They must try to make the game playable for blind or sight impaired people. Students will focus on collaboration while working on a maze design with another student. Students will take turns creating each part of the maze then passing off to the next team member. Students must include a simple machine device in their solution(s) and remember: have fun!

Age Range & Grade Level: *Ages 9+, Grade 4+*
Program Connection: *FIRST®* LEGO® League Explore
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ACTIVITY OUTCOMES

Participants will:
1. Research and brainstorm a solution to the problem.
2. Test one or more solutions.
3. Use the Engineering Design Process and track the parts you use most often.

RELEVANCE MATRIX – Subject Area Crosswalks and Core Values Addressed

Science	Math	Literacy	Social Studies	Computer Science
Using observations to test a solution	Measurement, 2D/3D modeling	Research, Content Reading	Career Connections, Engineering for social solutions	Logical Thinking
Discovery	Innovation	Impact	Inclusion	Teamwork

FUN! Our last Core Value should always be used when doing any *FIRST* activities.

KEY VOCABULARY

Engineering   Maze   Blind   Sight Impaired   Simple Machine   Test

MATERIALS & SUPPLIES NEEDED FOR THIS ACTIVITY

Marble Maze design brief, paper, markers and (Optional) assorted materials for building a solution, cardboard, glue, tape, ruler, marble or small ball.

GUIDANCE SET-UP

Description – Action – Guidance	Notes
Provide students with the Marble Maze Design Brief.	
Review the problem statement and criteria/constraints with the students. Remind students they will be using to work towards a solution.	Review the age appropriate engineering design process with your students.
Determine how students will brainstorm the problem and solutions. Give examples of how someone that is blind or visually impaired may complete a task without sight.	Students will practice coding by giving specific directions to complete the marble maze. Ask them to practice giving directions to their teammate while the team member is blindfolded.
Determine how students will complete the activity, what their length of time will be, how to collaborate and how to share their solutions. Have students work on their solutions.	Students must test their solution and show how they solved their problem.
Have students share their solution to the problem they solved and how testing helped to solve the problem.	Ask each student how testing helped to solve the problem?
Explore the *Go Further!* opportunities	See below
Wrap up – Have students complete their core values self-assessment and review.	

STUDENT OR TEAM ACTIONS

1. Review the problem statement and criteria/constraints.
2. Read and talk about the engineering design process steps.
3. Brainstorm what someone who is blind or sight impaired may need to complete the game.
4. Research the questions and discuss.
5. Create a solution to solve the challenge.
6. Share your solution and reflect on your learning.
7. Explore the Go Further! opportunities.
8. Complete your *FIRST* Core Values self-assessment.

GO FURTHER!

Added Feedback – ask other people to play your marble maze to get additional suggestions to improve your idea then make improvements.

Think of other types of simple games that you could create make sure your design continues to be inclusive for people with disabilities.

EVIDENCE OF ACHIEVEMENT

Evaluation Rubric			
Category	**3 points**	**2 points**	**1 point**
Requirements	All requirements on the design brief were met.	Some of the requirements on the design brief were met.	Only a few requirements on the design brief were met.
Design	Clearly showed how the solution would help others.	Showed how the solution would help others.	Not clear how the solution would help others.
Collaboration	Demonstrated collaboration by sharing information or working with team members.	Shared some information or with team members.	Respect and inclusion being developed.
Knowledge Gained	All the questions are answered completely.	All the questions are answered but could have more detail.	The questions are not answered.

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www.firstinspires.org

PROBLEM STATEMENT

If you have played any type of game, you know how much fun it can be, but have you ever thought about how that game was created or designed? In this activity you will be working as game designers to create an interactive maze game. As game designers you must try to make the game playable for blind or sight impaired people. Collaborate on the maze design with another student by creating each part of the maze then passing off to the next team member. You must include a simple machine and remember to have fun!

CRITERIA & CONSTRAINTS

1. The maze base/bottom must be constructed with a flat structure.
2. The maze must be used by holding the maze to roll the marble.
3. The marble will begin at the start and may not be touched by the player during its journey.
4. The starting point and ending point must be clearly marked.
5. The marble may not jump over any walls.
6. Instructions for completing the maze must be clearly explained.
7. Time will begin when the marble starts rolling and ends when the marble passes the ending point.
8. If the marble stops moving, the run ends immediately with no score.

ENGINEERING DESIGN PROCESS & *FIRST®* CORE VALUES

Explore *FIRST* Core Values

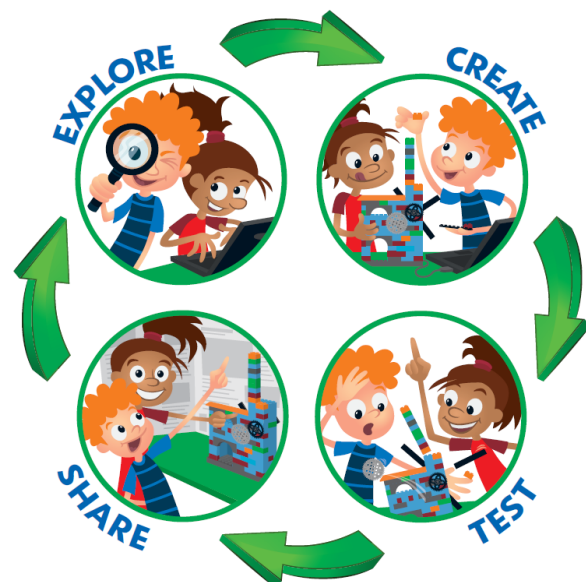**Engineering Design Process**

Explore – The problem

Create – Solutions to the problem

Test – Find ways to test your solutions

Share – Communication what you learned

BUILDING THE BACKGROUND & BRAINSTORMING
Start **EXPLORING** your engineering journey here

Brainstorm ways that someone that is blind or visually impaired gets around safely.
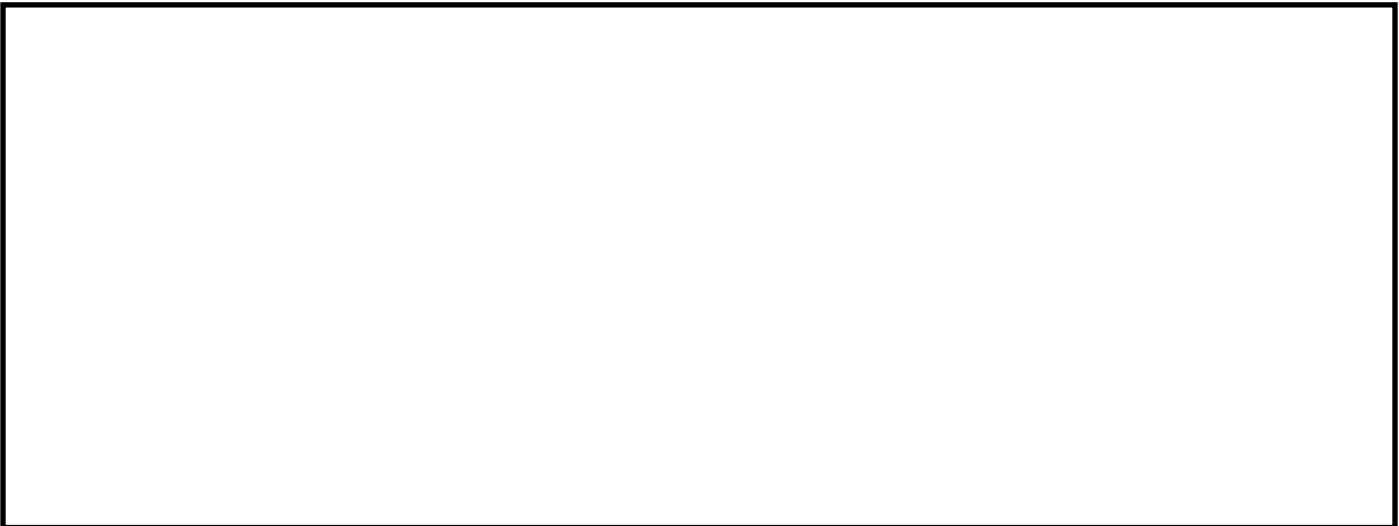How will you direct a person through a maze without using sight?
What modifications will you need to make a game for someone that is blind or sight impaired?

What parts of the engineering design process will you need to use?

SKETCH YOUR DESIGN
Generate a sketch of your maze design.   Include how the device will look, the dimensions (size), materials used, and other important information about the design. Once you have sketched your design pass it to a team member. The team member will improve upon your sketch to complete the design.

Design Solution 1

Design Solution 2

Design Problem

Using the systems model, design and construct a Maze. The goal of your design and construction will be for the maze passenger (marble) to travel the longest time during one complete run.

Describe how Design 1 was modified to Design 2 to improve the Maze.

Did your new Design 2 work better or worse than your first Design?
Explain why.

REFLECTION QUESTIONS

1. How did you try to test and solve the problem?

2. How did the engineering design process help you think about testing your solution?

GO FURTHER!

Added Feedback – ask other people to play your marble maze to get additional suggestions to improve your idea then make improvements.

Think of other types of simple games that you could create make sure your design continues to be inclusive for people with disabilities.

CORE VALUES SELF-REFLECTION

	Amazing Skill	Great Job	Making Progress	Could Be Better
Discover	I approached the tasks looking for all possible answers independently and used perseverance to discover the answer on my own.	I approached the tasks and asked questions from one other person but persevered to discover the answer on my own.	I approached tasks but needed assistance multiple times to reach a point of discovery.	I depended on others to make the discovery for me.
Innovation	I used creativity and perseverance to solve problems on my own, coming up with unique solutions for the tasks I was given.	I used creativity and perseverance to solve problems on my own coming up with different solutions for the tasks I was given.	I used creativity but struggled with perseverance to solve problems on my own.	I struggled with being creative and only used the information given and needed a lot of encouragement from others to complete the task.
Impact	I approached the tasks applying understanding of the information with the impact it can have on me and my future as well as how I could help others.	I approached the tasks knowing and applying the information with impact it can have on me and my future.	I understand the tasks but struggle to apply how it will help me in my future or to influence others.	I understand the tasks but did not approach it with understanding the impact it can have on my future or others.
Inclusion	I approached all tasks with inclusion of others' ideas, I showed tremendous kindness by including others' views in my projects and work. I approached my solution thinking how all people would interact with the solution.	I approached most with inclusion of others' ideas, I tried to understand others' views and include them in my projects and work. My solution mostly incorporates needs of others.	I approached some tasks with inclusion of others' ideas, I tried to understand others' views and include them in my projects and work. My solution meets only a few needs of others.	I did not approach tasks with inclusion of others' ideas, I tried to understand others' views and include them in my projects and work. My solution is not inclusive of different types of people.
Teamwork	I used collaboration, communication and project management to get all tasks accomplished for myself as well as the others.	I used collaboration, communication and project management to get most tasks accomplished for myself as well as the others.	I used collaboration, communication and project management to get some tasks accomplished for myself as well as the others.	I only sometimes used collaboration, communication and project management and accomplished a few tasks for myself as well as the others.
Fun	I kept a positive attitude throughout and found opportunities to have fun even through struggle. I looked for additional opportunities to have fun in my tasks.	I kept a positive attitude throughout and found opportunities to have fun even through struggle.	I saw the enjoyment and fun after the activity but struggled to see it during.	I only saw struggle in completing my tasks and did not look for times to have fun.