

20/21 Mobile Laboratory Activities

Learning Undefeated is providing new activities for the Texas Mobile STEM Labs centered around cross-curricular STEM experiences. These activities will introduce STEM to students from Kindergarten through Grade 8, and allow students to engage with the engineering design process. Learning Undefeated will provide the materials needed to complete engineering design challenges focused on brainstorming, designing, and testing. All activities focus on students designing solutions to problems, and allow for collaboration and exploration of the content.

Magnets Push, Magnets Pull (K-1)

In this design challenge, students will read the storybook *Magnets Push, Magnets Pull* to learn about how magnets work. The students will be presented with the following problem, "Jose loves to entertain his community by designing hay mazes every year. He needs some help this year in thinking of a new maze design. Today, you will be putting on your engineering hat to build a maze!" Students will engage in a STEM challenge to design a solvable maze with one entrance and exit that utilizes only a magnet to solve.

+ TEKS covered in this design challenge

Kinder TEKS: K.6B Grade 1 TEKS: 1.6B

Jack and the Beanstalk (K-2)

In this design challenge, students will be presented with a problem derived from the story *Jack and the Beanstalk* by Carol Ottolenghi. In the story Jack climbs a magical bean stalk where he finds a castle that he steals several items from before returning home. The students will be presented with the following problem, "Jack wants to go back to the castle in the sky to return the hen and the harp he stole, but he is out of magic beans. He does not know how he will get back to the castle. Today, you are going to put on your engineering hat to help Jack build a "bean stalk" that can reach all the way to the giant's castle in the sky so he can return the stolen items." Students will engage in a STEM challenge to build the tallest structure in 25 minutes that can hold a toy Jack for one minute. Teams will receive bonus points if their structure can withstand a 30 second windstorm before Jack safely returns to his home on the ground.

+ TEKS covered in this design challenge

Kinder TEKS: K.5A, K.6C Grade 1 TEKS: 1.5A, 1.5C Grade 2 TEKS: 2.5C, 2.5D





The True Story of the Three Little Pigs (Grades K-2)

In this design challenge, students will be presented with a problem derived from the story The True Story of the Three Little Pigs by Jon Scieszka. In the story, the wolf tells his side of the story of The Three Little Pigs. The wolf was planning to bake a birthday cake for his grandma and sought a cup of sugar. However, due to having a cold, his sneeze blows down the pig's homes. The students will be presented with the following problem, "The eldest brother of the three little pigs is looking to rebuild the destroyed homes in his community after the sneezing wind disaster caused by the wolf. "Students will put on their engineering hat to help the eldest brother rebuild homes in the community. Students will engage in a STEM challenge to build a home in 25 minutes that can withstand the wolf's sneeze for 10 seconds. Teams will receive bonus points if their home can withstand the wolf's super sneeze for 10 seconds while protecting the pig inside the home.

+ TEKS covered in this design challenge

K TEKS: K.5A, K.7C Grade 1 TEKS: 1.5A, 1.5C, 1.7C, 1.8D Grade 2 TEKS: 2.5D

What If There Were No Bees? (Grades 2-4)

In this design challenge, students will be presented with a problem derived from the story What If There Were No Bees? by Suzanne Slade. In the story, Suzanne talks about how bees help the ecosystem and the ramifications if bees were to disappear from the ecosystem. The students will be presented with the following problem, "The Martinez family has noticed that there are less bees around their farm. They are worried that over time, there may be no bees left to pollinate their crops. What can they do to make sure their crops and surrounding lands get pollinated?" Students will put on their engineering hat to design an artificial pollinator that can do the work of honeybees. Students will engage in a STEM challenge to build an artificial pollinator to help the Martinez family deal with the dwindling bee population.

+ TEKS covered in this design challenge

Grade 2 TEKS: 2.9A, 2.9C Grade 3 TEKS: 3.10B Grade 4 TEKS: 4.10C





City Planning (Grades 3-4, 7)

In this design challenge, students will be presented with flooding as a problem that needs to be addressed by City Planners. Students will get to look at an AR Sandbox demonstration on how rainfall can impact a city. The students will then be presented with the following problem, "**The city of Teastem has hired you, a City Planner, to assist in dealing with the city's problem of flooding. The city has brought in an AR sandbox to model the topography of the city and help you analyze the layout of the city and design a solution to the flooding." The student will put on their engineering hat to prevent flooding in the town of Teastem. Students will engage in a STEM challenge to design solutions for the city of Teastem that provides multiple methods to address flooding without causing further damage to the city. Teams will receive bonus points if their solutions hold up against slow changes to the surface caused by weathering and erosion or sudden changes caused by flashfloods and landslides.**

+ TEKS covered in this design challenge

Grade 3 TEKS: 3.7B Grade 4 TEKS: 4.7B Grade 7 TEKS: 7.8A, 7.8B, 7.8C

Circuits (Grades 4-6)

In this design challenge, students will be presented with the problem of improving an existing toy design called a wigglebot. The wigglebot is able to wiggle through the use of a dc motor. Students will learn about electricity and circuitry before taking on the challenge of adding more features to this toy. The students will be presented with the following problem, "Maria's company currently sells wigglebots, but has gotten feedback from her market research that they need to do more than just wiggle. She is looking to improve the design of this toy to not only include more features, but to also keep its look." The student will be putting on their engineering hat to help Maria improve the design of her toy. Students will engage in a STEM challenge to design a wigglebot that can produce light and sound while still being able to wiggle.

+ TEKS covered in this design challenge

Grade 4 TEKS: 4.6A, 4.6B, 4.6C Grade 5 TEKS: 5.6A, 5.6B Grade 6 TEKS: 6.9C





Biomimicry (Grades 4-5, 7)

In this design challenge, students will be presented with a problem of a need to develop a prosthesis for John, who works in an oilfield. Students will learn about biomimicry and get a basic understanding of how we, as humans, have looked to nature as a source of inspiration for designing solutions. The students will be presented with the following problem, "John works at the local oilfield, but recently got into an accident while operating machinery. Fortunately, he will recover but had to have his right arm amputated. With advances in technology, prosthetics can now be made with 3D printers. However, John is not sure how to create one and needs your help in designing a prosthesis that will allow him to complete specific tasks. Today, you will put on your engineering hat to create the initial design for a prosthesis. By looking to nature, you will be able to design a prosthesis that is able to grab, move, and open a water bottle." Students will engage in a STEM challenge to design a prosthesis that can hold a water bottle, lift one up and move it, and have a firm enough grip to open the water bottle. Teams will receive bonus points if their prosthesis can be tested using only one hand.

+ TEKS covered in this design challenge

Grade 4 TEKS: 4.10A Grade 5 TEKS: 5.10A Grade 7 TEKS: 7.12B

Space Capsule Drop (Grades 6-8)

In this design challenge, students will learn about the reason space capsules are used instead of shuttles and design a space capsule for an upcoming flight. The students will be presented with the following problem, "OceanX is looking to get involved in the space tourism business. However, they have mainly focused on designing rockets rather than space capsules. OceanX is now in the process of developing space capsules that are safe for human flight and can be reused to keep cost down." Students will put on their engineering hat to build a space capsule that can protect the astronauts who are inside. Students will engage in a STEM challenge to design a space capsule that is able to safely land on a target. Bonus points will be awarded for those who wish to push their design to safely land within the targeted landing zone in windy conditions.

+ TEKS covered in this design challenge

Grade 6 TEKS: 6.8B, 6.8C,6.11C Grade 7 TEKS: 7.9B Grade 8 TEKS: 8.6A, 8.6C





Rover Design (6, 8)

In this design challenge, students will learn about the friction and the Mars Rover to get a better understanding of how it traverses across different terrains. The students will be presented with the following problem, "JPL is looking to design their next rover. The particular terrain that this rover will be sent is particularly rough." Students will put on their engineering hat to build a rover that can travel across rough terrain. Students will engage in a STEM challenge to design a Mars Rover that will be able to travel rough terrain safely.

+ TEKS covered in this design challenge

Grade 6 TEKS: 6.8A, 6.8B, 6.8C, 6.8E Grade 8 TEKS: 8.6A, 8.6C, 8.9C

Bottle Car (Grades 6-8)

In this design challenge, students will be presented with a problem of a need to design a truck that is as efficient as possible for Jennifer's transportation company. Students will learn about Newton's laws, with emphasis on the first and third law, and see a lab demo of a chemical reaction. The chemical reaction will be vinegar and baking soda, the same materials they will use for their design challenge. The students will be presented with the following problem, "Jennifer's transportation company is currently trying to figure out how to maximize the output of her trucks. They travel far distances with a lot of goods, and do not want to waste any fuel. Today, you will put on your engineering hat to build a truck that will travel the farthest and on a single tank of gas." Students will engage in a STEM challenge to design a truck powered by a chemical reaction that will have to stop within a specific drop-off zone. Teams will receive bonus points as they are challenged with various payloads while still being able to stop in the drop-off zone.

+ TEKS covered in this design challenge

Grade 6 TEKS: 6.5C, 6.8B Grade 7 TEKS: 7.7A Grade 8 TEKS: 8.5E, 8.6A, 8.6C





Maintaining a Balance (Grades 3-5, 7-8)

In this design challenge, students will discuss briefly about ecosystems and take part in a species survival demonstration. This demonstration will challenge students to remove as many species from the environment as possible within one minute and discuss their results. The students will then be presented with the following problem, "Our ecosystem's population balance has gone out of control due to an invasive species. We need to eliminate the invasive species population as best we can in order to restore our ecosystem's balance." The students will put on their engineering hat to assist in removing the invasive species population within an ecosystem. The teams will have an opportunity to create a process through the use of different tools to remove the invasive species population. Students will engage in a STEM challenge to design their process used to remove species in order to attain population equilibrium.

+ TEKS covered in this design challenge

Grade 3 TEKS: 3.9A, 3.9C Grade 4 TEKS: 4.9B Grade 5 TEKS: 5.9A Grade 7 TEKS: 7.10B, 7.11B Grade 8 TEKS: 8.11B

