

## Mobile Laboratory Activities

*Learning Undefeated provides 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 real-world problems and allow for collaboration and exploration of the content.*

### **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.

#### **+ Science Scientific and Engineering Practices covered in this design challenge**

Kinder TEKS: K.1B, K.1E, K.1G, K.13A

Grade 2 TEKS: 2.1B, 2.1E, 2.1G, 2.1G, 2.13A

#### **+ Math TEKS covered in this design challenge**

Kinder TEKS: K.2A, K.2C, K.5, K.6E, K.7A

Grade 1 TEKS: 1.3D, 1.3E, 1.5A, 1.7A

Grade 2 TEKS: 2.2B, 2.4A, 2.9D

## **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.

### **+ Science Scientific and Engineering Practices covered in this design challenge**

Kinder TEKS: K.1B, K.1E, K.1G, K.6, K.10C

Grade 1 TEKS: 1.1B, 1.1E, 1.1G, 1.6A, 1.6C

Grade 2 TEKS: 2.1B, 2.1E, 2.1G, 2.6A, 2.6B, 2.6C

### **+ Math TEKS covered in this design challenge**

Kinder TEKS: K.2A, K.2C, K.5

Grade 1 TEKS: 1.3D, 1.3E, 1.5A

Grade 2 TEKS: 2.2B, 2.4A

## **Goldilocks and the Three Bears (K-2)**

In this design challenge, students will receive a problem inspired by the story Goldilocks and the Three Bears by James Marshall. In the story, Goldilocks is assigned the task of buying muffins in the next village but is warned not to take the shortcut through the forest. However, Goldilocks does as she pleases and ends up finding the home of the three Bears. She walks right into the house without knocking and begins to cause mischief. Having tried the Bear's food, chairs, and beds, Goldilocks eventually falls asleep. When the Bear family returns, they find a sleeping Goldilocks who awakes startled and runs home. Although everyone is safe in the end, the Baby Bear's chair is destroyed. Students will engage in a STEM challenge to build a chair for the Bear family's guest in 25 minutes. Teams will receive bonus points if a student from the team can sit in the chair.

### **+ Science Scientific and Engineering Practices covered in this design challenge**

Kinder TEKS: K.1.B, K.1.E, K.1.G, K.6.A

Grade 1 TEKS: 1.1.B, 1.1.E, 1.1.G, 1.6.C Grade

2 TEKS: 2.1.B, 2.1.E, 2.1.G, 2.6.C

**+ Math TEKS covered in this design challenge**

Kinder TEKS: K.2.A, K.2.C, K.5, K.6.E

Grade 1 TEKS: 1.3.D, 1.3.E, 1.5.A, 1.7.A

Grade 2 TEKS: 2.2.B, 2.4.A, 2.9.D

## **Finding My Dance (K-2)**

In this design challenge, students will receive a problem inspired by the story *Finding My Dance* by Ria Thundercloud. In the story, Ria describes her journey of self-discovery through different forms of dance. The students will be presented with the following problem: “Ria got invited to perform a new dance at an upcoming festival. She is looking for some musicians who can create unique instruments for her dance that can play loud enough for her to hear them on a stage that is 6 meters away. Today, you are going to put on your engineering hat to build some instruments for Ria’s dance performance.” Students will engage in a STEM challenge to build instruments in 25 minutes, create a rhythm to communicate choreography to Ria while she dances, and ensure the instrument can be heard on a stage 6 meters away.

**+ Science Scientific and Engineering Practices covered in this design challenge**

Kinder TEKS: K.2.B, K.1.E, K.1.G, K.2.D, K.6.A

Grade 1 TEKS: 1.1.B, 1.1.E, 1.1.G, 1.2.D, 1.6.A, 1.6.C

Grade 2 TEKS: 2.1.B, 2.1.E, 2.1.G, 2.2.D, 2.6.A, 2.6.C, 2.8.A, 2.8.C

**+ Math TEKS covered in this design challenge**

Kinder TEKS: K.2.A, K.2.C, K.5, K.6.E, K.7.A

Grade 1 TEKS: 1.3.D, 1.3.E, 1.5.A, 1.7.A

Grade 2 TEKS: 2.2.B, 2.4.A, 2.9.D

**+ Music TEKS covered in this design challenge**

Grade 1 TEKS: 1.2.A, 1.3.A, 1.4.A

Grade 2 TEKS: 2.2.B, 2.3.A, 2.3.C

## **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 a way to attract honeybees or design an artificial pollinator that can do the work of honeybees. Students will engage in a STEM challenge to build an environment to attract bees or an artificial pollinator to help the Martinez family deal with the dwindling bee population.

#### **+ Science Scientific and Engineering Practices covered in this design challenge**

Grade 2 TEKS: 2.1B, 2.1G, 2.12B, 2.12C

Grade 3 TEKS: 3.1B, 3.1G, 3.12B

Grade 4 TEKS: 4.1B, 4.1G

#### **+ Math TEKS covered in this design challenge**

Grade 2 TEKS: 2.2B, 2.4A, 2.9D Grade

3 TEKS: 3.4A, 3.7E

### **Stable Figures (3-5)**

In this design challenge, students will review a variety of mathematical equations and concepts. The students will then be presented with the following problem: The Jeffersons, a retired couple, are thinking about purchasing 2 horses, 5 chickens, and 3 pigs for their farm. They have already begun the process of purchasing the animals; however, they don't want to go any further without securing a construction company to build their dream barn. Today, you will put on your engineering hat to design and create the initial design for the Jeffersons' dream barn. They are looking for a group that can give them the best value. The Jeffersons' dream barn should include shapes and angles that create a unique design and a large enough area and perimeter for livestock animals and should be strong enough to survive a windstorm.

#### **+ Science Scientific and Engineering Practices covered in this design challenge**

Grade 3 TEKS 3.1.B, 3.1.D, 3.1.E, 3.1.G, 3.2.D, 3.6.D

Grade 4 TEKS 4.1.B, 4.1.D, 4.1.E, 4.1.G, 4.2.D

Grade 5 TEKS 5.1.B, 5.1.D, 5.1.E, 5.1.G, 5.2.D

#### **+ Math TEKS covered in this design challenge**

Grade 3 TEKS: 3.1.A, 3.1.B, 3.1.C, 3.1.D, 3.4.C, 3.4.G, 3.6.C, 3.6.D, 3.7.B

Grade 4 TEKS: 4.1.A, 4.1.B, 4.1.C, 4.1.D, 4.4.A, 4.5.C, 4.5.D, 4.6.A, 4.6.C Grade

5 TEKS: 5.1.A, 5.1.B, 5.1.C, 5.1.D, 5.4.G, 5.4.H

### **Care Package Launch (2-3, 5, 7)**

Students will engage in a STEM challenge to design a catapult that can land on two different targets. In this design challenge, students will learn forces and motion in the operation of the simple machine known as a lever. Students will then design a catapult to hit two targets at two different distances. The students will be presented with the following problem: The Kingdom of All You are looking to deliver care packages to the town of Teastem but is prevented by a large canyon. Students will put on their engineering hats to build a catapult to deliver care packages to two different target locations. Bonus points will be awarded to those who wish to build a catapult that can successfully launch a heavier care package to both locations.

**+ Science Scientific and Engineering Practices covered in this design challenge**

Grade 2 TEKS: 2.1.B, 2.1.E, 2.1.G, 2.2.D, 2.6.A, 2.6.C, 2.7.B

Grade 3 TEKS: 3.1.B, 3.1.E, 3.1.G, 3.2.D, 3.7.B, 3.8.B

Grade 5 TEKS: 5.1.B, 5.1.E, 5.1.G, 5.2.D, 5.7.A

Grade 7 TEKS: 7.1.B, 7.1.E, 7.1.G, 7.2.D, 7.7.D

**+ Math TEKS covered in this design challenge**

Grade 3 TEKS: 3.4.F, 3.4.G

Grade 5 TEKS: 5.3.K, 5.10.F

Grade 7 TEKS: 7.3.A, 7.3.B

### **River Crossing (2-3, 7-8)**

In this design challenge, students will learn about the history of westward expansion in the United States and the difficulties that migrants faced while traveling. Students will be presented with a scenario, which is crossing a river with all of their belongings, that many migrants faced when traveling west. The students will be presented with the following problem: In search of new beginnings, the Jacksons are on a journey to West Texas. However, they have come across a river that is too deep to cross with their wagon alone. The Jacksons must figure out how to get across the river to continue their journey. Students will put on their engineering hats to build a bridge that can safely deliver travelers across the river. Bonus points will be awarded to those who are able to add additional cargo to their wagon and successfully travel across the river.

**+ Science Scientific and Engineering Practices covered in this design challenge**

Grade 2 TEKS: 2.1.B, 2.1.E, 2.1.G, 2.2.D, 2.6.A, 2.6.C

Grade 3 TEKS: 3.1.B, 3.1.E, 3.1.G, 3.2.D, 3.6.D, 3.7.B

Grade 7 TEKS: 7.1.B, 7.1.E, 7.1.G, 7.2.D, 7.7.D

Grade 8 TEKS: 8.1.B, 8.1.E, 8.1.G, 8.2.D, 8.7.B

**+ Math TEKS covered in this design challenge**

Grade 2 TEKS 2.2.B, 2.4.A, 2.9.D

Grade 3 TEKS 3.4.A, 3.4.G

**+ Social Studies TEKS covered in this design challenge**

Grade 7 TEKS: 7.10.A

Grade 8 TEKS: 8.6.B

## **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 can 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 Wigglebot, 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.

### **+ Science Scientific and Engineering Practices covered in this design challenge**

Grade 4 TEKS: 4.1B, 4.1G, 4.2D, 4.8C

Grade 5 TEKS: 5.1B, 5.1G, 5.2D, 5.8A, 5.8B

### **+ Math TEKS covered in this design challenge**

Grade 4 TEKS: 4.8C

Grade 5 TEKS: 5.10F Grade

6 TEKS: 6.3D, 6.3

## **Biomimicry (Grades 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.

### **+ Science Scientific and Engineering Practices covered in this design challenge**

Grade 5 TEKS: 5.1B, 5.1G, 5.2D, 5.13A

Grade 7 TEKS: 7.1B, 7.1G, 7.2D, 7.13A

**+ Math TEKS covered in this design challenge**

Grade 5 TEKS: 5.10F Grade

7 TEKS: 7.3A

### **Space Capsule (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, “LU X is looking to get involved in the space tourism business. However, they have mainly focused on designing rockets rather than space capsules. LU X 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.

**+ Science Scientific and Engineering Practices covered in this design challenge**

Grade 7 TEKS: 7.1B, 7.1G, 7.2D, 7.7A

Grade 8 TEKS: 8.1B, 8.1G, 8.2D

**+ Math TEKS covered in this design challenge**

Grade 6 TEKS: 6.3D, 6.3E Grade

7 TEKS: 7.3A, 7.3B, 7.4B

### **Bottle Rocket Truck (Grades 6-8)**

In this design challenge, students will design a truck that is as efficient as possible for Jennifer's transportation company. Students will learn about Newton's Laws of Motion, 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.” The students will put on their engineering hat to build a truck that will travel an exact distance on a single tank of gas. They 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 be challenged with various payloads to earn bonus points if they are able to stop in the drop-off zone.

**+ Science Scientific and Engineering Practices covered in this design challenge**

Grade 6 TEKS: 6.1B, 6.1G, 6.2D, 6.6E, 6.7C

Grade 7 TEKS: 7.1B, 7.1G, 7.6C, 7.7D

Grade 8 TEKS: 8.1B, 8.1G, 8.6E

### **+ Math TEKS covered in this design challenge**

Grade 6 TEKS: 6.3D, 6.3E Grade

7 TEKS: 7.3A, 7.3B

## **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. We need to fix our ecosystem to make sure there is equilibrium amongst the species.” The students will put on their engineering hat to assist in maintaining species populations within an ecosystem. The teams will have an opportunity to design a tool to remove the invasive species and restore balance to the ecosystem.

### **+ Science Scientific and Engineering Practices covered in this design challenge**

Grade 3 TEKS 3.1B, 3.1G, 3.2D, 3.12B, 3.12C

Grade 4 TEKS 4.1B, 4.1G, 4.2D, 4.12B

Grade 5 TEKS 5.1B, 5.1G, 5.2D, 5.12B

Grade 7 TEKS 7.1B, 7.1G, 7.12B Grade

8 TEKS 8.1B, 8.1G, 8.12B

### **+ Math TEKS covered in this design challenge**

Grade 3 TEKS 3.4A, 3.4G

Grade 4 TEKS 4.4H, 4.8H

Grade 5 TEKS 5.10F Grade

7 TEKS: 7.3A, 7.3B

## **Flood Barriers (3-4,7)**

In this design challenge, students will be presented with downstream flooding as a problem for their community. Students will get to look at how downstream water can cause flooding through the aid of an AR sandbox. They will then be presented with the following problem, “Your home has had issues with flooding. The city is unable to provide direct assistance, and so you must design a solution to deal with this incoming water during a flood.” Students will put on their engineering hat to design flood barriers made from different earth materials to determine what works best in diverting water away from their home. Students will engage in a STEM challenge to design solutions to help their community and limit the amount of water seeping into their own property.



**+ Science Scientific and Engineering Practices covered in this design challenge**

Grade 3 TEKS: 3.1D, 3.10C, 3.11A

Grade 4 TEKS: 4.1D, 4.10B

Grade 7 TEKS: 7.1B, 7.1G, 7.2G, 7.11A

**+ Math TEKS covered in this design challenge**

Grade 3 TEKS: 3.4A, 3.4G

Grade 4 TEKS: 4.6B, 4.8C

Grade 7 TEKS: 7.3A, 7.3B