TEXAS MOBILE STEM LABORATORY ACTIVITIES

The Texas Education Agency's Texas Mobile STEM Laboratory provides activities centered around cross-curricular STEM experiences. These activities will introduce STEM to students from kindergarten through grade 8 and allow students to engage in the engineering design process. The Texas Mobile STEM Laboratory 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 (GRADES 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 beanstalk, finds a castle, and steals several items 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 "beanstalk" 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 TEKS covered in this design challenge

- Kindergarten Texas Essential Knowledge and Skills (TEKS): K.1.B, K.1.E, K.1.G, K.13.A
- Grade 2 TEKS: 2.1.B, 2.1.E, 2.1.G, 2.1.G, 2.13.A

+ Math TEKS covered in this design challenge

- Kindergarten 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

+ 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 hats 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 TEKS covered in this design challenge

- Kindergarten TEKS: K.1.B, K.1.E, K.1.G, K.6, K.10.C
- Grade 1 TEKS: 1.1.B, 1.1.E, 1.1.G, 1.6.A, 1.6.C
- Grade 2 TEKS: 2.1.B, 2.1.E, 2.1.G, 2.6.A, 2.6.B, 2.6.C

+ Math TEKS covered in this design challenge

- Kindergarten TEKS: K.2.A, K.2.C, K.5
- Grade 1 TEKS: 1.3.D, 1.3.E, 1.5.A
- Grade 2 TEKS: 2.2.B, 2.4.A

+ GOLDILOCKS AND THE THREE BEARS (GRADES 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 three Bears' home. She walks right into the house without knocking and starts causing 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 TEKS covered in this design challenge

- Kindergarten 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

- Kindergarten 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 (GRADES 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 musicians who can create unique instruments for her dance that play loudly enough to be heard from a stage six 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 as she dances, and ensure the instruments can be heard from a stage 6 meters away.

+ Science TEKS covered in this design challenge

- Kindergarten 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

- Kindergarten 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 based on 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 fewer 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 hats 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 that attracts bees or an artificial pollinator to help the Martinez family address the dwindling bee population.

+ Science TEKS covered in this design challenge

- Grade 2 TEKS: 2.1.B, 2.1.G, 2.12.B, 2.12.C
- Grade 3 TEKS: 3.1.B, 3.1.G, 3.12.B
- Grade 4 TEKS: 4.1.B, 4.1.G

+ 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, 3.7.E

+ STABLE FIGURES (GRADES 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 two horses, five chickens, and three pigs for their farm. They have already begun purchasing the animals; however, they don't want to proceed 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 offers the best value. The Jeffersons' dream barn should include shapes and angles that create a unique design, a large enough area and perimeter for livestock animals, and be strong enough to withstand a windstorm.

+ Science TEKS 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 (GRADES 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 about 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 are 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 build a catapult capable of successfully launching a heavier care package to both locations.

+ Science TEKS 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 (GRADES 2–3, 7–8)

In this design challenge, students will learn about the history of westward expansion in the United States and the difficulties migrants faced during their journeys. 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 can add additional cargo to their wagon and successfully cross the river.

+ Science TEKS 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 called the Wigglebot. The Wigglebot can wiggle using 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 also to 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 produces light and sound while wiggling.

+ Science TEKS covered in this design challenge

- Grade 4 TEKS: 4.1.B, 4.1.G, 4.2.D, 4.8.C
- Grade 5 TEKS: 5.1.B, 5.1.G, 5.2.D, 5.8.A, 5.8.B

+ Math TEKS covered in this design challenge

- Grade 4 TEKS: 4.8.C
- Grade 5 TEKS: 5.10.F
- Grade 6 TEKS: 6.3.D, 6.3

+ BIOMIMICRY (GRADES 5, 7)

In this design challenge, students will be presented with the problem of developing a prosthesis for John, who works in an oilfield. Students will learn about biomimicry and gain a basic understanding of how we, as humans, have looked to nature for inspiration in 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 he had to have his right arm amputated. With advances in technology, prosthetics can now be made with 3D printers. However, John is unsure how to create one and needs your help designing a prosthesis to enable 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 can 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 TEKS covered in this design challenge

- Grade 5 TEKS: 5.1.B, 5.1.G, 5.2.D, 5.13.A
- Grade 7 TEKS: 7.1.B, 7.1.G, 7.2.D, 7.13.A

+ Math TEKS covered in this design challenge

- Grade 5 TEKS: 5.10.F
- Grade 7 TEKS: 7.3.A

+ SPACE CAPSULE (GRADES 6–8)

In this design challenge, students will learn why 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 costs down.” Students will put on their engineering hats 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 can safely land on a target. Bonus points will be awarded to those who push their design to land safely within the targeted landing zone in windy conditions.

+ Science TEKS covered in this design challenge

- Grade 7 TEKS: 7.1.B, 7.1.G, 7.2.D, 7.7.A
- Grade 8 TEKS: 8.1.B, 8.1.G, 8.2.D

+ Math TEKS covered in this design challenge

- Grade 6 TEKS: 6.3.D, 6.3.E
- Grade 7 TEKS: 7.3.A, 7.3.B, 7.4.B

+ 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 laws, 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 hats 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 must stop within a specific drop-off zone. Teams will be challenged with various payloads to earn bonus points if they can stop in the drop-off zone.

+ Science TEKS covered in this design challenge

- Grade 6 TEKS: 6.1.B, 6.1.G, 6.2.D, 6.6.E, 6.7.C
- Grade 7 TEKS: 7.1.B, 7.1.G, 7.6.C, 7.7.D
- Grade 8 TEKS: 8.1.B, 8.1.G, 8.6.E

+ Math TEKS covered in this design challenge

- Grade 6 TEKS: 6.3.D, 6.3.E
- Grade 7 TEKS: 7.3.A, 7.3.B

+ 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 as possible from the environment 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 hats to help maintain 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 TEKS covered in this design challenge

- Grade 3 TEKS: 3.1.B, 3.1.G, 3.2.D, 3.12.B, 3.12.C
- Grade 4 TEKS: 4.1.B, 4.1.G, 4.2.D, 4.12.B
- Grade 5 TEKS: 5.1.B, 5.1.G, 5.2.D, 5.12.B
- Grade 7 TEKS: 7.1.B, 7.1.G, 7.12.B
- Grade 8 TEKS: 8.1.B, 8.1.G, 8.12.B

+ Math TEKS covered in this design challenge

- Grade 3 TEKS: 3.4.A, 3.4.G
- Grade 4 TEKS: 4.4.H, 4.8.H
- Grade 5 TEKS: 5.10.F
- Grade 7 TEKS: 7.3.A, 7.3.B

+ FLOOD BARRIERS (GRADES 3–4, 7)

In this design challenge, students will be presented with downstream flooding as a problem for their community. They will 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 hats to design flood barriers from different earth materials to determine what works best at diverting water away from their homes. Students will engage in a STEM challenge to design solutions that help their community and reduce the amount of water seeping onto their property

+ Science TEKS covered in this design challenge

- Grade 3 TEKS: 3.1.D, 3.10.C, 3.11.A
- Grade 4 TEKS: 4.1.D, 4.10.B
- Grade 7 TEKS: 7.1.B, 7.1.G, 7.2.G, 7.11.A

+ Math TEKS covered in this design challenge

- Grade 3 TEKS: 3.4.A, 3.4.G
- Grade 4 TEKS: 4.6.B, 4.8.C
- Grade 7 TEKS: 7.3.A, 7.3.B