



Robotics at Works

LEGO[®] MINDSTORMS[®] Education EV3
Advanced Robotics Program

Robotics at Work

LEGO® MINDSTORMS® Education EV3 Robotics Program

Middle School Robotics Overview:

This five-day robotics camp outline will provide students with STEM-focused, hands-on activities to promote 21st century skills as well as design engineering and computer science. Each day, students will participate in team building activities and opportunities for physical activity as well as receive a team briefing for challenges aligned to standards. Daily challenges will help students develop skills and knowledge to complete the culminating project of designing a solution for a problem in a career area and pitching the solution to stakeholders.

Program at a Glance		
Day 1	Welcome to Orientation Why do we use robots? What can a robot do that humans cannot?	<ul style="list-style-type: none">• Exploring Robots The Inner Workings of a Robot: Gearing Challenge
Day 2	Building a Robot Robots at work: Make a System What types of robots follow a line? Why? How is it helpful?	<ul style="list-style-type: none">• Follow a Line
Day 3	Design Challenge: Robotics at Work How can robots make work easier? How can we design robots to help solve problems?	<ul style="list-style-type: none">• Design Challenge
Day 4	Design Challenge: Robotics at Work How can robots make work easier? How can we design robots to help solve problems?	<ul style="list-style-type: none">• Design Challenge
Day 5	Design Challenge: Pitch Day Culminating Project	<ul style="list-style-type: none">• Wrap Up Culminating Project• Showcase

Prior to First Day:

1. Sort sets.
2. Charge EV3 Batteries.
3. Download and install the EV3 software on devices to be used for camp.
4. Determine a naming convention for each set.
Suggestions include school initials and a number. (Example: Millcreek Elementary robotics kits names could be MES1; MES2; MES3.)
5. Write set name on the EV3 brick and on the set.
6. Connect EV3 to iPad, Chromebook or computer and rename each brick on the computer to match the name you assigned to the set.
7. Gather any consumable materials needed for the week.
8. Make sure devices are fully charged, Bluetooth is enabled (if needed) and students can access the software.
9. Determine the procedure for when a LEGO piece is dropped (everyone freeze; say LEGO down/LEGO found) and where to place LEGO pieces found that do not belong to the finder.

Robotics at Work Day 1

Orientation

Big Questions:

- Why do we use robots?
- What can a robot do that humans cannot?

Materials:

- EV3 kits
- Devices with EV3 software
- Chart paper
- Student journals (could be paper stapled together with students creating the outside of the journal using Construction paper and other consumable materials)
- Various craft materials
- Pens
- Pencils
- Markers

Outline of Day	Tasks	Time	Materials
9:00 - 10:30	Introductions	30 min	<ul style="list-style-type: none">• LEGO bricks
	Establishing Group Rules Chart	15 min	<ul style="list-style-type: none">• Chart paper• Markers• Pens
	Team Building Activity	15 min	<ul style="list-style-type: none">• LEGO bricks
	Team Briefing 1	5 min	<ul style="list-style-type: none">• None
	Partner Selection, Team Name and Team Badge	25 min	<ul style="list-style-type: none">• Varies, based on the activity selected• Team badge templates• Markers• Pencils• Scissors
10:30 -10:35	Break		
10:35 -11:25	Workplace Wellness	10 min	<ul style="list-style-type: none">• Varies, based on

			the activity selected
	Design a Journal	20 min	<ul style="list-style-type: none"> • Student journals • Markers • Scissors • Construction Paper • Other craft materials
	Reading and Wonderings	20 min	<ul style="list-style-type: none"> • Book about robots • Student journals
11:25 - 11:30	Get ready for lunch		
11:30 -12:00	Lunch		
12:00 - 2:10	Team Briefing 2	5 min	<ul style="list-style-type: none"> • None
	Challenge 1: Building your Robot	60 min	<ul style="list-style-type: none"> • Student journals • EV3 kit • Devices with software
	Break	5 min	<ul style="list-style-type: none"> • None
	Workplace Wellness	10 min	<ul style="list-style-type: none"> • Varies, based on the activity selected
	Team Briefing 3	5 min	<ul style="list-style-type: none"> • None
	Challenge 2: Move like a Robot	45 min	<ul style="list-style-type: none"> • Student journals • EV3 kit • Devices with software
2:10 - 2:30	Daily Debrief and Wrap Up	20 min	<ul style="list-style-type: none"> • Student journals

Introductions

Time: 30 minutes

Materials:

- Loose LEGO bricks

Using the LEGO bricks, have students build a model that shows something they really like to do and one thing they really hope to learn at robotics camp. When it is time to share, have students say their name and share their model. The teacher can record what the group hopes to learn on a piece of chart paper.

Group Rules Chart

Time: 15 minutes

Materials:

- Chart paper, markers

Using a piece of chart paper, establish Group Rules Chart for the week as a class. You can have campers sign the chart paper and then place the rules and expectations in a location that can be reviewed each day.

Team Building Activity

Time: 15 minutes

Materials:

- Loose bricks

Explain to students that each day will include some kind of team building challenge. Working together is an important skill and just like other skills, we can practice it to get better and better.

Build the Tallest Tower

Have students work in pairs. Make sure each group has the same bricks or give a constraint of using a specific number of bricks. Challenge students to build the tallest tower they can within 5 minutes.

At the end of the 5 minutes, encourage students to reflect on:

- What was challenging?
- How did you overcome the challenge?
- What was successful?
- How did you work together?
- If you were to build a tall tower build again, what would you change?

Team Briefing 1

Time: 5 minutes

Materials: None

Welcome to orientation! Your first tasks for today are as follows:

- *Determine a partner for training exercises*
- *Work with partner to determine a name for your design company and a logo*
- *Design a journal for keeping important records this week*
- *Explore different ways we use robots*

Partner selection, design company name and logo

Time: 25 minutes

Materials:

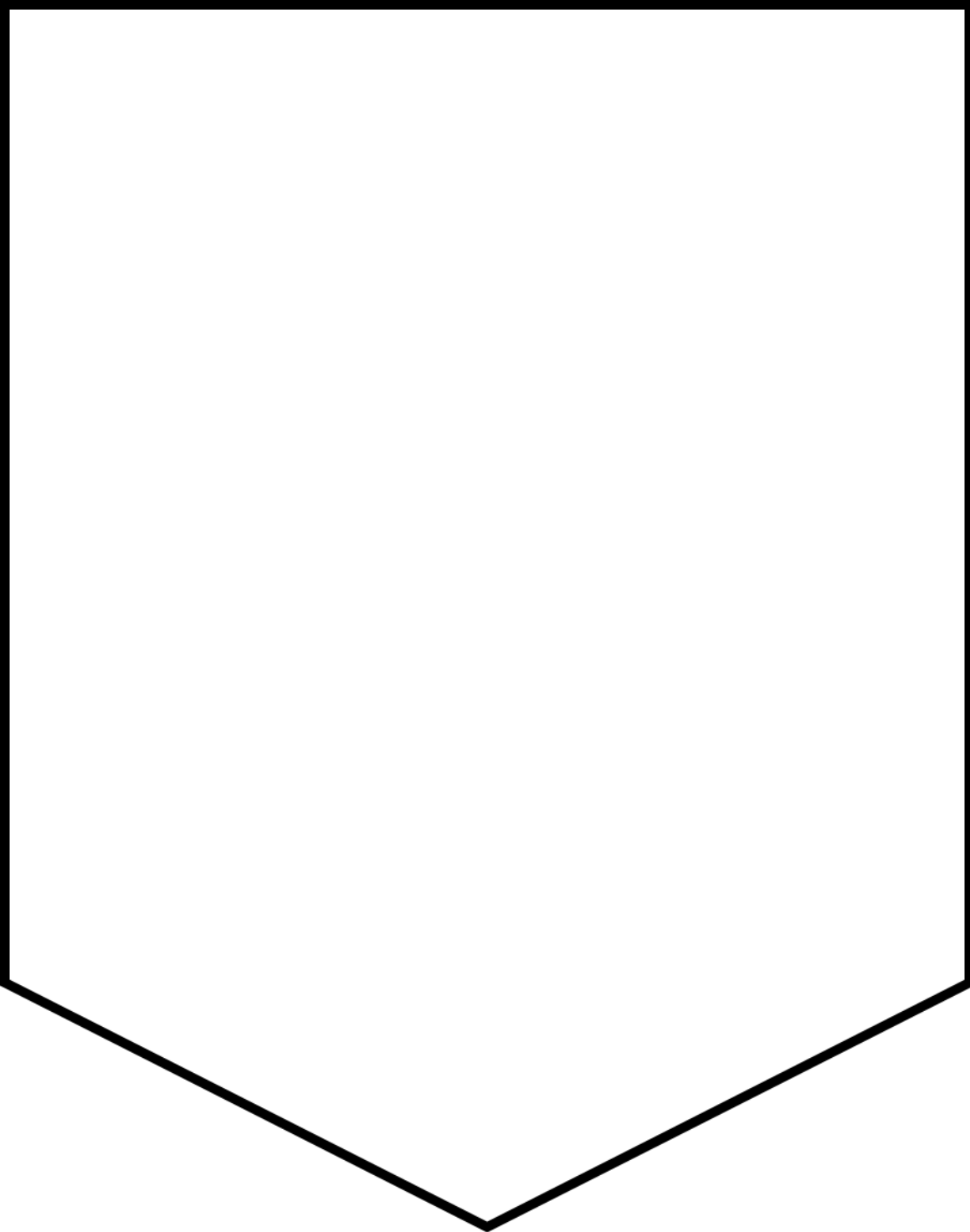
- Student journals (see note in materials section)

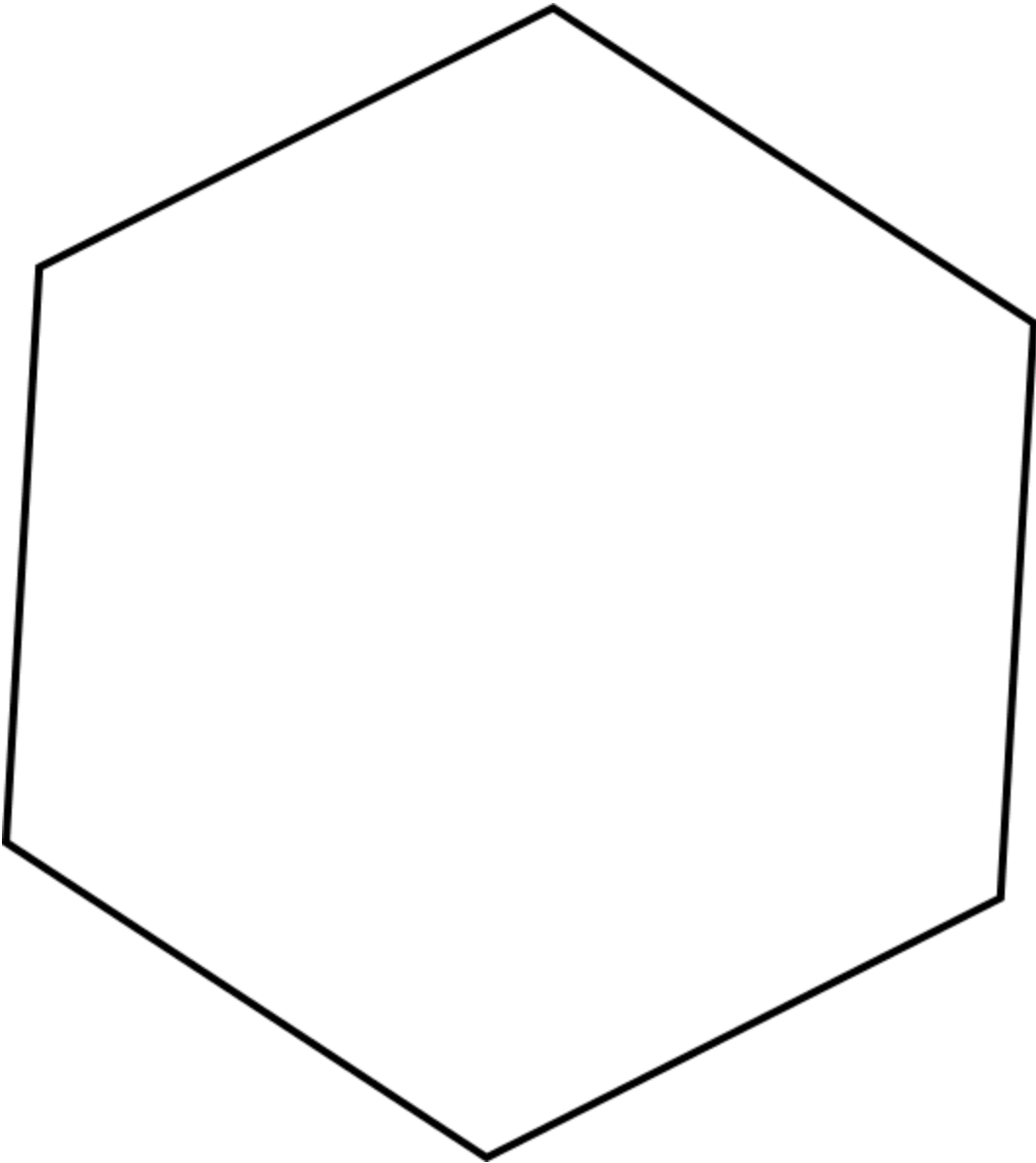
- Markers
- Scissors
- Construction Paper
- Other craft materials

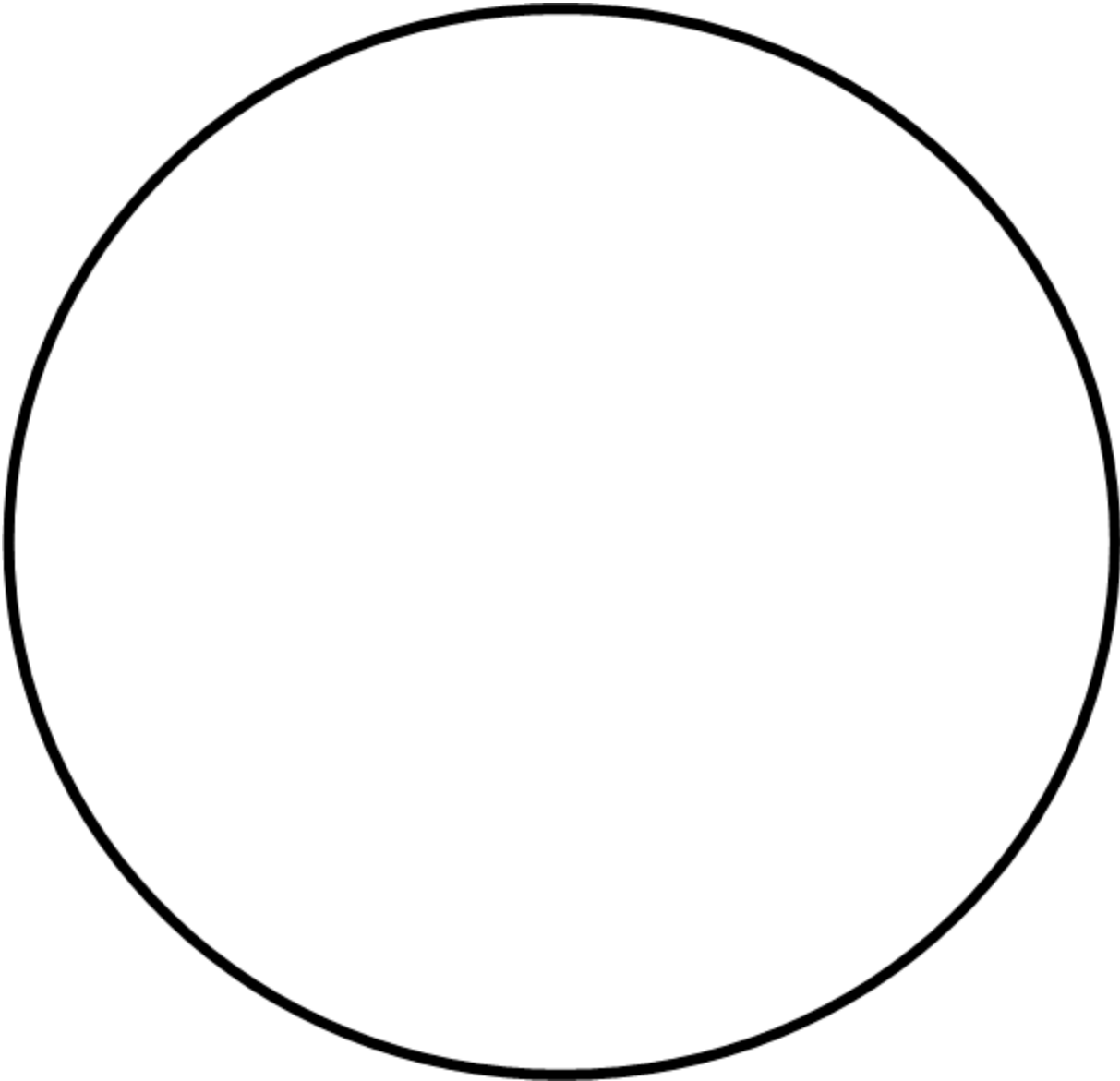
You can use one of several different activities to help students find a partner to work with for the week. A simple web search for creative ways to group students may provide appropriate resources for you to review.

Once partners have been established, student teams can determine a design company name (team name) for their team and design a logo.

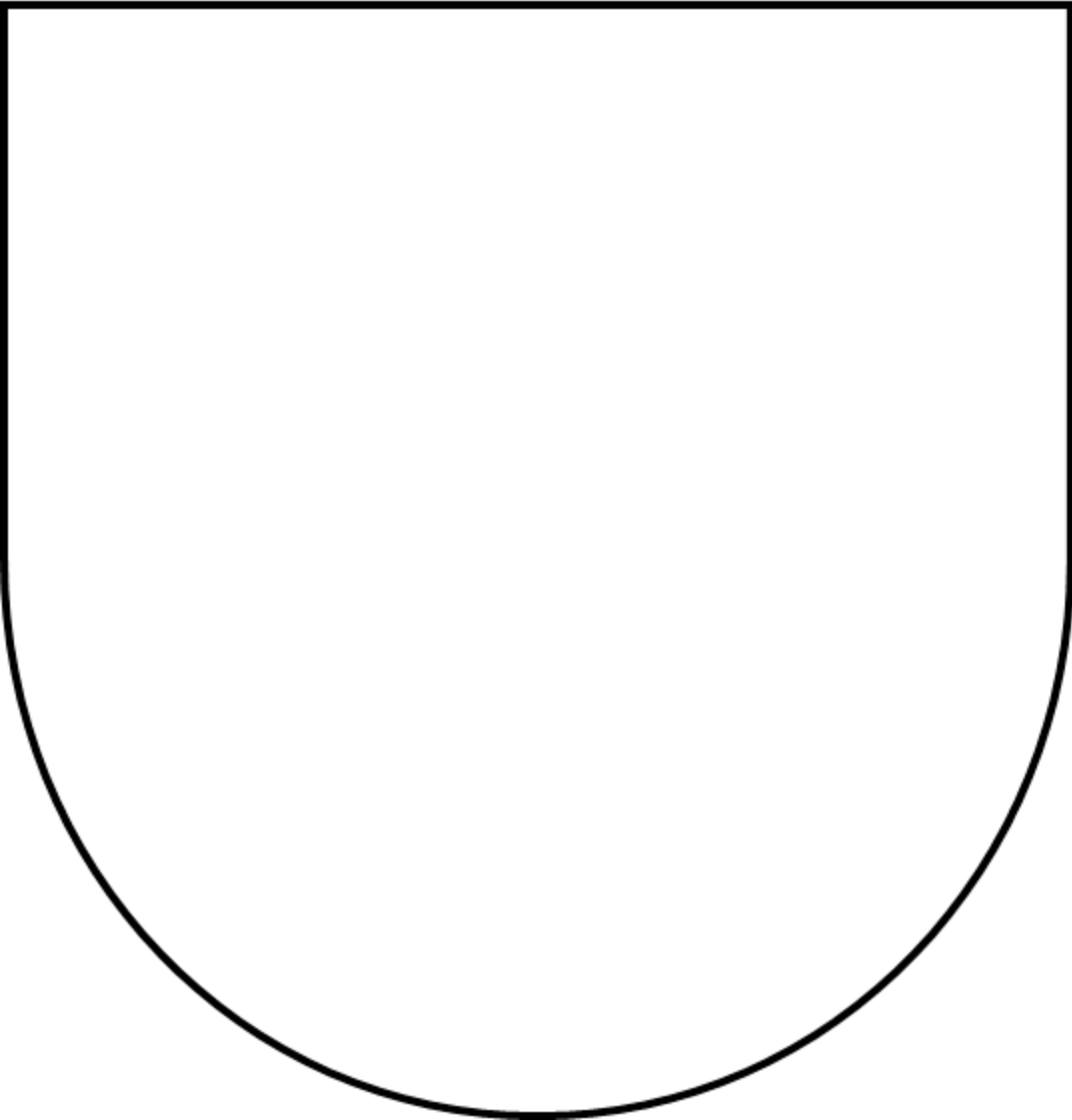
LOGO Template

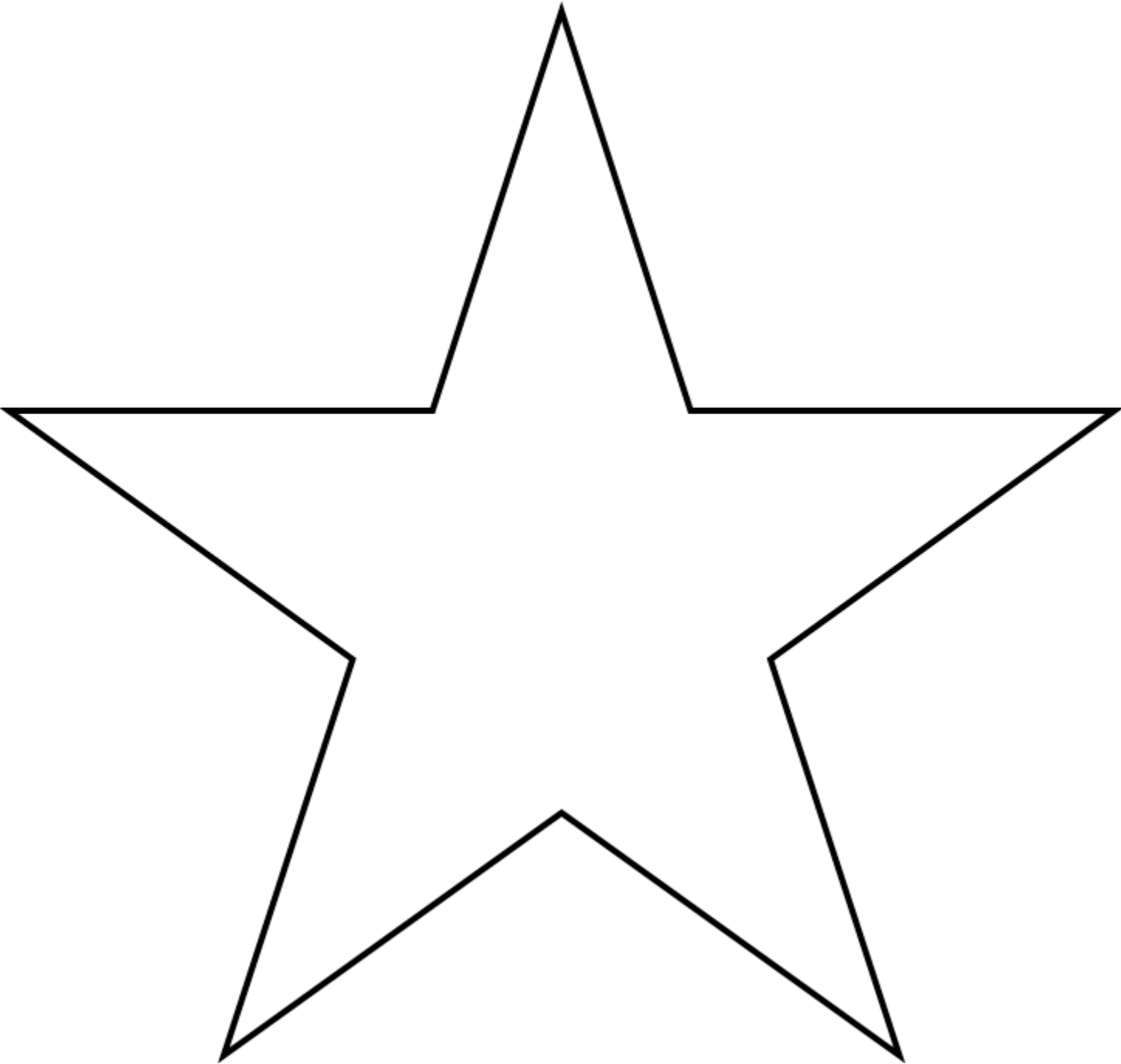






LOGO Template





Break

Time: 5 minutes

Workplace Wellness

Time: 10 minutes

Materials:

- Materials may vary depending on what activity is selected.

Take a minute to complete a short physical activity. You may find several ideas for short physical activities for students through a simple web search. Ideas include simple exercises like jumping jacks or running in place.. Manufacturing companies often encourage physical activity during the workday.

Design a Journal

Time: 20 minutes

Materials:

- Student journals (see note in materials section)
- Markers
- Scissors
- Construction paper
- Other craft materials

Have students create a design journal to take notes, share wonderings, write reflections and collect ideas. Ideas for types of journals can be found online.

Readings and Wonderings

Time: 20 minutes

Materials:

- Book or articles about robots

Read a book or a kid friendly journal article about robots and what robots can do that humans cannot. Have students write things they wonder about robots in their journals.

Lunch

Time: 30 minutes

Team Briefing 2

Time: 5 minutes

Materials: None

Hello, fellow engineers! Your task today is to build and work with your robot to understand how it can move. You will be working with more advanced robotic element throughout the week so first we need to remember the basics.

Challenge 1: Building Your First Robot

Time: 60 minutes

Materials:

- EV3 sets

- Device with software
- Student journals

Students will use the knowledge gained from how motors and sensors work in order to build a driving base.

Go to the Make a Straight Move lesson and select [the building instructions](#) for the driving base robot. Have students complete the instructions to build a full robot.

While the students are building, ask them question about how the robot is designed. Ask students to think about how the motors are attached. How do they anticipate the robot will move based on the way it is built? Have students begin to discuss ways that the robot could be programmed to move. (Forward, backward, one wheel moves, both wheels move, and so forth)

As students finish building, allow them to start programming the robot to move to investigate their ideas.

Have students write a brief reflection on the activity in their design journals.

- What was easy about this challenge?
- What was difficult about this challenge?
- What did I learn from this challenge?

Break

Time: 5 minutes

Workplace Wellness

Time: 15 minutes

Materials:

- Materials may vary depending on what activity is selected.

Take a minute to complete a short physical activity. You may find several ideas for short physical activities for students through a simple web search. Ideas include simple exercises like jumping jacks or running in place. Consider having students move like a robot to prepare them for the next challenge.

Team Briefing 3

Time: 5 minutes

Materials: None

Now that you have investigated why people explore and have built a tool used for exploration, I am presenting you with a new challenge. I would like for you to investigate what scientists and engineers do when they cannot go where they want to explore. To help with your investigation, you are going to program a rover to complete several different type of movements.

Challenge 2: Move Like a Robot

Time: 45 minutes

Materials:

- EV3 Sets
- Device with software
- Student journals
- Mini-figures
- Tape

Preparation:

Set up two stations. Station 1 will challenge students to drive in a straight line without hitting the LEGO mini-figure. Set up several lines for the robot to drive along with a LEGO mini-figure at the end of the line. Students will have to learn to program the movement of the robot to be precise enough to not hit the mini-figure.

Station 2 will challenge students to drive their robot in a “perfect square” which will challenge the students to develop longer programs that include straight lines and accurate turns. Create a square using the tape for students to drive along.

Challenge

Scientists have to control their robots’ movements very carefully to ensure that the robots are not damaged and that the robots do not damage anything else. In this challenge, students need to learn to control their robots’ movements by ensuring the robot does not run over any LEGO mini-figures.

Once the students have created and run their programs in each station, ask them to think about and explain the program and the function of the robot.

They should be able to answer questions like:

- How does the program work?
- What do the different program blocks do?

Keep the robots built.

Have students reflect in their journals:

- What was easy about this challenge?
- What was difficult about this challenge?
- What did I learn from this challenge?

Challenge 2: Move Like a Robot continued

Time: 35 min

Materials:

- EV3
- Devices with EV3 software
- Student journals

If students completed the first challenges, have them program a “Figure 8” using two squares with at least 12 inches per side.

Daily Debrief and Wrap Up

Time: 20 minutes

Materials:

- Sticky notes
- Student journals
- Pencils
- Pens
- markers

Make sure EV3 bricks containing less than 50% battery charge are plugged in overnight.

Devices have been powered off and plugged in or stored for the next day.

Have students use sticky notes to write down three things they really enjoyed about the day. Have students use a different sticky note to write down one thing they are still wondering about. Place sticky notes in student design journals.

Robotics at Work Day 2

Robots at Work: Make a System

Big Questions:

What types of robots follow a line? Why? How is it helpful?

Materials:

- EV3 kits
- Devices with EV3 software
- Chart paper
- Student journals
- Various craft materials
- Pens
- Pencils
- Markers
- Bottles of water OR sticky notes (See teambuilding activity.)

Outline for Day	Tasks	Time	Materials
9:00 - 10:30	Welcome	5 min	<ul style="list-style-type: none">• Student journals
	Team Building Activity	15 min	<ul style="list-style-type: none">• LEGO bricks• Object such as water bottles or packs of sticky notes
	Review Group Rules Chart	5 min	<ul style="list-style-type: none">• Group Rules Chart
	Team Briefing 1	5 min	<ul style="list-style-type: none">• None
	Research and Wonderings	10 min	<ul style="list-style-type: none">• Discussion• Internet research
	Inventory Check	5 min	<ul style="list-style-type: none">• EV3 sets
	Challenge 1: Follow a Line	60 min	<ul style="list-style-type: none">• EV3 sets• Devices with EV3 software
10:35 - 10:40	Break		
10:40 - 11:25	Challenge 1: Follow a Line - continued	45 min	EV3 sets Devices with EV3 software

			Student journals
11:25 - 11:30	Get ready for lunch		
11:30-12:00	Lunch		
12:00-2:10	Field Trip		
2:20-2:30	Daily Debrief and wrap up	10 min	Student journals

Welcome

Time: 5 minutes

Materials:

- Student journals

Welcome students back to camp. Have students share what they enjoyed yesterday from Day 1 debrief with a friend.

Team Building Activity

Time: 15 minutes

Materials:

- LEGO bricks

Have students work in groups of 4-6 students.

Tower Build — Part 2

Provide each group with a container of loose bricks. Have students work together to build the tallest tower that will hold the weight of an object. The object could be a water bottle or a pack of sticky notes. The object needs to be given to each group and needs to be consistent. Hopefully, students will apply some of the knowledge learned previously to the build.

Review Group Rules Chart

Time: 5 minutes

Materials:

- Group Rules Chart

Quickly review the Group Rules Chart created on Day 1 by the students.

Highlight positive moments from previous day (times when students helped each other, asking great questions, teamwork, helping to clean up...)

Team Briefing 1

Time: 5 minutes

Materials: None

Today we are going to investigate how objects move in space. First, we will need to explore a little bit about how objects move on earth. You will read a little bit about gravity and then build a pull robot to examine pushing, pulling and friction.

Research and Wonderings

Time: 10 minutes

Materials:

- Internet research
- Student journal

Have students investigate where robots are used that follow a line.

Inventory Check

Time: 5 minutes

Materials:

- EV3 set

Ask students to find their partner from Day 1.

Have students confirm the bricks in two trays are in the correct tray compartments. Teacher chooses which two trays.

Challenge 1: Follow a Line

Time: 60 minutes

Materials:

- EV3 sets
- Devices with EV3 software
- Objects to test the pull robot

Complete **Follow a Line**. Students will need to journal their findings and answer the questions. Students should video their robot if possible.

Your robot might encounter something special on the ground. In some cases, it might be possible to follow it. Your mission is to program your robot to follow a line using the Color Sensor.

Use the Driving Base with the Color Sensor attached.

Complete the **Follow a Line** tutorial.

Create Your Program

- Loop Infinite Inside this loop place the following:
- Large Motor Motor On Motor C Power 30
- Add Wait for Color Sensor less than 45
- Add Large Motor Motor Off Motor C
- Add Large Motor Motor On Motor B
- Add Wait for Color Sensor greater than or equal to 45
- Add Large Motor Motor Off Motor B

Place your robot on starting position near or on the long line.
If your robot does not follow the line, return to the tutorial.

Break

Time: 5 minutes

Challenge 1: Follow a Line continued

Time: 45 minutes

Materials:

- EV3 sets
- Devices with EV3 software
- Objects to test the pull robot

Write in your journal. Describe what each part of the program made your robot do.
Explain some factors that could make the robot miss the contact with the black line.

Note: If the robot moves too fast, the sensor might not detect the line. If the threshold value is wrong, one motor will keep running. The black line can be too narrow for the sensor to detect it.

Modify your program:

1. Increase the power level of the motors and see how fast the robot can go and still be a reliable line follower.
2. Place your robot on starting position and run the program.
3. Explain why the robot might not follow the line at a high power level in your journal.
- 4.

Modify your program:

1. Explore ways to stop the robot at a precise location.
2. Click on the loop to change its mode from unlimited to:
 - a. Stop the loop after 10 seconds (time mode)
 - b. Stop the loop after 10 repetitions (count mode)
3. Place your robot on starting position and run the program.
4. Did your robot travel the same distance? Explain why or why not in your journal.

Place the cuboid anywhere on the inner side of a black oval or circle of tape on the floor.

Modify your program:

1. Follow the black line and stop your robot as close as possible to the cuboid.
2. When you are ready, place your robot in starting position and run the program.

Note: One strategy could be to follow the line slowly until the object is 5 cm from the Ultrasonic Sensor and stop the robot by escaping the Loop.
3. Describe your strategy and your solution in your journal. Explain what iterations you had and issues you had to overcome.

Lunch

Time: 30 minutes

Field Trip

Plan to visit a local manufacturing company in order for students to understand how robots are used in industry.

Daily Debrief and Wrap Up

Time: 20 minutes

Materials:

- Student journals
- Markers
- Crayons
- Colored pencils

Take a minute to clean up the room from the day. Return all the supplies to their place in the classroom. Be sure to plug in devices for the next day that have less than 50% battery power.

Once the room is clean, have students write the following reflection in their Student journals: Ask students to reflect on the day and select their “super-hero moment”- a time during the day when they accomplished something great. Have students design a cape in their Student journals and write their “super-hero moment” underneath.

Robotics at Work Day 3

Design Challenge: Robots at Work

Big Questions:

How can robots make work easier? How can we design robots to help solve problems?

Materials:

- EV3 kits
- devices with EV3 software
- chart paper
- Student journals or journals
- Various craft materials
- Pens
- Pencils
- Markers
- Index Cards
- Book and/or articles about career areas

Outline for Day	Tasks	Time	Materials
9:00 - 10:30	Welcome	5 min	<ul style="list-style-type: none">• Student journals
	Team Building Activity	15 min	<ul style="list-style-type: none">• LEGO bricks
	Review Group Rules Chart	5 min	<ul style="list-style-type: none">• Group Rules Chart
	Team Briefing	5 min	<ul style="list-style-type: none">• None
	Design Challenge: Research and Planning	60 min	<ul style="list-style-type: none">• EV3 sets• Devices with EV3 softwareBooks or articles about problems in specific career areas• Student journals
10:35 - 10:40	Break		
10:40 - 11:25	Design Challenge: Continued	45 min	EV3 sets Devices with EV3 software Student journals

11:25 - 11:30	Get ready for lunch		
11:30 - 12:00	Lunch		
12:00 - 2:10	Workplace Wellness	10	<ul style="list-style-type: none"> Varies, based on the activity selected
	Design Challenge: Continued	120 min	<ul style="list-style-type: none"> EV3 sets Devices with EV3 software Student journals
2:10 - 2:30	Daily Debrief and Wrap Up	20 min	<ul style="list-style-type: none"> Student journals

Welcome

Time: 5 minutes

Materials:

- Student journals

Welcome students back to camp. Have students share their super-hero creations with a peer. Create a chart on the wall with a picture of a large super-hero cape and capture student ideas shared from their journals.

Team Building Activity

Time: 15 minutes

Materials:

- LEGO bricks

Note: You will need identical sets of 12-20 bricks – one set for each team and one for teacher use.

Relay race

- Create teams of 4-5 participants.
- Introduce the Relay race activity as described below.
- Build and hide model using 12-15 LEGO bricks, you decide how it looks – remember, it should not be too easy to copy.
- Give the participants approximately 10 minutes to complete the activity.

The goal is to copy the hidden model as fast as possible.

- Teams line up and one member from each team runs to see the model.
- When the team member returns to the base, he/she can place one brick, then the next team member runs to see the model, etc.

Note: A member can only add or take away one brick on his or her turn.

Tip: Variation — The teams cannot talk while working on building the model.

Review Group Rules Chart

Time: 5 minutes

Materials:

- Group rules chart

Quickly review the Group Rules Chart. Highlight positive moments from Day 1 (times when students helped each other, asking great questions, teamwork, helping to clean up...)

Team Briefing

Time: 5 minutes

Materials: None

Your design company has been given the task to:

- Identify a problem within a career area
- Develop a solution for the problem using robotics
- Create a campaign to pitch your solution to stakeholders

Career areas include, but are not limited to:

- Medicine
- Health care
- Communication
- Entertainment
- Transportation
- Manufacturing
- Water quality
- Agriculture
- Safety

1. Select a career area.
2. Research and brainstorm potential problems or challenges.
3. Select a problem from the list.
4. Brainstorm design possibilities.
5. Build and test a model.
6. Obtain feedback.
7. Redesign/Modify. Repeat as necessary.
8. Create pitch for the solution.

Questions you may consider:

- What problem are you trying to solve?
- What specific functions of the problem are you wanting the robot to solve?

- What materials will you need?
- Why is a robot better for this solution than a human?
- What limitations does your design or robot build have?

Design Challenge: Research and Planning

Time: 60 min

Materials:

- Devices with internet access and EV3 software
- EV3 set
- Books or articles on various career areas for research
- Student journals

As a group, you may take the first fifteen minutes to brainstorm together potential problems in one career area to model the process for students. Use the remaining time for students to research and identify a problem to solve for the design challenge.

See the end of the document for graphic organizers that may be helpful for the design challenge. An organizer that is designed with cutting lines can be used for students to rank order their list of ideas or identified problems for determining the problem they will work on for the culminating project.

Break

Time: 5 minutes

Design Challenge: Continued

Time: 45 min

Materials:

- Devices with internet access and EV3 software
- EV3 set
- Books or articles on various career areas for research
- Student journals

Allow students time to work and research potential problems. Provide assistance as needed to groups.

Lunch

Time: 30 minutes

Workplace Wellness: Physical Fitness

Time: 10 minutes

Materials:

- Materials may vary depending on what activity is selected

Take a minute to complete a short physical activity. You may find several ideas for short physical activities for students through a simple web search. Ideas include simple exercises like jumping jacks or running in place.

Design Challenge: Continued

Time: 120 min

Materials:

- Devices with internet access and EV3 software
- EV3 set
- Books or articles on various career areas for research
- Student journals

Groups continue to work on design challenge.

Daily Debrief and Wrap Up

Time: 20 minutes

Materials:

- Student journals
- Markers
- Crayons
- Colored pencils

Let's Give a Shout Out!

Have students trace their hand in their student journals. On the hand, have students give themselves a shout out for the day for any achievement. Take a minute to talk about why positive feedback from our friends is good for us and encourages us to work even harder. Have students share some comments that would be positive to tell a friend in class.

Have students trace their hand again in their student journals. Have students pair up and give each other shout outs in their journals for positive things they noticed.

Robotics at Work Day 4

Design Challenge: Robots at Work Continued

Big Questions:

How can robots make work easier? How can we design robots to help solve problems?

Materials:

- EV3 kits
- Devices with EV3 software
- Chart paper
- Student journals
- Various craft materials
- Pens
- Pencils
- Markers
- Book and/or articles about career areas

Outline for Day	Tasks	Time	Materials
9:00 - 10:30	Welcome	5 min	<ul style="list-style-type: none">• Student journals
	Team Building Activity	15 min	<ul style="list-style-type: none">• LEGO bricks
	Review Group Rules Chart	5 min	<ul style="list-style-type: none">• Group Rules Chart
	Team Briefing	5 min	<ul style="list-style-type: none">• None
	Design Challenge: Continued	60 min	<ul style="list-style-type: none">• EV3 sets• Devices with EV3 software• Various craft materials
10:35 - 10:40	Break		
10:40 - 11:25	Design Challenge: Continued	45 min	<ul style="list-style-type: none">• EV3 sets• Devices with EV3 software• Various craft materials
11:25 - 11:30	Get ready for lunch		
11:30 - 12:00	Lunch		

12:00 - 2:10	Workplace Wellness	10	<ul style="list-style-type: none"> Varies, based on the activity selected
	Design Challenge Work Time	120 min	<ul style="list-style-type: none"> EV3 sets Devices with EV3 software Additional craft materials
2:10 - 2:30	Daily Debrief and Wrap Up	20 min	<ul style="list-style-type: none"> Student journals

Welcome

Time: 5 minutes

Materials:

- Student journals

Welcome students back to camp. Take a minute to have students read over their shout outs from the previous day. Then have students high five each other with a positive word to start the morning.

Team Building Activity

Time: 15 minutes

Materials:

- Sets of identical LEGO bricks Each pair of students will need the same set of 6 bricks; sets may vary among groups.

Pair students together. Designate one student as Designer and one student as Builder

Back to Back

Students will sit back to back. Designer will build a model using the bricks they have without letting their partner see. When model is complete, Designer will communicate to Builder the steps to create the exact same build. Builder cannot look at Designer's model. Builder may ask questions. The goal is for the students to have the same models.

Review Group Rules Chart

Time: 5 minutes

Materials:

- Group Rules Chart

Quickly review the Group Rules Chart. Highlight positive moments (times when students helped each other, asking great questions, teamwork, helping to clean up...)

Team Briefing

Time: 5 minutes

Materials: None

Just a reminder. Your design company has been given the task to:

- Identify a problem within a career area.

- Develop a solution for the problem using robotics.
- Create a campaign to pitch your solution to stakeholders.

Career areas include, but are not limited to:

- Medicine
- Health care
- Communication
- Entertainment
- Transportation
- Manufacturing
- Water quality
- Agriculture
- Safety

1. Select a career area.
2. Research and brainstorm potential problems or challenges.
3. Select a problem from the list.
4. Brainstorm design possibilities.
5. Build and test.
6. Obtain feedback.
7. Redesign/Modify. Repeat as necessary.
8. Create pitch for solution.

At this point, you should have a problem identified, a design solution to test and are ready to build and test today.

Design Challenge: Continued

Time: 60 min

Materials:

- Devices with internet access and EV3 software
- EV3 set
- Books or articles on various career areas for research
- Student journals

Groups should work on the design challenge.

Break

Time: 5 minutes

Design Challenge: work time

Time: 45 min

Materials:

- Devices with internet access and EV3 software

- EV3 set
- Books or articles on various career areas for research
- Student journals

Groups should work on the design challenge.

Lunch

Time: 30 minutes

Workplace Wellness: Physical Fitness

Time: 10 minutes

Materials:

- Materials may vary depending on what activity is selected

Take a minute to complete a short physical activity. You may find several ideas for short physical activities for students through a simple web search. Ideas include simple exercises like jumping jacks or running in place.

Design Challenge: Continued

Time: 120 minutes

Materials:

- Devices with internet access and EV3 software
- EV3 set
- Books or articles on various career areas for research
- Student journals

Groups should work on the design challenge.

Daily Debrief and Wrap Up

Time: 20 minutes

Materials:

- Student journals
- Markers
- Crayons
- Colored pencils

Have students draw a light bulb in their student journals. Inside the light bulb, have students write one or two things they discovered about themselves during camp.

Robotics at Work Day 5

Design Challenge Day

Outline for Day	Tasks	Time	Materials
9:00 - 10:30	Welcome and Team Building Activity	10 min	<ul style="list-style-type: none"> LEGO bricks
	Review Group Rules Chart	5 min	<ul style="list-style-type: none"> Group Rules Chart
	Team Briefing	5 min	<ul style="list-style-type: none"> None
	Pitch overview and expectations	10 min	<ul style="list-style-type: none"> None
	Design Challenge: Continued	60 min	<ul style="list-style-type: none"> EV3 sets Devices Craft materials
10:35 - 10:40	Break		
10:40 - 11:25	Design Challenge: Prepare for Showcase	45 min	<ul style="list-style-type: none"> EV3 sets Devices Student projects
11:25 - 11:30	Get ready for lunch		
11:30 - 12:00	Lunch		
12:00 - 1:30	Showcase	90 min	<ul style="list-style-type: none"> Student Projects
1:30 - 2:30	Daily Debrief, Clean Up and Wrap Up	60 min	<ul style="list-style-type: none"> EV3 sets Certificates of completion

Welcome

Time: 5 minutes

Materials: Student journals

Welcome students back to camp. On a piece of chart paper, draw a very large light bulb. Have students write positive things they discovered about themselves during camp.

Team Building Activity

Time: 15 minutes

Materials:

- LEGO bricks

Build Something That

- Work in groups of 4-5.
- Place the bricks in front of you.
- The teacher will name a category and your group will build an 2-3 items that belongs in this category.
- When done building, please explain why this item belongs in the category.

Build something that:

- *can fly*
- *is an animal*
- *can be used for transportation*
- *you can have for lunch or dinner*

Tip: Ideas for other categories include a movie, cartoon characters, buildings, and so forth.

Team Briefing

Time: 5 minutes

Materials: None

Today, your mission is to pitch your solutions to stakeholders. You will need to make sure your team is prepared. Be sure to practice your pitch with another team or with a teacher during setup time.

Go over your expectations for the pitches at the showcase in the afternoon so students are prepared for guests.

Culminating Project

Time: 60 minutes

Materials:

- EV3 sets
- Devices with EV3 software
- Craft materials

This is time set aside for groups to work on culminating project.

Break

Time: 5 minutes

Culminating Project: Set up for Showcase

Time: 45 minutes

Materials:

- EV3 sets
- Devices with EV3 software
- Craft materials

Time for students to get ready for guests after lunch. Pair up teams and have them practice their pitch to each other.

Lunch

Time: 30 minutes

Showcase: Pitch our Solutions

Time: 90 minutes

Materials:

- Student work

Students should be set up and ready when guests arrive. Other materials you might have on display:

- Charts you've created during the week
- Pictures
- Any videos you have taken

Daily Debrief, Clean Up and Wrap Up

Time: 60 minutes

Materials:

- Student projects
- Certificates

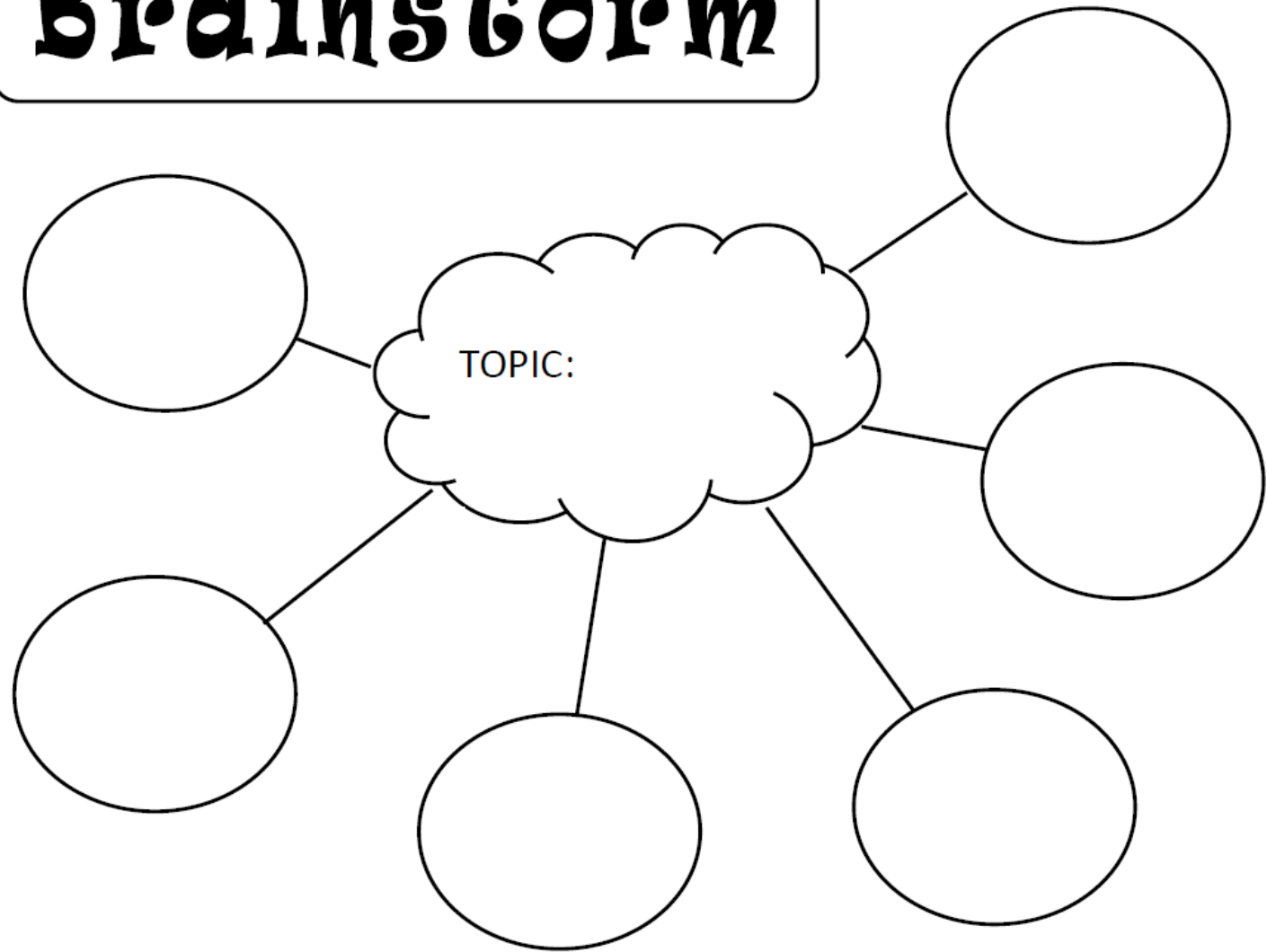
Have students disassemble their EV3 models. Make sure kits have the EV3 brick, motors, sensors and kits are in good order. Make sure devices are powered off and stored.

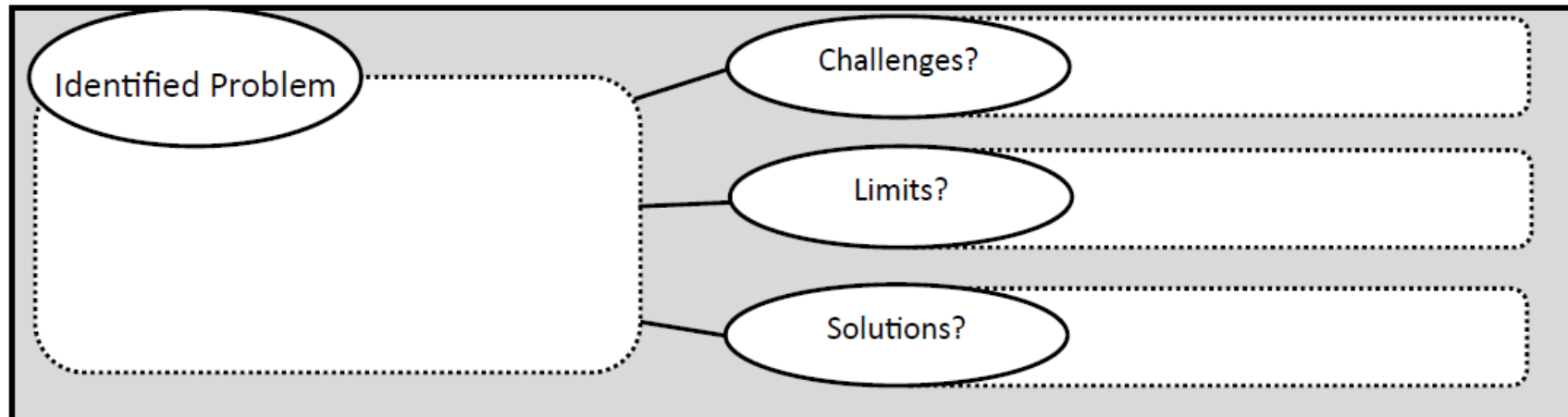
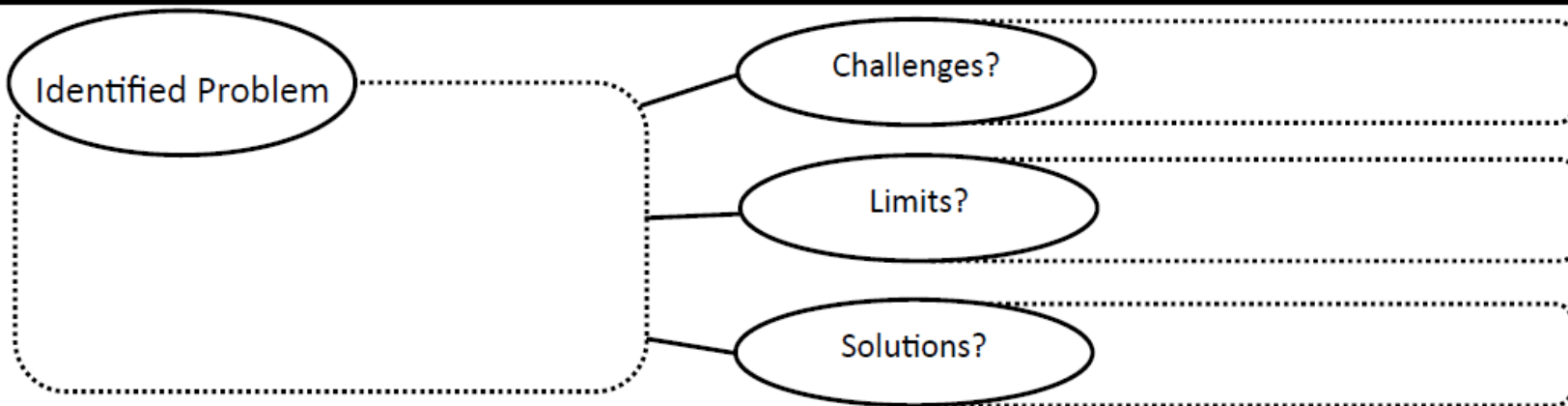
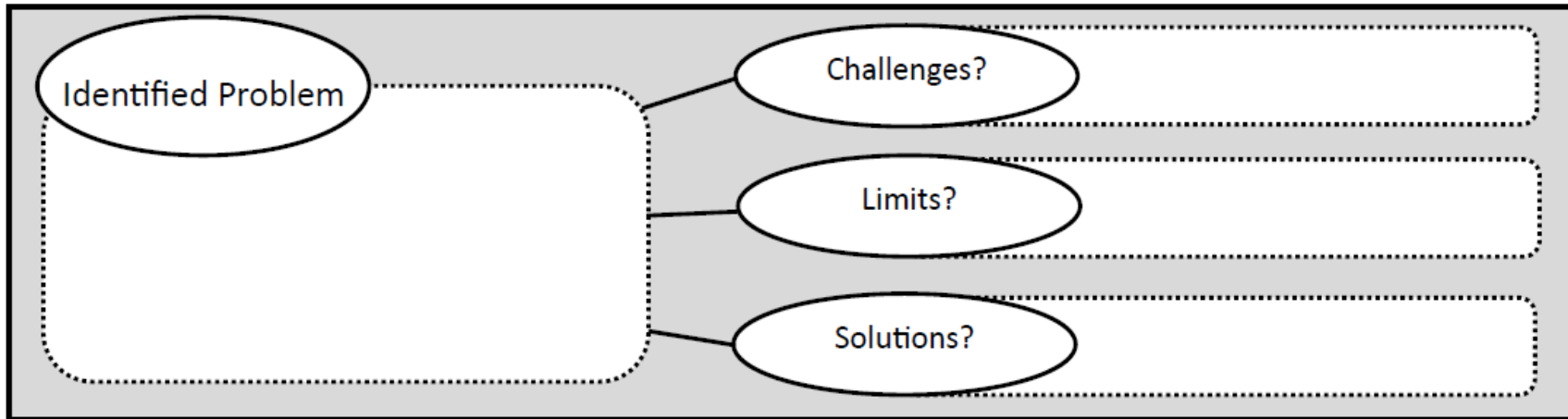
Have students clean up materials from the showcase.

Students can take home their journals from camp.

You can present each student with a certificate of completion

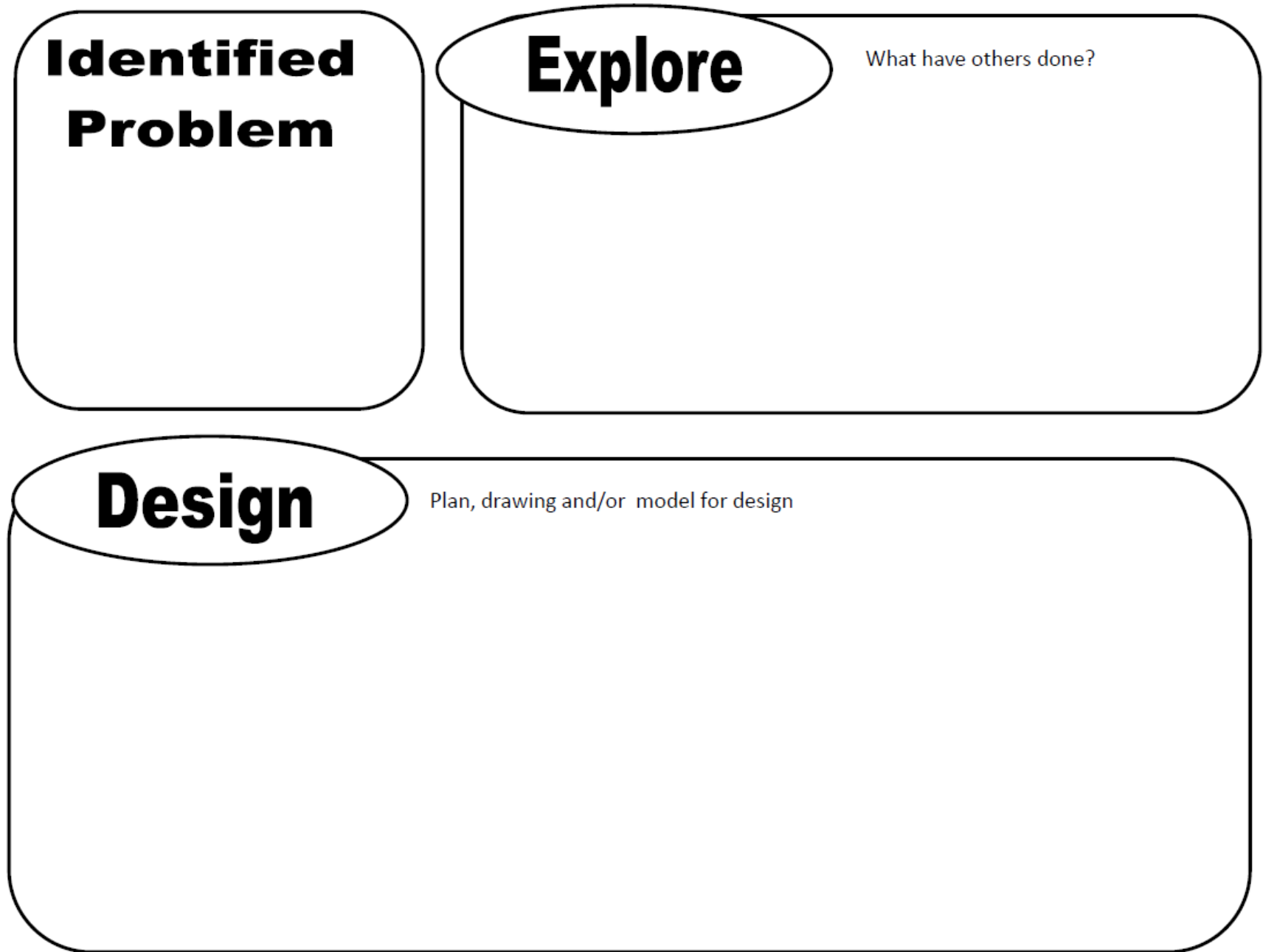
Brainstorm





Graphic Organizer

Career Area	Identified Problem	Positives for selecting	Drawbacks for selecting
Career Area	Identified Problem	Positives for selecting	Drawbacks for selecting
Career Area	Identified Problem	Positives for selecting	Drawbacks for selecting
Career Area	Identified Problem	Positives for selecting	Drawbacks for selecting



Graphic Organizer

Organizer for Pitch

Name of your solution:

Industry or career area:

Target audience (who would use it)

Problem it solves:

Description of your solution:

Explanation of how your solution solves
the problem

Reasons why this solution is the best

Other important information to share
