FIRST® at Home
Stable Tower

ACTIVITY SUMMARY

Students will use a variety of skills and *FIRST* Core Values, while building a tower to help Andrea create a new building in her town. Students can use LEGO® bricks, blocks, boxes, or other toys and found materials.

Age Range & Grade Level: *Ages 4-6, Grades Pre-K through 1st*

Program Connection: *FIRST*® LEGO® League Discover

Authored By: Kathy Morgan, Project Manager *FIRST*® LEGO® League

ACTIVITY OUTCOMES

Participants will:

1. Sketch designs of towers
2. Construct towers for different purposes
3. Explore concepts learned and share what they discovered about their design

RELEVANCE MATRIX – Subject Area Crosswalks and Core Values Addressed

Science	Math	Literacy	Social Studies	Technology Literacy
Motion, Stability, Forces	Counting, Geometry	Reading Foundational Skill, Speaking & Listening	N/A	Engineering Design Design Thinking
Discovery	**Innovation**	**Impact**	**Inclusion**	**Teamwork**

FUN! Our last core value should always be used when doing any *FIRST* activities.

Explore *FIRST* Core Values

KEY VOCABULARY

Height Balance Stable Gravity

MATERIALS & SUPPLIES NEEDED FOR THIS ACTIVITY

- At least 12 similar-sized blocks or boxes, preferably rectangular instead of cubes. For example, LEGO DUPLO 2x4 bricks. (Number of blocks does not matter)
- (Optional) measuring tape

GUIDANCE SET-UP

Description – Action – Guidance	Notes
Provide students with the student Design Brief. Share FIRST core values with students, ask them to think about using these during the activity. Explore *FIRST* Core Values	The design brief document is for the students and is the document after this lesson plan. Encourage students to plan and draw a design before building their tower. Use the design brief to reflect on the learning.
Set out the blocks for the student to use	
Review the problem statement and criteria/constraints with the students. Remind students they will be using the engineering design process to work towards a solution. **Criteria / Constraints:** • Tower should be free-standing (not held up by hands or propped up by any other objects) Blocks cannot be "clicked" or stuck together (such as when using LEGO bricks). The must freely separate when one is picked up.	Review the age appropriate engineering design process with your students.
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.	Sharing can take place virtually by showing video or pictures of the towers built.
Determine how (or if) the activity will be graded, such as with the student design brief or evaluation of the tower itself.	Questions for Reflection: How many ways can they think of to stack the blocks to build a tower? Which way is most stable? Tallest? Use the measuring tape to measure the height of each tower and compare to determine the tallest.
Explore the *Go Further!* opportunities	See below
Wrap up – Have students complete their self- reflection and review.	Core Values self-reflection is found in the student Design Brief document.

STUDENT OR TEAM ACTIONS

1. Review the student design brief, problem statement and criteria/constraints.
2. Students complete the design brief by drawing sketches.
3. Students set out their blocks separately, in any order.
4. Students build towers.
5. *Optional* - Explore the Go Further! opportunities.
6. Students share their solution and reflect on their learning by explaining what they did to a teacher, friend, or family member.
7. Students complete their self-reflection.

GO FURTHER!

- Try changing hands or using only one hand.
- Team up with a family member to combine all their blocks to build a single tower.
- Add additional blocks and see how tall a tower they can build.

FIRST®

FIRST® at Home

Stable Tower

PROBLEM STATEMENT

This is Andrea and she needs to create a new tower for her town. She needs a tower that is tall but stable. It must not fall easily.

Make three different towers and share your designs and builds.

SKETCH YOUR DESIGN

Draw how you will stack your blocks in a TALL tower.

How many blocks can you stack into a tower?

Draw how you will stack your blocks in a SHORT tower.

Draw how you will stack your blocks in a STABLE tower.

Will your tower fall easy?

CORE VALUES SELF-REFLECTION

Questions for reflection

1. Which tower is your favorite design?

2. What is the best thing about your favorite design?

3. Which tower design will you share with Andrea?

Circle or color the face that matches your feeling for this activity

	Amazing Skill	Great Job	Making Progress
I helped myself learn.			
I followed instructions.			
I had fun during this activity.			

FIRST® at Home
Treasure Hunt

ACTIVITY SUMMARY

Practice pre-coding skills by writing and following step-by-step instructions using directions on blocks.

Age Range & Grade Level: *Ages 4-6, Grades Pre-K through 1st*

Program Connection: *FIRST*® LEGO® League Discover

Authored By: Kathy Morgan, Project Manager, *FIRST*® LEGO® League

ACTIVITY OUTCOMES

Participants will:

1. Create a code using symbols and words.
2. Test the code with a partner by reading aloud or showing the partner the code symbols.
3. Reflect on how the symbols created specific movements to achieve the goal.

RELEVANCE MATRIX – Subject Area Crosswalks and Core Values Addressed

Science	Math	Literacy	Social Studies	Computer Science
Sketching, Ask Questions, Analyze Data	Shapes and Logical Thinking	Writing and Reading Aloud	N/A	Pre-Coding Syntax Development
Discovery	Innovation	Impact	Inclusion	Teamwork

FUN! Our last core value should always be used when doing any *FIRST*® activities.

KEY VOCABULARY

Right
Left
Coding
Symbols
Obstacles

MATERIALS & SUPPLIES NEEDED FOR THIS ACTIVITY

Treasure Hunt Design Brief, (Optional) Printed symbol cards, obstacles to represent the tree and treasure.

GUIDANCE SET-UP

Description – Action – Guidance	Notes
Prepare the activity ahead of time to determine the obstacles and if printing the direction cards and cut them out. Students may assist with cutting out cards.	Tape the cards to blocks, boxes, or other physical items to serve as physical manipulative's. Pick a designated starting spot on the floor and mark it with tape.
Provide students with the student Design Brief. Read aloud the problem statement.	The design brief document is for the students and is in a separate link.
Show students the location of the treasure and point out where the obstacles are located.	If being done virtually provide examples to set up at home.
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.	
Determine how (or if) the activity will be assessed, such as with the student design brief or evaluation of the student completion of the activity.	
Explore the *Go Further!* opportunities	See below
Wrap up – Have students complete their self- reflection and review.	Core Values self-assessment is found in the student Design Brief document.

STUDENT OR TEAM ACTIONS

1. Review the student design brief, problem statement and criteria/constraints.
2. Begin by discussing each symbol and what it means:
3. Start the designated starting spot and have the student follow the directions.
4. Take turns between writing and following if you have multiple students or between the adult and the student.
5. Go to the next code and add steps.
6. Once all three pieces of code are written, test out the code and see if you capture the treasure.
7. Optional - Explore the Go Further! opportunities.
8. Students share their solution and reflect on their learning by explaining what they did to a teacher, friend, or family member.
9. Students complete their self-reflection.

GO FURTHER!

Make some new symbols and words and try to get to the treasure faster.

Move the treasure to a new location with different obstacles and make a new code.

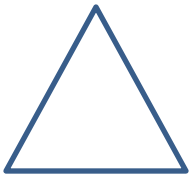
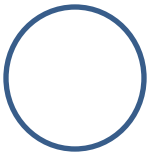
Or take it digital and use Hour of Code Prereader activities

FIRST® at Home
Treasure Hunt
Design Brief

PROBLEM STATEMENT

Andrea was on an adventure with her friend Rok, when they spotted something that looked like a sparkling treasure! The only way to get to the treasure is by Andrea and Rok making a step-by-step coded plan to get there. Watch out! There is a tree on the path, and you need to make some noise to scare off critters that are guarding the treasure. Use the steps below to help Andrea and Rok get to the treasure and return safely.

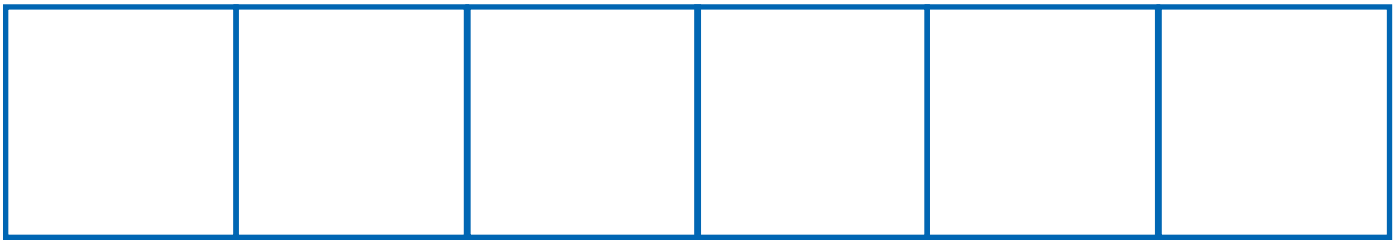
Use the symbols or words below in the boxes to code a path to the treasure.

Walk Forward 	**Turn** 	**Hop** 
Clap 	**Pick Up** 	**Walk Backward** 

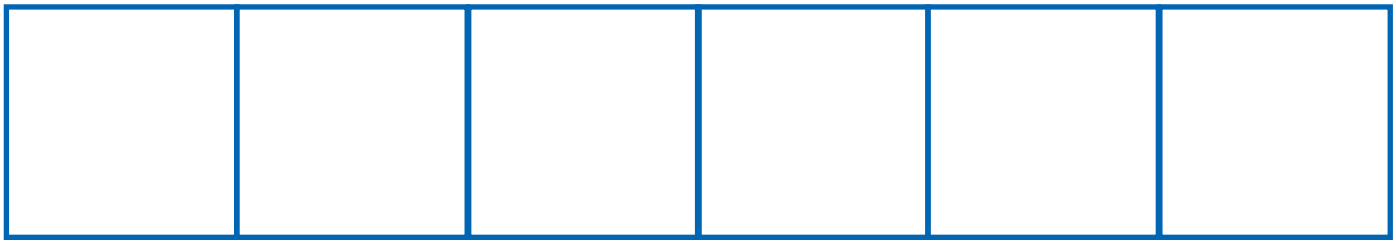
SKETCH YOUR DESIGN

Code 1: Get to the treasure

Code 2: Pick up the treasure



Code 3: Return with the treasure



Test your idea

With a partner or family member read your programs to see if you can collect the treasure

Questions for reflection

1. What symbols helped you get through the tree obstacle?

2. What part of your code worked the best?

3. Could you get the treasure and return without walking backward?

GO FURTHER!

Make some new symbols and words and try to get to the treasure faster.

Move the treasure to a new location with different obstacles and make a new code.

CORE VALUES SELF-REFLECTION

Circle or color the face that matches your feeling for this activity

	Amazing Skill	Great Job	Making Progress
I helped myself learn.			
I followed instructions.			
I had fun during this activity.			

FIRST® at Home
Design & Build
Design Brief

PROBLEM STATEMENT

Hi! I'm Rok and I like to design things. I share my designs with my friends who like to build them.

Pick one of these objects to design – Circle your choice

House Rocket Animal

Draw your design so someone else can build it. How can you build this with your materials?

Build your own design or trade with a friend or family member. Ask them to build your design while you build theirs!

SKETCH YOUR DESIGN

CORE VALUES SELF-REFLECTION

Questions for reflection

1. How did you decide what to build? What did you put in your design so someone else could follow your picture?

2. Did you know what to build following the design?

3. Which design will you share with Rok so his friends can build it?

Circle or color the face that matches your feeling for this activity

	Amazing Skill	Great Job	Making Progress
I helped myself learn.			
I followed instructions.			
I had fun during this activity.			

FIRST® at Home
Roll with It!

ACTIVITY SUMMARY

Students will use a variety of skills and *FIRST*® Core Values to design and test wheels made from readily available materials.

Age Range & Grade Level: *Ages 4-6, Grades Pre-K through 1st*

Program Connection: *FIRST*® LEGO® League Discover

Authored By: Kathy Morgan, Project Manager, *FIRST*® LEGO® League

Inspired By: Heidi Mendenhall, WestEd Center for Child and Family Studies, NAEYC session presentation at 2019 conference

ACTIVITY OUTCOMES

Participants will:

1. Sketch designs of wheels
2. Design their own wheel and test it
3. Explore concepts learned and share what they discovered about their design

RELEVANCE MATRIX – Subject Area Crosswalks and Core Values Addressed

Science	Math	Literacy	Social Studies	Technology Literacy
Sketching, Ask Questions, Motion, Forces	Shapes	Writing and Reading Aloud, Speaking, Following Instructions	N/A	Engineering Design Design Thinking
Discovery	**Innovation**	**Impact**	**Inclusion**	**Teamwork**

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

ENGINEERING DESIGN PROCESS & *FIRST*® CORE VALUES

FIRST Engineering Design Process | Explore *FIRST* Core Values

KEY VOCABULARY

Simple Machine	Wheel	Axle	Inclined Plane	Ramp
Gravity	Motion			

MATERIALS & SUPPLIES NEEDED FOR THIS ACTIVITY

- Round materials for wheels (paper plates, cups, lids, CD's cardboard, etc.)
- Long materials for axles (straws, pencils, dowel rods, pipe cleaners, etc). Other readily available materials for wheels and axles may be added if you choose.
- Tape and age-appropriate scissors
- A board, cardboard, folding table, small or long rug, or book for the ramp
- Blocks, books, a chair or other materials to hold up the ramp. Blocks or books will allow students to change the slope of the ramp during the activity.

GUIDANCE SET-UP

Description – Action – Guidance	Notes
Provide students with the student Design Brief. Share *FIRST* core values with students, ask them to think about using these during the activity. Explore *FIRST* Core Values	
Introduce students to simple machines and how wheels work. Choose the materials to be used for the activity based on what is available on-hand. Providing a variety of wheel and axle material will allow a more in-depth investigation. Set out the materials for the students to use.	Simple machines this video from PBS and how wheels work with this video from Sid the Science Kid. You may also want to watch this video to introduce where wheels are found.
Review the problem statement and criteria/constraints with the students. Remind students they will be using the engineering design process to work towards a solution. **Criteria / Constraints:** Wheels may be created only with the materials provided for the activity.	Review the age appropriate engineering design process with your students. Review safety procedures with students – what should they do if they need a hole in their wheel?
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.	Sharing can take place virtually by showing video or pictures of the designs built.
Determine how (or if) the activity will be graded, such as with the student design brief or evaluation of the built design itself.	Questions for Reflection: What would you do differently to get your wheel to go further? Which of the wheels you tried work the best? Why do you think that design worked best?
Explore the *Go Further!* opportunities	See below
Wrap up – Have students complete their self- reflection and review.	Core Values self-reflection is found in the student Design Brief document.

STUDENT OR TEAM ACTIONS

1. Learn about simple machines by watching this video from PBS and how wheels work with this video from Sid the Science Kid. You may also want to watch this video to introduce where wheels are found.
2. Review the student design brief, problem statement and criteria/constraints.
3. Complete the design brief by drawing wheel designs.
4. Build and test wheels.
5. *Optional* - Explore the Go Further! opportunities.
6. Share your solution and reflect on what you learned
7. Complete self-reflection.

GO FURTHER!

- Change the ramp – increase or decrease the slope and test the wheels again. Do they go the same distance as before?
- Try more wheel designs to see if you can get the wheels to go further.
- Try the tests again. Measure the distance each wheel went. Write down the distances and make a chart or graph to compare them.
- Learn move about wheels, simple machines or take a virtual field trip
- Play Simple Machines Simon Says. After watching the videos above, have the students create a motion to represent each of the six simple machines. Choose who is going to be Simon first. Simon says, "Simon says" and calls out a simple machine. The students do the motion for that machine. Students should not do the motion without Simon saying, "Simon says." Those who do the motion without "Simon says" are out. When only one student is left, that student wins and becomes Simon for the next round.

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.

FIRST® at Home

Roll with It!

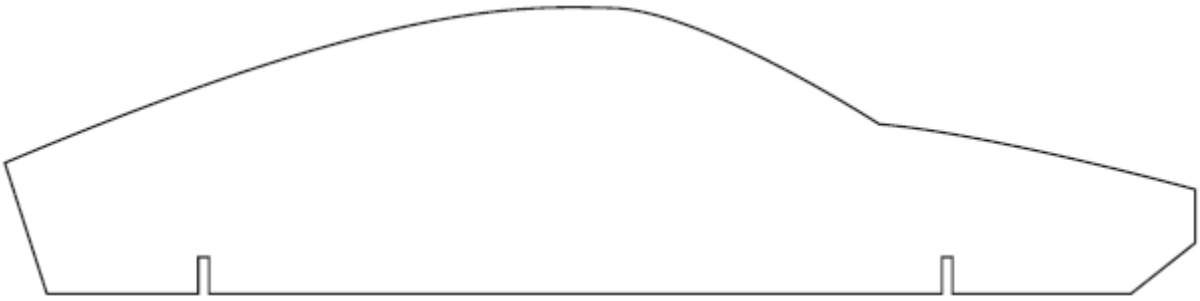
Design Brief

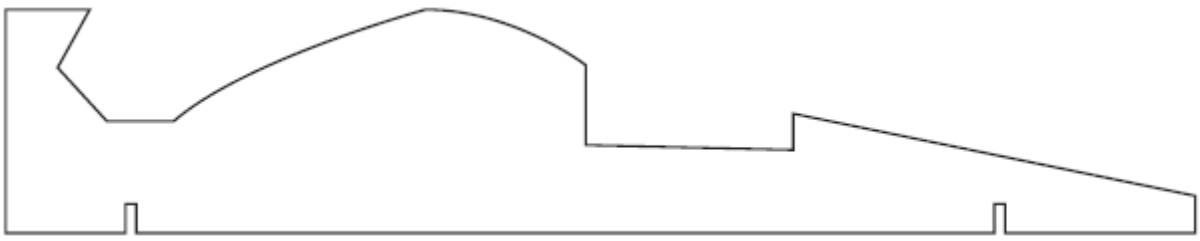
PROBLEM STATEMENT

Andrea's town is getting ready for their box car derby race. This is a race with small cars designed to roll down a hill. Andrea needs your help finding a good wheel design. How should she design the wheels?

SKETCH YOUR DESIGN

Draw designs for at least TWO (2) types of wheels you want to build out of your materials. Then draw an arrow to label the axle.





CORE VALUES SELF-REFLECTION

Questions for reflection

1. How did you decide on your wheel designs?

2. Which wheel worked the best? Why?

3. What would you do differently to get your wheels to roll further?

Circle or color the face that matches your feeling for this activity

	Amazing Skill	Great Job	Making Progress
I helped myself learn.			
I followed instructions.			
I had fun during this activity.			

FIRST® at Home
Paper Engineering

ACTIVITY SUMMARY

Students will use a variety of skills and *FIRST*® Core Values to design and build towers made from ordinary paper.

Age Range & Grade Level: *Ages 4-6, Grades Pre-K through 1st*

Program Connection: *FIRST*® LEGO® League Discover

Authored By: Kathy Morgan, Project Manager *FIRST*® LEGO® League

Inspired By: "STEM Activities for Kids: How strong is a piece of paper?," Creekside Learning

ACTIVITY OUTCOMES

Participants will:

1. Sketch designs of towers
2. Build and test their tower designs
3. Explore concepts learned and share what they discovered about their design

RELEVANCE MATRIX – Subject Area Crosswalks and Core Values Addressed

Science	Math	Literacy	Social Studies	Technology Literacy
Sketching, Ask Questions, Motion, Forces, Weight	Shapes	Writing and Reading Aloud, Speaking, Following Instructions	Cultural Representation in Structures	Engineering Design Design Thinking
Discovery	**Innovation**	**Impact**	**Inclusion**	**Teamwork**

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

ENGINEERING DESIGN PROCESS & *FIRST* CORE VALUES

FIRST Engineering Design Process | Explore *FIRST* Core Values

KEY VOCABULARY

Circle	Triangle	Rectangle	Square	Weight
Engineering	Strength	Gravity	Support	Collapse

MATERIALS & SUPPLIES NEEDED FOR THIS ACTIVITY

- Paper. The activity is designed with ordinary copy paper in mind, but newspaper or other types of paper could be substituted if copy paper is not available.
- Tape
- Books or other weights to test the towers

GUIDANCE SET-UP

Description – Action – Guidance	Notes
Provide students with the student Design Brief. Share *FIRST* core values with students, ask them to think about using these during the activity. Explore *FIRST* Core Values	Use the design brief to reflect on the learning.
Set out the materials for the students to use.	
Review the problem statement and criteria/constraints with the students. Discuss possible shapes for the tower columns and ask the students to make a hypothesis about which one will be strongest. Remind students they will be using the engineering design process to work towards a solution. **Criteria / Constraints:** • Paper must be folded or rolled into vertical columns (shape of column to be determined by student. • Only enough tape should be used to hold the columns together, so that the activity is testing the strength of the paper, not the tape.	Review the age appropriate engineering design process with your students. Encourage testing of many designs before choosing a on the final design. Some students may need to work in pairs to construct towers, with one holding the paper and the other the tape. Towers may be stronger by overlapping a small section of the paper instead of taping edge to edge.
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.	Sharing can take place virtually by showing video or pictures of the designs built. Limit the number of pieces of paper to be used in final designs to 10. Adjust the limit based on your time or materials available or student abilities.
Determine how (or if) the activity will be graded, such as with the student design brief or evaluation of the built design itself.	Questions for Reflection: How did you decide on your tower design? Which shapes worked best? Why? What would you do differently to get your tower to be stronger?
Explore the *Go Further!* opportunities	See below
Wrap up – Have students complete their self- reflection and review.	Core Values self-reflection is found in the student Design Brief document.

STUDENT OR TEAM ACTIONS

1. Discuss possible shapes for columns (square / circle / triangle / others).
2. Review the student design brief, problem statement, criteria/constraints, and testing procedures.
3. Begin by testing single columns in various sizes. Pile weights on each column until it collapses. Record the shape of the column and how many weights could hold.
4. Complete the design brief by drawing tower designs.
5. Provide the materials for the final tower design. Build a strong tower. Test it by gently setting weights on the tower until it collapses. Record the number of weights.
6. Optional - Explore the Go Further! opportunities.
7. Share your solution and reflect on what you learned
8. Complete self-reflection.

GO FURTHER!

- Try again! Can you change the design of your tower so it will hold even more weights?
- Buildup – Design a tall tower that will hold at least one weight.
- Apply your new knowledge about paper strength to make a chair out of newspaper that you can sit in for at least 1 minute without it collapsing.

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.

FIRST® at Home
Paper Engineering
Design Brief

PROBLEM STATEMENT

Rok and his friend Christopher have decided to challenge each other to see who can build the STRONGEST tower out of just paper. Christopher made a tower that held almost 20 books! Can you help Rok design his tower?

SKETCH YOUR DESIGN

Draw ideas for different column shapes of the tower, then write the number of weights you think each column shape could hold.

□ ○ △

BUILD AND TEST A PROTOTYPE

Build each or your design ideas and observe which shape was the strongest.

BUILD AND TEST A FINAL SOLUTION

What shape will you use in your tower design?
Draw how you will build a STRONG tower.

How many weights did your tower hold? _____

Questions for reflection

1. How did you decide on your tower design?

2. Which shapes worked best? Why?

3. What would you do differently to get your tower to be stronger?

CORE VALUES SELF-REFLECTION

Circle or color the face that matches your feeling for this activity

	Amazing Skill	Great Job	Making Progress
I helped myself learn.			
I followed instructions.			
I had fun during this activity.			

FIRST® at Home
Make a Maze

ACTIVITY SUMMARY

Students will use a variety of skills and *FIRST*® Core Values to design and build a maze game.

Age Range & Grade Level: *Ages 4-6, Grades Pre-K through 1st*

Program Connection: *FIRST*® LEGO® League Discover

Authored By: Kathy Morgan, Project Manager *FIRST*® LEGO® League

Inspired By: LEGO® Education and the YouTube videos listed in the Notes section

ACTIVITY OUTCOMES

Participants will:

1. Sketch a design of a maze
2. Build and try out their maze
3. Explore concepts learned and share what they discovered about their design

RELEVANCE MATRIX – Subject Area Crosswalks and Core Values Addressed

Science	Math	Literacy	Social Studies	Technology Literacy
Sketching, Ask Questions, Motion, Forces, Simple Machines	Shapes	Writing and Reading Aloud, Speaking, Following Instructions	N/A	Engineering Design Design Thinking
Discovery	**Innovation**	**Impact**	**Inclusion**	**Teamwork**

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

ENGINEERING DESIGN PROCESS & *FIRST* CORE VALUES

FIRST Engineering Design Process | Explore *FIRST* Core Values

KEY VOCABULARY

Maze Start Finish Rules Edge

MATERIALS & SUPPLIES NEEDED FOR THIS ACTIVITY

- A base for the maze. Use a LEGO or DUPLO base plate if LEGO or DUPLO is being used to create the maze. A shallow cardboard box works well for all other materials, but a flat piece of cardboard, cardstock, tabletop, or any other sturdy surface will also work.
- Materials for the maze. Choose materials based on what is available to you, such as LEGO or DUPLO, corrugated cardboard, straws, cardboard tubes, magnetic tiles. Students may help select the material.
- Marble, ball, pom-pom or another small round object to navigate the maze.
- Tape and age-appropriate scissors if needed, based on the chosen material.

GUIDANCE SET-UP

Description – Action – Guidance	Notes
Provide students with the student Design Brief. Share *FIRST* Core Values with students, ask them to think about using these during the activity. Explore *FIRST* Core Values	
Set out the materials for the students to use.	

Review the problem statement and criteria/constraints with the students. Remind students they will be using the engineering design process to work towards a solution.
 	
Criteria / Constraints:
• Design with a partner
• Include instructions for the maze
• Use a simple machine in your design
• Use Strong Shapes
• Maze should have at least one designated start and finish
• Students can design additional constraints (rules) for completing the maze. Ask guiding questions:
  ○ How will the ball start in the maze?
  ○ How will the ball move through the maze?
  ○ What does the ball have to do on the way to the finish?
	Review the age appropriate engineering design process with your students.
	
	Encourage students to come up with their own original ideas. If students are stuck or need some inspiration to get started, watch a few videos for ideas:
	• LEGO Maze
	• Maze with Straws
	• Maze with cardboard and cardstock
	• Maze with magnetic tiles on a cookie sheet
	• Maze with cardboard tubes
	• Maze with playdough

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.	Sharing can take place virtually by showing video or pictures of the designs built. If multiple students are completing the activity in the same location, trade mazes and complete them.
Determine how (or if) the activity will be graded, such as with the student design brief or evaluation of the maze itself.	Questions for Reflection: How did you decide on your maze design? What rules did you make for your maze? Was your maze easy or hard? Why? What would you do differently if you made another maze?
Explore the *Go Further!* opportunities	See below
Wrap up – Have students complete their self- reflection and review.	Core Values self-reflection is found in the student Design Brief document.

STUDENT OR TEAM ACTIONS

1. Review the student design brief, problem statement, and criteria/constraints.
2. Complete the design brief by drawing a maze design.
3. Provide the materials for the maze. Students build their mazes.
4. *Optional* - Explore the Go Further! opportunities.
5. Share your solution and reflect on what you learned
6. Complete self-reflection.

GO FURTHER!

- Try again! Can you change the design of your maze to make it easier? Harder?
- Change materials – can you build a maze with another type of materials?
- Go vertical – add height and ramps to create a maze that your ball can complete by rolling.

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.

FIRST® at Home
Make a Maze
Design Brief

PROBLEM STATEMENT

Andrea loves to do mazes. Can you make a maze for her? Try to incorporate the following concepts in your maze or design process:

- Design with a partner
- Include instructions for the maze
- Use a simple machine in your design
- Use Strong Shapes

SKETCH YOUR DESIGN

Draw the design of your maze. Use the large box below to show the edge of your maze. Label the Start with an "S" and the finish with an "F."

CORE VALUES SELF-REFLECTION

Questions for reflection

1. How did you decide on your maze design? What rules did you make for your maze?

2. Was your maze easy or hard? Why?

3. What would you do differently if you made another maze?

Circle or color the face that matches your feeling for this activity

	Amazing Skill	Great Job	Making Progress
I helped myself learn.			
I followed instructions.			
I had fun during this activity.			

FIRST® *at* Home
Direction Designer

ACTIVITY SUMMARY

Students will use a variety of skills and *FIRST*® Core Values to communicate and build a simple model.

Age Range & Grade Level: *Ages 4-6, Grades Pre-K through 1st*

Program Connection: *FIRST*® LEGO® League Discover

Authored By: Kathy Morgan, Project Manager *FIRST*® LEGO® League

Inspired By: LEGO Foundation Six Bricks activities "Blind Build" and "Communication House"

ACTIVITY OUTCOMES

Participants will:

1. Use observation and communication skills to give instructions to a partner
2. Build a model based on instructions from a partner
3. Explore concepts learned and share what they discovered about the building process

RELEVANCE MATRIX – Subject Area Crosswalks and Core Values Addressed

Science	Math	Literacy	Social Studies	Technology Literacy
Sketching, Ask Questions, Motion, Forces	Shapes	Writing and Reading Aloud, Speaking, Following Instructions	N/A	Engineering Design Design Thinking
Discovery	**Innovation**	**Impact**	**Inclusion**	**Teamwork**

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

ENGINEERING DESIGN PROCESS & *FIRST*® CORE VALUES

FIRST Engineering Design Process | Explore *FIRST* Core Values

KEY VOCABULARY

Memory Communicate Tricks

MATERIALS & SUPPLIES NEEDED FOR THIS ACTIVITY

- Two sets of boxes, blocks, other building or constructing toys, or other building material. Each set should have identical items. About 10-12 items or elements per set are recommended (for example, two sets of 12 LEGO DUPLO bricks).
- A box or piece of fabric like a bandana to cover the build.
- (Optional) Blindfolds or bandanas to cover students' eyes.

GUIDANCE SET-UP

Description – Action – Guidance	Notes
Provide students with the student Design Brief. Share *FIRST* Core Values with students, ask them to think about using these during the activity. Explore *FIRST* Core Values	**Use the design brief to reflect on the learning.**
Build a simple model with one set of materials. You may put the model in another room or cover it with the box or fabric. Provide the other set of materials for the students to use.	This activity is designed to be done in pairs of students. If you are doing the activity with a single student, you may need to fill in as the student's partner.
Review the problem statement and criteria/constraints with the students. Remind students they will be using the engineering design process to work towards a solution. **Criteria / Constraints:** • The student who views the model cannot touch the materials. • The student who builds the model cannot see the example model.	Review the age appropriate engineering design process with your students. If the model is in another room, one student can go to that room to view it. If it's covered by fabric, lift the fabric so the student viewer can see the model but it is blocked from the view of the builder.
Determine how students will complete the activity, what their length of time will be, how to collaborate and how to share what they did. Have students complete the activity.	Sharing can take place virtually by showing video or pictures of the designs built.
Determine how (or if) the activity will be graded, such as with the student design brief or evaluation of communication during the activity.	Questions for Reflection: What was easy or difficult about remembering the model? What "tricks" did you use to remember? How did your partner do in giving instructions? What would you do better if you do the activity again?
Explore the *Go Further!* opportunities	See below
Wrap up – Have students complete their self- reflection and review.	Core Values self-reflection is found in the student Design Brief document.

STUDENT OR TEAM ACTIONS

1. Review the student design brief, problem statement, and criteria/constraints.
2. Provide the materials.
3. Determine which student will be the "viewer" and which will be the "builder."
4. The viewer has a short time to view the model while keeping it out of view of the builder. Viewers can make notes or drawings on their design brief to help them remember.
5. The viewer returns to the builder and gives instructions on how to build the model. Viewers may return for another look as many times as needed.
6. Compare models – what was the same? Different?
7. Switch roles and repeat the activity
8. *Optional* - Explore the Go Further! opportunities.
9. Share and reflect on what you learned
10. Complete self-reflection.

GO FURTHER!

- Try again!
  - Do the activity again with a different model.
  - If you're ready for a bigger challenge, add more materials.
  - Make it a race – which group can build the model correctly first?
  - Set a limit to the number of times the model can be viewed.
  - Do the activity again but without the design brief to make notes.
  - This time, both partners can look and build, but once they start building, they may not speak or check the example model.
- Blind build – One child in the pair closes eyes or is blindfolded while the other builds a simple model. The child who is "blind" feels the model to figure out how it was built. After handing it back, the model is hidden. The child who is blind can now see and builds the model. (Color is not important). Switch roles and do the activity again.

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.

FIRST® *at* Home
Direction Designer
Design Brief

PROBLEM STATEMENT

What would Rok need to know to be able to build the model?

SKETCH YOUR DESIGN

Use this space to make notes about the model. You could draw the design, write or draw colors, or anything else that will help you give directions to your partner.

CORE VALUES SELF-REFLECTION

Questions for reflection

1. What was easy or difficult about remembering the model? What "tricks" did you use to help you remember?

2. How did your partner do in giving instructions?

3. What would you do better if you do the activity again?

Circle or color the face that matches your feeling for this activity

	Amazing Skill	Great Job	Making Progress
I helped myself learn.			
I followed instructions.			
I had fun during this activity.			

FIRST® at Home
Music Coder

ACTIVITY SUMMARY

Students will use a variety of steps and *FIRST*® Core Values to communicate and write a "song" to practice pre-coding and computational thinking skills.

Age Range & Grade Level: *Ages 4-6, Grades Pre-K through 1st*

Program Connection: *FIRST*® LEGO® League Discover

Authored By: Kathy Morgan, Project Manager *FIRST*® LEGO® League

Inspired By: "Coding Demystified for Ages 3-8," Jennifer Bowden, Goddard Systems, Inc; Sarah Allen, Indian Creek School; Wendy Oliver, Kamehameha Schools. Presentation at NAEYC Annual Conference, November 2019

ACTIVITY OUTCOMES

Participants will:

1. Make connections between written symbols and physical actions.
2. Write and follow symbolic instructions (code) to make a rhythm (song)
3. Explore concepts learned and share what they discovered about the process

RELEVANCE MATRIX – Subject Area Crosswalks and Core Values Addressed

Science	Math	Literacy	Social Studies	Technology Literacy
Sketching, Ask Questions, Design Thinking	Patterns, Counting, Shapes	Writing and Reading Aloud, Speaking, Following Instructions	N/A	Computational Thinking
Discovery	**Innovation**	**Impact**	**Inclusion**	**Teamwork**

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

ENGINEERING DESIGN PROCESS & *FIRST* CORE VALUES

FIRST Engineering Design Process | Explore *FIRST* Core Values

KEY VOCABULARY

Follow Code Symbol Pattern

MATERIALS & SUPPLIES NEEDED FOR THIS ACTIVITY

No materials, except for the Design Brief and writing materials, are required.
(Optional) Boxes, pans, spoons, noise makers, musical instruments, or any other objects students can use to make noises as part of their "songs"

GUIDANCE SET-UP

Description – Action – Guidance	Notes
Provide students with the student Design Brief. Share *FIRST* core values with students, ask them to think about using these during the activity. Explore *FIRST* Core Values	
Provide the materials for the students to use.	Students can participate in selecting materials that they can use to make noises as part of the activity.
Review the problem statement and criteria/constraints with the students. Remind students they will be using the engineering design process to work towards a solution. **Criteria / Constraints:** • Depending on the materials chosen, you may need to set a constraint on appropriate use of the materials.	Review the age appropriate engineering design process with your students.
Determine how students will complete the activity, what their length of time will be, how to collaborate and how to share what they did. Have students complete the activity.	Sharing can take place virtually by showing video or pictures of the "songs."
Determine how (or if) the activity will be graded, such as with the student design brief or completion of the activity itself.	Questions for Reflection: How did you pick the actions and symbols you used? Did you include a pattern? What changes would you make if you wrote another song? Can you think of anything other than music that requires following step-by-step instructions?
Explore the *Go Further!* opportunities	See below
Wrap up – Have students complete their self- reflection and review.	Core Values self-reflection is found in the student Design Brief document.

STUDENT OR TEAM ACTIONS

1. Review the student design brief, problem statement, and criteria/constraints. Explain that music is like coding because they both provide step-by-step instructions.
2. Provide the materials.
3. Students write a simple, three-step rhythm, using an "X" for a clap and "–" for stomping a foot. Then they try it out. They may repeat the rhythm or try it in a different order. Students could trade rhythms and try out their partner's rhythm.
4. Students write their own three-step rhythm, choosing their own actions and symbols. For example, an "O" could be for slapping their thighs with their hands or a smiley face for patting their heads. If you are using any materials, you can introduce them in this step or the next step. Have students try out their rhythm and then share with a partner.
5. Now students are ready to write a longer "song." Students can use the second page of the Design Brief to write their own "songs" with their own symbols and actions.
6. Optional - Explore the Go Further! opportunities.
7. Share and reflect on what you learned
8. Complete self-reflection.

GO FURTHER!

- Do the activity again by writing another song using different patterns, symbols, or actions.
- If you didn't use any materials the first time through the activity, have students identify materials that could be used to make sounds. Complete the activity again using the materials to write another "song."
- Dance the Cha-Cha-Slide using these slides from Wendy Oliver. Discuss how the song give step-by-step instructions, just like a robot follows a code.
- Have a coding themed dance party with these songs in a Spotify playlist, also created by Wendy Oliver. Each song has motions or dance moves instructed by the music.

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.

FIRST® at Home
Music Coder
Design Brief

PROBLEM STATEMENT

Did you know that reading music is like following a code?

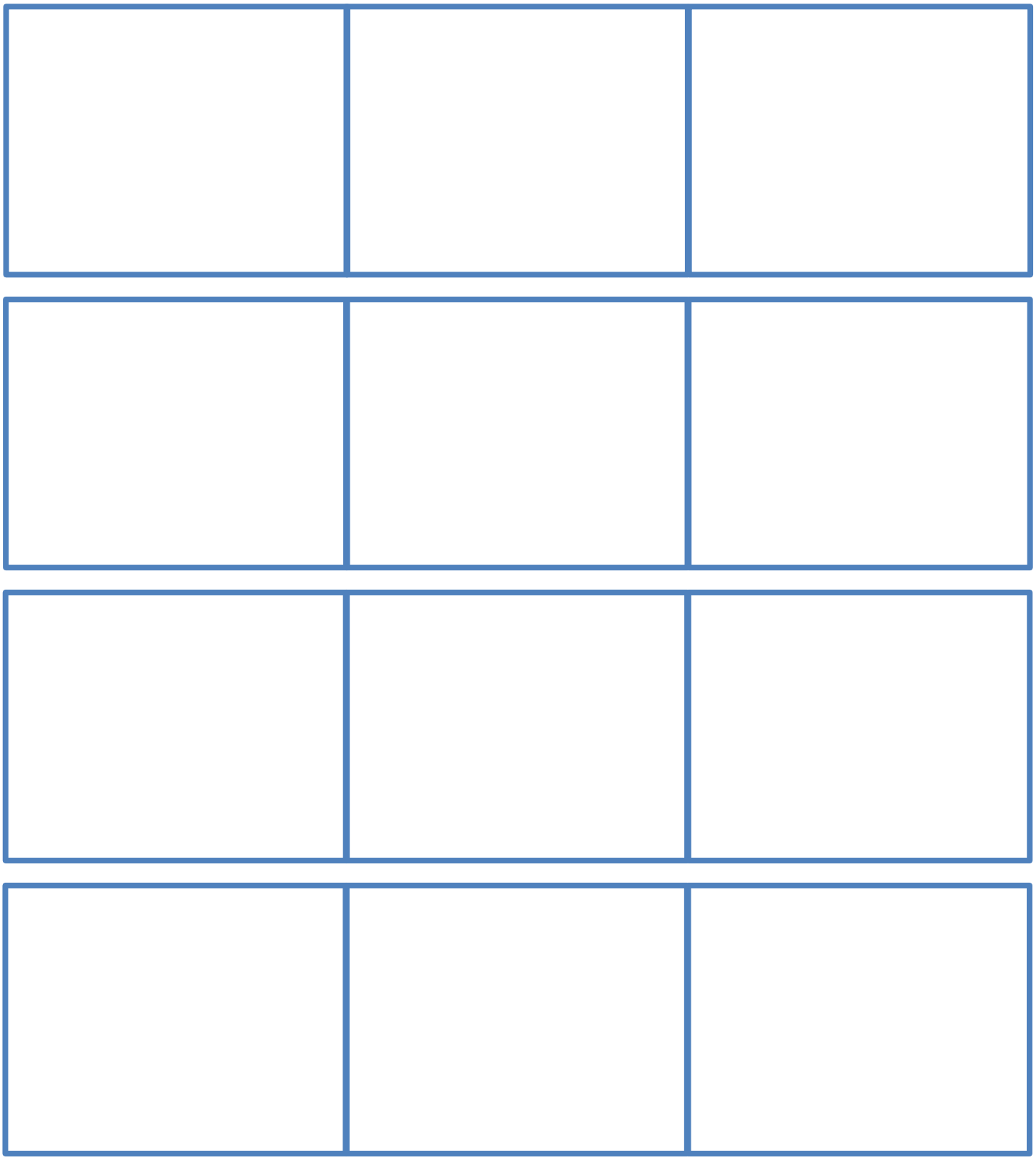
Andrea loves to dance! Can you write a song for her?

SKETCH YOUR DESIGN

Start by writing a 3 step rhythm. Write an **X** for a clap and **–** for a stomp. Try it!

Write another 3-step rhythm. This time, choose your own actions and symbols!

Now write a longer song! Pick an action and a symbol for each box. You might choose to include a repeating pattern.



CORE VALUES SELF-REFLECTION

Questions for reflection

1. How did you pick the actions and symbols you used? Did you include a pattern?

2. What changes would you make if you wrote another song?

3. Can you think of anything other than music that requires following step-by-step instructions?

Circle or color the face that matches your feeling for this activity

	Amazing Skill	Great Job	Making Progress
I helped myself learn.			
I followed instructions.			
I had fun during this activity.			

FIRST® at Home
Room Designer

ACTIVITY SUMMARY

Students will use a variety of skills and *FIRST*® Core Values to design their perfect bedroom or other living space and then build a model.

Age Range & Grade Level: *Ages 4-6, Grades Pre-K through 1st*

Program Connection: *FIRST*® LEGO® League Discover

Authored By: Kathy Morgan, Project Manager *FIRST*® LEGO® League

ACTIVITY OUTCOMES

Participants will:

1. Draw a design for their perfect bedroom or another space where they want to live.
2. Build a model following the design they drew.
3. Explore concepts learned and share what they discovered about the process

RELEVANCE MATRIX – Subject Area Crosswalks and Core Values Addressed

Science	Math	Literacy	Social Studies	Technology Literacy
Sketching, Ask Questions	Shapes, Number Sense, Size and Measurement	Writing and Reading Aloud, Speaking, Following Instructions	N/A	Engineering Design Design Thinking
Discovery	**Innovation**	**Impact**	**Inclusion**	**Teamwork**

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

ENGINEERING DESIGN PROCESS & *FIRST* CORE VALUES

FIRST® Engineering Design Process | Explore *FIRST* Core Values

KEY VOCABULARY

Design Thinking	3-D	2-D	Model
Measurement	Floor Plan	Graphic Design	Architect

MATERIALS & SUPPLIES NEEDED FOR THIS ACTIVITY

- LEGO or DUPLO, wooden blocks, other building toys or cardboard, construction paper, or other recycled materials for building.
- If cardboard, construction paper, or recycled materials are chosen for building, provide scissors and tape.
- (Optional) Paper and crayons, colored pencils, or markers to provide additional decoration

GUIDANCE SET-UP

Description – Action – Guidance	Notes
Provide students with the student Design Brief. Share *FIRST* core values with students, ask them to think about using these during the activity. Explore *FIRST* Core Values	
Review the problem statement and criteria/constraints with the students. Remind students they will be using the engineering design process to work towards a solution. **Criteria / Constraints:** • Students should draw designs on their Design Brief *before* building the model. • Depending on the materials chosen, you may need to set a constraint on appropriate use of the materials.	Review the age appropriate engineering design process with your students. Students may design their real bedroom, any other room in their living space, or a pretend room. Be aware that students may have many different varieties of living arrangements and may not wish to share. Allow students to include fantasy pretend elements if they choose.
Provide the materials for the students to use.	Students can participate in selecting materials for building. If cardboard, construction paper, or other recycled materials are chosen, review safety for using scissors and appropriate use of tape.
Determine how students will complete the activity, what their length of time will be, how to collaborate and how to share what they did. Have students complete the activity.	Sharing can take place virtually by showing video or pictures of the drawings and models.
Determine how (or if) the activity will be graded, such as with the student design brief or the model itself.	Questions for Reflection: How did you decide what to draw in your design? How did you use your guide
Explore the *Go Further!* opportunities	See below
Wrap up – Have students complete their self- reflection and review.	Core Values self-reflection is found in the student Design Brief document.

STUDENT OR TEAM ACTIONS

1. Review the student design brief, problem statement, and criteria/constraints. Explain that the design brief shows a room, where the middle rectangle is the back wall of the room.
2. Students complete the design brief by drawing a design of their perfect bedroom.
3. Provide the materials.
4. Students use their drawn design as a guide to build a model of their perfect bedroom.
5. *Optional* - Explore the Go Further! opportunities.
6. Share and reflect on what you learned
7. Complete self-reflection.

GO FURTHER!

- Use paper and drawing materials to further decorate the model.
- Learn about what an architect does by watching this video.
- Talk about how fashion design and interior design can be similar. Then watch this video to learn about becoming a fashion designer
- Learn about floor plans and then draw a floor plan for your perfect bedroom. Watch this video for an example and some tips.

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.

FIRST® at Home
Room Designer
Design Brief

PROBLEM STATEMENT

Imagine your perfect bedroom or another space where you live. What would it look like?

SKETCH YOUR DESIGN

Show Rok what would be in your room. Then build a model of it!

CORE VALUES SELF-REFLECTION

Questions for reflection

1. How did you decide what to draw in your design?

2. How did you use your design as a guide for building your model?

3. What would you do differently if you did this activity again?

Circle or color the face that matches your feeling for this activity

	Amazing Skill	Great Job	Making Progress
I helped myself learn.			
I followed instructions.			
I had fun during this activity.			

FIRST® at Home
Static Electricity

ACTIVITY SUMMARY

Students will use a variety of skills and *FIRST*® Core Values to experiment with static electricity and then use what they've learned to design a game using static electricity.

Age Range & Grade Level: *Ages 4-6, Grades Pre-K through 1st*

Program Connection: *FIRST*® LEGO® League Discover

Authored By: Kathy Morgan, Project Manager *FIRST* LEGO League

Inspired By: SciShow Kids The Sticky Balloon Trick, That After School Life Static Electricity Can Races, Planning Playtime Falling Up, Learning4Kids Taking a Little Idea and Making it Big, The Science Kiddo Separate Salt and Pepper with Static Electricity

ACTIVITY OUTCOMES

Participants will:

1. Conduct several experiments using static electricity
2. Design a game using static electricity
3. Explore concepts learned and share what they discovered about the process

RELEVANCE MATRIX – Subject Area Crosswalks and Core Values Addressed

Science	Math	Literacy	Social Studies	Technology Literacy
Sketching, Ask Questions, Motion, Forces, Static Electricity	Shapes	Writing and Reading Aloud, Speaking, Following Instructions	N/A	Engineering Design Design Thinking
Discovery	**Innovation**	**Impact**	**Inclusion**	**Teamwork**

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

ENGINEERING DESIGN PROCESS & *FIRST*® CORE VALUES

FIRST Engineering Design Process | Explore *FIRST* Core Values

KEY VOCABULARY

Static Electricity Particles | Design | Safety | Materials | Air

MATERIALS & SUPPLIES NEEDED FOR THIS ACTIVITY

- Balloons, toilet paper or coffee filter, empty aluminum can, salt, pepper, and/or water faucet. Choose materials based on the static electricity experiments chosen.
- (Optional) Additional household materials for students to use while designing their game.

GUIDANCE SET-UP

Description – Action – Guidance	Notes
Provide students with the student Design Brief. Share *FIRST* Core Values with students, ask them to think about using these during the activity. Explore *FIRST* Core Values	
Provide the materials for the students to use for experiments. Explain that you're going to do several experiments to see the power of static electricity. Then give instructions for each activity. • Blow up a balloon and rub it on hair, clothing, or a carpet to charge it with static electricity. Then stick it to the wall with the power of static electricity. • Tear a couple squares of toilet paper or a coffee filter into small pieces. Rub the balloon on hair, clothing, or carpet again, then hold the balloon above the pieces. Watch them "fall up" and stick to the balloon. • At a sink, turn on the faucet with a small but steady stream of water. Rub the balloon to charge it again, then hold the balloon near the stream of watch. Watch the static electricity pull the water toward the balloon. • Mix salt and pepper together by sprinkling them in a small pile on the table or a paper plate. Charge the balloon and hold it above the pile to separate the salt from the pepper. Discuss why the students think the balloon doesn't pick up both the salt and the pepper • Designate a start and finish line on the floor – you may want to use tape to mark them. Then set a clean, dry aluminum can on its side on the starting line. Students charge the balloon and then use them to move the can to the finish line. They should only use static electricity and not move the can in any other way.	For the first part of the activity, you will provide direct instruction for the experiments. Depending on the time and materials available, you may choose to only do a few of the experiments. If you're doing the activities with multiple students, they can race against each other in the aluminum can race. If time allows, encourage the students to explore static electricity further and create their own experiments.
Review the problem statement and criteria/constraints with the students. Remind students they will be using the engineering design process to work towards a solution. **Criteria / Constraints:** • Depending on the materials chosen, you may need to set a constraint on appropriate use of the materials. • Games must use static electricity as an important component of the game play. For example, in the aluminum can race, students may only move the can by using the balloon and not by touching it or any other means.	Review the age appropriate engineering design process with your students. Students can participate in selecting materials that are available around the learning environment.
Determine how students will complete the activity, what their length of time will be, how to collaborate and how to share what they did. Have students complete the activity.	Sharing can take place virtually by showing video or pictures of the experiments and games.
Determine how (or if) the activity will be graded, such as with the student design brief or completion of the activity itself.	Questions for Reflection: What did you learn about static electricity during your experiments? How did you decide on the materials and rules for your game? What would you change or add to your game if you play it again?
Explore the *Go Further!* Opportunities	See below
Wrap up – Have students complete their self- reflection and review.	Core Values self-reflection is found in the student Design Brief document.

STUDENT OR TEAM ACTIONS

1. Introduce static electricity by watching this YouTube video from SciShow Kids.
2. Provide the materials and complete some or all the static electricity experiments described above.
3. Review the student design brief, problem statement, and criteria/constraints. Students complete the first part of the design brief by recording their experiments.
4. Students design a game using static electricity.
5. *Optional* - Explore the Go Further! opportunities.
6. Share and reflect on what you learned
7. Complete self-reflection.

GO FURTHER!

- If you didn't complete all the experiments listed above, complete them now.
- Try the experiments again by charging another object, such as a plastic straw or a spoon.
- Search Pinterest or YouTube for more static electricity experiment ideas. For example:
  - Move bubbles with static electricity from Create Play Travel
  - Test different materials to see if the charged balloon can pick them up, as shown on Learning4Kids
- Can you design your own experiment to explore static electricity?
- Improve the game you created or create another game using static electricity.

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.

FIRST® at Home

Static Electricity Design Brief

PROBLEM STATEMENT

What can we do with static electricty?

Can you design a game for Andrea to play using static electricity?

SKETCH YOUR DESIGN

Draw or write the materials you used for your static electricity experiments. You can draw an experiment in action too!

Now use what you know to design a game that uses static electricity! What materials are needed? How do you play? Draw a picture that will help you teach your game to a friend.

My static electricity game is called _____

CORE VALUES SELF-REFLECTION

Questions for reflection

1. What did you learn about static electricity during your experiments?

2. How did you decide on the materials and rules for your game?

3. What would you change or add to your game if you play it again?

Circle or color the face that matches your feeling for this activity

	Amazing Skill	Great Job	Making Progress
I helped myself learn.			
I followed instructions.			
I had fun during this activity.			

FIRST® at Home
Cup Tower

ACTIVITY SUMMARY

Students will use a variety of skills and *FIRST*® Core Values to build a tower strong enough to hold them up.

Age Range & Grade Level: *Ages 4-6, Grades Pre-K through 1st*

Program Connection: *FIRST*® LEGO® League Discover

Authored By: Kathy Morgan, Project Manager *FIRST*® LEGO® League

Inspired By: Science Sparks How can you Stand on a Paper Cup without Breaking It?, Preschool Powol Packets Ancient Greek Architecture STEM Challenge & Activities, Hands-On Teaching Ideas How to Make a STEM Building Challenge, History for Kids Greek Architecture, The Metropolitan Museum of Art How do You Recognize Ancient Greek Architecture?

ACTIVITY OUTCOMES

Participants will:

1. Build a tower strong enough to hold them up.
2. Create a drawing of their tower designs before and after creating their towers.
3. Explore concepts learned and share what they discovered about the process.

RELEVANCE MATRIX – Subject Area Crosswalks and Core Values Addressed

Science	Math	Literacy	Social Studies	Technology Literacy
Sketching, Ask Questions, Forces	Shapes & Measurement	Writing and Reading Aloud, Speaking, Following Instructions	Architecture	Engineering Design & Design Thinking
Discovery	**Innovation**	**Impact**	**Inclusion**	**Teamwork**

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

ENGINEERING DESIGN PROCESS & *FIRST*® CORE VALUES

FIRST Engineering Design Process | Explore *FIRST* Core Values

KEY VOCABULARY

Strength Weight Gravity

MATERIALS & SUPPLIES NEEDED FOR THIS ACTIVITY

- Paper cups or tubes (toilet paper or paper towel) – at least 18 per group of students. Have extras available.
- Sheets of cardboard large enough for students to stand on – at least 2 per group of students. Metal or plastic trays or baking sheets may be used as an alternative.
- (Optional) Measuring tape, Books or other heavy objects for testing towers

GUIDANCE SET-UP

Description – Action – Guidance	Notes
Provide students with the student Design Brief. Share *FIRST* Core Values with students, ask them to think about using these during the activity. Explore *FIRST* Core Values	
Review the problem statement and criteria/constraints with the students. Remind students they will be using the engineering design process to work towards a solution. **Criteria / Constraints:** • Students should first draw designs on their Design Brief *before* building the tower. • Students should only use the provided set of materials. Set a constraint on appropriate use of the materials, for example, that they will not receive replacement cups or cardboard. • Follow safety instructions while testing out tower (carefully step onto tower, no jumping, whether students may stand on a chair to get onto tower). • You may wish to require students to use at least two levels in their towers.	Review the age appropriate engineering design process with your students. If this activity is being done with a group of students, divide them into groups of no more than 4 students. You may wish to divide the materials in advance, so they are easier to hand out. Be prepared to add additional challenge for students who complete the activity early. See the *Go Further!* section for ideas.
Provide the materials for the students to use.	Avoid providing an example tower and encourage students to experiment.
Determine how students will complete the activity, what their length of time will be, how to collaborate and how to share what they did. Have students complete the activity.	Sharing can take place virtually by showing video or pictures of the towers.
Determine how (or if) the activity will be graded, such as with the student design brief or the tower itself.	Questions for Reflection: How did you decide on your design? What changes did you make between your design and your final tower? How could you make your tower even stronger? Could you make it hold up you and a friend? An adult?
Explore the *Go Further!* opportunities	See below
Wrap up – Have students complete their self- reflection and review.	Core Values self-reflection is found in the student Design Brief document.

STUDENT OR TEAM ACTIONS

1. Review the student design brief, problem statement, criteria/constraints, and materials available.
2. Students complete the first half of the design brief by drawing their tower designs, before building them.
3. Provide the materials.
4. Students build and test their towers.
5. Students complete the second half of the design brief by drawing their final tower design.
6. *Optional* - Explore the *Go Further!* opportunities.
7. Share and reflect on what you learned
8. Complete self-reflection.

GO FURTHER!

- Can you make the tower taller and still hold you up?
- What is the least amount of materials you can use and still have the tower be strong enough to hold you up?
- How strong can you make your tower? Can it hold you if you are holding a heavy object? Can it hold two students? An Adult?
- Learn more about how columns were used in Greek architecture to make buildings stronger.
    - History for Kids
    - Greek Architecture from The Met

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.

FIRST ® at Home

Cup Tower
Design Brief

PROBLEM STATEMENT

Rok wants to build a tower that will hold you up! Can you help him design the tower?

SKETCH YOUR DESIGN

Draw your tower design BEFORE you build it.	Now draw your tower AFTER you built it.

CORE VALUES SELF-REFLECTION

Questions for reflection

1. How did you decide on your design?

2. What changes did you make between your design and your final tower?

3. How could you make your tower even stronger? Could you make it hold up you and a friend? An adult? Can it hold you while you are holding a heavy object?

Circle or color the face that matches your feeling for this activity

	Amazing Skill	Great Job	Making Progress
I helped myself learn.			
I followed instructions.			
I had fun during this activity.			

FIRST® at Home
Build a Story

ACTIVITY SUMMARY

Students will use a variety of skills and *FIRST*® Core Values to design and build something to help them tell a story.

Age Range & Grade Level: *Ages 4-6, Grades Pre-K through 1st*

Program Connection: *FIRST*® LEGO® League Discover

Authored By: Kathy Morgan, Project Manager *FIRST*® LEGO® League

ACTIVITY OUTCOMES

Participants will:

1. Choose a story and design something to build to help them tell the story.
2. Build what they design, using ideas from previous activities, and tell the story.
3. Explore concepts learned and share what they discovered about their design.

RELEVANCE MATRIX – Subject Area Crosswalks and Core Values Addressed

Science	Math	Literacy	Social Studies	Technology Literacy
Sketching, Ask Questions, Motion, Forces	Shapes	Writing and Reading Aloud, Speaking, Following Instructions, Characters, Story Details	N/A	Engineering Design Design Thinking
Discovery	**Innovation**	**Impact**	**Inclusion**	**Teamwork**

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

ENGINEERING DESIGN PROCESS & *FIRST*® CORE VALUES

FIRST Engineering Design Process | Explore *FIRST* Core Values

KEY VOCABULARY

Story	Diorama	Scene	Interactive

MATERIALS & SUPPLIES NEEDED FOR THIS ACTIVITY

- Choose materials based on what is available to you, such as LEGO® or DUPLO®elements, corrugated cardboard, cardboard tubes, construction paper, or other found materials for creative building. You may wish to have students start with a shoe box or other small box to create their story. Students may help select the materials.
- Tape, age-appropriate scissors, and markers/crayons if needed, based on the chosen material.

GUIDANCE SET-UP

Description – Action – Guidance	Notes
Provide students with the student Design Brief. Share *FIRST* Core Values with students, ask them to think about using these during the activity. Explore *FIRST* Core Values	
Assist students in choosing a story. You may wish to have them all use the same story or allow them to choose their own. They might choose a favorite fairy tale, story from a picture book, or make up their own story. They could also choose a story from a favorite movie or TV show.	If students need help choosing a story, direct them to these fairy tales for inspiration: • Stories to Grow By Teachers may choose to link this activity to stories read in their literacy units.
Review the problem statement and criteria/constraints with the students. Remind students they will be using the engineering design process to work towards a solution. **Criteria / Constraints:** • Diorama or other creations should represent at least one scene in their chosen story. Students may choose to show more than one scene or the entire story. • Creations should have at least one interactive element that uses what they learned in previous activities.	Review the age appropriate engineering design process with your students. Encourage open-ended building and experimenting. Avoid overly constraining student creations. If students are having trouble deciding what to make, encourage them to choose just one scene in their story. They might also show the beginning, middle, and end of the story in their creation. Students may need some help deciding how to add interactive elements. Some ideas to help inspire students: • Draw or build the main character in the story and have students move the character through their creation, following the story. • Write step-by-step instructions for a friend to move the character through their creation • Add a ramp, slide, wheel, or another simple machine to the creation. • Use paper or cups to create a tall or strong part of the creation • Is there a way to use static electricity (real or pretend) in their creation? • Create a maze that follows the scenes in the story.
Set out the materials for the students to use.	
Determine how students will complete the activity, what their length of time will be, how to collaborate and how to share their creations. Have students work on their creations.	Sharing can take place virtually by showing video or pictures of the creations built.
Determine how (or if) the activity will be graded, such as with the student design brief or evaluation of the creation itself.	Questions for Reflection: How did you decide on your story and what you would build? What did you use from other activities to help you tell your story? What would you do differently if you did this activity again?
Explore the *Go Further!* opportunities	See below
Wrap up – Have students complete their self- reflection and review.	Core Values self-reflection is found in the student Design Brief document.

STUDENT OR TEAM ACTIONS

1. Students choose a story.
2. Review the student design brief, problem statement, and criteria/constraints.
3. Complete the design brief by drawing what they plan to build to tell the story.
4. Provide the materials for the creations. Students build dioramas or other creations to demonstrate one or more parts of a story. Creations must have at least one interactive element.
5. *Optional* - Explore the Go Further! opportunities.
6. Share your solution and reflect on what you learned
7. Complete self-reflection.

GO FURTHER!

- Keep going – can you add more to your creation to show more parts of the story?
- Can you add more interactive elements to your creation?
- Continue decorating your creation.
- Use your creation to put on a puppet show or create a video that tells the story.
- If you have a LEGO® WeDo 2.0 set available, build a part of your story and add a moving element to your creation.
- What happens if stories get mixed up? Watch this Super WHY! episode and then build a creation that shows what happens when characters from different stories meet.
- Think about what is similar between art and engineering. You might watch this video from SciShow Kids and listen for things that engineers do that artists or authors also do. Some examples: imagine, create, build, design, explore, etc. What did you do in this activity that combined art and engineering?

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FIRST® at Home

Build a Story

PROBLEM STATEMENT

What can you build to help you tell Rok a story?

SKETCH YOUR DESIGN

Pick the story you will tell. Then decide if you will be telling the whole story or just a part. Draw your design before building. How can you use what you've learned to tell your story?

CORE VALUES SELF-REFLECTION

Questions for reflection

1. How did you decide on your story and what you would build?

2. What did you use from other activities to help you tell your story?

3. What would you do differently if you did this activity again?

Circle or color the face that matches your feeling for this activity

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