Robotics and Automation

Launch Log



Name \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

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Did you know that Leonardo da Vinci drew plans for a robotic machine, kind of an armored humanoid in 1945?humanoid in 1495.

**Activity 1 Part 1**

Introduction to Robots

When you think of a robot, what comes to mind?

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After reading the introduction to the story, what is the problem that Mylo, Suzi, and Angelina are faced with?

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Define these terms:

Robot:

Robotics:

|  |  |  |
| --- | --- | --- |
| K – What we KNOW about robots | W – What we WANT to know | L – What we LEARNED |
|  |  |  |

**Activity 1 Part 1**

What is a robot?

Research Source: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

* Follow procedures 2 – 6.
* Write all your notes here.

**Activity 1 Part 2**

Types of Robots

Type of robot for group research \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

* Follow procedures 7 – 10.
* Take notes below.
* Use Popplet to prepare your presentation.

**Activity 1 Part 3**

Engineering Design Process

* Follow procedures 11 – 12.

|  |  |
| --- | --- |
| Design Process Step | Response To Questions |
|  | What was the problem the robot was designed to solve? |
|  | How had this problem been solved in the past?What skills or knowledge would the designer have developed to design a model? |
|  | Create a sketch of the robot that includes labels and information about how the robot works. |
|  | How could the designer test the robot?What are some strengths and weaknesses of this robot? |
|  | Describe how the robot solved (or did not solve) the problem.How could the robot design be improved? |

**Activity 1**

Conclusion Questions

1. What is your definition of “robot”? \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
2. If you were a roboticist, what type of robot would you want to design? What would it be able to do? Draw a sketch of your robotic idea.

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1. Which step in this design process do you think would have been most difficult for the designers of the robot you selected? Explain your answer based on your research.
2. Answer the questions below for the development of one of the following inventions: phone, car, or airplane.
	1. What was the problem the invention was designed to solve?
	2. What were two criteria that would make this invention successful?
	3. What were two constraints that limited the design of this invention?

**Activity 2 Part 1**

Outputs – Small Motor Observations

* Follow the procedures 1 – 12.
* Record your results below.

**Activity 2 Part 2**

Inputs – Bumper Switch

* Follow procedures 13 – 26.
* Record your results below.

**Activity 2 Part 3**

Inputs – Touch LED

* Follow procedures 27 -40.
* Record your observations below.

**Activity 2 Part 4**

Inputs – Color Sensor

* Follow procedures 41 – 51.
* Record observations below.

**Activity 2**

Conclusion Questions

1. Which sensor or sensors could be used to stop a robot in an emergency? Explain by citing evidence from your observations.

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1. A motor is a type of output because it reacts to an input. What other output device did you test in this activity? What makes it an output?

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**Activity 3**

Build a Toy



Define the terms:

Engineer:

Engineering:

* Follow procedures 1 – 6.
* Complete the table with the criteria and constraints.

|  |  |
| --- | --- |
| CRITERIA | CONSTRAINTS |

**Activity 3**

Conclusion Questions

1. How did the criteria and constraints for the problem impact your design? \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
2. Using the knowledge and skills you gained in the Inputs and Outputs activity, how could you use motors, sensors, the remote control, and the robotic brain to make your toy model automated? \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
3. Would you be interested in a career designing or testing toys? Why or why not? \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

**Project**

Build a Robot

 

Define these terms:

Input:

Output:

Sensor:

* Follow procedures 1 – 4
* List your criteria and constraints in the table.

|  |  |
| --- | --- |
| CRITERIA | CONSTRAINTS |

* Follow procedures 5 -6
1. **Ask**
What are the criteria that will make the design successful?

What are the constraints that will limit the design?

1. **Explore**
Sketch several ideas below on how you will modify the vehicle to meet the criteria and constraints. Use a ruler if needed.
2. **Model**
Sketch the final design.  Use a ruler. Label parts of your design.
3. **Evaluate**
Record the number of blocks moved to the collection zone in each of your trials.

Trial 1:

Trial 2:

Trial 3:

Average:

1. **Explain**Was your design successful at moving the blocks to the collection zone? Provide evidence to support your answer. \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
List two changes you would make to improve your design. \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

**Project**

Conclusion Questions

1. What part of the design process was the most challenging for you during this project? Why? \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
2. What are some ways this vehicle could be used outside of the classroom? \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

**Problem**

Environmental Design Problem

* Follow procedures 1 – 8

**Ask** (Skip part c)

* 1. What is the need or want that we are trying to fulfill? \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

 What will make the design solution successful?

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1. List the criteria and constraints for the design problem.

|  |  |
| --- | --- |
| CRITERIA | CONSTRAINTS |

**Explore** (skip part e)

1. Write or sketch below how others have tried to solve a similar problem.
2. You may use information you learned from your research on robots using the Robots for iPad® app or other information found from other sources.
3. Brainstorm several ideas that may solve the problem. Create sketches of your ideas for the robot modifications in the Explore section.
4. Talk to your team and share ideas.

**Model**

1. In this step you will compare the solutions that your team has generated from the Explore step.
2. Use a [**Decision Matrix**](https://pltw.read.inkling.com/a/b/c258bec07bf2487989e5ed129db98194/p/3bf7d7a3e82e413297c9e59f6deb3dab) to choose one design and sketch the final design below. Label your sketch with materials and other details.



Decision Matrix

Introduction

Now that all of the team members have completed a detailed robot design, the team must decide which designs most closely match the original criteria for the Environmental Design Problem. Up to this point, your team has been working hard on your design, and you most likely think that it is the best design in the class. If a vote were taken, everyone would probably vote for their own idea!

Deciding which design is the best is not an easy task even for professional engineers. A decision matrix is a tool that a team or individual can use to look at each design objectively and compare the design to the original criteria. Components of each design are rated to see how they solved the original requirements or criteria. Numbers are used to rate or score each component, which can then be added up and averaged to get a final score.

Procedure

In this activity you will use a decision matrix to aid you in analyzing your design as well as those of other team members.

1. The first step in using the decision matrix and analyzing a design is for each team member to present their design and explain how it is supposed to work as well as any special features it may include.
2. After each presentation, team members will ask questions in order to fully understand your design concepts. They will also make suggestions that might improve your design.
3. The second step of this activity is to use the decision matrix to guide the team’s selection of the best solution to the design process.
	1. In the left-hand column, list each of the designs that are being rated. Example: Mylo’s design #1, Mylo’s design #2, Suzi’s design #1…
	2. Rate each design against each criterion using the scale found below the matrix. This can be completed together by the group, or each group member can rate the criteria separately and the total score can be entered. Example: Mylo thinks the wheels for the first design rates at 3, Suzi and Angelina only rate them at 2 – the total of 7 should be entered under the wheel column.
	3. Tally the scores to determine the best designs. Add the scores located in the row to the right for each design. Average each total score and compare the averages to determine the highest score. The design with the highest average will indicate the best design.
4. Remember, it is okay to go back in the design process to see if any additional improvements could be made to your team’s best design. Go back to the decision matrix and see if any of the components could be improved, and then brainstorm to try to find solutions. It is okay to combine ideas and add features from other designs on your team. Once your team has tweaked the final design to include ideas that provided the best score, you should be sure you identify the best design in your Launch Log.

**Directions**: Use the decision matrix to help your group choose the best robot design for solving the problem.

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
|  | **Design will take a short time to build** | **Design uses available materials** | **Design meets criteria and constraints of the problem** | **Design will be able to collect the materials necessary to solve the problem** | **Total** |
| **Idea #1** |  |  |  |  |  |
| **Idea #2** |  |  |  |  |  |
| **Idea #3** |  |  |  |  |  |
| **Idea #4** |  |  |  |  |  |

|  |  |  |  |
| --- | --- | --- | --- |
| **SCALE** | 1 = Does NOT meet criteria | 2 = Meets criteria | 3 = Exceeds criteria |

**Problem**

Conclusion Questions

1. Why is a decision matrix used? Give at least two reasons.

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1. Where else can you use a decision matrix when making important decisions? \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_