Four Week Session: Bridge Building Challenge

Lesson Title: Bridge Building Challenge		**Lesson Number:** 1
Created By: WPI Student Team	**Subject:** Engineering Design	**Intended Age:** 7-10
Length of Session: 1 hour	**Number of Instructors:** at least 1	**Last Updated:** March 3, 2023

Purpose of Session:

The purpose of this session is to provide students with hands-on experience to engage them in the field of engineering.

Prescribed Learning Outcomes:

Students will learn how to work collaboratively and use creative problem solving to come up with an idea.

Instructional Objectives:

- Student teams will work together to build a bridge.
- Students will learn how to work in a team.
- Students will learn about creative problem solving.

Prerequisite Concepts and Skills:

There are no prerequisites for this lesson.

Materials and Resources:

Instructor	Students
Paper Masking Tape	----------

Lesson Activities:

Instructor	Students	Time Allotted
<u>Introduction</u> Instructor introduces themselves and what the students will be doing during this workshop. Opening Question: What is engineering? Instructor teaches students that engineering is the process of using knowledge to build anything.	Students arrive. Students provide answers. Students provide answers.	10 minutes 10 minutes

Instructor asks: What is problem solving? Instructor explains an overview of problem solving. Instructor explains the bridge building challenge. Students will work together in small groups to create a bridge out of paper and masking tape. This bridge may go from one table to another or be free standing on the floor.		
<u>Body</u> Instructor explains the bridge building challenge. Students in small groups will work together to create a bridge out of paper and masking tape. This bridge may go from one table to another or be free standing on the floor. Students are broken into small groups and each group is given a certain number of sheets of paper and a given amount of tape. **If students are struggling, the instructor can show students how to roll the paper to make it sturdy, how to use diagonal pieces to support a structure, etc.*	In small groups, students work to design a bridge with help from the instructor.	10 minutes 20 minutes
<u>Closure</u> Instructor reviews what they learned today and asks the following questions: 1. *What did you learn today?* 2. *Do you have any questions?*	Students are given the chance to ask questions and talk about what they learned.	10 minutes

Four Week Session: Obstacle Building

Lesson Title: Obstacle Building **Lesson Number:** 2

Created By: WPI Student Team	**Subject:** Engineering Design	**Intended Age:** 7-10
Length of Session: 1 hour	**Number of Instructors:** at least 1	**Last Updated:** March 3, 2023

Purpose of Session:

This session will provide students with additional hands-on engineering experience. They will get the chance to play with the interactive display. They will also get a taste of planning their design before they create it.

Prescribed Learning Outcomes:

Students will further their understanding of the engineering design process and their ability to work collaboratively through obstacle design.

Instructional Objectives:

- Students further their understanding of other applications of engineering.
- Students gain experience in engineering design with more constraints.
- Students practice drawing their ideas before they build.

Prerequisite Concepts and Skills:

Ideally students would have attended the first session, but this is not required.

Materials and Resources:

Instructor	Students
Rubber Bands Paper Pencils/ pens Tape Cardboard Any miscellaneous scraps of materials that students could incorporate into their design. Obstacle Examples These can be 3D printed/ laser cut from the website or can use ones that have been created by other students in this space.	----------

Lesson Activities:

Instructor	Students	Time Allotted

Introduction Instructor introduces themselves and welcomes everyone. Instructor reminds students of the bridge building activity from the last session. Preferably ask student what they remembered to engage them and review the core concepts from that lesson. Students are then told they will have a new engineering design challenge. This session they will be creating an obstacle for the pinball machine. Students are shown the pinball machine. The instructor demonstrates how to play. The group settles down and takes their seats again.	Students arrive. Students are given time to explore the interactive display, while the musical lights are turned off.	5 minutes 10 minutes
Body The students are introduced to the materials available. **For this section of the lesson, it depends on the instructor's opinion. Students may each develop their own obstacle or may be divided into teams to work together. Keeping in mind the number of students and available resources. Especially with students this young it is advised that materials are evenly split and distributed to each group or individually by the instructor.* The instructor demonstrates how the obstacle effects the path of the marble. (Use a variety of obstacles and show how they can be placed on different ways on the board). Students are then each given a piece of paper and asked to draw their own	 Students are given the opportunity to move around obstacles and experiment with different example obstacles. Students work individually or in teams to design their own obstacle.	 10 minutes 10 minutes

ideas for an obstacle. Depending on time, explain the purpose of drawing out ideas before you create them. Students are then given their materials and may begin working.	Students experiment with creating obstacles with the given materials	10 minutes
<u>Closure</u> Review what they learned today focusing on the importance of drawing before you create and working with others. Can also review what it was like to work with limited materials, and on a surface with constraints.	Students are given a chance to share what they learned and ask questions.	5 minutes

Lesson Title: Coding Games		**Lesson Number:** 3
Created By: WPI Student Team	**Subject:** Coding	**Intended Age:** 7-10
Length of Session: 1 hour	**Number of Instructors:** at least 1	**Last Updated:** March 3, 2023

Purpose of Session:

The purpose of this session is for students to learn that coding is a fun way to be creative, and to learn a few coding techniques.

Prescribed Learning Outcomes:

Students will gain fundamental experience in coding and learn that anyone can do it!

Instructional Objectives:

- Fundamental coding techniques.
- Creativity with a technological application.

Prerequisite Concepts and Skills:

Students will not need any prior knowledge or skills.

Materials and Resources:

Instructor	Students
Laptop with internet connection.	Laptop with internet connection.

Lesson Activities:

Instructor	Students	Time Allotted
<u>Introduction</u> Coding is the method of communicating between humans and computers, and you can see coding in real life every day. While coding has created many cool and sophisticated things, it is accessible to anyone who wants to learn.		10 minutes
<u>Body</u>		45 minutes

Using the website lightbot.lu , students will accomplish the first 15 levels of the course.	Using the website lightbot.lu , students will accomplish the first 15 levels of the course.	
Closure While a cool game, this website has taught you important foundations of coding!	Students may ask questions as they arise.	5 minutes

Four Week Session: Coding Games Part 2!

Lesson Title: Coding Games Part 2!		**Lesson Number:** 4
Created By: WPI Student Team	**Subject:** Coding	**Intended Age:** 7-10
Length of Session: 1 hour	**Number of Instructors:** at least 1	**Last Updated:** March 3, 2023

Purpose of Session:

The purpose of this session is for students to learn that coding is a fun way to be creative, and to learn more about coding techniques.

Prescribed Learning Outcomes:

Students will continue to gain fundamental experience in coding and learn that anyone can do it!

Instructional Objectives:

- Fundamental coding techniques
- Creativity with a technological application

Prerequisite Concepts and Skills:

Students will not need any prior knowledge or skills.

Materials and Resources:

Instructor	**Students**
Laptop with internet connection.	Laptop with internet connection.

Lesson Activities:

Instructor	**Students**	**Time Allotted**
<u>Introduction</u> Coding is the method of communicating between humans and computers, and you can see coding in real life every day. While coding has created many cool and sophisticated things, it is accessible to anyone who wants to learn.		10 minutes

<u>Body</u> Using website https://scratch.mit.edu/, students will accomplish a given task. Tasks could include: 1. Creating a scene where there is dialogue and movement. 2. Make an interesting and functional game. Go to Tutorials and they already have a lot of ideas documented that are relatively easy to learn once you watch their videos.	Students explore on Scratch.	45 minutes
<u>Closure</u> While a cool game, this website has taught you important foundations of coding!	Students may ask questions as they arise.	5 minutes