



STUDENT GUIDEBOOK

2026 - 2027

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Section Descriptions



Section 1

Section 1 of the Student Guidebook contains an overview of the Junior STEM Challenge.



Section 2

Section 2 of the Student Guidebook contains your Junior STEM Challenge activity sheets.

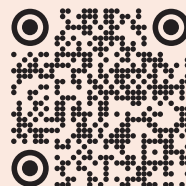


Section 3

Section 3 of the Student Guidebook contains information about your final products, including guidelines, examples, and rubrics for your solutions, models, and displays. This section also contains tips and additional resources.

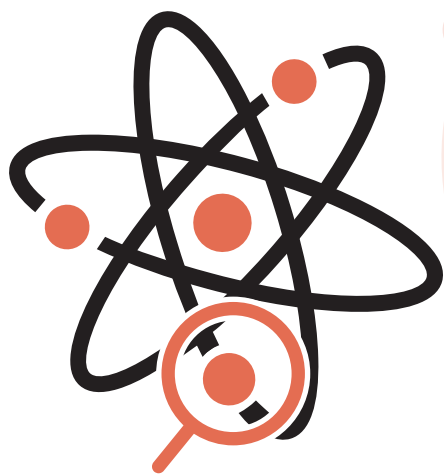
Resources: STEM Challenge Website

Additional resources can be found on the STEM Challenge website. Resources listed on the STEM Challenge website may be modified over time.



Section 1

About the Junior STEM Challenge



*“Scientists investigate that which already is;
engineers create that which has never been.”*

—Albert Einstein

Frost Science Junior STEM Challenge

The Frost Science Junior STEM Challenge is a year-long science and engineering project for middle school students and teachers. In this challenge, students will use the engineering design process to create solutions to some of the problems scientists are trying to solve. These problems cover four different science disciplines: astronomy, marine science, paleontology, and health.

In the Junior STEM Challenge, groups of 2-4 students can pick one science discipline and problem to solve and create a solution, model, Engineering Notebook, display, and 5-minute presentation. Even if lots of students pick the same science discipline and problem, students have different skills, interests, and knowledge, and can come up with completely different solutions.

The theme and problems in the Junior STEM Challenge change every year. This means that students can participate in the Junior STEM Challenge every year in middle school. Once students graduate from middle school, they will be able to compete in the high school version of the competition, the STEM Challenge.

The Junior STEM Challenge has a two-step judging process. At the end of the school year, teachers will submit student projects online for judging. Students from the top scoring projects will then be invited to the STEM Challenge Expo where they will present their projects to judges in-person at Frost Science. Winning students will receive college scholarships that cover one year of college tuition.

Sponsored by:

The logo for the Glenn W. Bailey Foundation features the name in a teal serif font, centered between a solid gold bar above and a horizontal bar below. The horizontal bar is divided into four equal segments of red, blue, green, and teal.

GLENN W. BAILEY
FOUNDATION

Junior STEM Challenge Timeline

- 1 Get a student guidebook
- 2 Read over the Junior STEM Challenge
- 3 Do *Activity 1: Let's Get Started*
- 4 Research your science discipline
- 5 Pick one problem related to your science discipline
- 6 Brainstorm a solution to your problems
- 7 Adjust your solution using the Engineering Design Process
- 8 Create a model of at least part of your solution
- 9 Create a display, like a poster or slideshow
- 10 Turn in your project to your teacher
- 11 Your teacher takes pictures of your project and submits it online for judging
- 12 Top scoring projects will be invited to the STEM Challenge Expo at Frost Science to be judged in-person
- 13 Winners will be announced!

2026 - 2027 STEM Challenge Theme

The Junior STEM Challenge theme and prompts will change every year. The 2026-2027 Junior STEM Challenge theme is “Sustainable Energy Generation and Use” Teachers may assign a prompt or let students choose one of the prompts for the Junior STEM Challenge.

Sustainable Energy Generation and Use

Energy makes modern life possible, powering our homes, technologies, transportation systems, and more. However, a lot of energy generation methods and energy use have negative impacts. The future of sustainable energy will be shaped by the next generation of problem-solvers. This year’s Junior STEM Challenge encourages students to investigate, design, and innovate as they explore what the future of sustainable energy could look like.

2025 - 2026 STEM Challenge Prompts

In the STEM Challenge, you will be developing a solution to one of four prompts. These prompts are based on different scientific disciplines and are broad, allowing you to create a wide variety of different solutions. These prompts will change each year of the STEM Challenge and are based around the central theme.

Marine Science



There are many different ways that the ocean and its resources can be used to generate energy. However, accessing or generating energy can negatively impact marine ecosystems. Create a way to reduce or mitigate negative environmental impacts caused by energy production or create a more sustainable alternative to current energy generation methods in marine environments.

Astronomy



In space, access to Earth-based energy sources, like fossil fuels, is limited. Because of this, scientists are looking for new ways to study and use space-based energy sources as an alternative. Develop a way to expand our ability to observe, capture, or use energy in space.

Geology



Places that experience frequent tectonic activity can use the heat generated by the Earth's core to produce geothermal energy. However, not all places on Earth have access to this energy. Develop a way that places with less tectonic activity can gain access to geothermal energy. This can include new methods or more sustainable versions of current methods used for energy generation and transfer.

Health



Hospitals require constant energy to sustain vital support systems. Currently, hospitals primarily rely on generators in case of power shortages or emergencies. Create a way for hospitals to become more self-sustaining and off-the-grid in case of widespread or long-term power outages.

Why Should You Participate in the STEM Challenge?

The Junior STEM Challenge lets students explore what it means to be a scientist in a different way than a science fair. In a science fair, students have to write a hypothesis, do research, and collect data. Instead of this, the Junior STEM Challenge asks students to create solutions to real-world scientific problems.

The problems in the Junior STEM Challenge are real problems that scientists are trying to solve, and student solutions will be judged by real scientists.

Students in the Junior STEM Challenge will be judged in a two-step judging process. Student projects will be submitted by their teacher or mentor online for judging. Top scoring projects will then be invited to Frost Science for the STEM Challenge Expo, where students will present to judges in-person. Students that win 1st, 2nd, and 3rd place in the Junior STEM Challenge will receive a 1-year Florida University Plan scholarship through Florida Prepaid.

For winners to get their college scholarship from Florida Prepaid, they have to:

- Have a valid Social Security Number
- Be less than 21 years of age
- Not have graduated high school
- Be a Florida resident for at least 1 year
- Be a U.S. citizen

If the winning student is missing one or more of the criteria listed above, Frost Science will work with the student to give them the value of the scholarship, which will be less than the cost of a 1-year Florida University Plan.

Florida University Plans from Florida Prepaid are for public Florida state universities but can also be used for private and out-of-state schools. When using these scholarships for private and out-of-state schools, the scholarship cost will be applied to student tuition. The scholarships will not cover 1-year of tuition like they would at a public Florida state university.

Student Expectations

Complete Activity 1: Let's Get Started

Students will start the Junior STEM Challenge by doing *Activity 1: Let's Get Started*. This activity walks students through a practice version of the Junior STEM Challenge.

Create a Solution

Creating a solution to one of the prompts is the first step in completing the Junior STEM Challenge. When students create their solution, they need to make sure that it is realistic and solves their Junior STEM Challenge prompt.

Use the Engineering Design Process

After students create their solutions, they should continue to make them better. Looking for problems with their solution and fixing those problems is a very important step in making a strong solution.

Create a Model and a Engineering Notebook

Once students feel like they have a strong solution, they should create a model of their solution. This model can be anything that shows at least part of their solution. While they create their model, students will take pictures or screenshots of their model as they go and save them for their Engineering Notebook. After they have finished their model, they should write at least one sentence for each of their pictures to show how they made their model over time.

Create a Display and Presentation

Students will then create a display and presentation for their solution and model. The display can be anything from a poster to a slideshow! Students should use their creativity, skills, and interests to make a display that they think works for their projects. Once students have a display, they can practice presenting their solutions. Presentations can only be 5 minutes long.

Section 2

Student Activity Sheets



“Never be limited by other people’s imagination; never limit others because of your own limited imagination.”

—Mae Jemison

Activity 1: Let's Get Started

STEM Challenge Practice

Hurricanes

Overview

Due to warming ocean temperatures, strong hurricanes are becoming more common. Florida is vulnerable to hurricanes due to its location and lengthy coastline.

Dangers

Wind: While Category 1 hurricanes have constant winds that are at least 74 miles per hour, Category 5 hurricanes have constant winds of over 154 miles per hour. In 2015, Hurricane Patricia had the highest constant winds ever recorded, at 215 miles per hour.

Debris: The winds created by a hurricane can pick up and carry objects, creating fast-moving debris. This debris can hit people, houses, or other objects. If debris hits things that break, it can create more debris.

Storm Surge: Hurricanes can push water up onto land, flooding coastal areas. Storm surge can also flood areas near rivers or lakes as the hurricane pushes the sea water up rivers. While storm surges can be 4-5 feet in Category 1 hurricanes, they can reach over 20 feet in some Category 5 storms if the tides are just right.

Damages

Breakage: Debris carried by the wind can hit buildings, breaking their windows, doors, and siding. This can let the wind and water into the building. If the building has shingles, the wind can also rip off the shingles off the roof, creating leaks in the building.

Water Damage: When hurricanes cause flooding or leaks, buildings can end up with mold, warping wood, electrical damage, and structural problems. Water damage can cause so much mold and damage that the damaged buildings have to be gutted or torn down.

Considerations

Elevation: Buildings that are higher up are less likely to flood in a storm surge.

Shape: Flat surfaces, like walls, catch more wind, making it easier for the wind to damage them. Curved surfaces catch less wind by allowing the wind to flow around them, making them better for buildings in high wind areas.

Engineer

Design a hurricane resistant building.

Sea Level Rise

Overview

Global sea levels have risen 7-8 inches since 1900. Miami is especially vulnerable to sea level rise due to its proximity to the coast and its low elevation.

Dangers

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Engineer

Design a hurricane resistant building.

Extreme Heat

Overview

Temperatures worldwide are rising, causing extreme heat. Due to its proximity to the equator, Miami already experiences high heat and humidity, especially during the summer. As global temperatures increase year-round, summer months in Miami can have dangerously high temperatures.

Dangers

Material Weakness: All materials have an ideal range of temperatures. If the materials are too cold or too hot, they may work as intended and be too brittle, soft, or have another problem. Some materials can also not set, cure, or dry in certain temperatures. Even materials as simple as paint will not dry properly if they are too cold or too hot.

Damages

Bubbling Paint: When it is too hot, paint dries too quickly and might not attach to the surface it is painted on. Because the paint does not fully attach, gas can get trapped below the paint. When the gas gets hot, it expands and creates bubbles in the paint.

Crumbling Concrete: When it is too hot, the concrete dries too quickly. This makes the concrete less strong and more brittle. Along with making new concrete weaker, even concrete made in good temperatures can crack when it gets too hot.

Warping Wood: If new wood gets too hot as its drying, it can warp and crack. Even dried wood can still gain and lose moisture when it is used in a building. This can cause wood in hot areas to slowly warp over time.

Considerations

Color: Some colors, especially darker colors and black, absorb more light energy and become hotter than light colors. On the other hand, light colors and white reflect more light and absorb less light. This means that light colors will stay cooler than dark colors.

Water: Plants can absorb water, which evaporates through the leaves in a process called transpiration. When water evaporates, water uses heat to gain energy and become gas. This can remove heat energy from the area, cooling it down.

Engineer

Design a building that can stay cool in hot temperatures.

What else would you like to know about your problem? These can be questions or topics.

Stakeholders: Who are the stakeholders for your project? Who are you designing your building for and who would care about your building?

Brainstorm: What should your building have?

Brainstorm: Draw your building

Engineering Notebook: Write down what you did to create your model, including what you did during each step of the process and any mistakes you made and later had to fix. For the Junior STEM Challenge, you will also have to take pictures or make screenshots of your model during each step.

Activity 2

Dinosaur Drama

Create a list of traits that you can use to help identify a “reliable” and “unreliable” source using the table. At the end of the activity, you will add onto this list. Use this list as a checklist when looking for sources for your Junior STEM Challenge.

Reliable Traits		Unreliable Traits	
☐		☐	
☐		☐	
☐		☐	
☐		☐	
☐		☐	
☐		☐	
☐		☐	
☐		☐	
☐		☐	

After reading all eight sources, rank the sources in the tier list below:

Tier		Sources
	S	
	A	
	B	
	C	
	D	
	F	



Home



John McGuire · @JMcGuire74 · January 13, 2013

Keep an eye out for Prairie Stacks coming to an area near you! The first location of our restaurant was so successful that we're expanding! Two more Prairie Stacks will be opening soon!



The Daily Shockwave · @DailyShockwave · July 29, 2014 ✓

Company recalls "Midnight Mint Energy Bars" after revealing that the SECRET INGREDIENT is glitter!



John McGuire · @JMcGuire74 · August 21, 2015

Prairie Stacks has expanded to more than 20 locations across the state of Montana! Things are looking up!



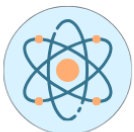
Star Ranch · @StarRanch · April 2, 2016 ✓

We're happy to announce that Star Ranch is now the only supplier of beef for Prairie Stacks! Go get a burger at Prairie Stacks today!



The Daily Shockwave · @DailyShockwave · November 11, 2017 ✓

Mega-influencer Sunny Summer was caught ILLEGALLY swimming in the Central Park Lake at 3:00 AM! She says she was looking for the goldfish her parents "let go" while she was in summer camp as a child.



Ash Science Center · @AshSC · September 18, 2022 ✓

Paleontologists Alejandra Solís and Soren Kade discovered a complete T. rex skeleton! The T. rex has been named Tim and will be traveling to Ash Science Center all the way from Montana in the next few weeks. To learn more about Tim the T. rex, check out our blog post!



Source 1



Home

**Star Ranch** · @StarRanch · September 22, 2022 

Please keep an eye out for our prize-winning bull, Berry! He may look big and scary, but he's super sweet and we miss him so much. A tiny piece of our fence was torn down and he ran away. Share our post to help spread the word! We want to find our baby soon.

**The Daily Shockwave** · @DailyShockwave · November 11, 2022 

Ash Science Center has been SUED after destroying the property of two Montana locals!

**Ash Science Center** · @AshSC · November 14, 2022 

Tim the T. rex's journey to Ash Science Center has been delayed. Once he can be moved, we will keep you updated on his journey!

**ForgePoint Heavy Movers**

Do you need to move something big? Let ForgePoint Heavy Movers handle it! From pianos to pool tables, we can move anything.

 Call us for a free quote today.

#MovingDay #HeavyDutyMoving #StressFreeMove



Source 1



Home

**Star Ranch** · @StarRanch · February 19, 2023 ✓

It's really cold and snowy out there. Stay warm tonight! We hope Berry found somewhere cozy to settle in for the winter.

**Star Ranch** · @StarRanch · May 30, 2023 ✓

We got a call! Someone thinks they might've seen Berry! We're going there now and we'll keep everyone updated.

**Star Ranch** · @StarRanch · May 31, 2023 ✓

It's him! Our Berry is back! He's a little skinnier than when he left, but he's home and safe and that's all that matters!

**John McGuire** · @JMcGuire74 · March 5, 2025

Prairie Stacks have been struggling to make money recently. People don't have much money to spend, so we aren't making much money either. It's also hard keeping staff right now. We might have to close a few locations if things don't turn around soon.

**Ash Science Center** · @AshSC · March 17, 2025 ✓

Tim the T. rex has been loaded up and is ready to finally come home! We will be posting his location as he travels every day, so make sure to follow us for updates! Today, he will be leaving Elk Ridge and headed west!

**Ash Science Center** · @AshSC · March 19, 2025 ✓

Tim the T. rex has been stolen on the road and is now missing. Keep an eye out and please let us know if you have any information that may help #BringTimHome.





Home

**John McGuire** · @JMcGuire74 · March 20, 2025

After a bit of luck, things are about to turn around! I don't need to worry about closing any of my restaurant locations anymore!

**The Daily Shockwave** · @DailyShockwave · March 22, 2025 ✓

The DINOSAUR DRAMA continues after T-rex goes missing! While police try to find the thief, others think it might be an inside job.

**Star Ranch** · @StarRanch · March 26, 2025 ✓

We need to get better at social media, but we're always busy here at Star Ranch! Our family keeps growing and we just welcomed two more goats to our home. Everyone welcome Tina and Timmy!

**John McGuire** · @JMcGuire74 · April 30, 2025

I've finally been able to purchase my dream car with my newfound fortune! Look at this beauty!

**John McGuire** · @JMcGuire74 · September 24, 2025

I just got the building plans for my new mansion! It'll be big enough to have a full garage for all the classic cars I've collected over the past few months!



Source 1

KTRK 8 – Trail Rock News Network



Aired March 18, 2025 - 10:30 AM MT

THIS IS A TRANSCRIPT. THE TEXT COPY MAY CHANGE.

[10:30:00]

EMILY CHEN, NEWS ANCHOR, KTRK 8: Breaking news, live from Elk Ridge. A whole dinosaur has gone missing after being stolen late last night. I am here with Bill Rutford from ForgePoint Heavy Movers and Samantha Hill from Cedar Ridge Rest Stop, the scene of the crime. Bill, what happened?

BILL RUTFORD, TRUCK DRIVER, FORGEPOINT HEAVY MOVERS: ForgePoint was in charge of moving the dinosaur from Elk Ridge to Sunnyside Harbor in Florida. We parked at Cedar Ridge for the night and when we woke up this morning and checked our trucks, we noticed that the back of the trucks were all open.

CHEN: And the dinosaur was gone?

RUTFORD: And the dinosaur was gone.

CHEN: How do you think the back of the trucks were opened?

RUTFORD: We had pretty big locks on our trucks. The locks were cut.

CHEN: What did you do when you noticed?

RUTFORD: We panicked. We weren't sure what to do because we've seen nothing like this before. That thing was huge and heavy and was in over ten parts. My truck had four and one of them was over a ton.

[10:35:00]

CHEN: And Samantha, you're the manager at Cedar Ridge Rest Stop. Were the cameras at Cedar Ridge able to catch anything?

Source 2

KTRK 8 – Trail Rock News Network



SAMANTHA HILL, MANAGER, CEDAR RIDGE REST STOP: No, they weren't. The trucks were in the back of our parking lot --

RUTFORD: In the spots set aside for big trucks --

HILL: And there isn't much light back there. Plus, the back of the lot is far from the cameras and the back of the trucks were facing away from the rest stop, so even if the cameras could see that part of the parking lot the trucks would've blocked the view.

CHEN: Why do you think someone would have done this? Why steal a dinosaur?

RUTFORD: I don't know, but they must've planned it. The locks were cut by someone who knew what they were doing. They didn't leave anything behind either.

HILL: They did damage some of our property though. The highway's nearby, but they had to go over our grass to get to the back of the trucks. They must've used heavy equipment because the grass is all torn up.

CHEN: That's unfortunate. Looks like the thief caused problems for everyone, from ForgePoint Heavy Movers to Cedar Ridge Rest Stop. Up next, we'll be speaking with the paleontologist responsible for finding the dinosaur. Stay tuned.

(COMMERCIAL BREAK)

[10:45:00]

CHEN: We have Alejandra Solís on the line from Ash Science Center. She's the person who found the dinosaur. Alejandra, why do you think someone would do this?

Source 2

KTRK 8 – Trail Rock News Network



ALEJANDRA SOLÍS, CURATOR OF PALEONTOLOGY, ASH SCIENCE CENTER: Believe it or not, but people try to steal dinosaurs all the time. This is just the first time it's happened to us. People steal dinosaurs for lots of reasons, but the most common one is probably easy to guess --

CHEN: Money?

SOLÍS: Yep, it's money. And the nicer the dinosaur the more money someone would be able to get for it when they sell it illegally. It's hard to do that in the U.S., so lots of people end up trying to smuggle dinosaurs out of the country before selling them. You can imagine for a whole T. rex, people would be able to get a lot of money by selling it.

[10:50:00]

CHEN: How much would the T. rex be worth?

SOLÍS: We haven't prepared the T. rex yet, so it's still covered in rock so it's hard to give an exact amount, but if everything looks good, it should be worth several million dollars. Whole T. rex skeletons have been sold from 5 to over 30 million dollars before on auction.

CHEN: Wow! That's a lot of money! Hopefully they find the dino before it gets sold.

SOLÍS: Yes, it would be much harder to find our T. rex once it's been sold. Fossils in private collections can be really hard to find and track.

CHEN: Then let's keep our fingers crossed. Thank you for talking with us today, Alejandra. We'll be right back for more morning news after this quick break.

Source 2



ELK RIDGE POLICE DEPARTMENT REPORT

Case No.: 3 4 6 6 3 7 2 6 2 Date: 0 3 / 1 8 / 2 0 2 5

Reporting Officer: Jane Sorenson Time: 0 6 : 0 9 ^{AM} PM

Detail of Event:

Location: [REDACTED] US-2, Chester, MT 59522

Incident Type: Property/vehicle damage, Theft

Describe the incident: A Tyrannosaurus rex being carried by three Freightliners was stolen sometime during between the hours of 10:26 PM and 06:09 AM on the night of 03/17/2025. The locks on each container were cut. Truck 1 was carrying 4 pieces, truck 2 was carrying 6 pieces, and truck 3 was carrying 5 pieces of the dinosaur. The grass behind the trucks had tracks that looked like they belonged to heavy machinery.

Injuries and Damages:

Were there any injuries? ☐ Yes ☒ No Were there any damages? ☒ Yes ☐ No

Describe the injuries or damages: The locks on the back of the Freightliners were broken and can no longer be used. The grass and some nearby bushes on Cedar Ridge Rest Stop's property were torn up. Broken pieces of plaster were found near the back of the Freightliners where the dinosaur was broken was stolen.

Witnesses:

Were there any witnesses? ☒ Yes ☐ No

List the witnesses names and contact information:

ForgePoint Heavy Movers Drivers: Bill Rufford, (406) [REDACTED] - [REDACTED], Caleb Henderson, (406) [REDACTED] - [REDACTED].

Molly Whitaker, (406) [REDACTED] - [REDACTED]

Cedar Ridge Rest Stop Manager: Samathana Hill, (406) [REDACTED] - [REDACTED]

Actions Taken:

I talked with the witnesses from ForgePoint Heavy Movers to figure out what was stolen from the Freightliners and the manager from Cedar Ridge Rest Stop to learn about damages to the property. I put the cut locks in evidence bags and dusted the handles on the back of each container for fingerprints. I picked up the pieces of plaster found near the Freightliners put it in a second evidence bags. A pen engraved with "JM" was found 100 yards away in the grass and was placed in an evidence bag. The pen may or may not be related to the theft.

Source 3

Dinosaur 'Stolen' on the Road Raises Questions

March 2025 · By Leroy Wood



A tyrannosaurus rex went missing in Montana right after leaving for Ash Science Center. This is just the latest problem for the dinosaur, which has been in the middle of several legal battles over the last three years. The lawsuits were all settled peacefully, so what could have happened to the dinosaur? One insider thinks that the thief might be the shipping company.

ForgePoint Heavy Movers was hired by Ash Science Center to move the dinosaur all the way from Montana to Florida. After driving only a few miles, the truckers stopped at Cedar Ridge Rest Stop for the night. The truckers all parked in the very back of the parking lot with the back of their trucks near the busy highway. This area of the parking lot was also far from all the streetlamps, making it very dark, and was in a blind spot for Cedar Ridge Rest Stop's security cameras. In the middle of the night, the locks on each truck were smashed and the dinosaur was stolen.

Source 4



Our insider said that they had seen the truckers arguing earlier in the day after dropping part of the dinosaur while putting it into one of the trucks. While the container holding the dinosaur looked fine, it's hard to know if the fossil broke when it fell. Now, with the dinosaur missing and no way to check for damage, ForgePoint Heavy Movers can't get in trouble.

One staff member at Cedar Ridge Rest Stop said, **"We've had problems with ForgePoint before. The truckers always come in here and cause problems and I've caught them several times trying to take food, like granola bars and stuff, from the lobby without paying. I wouldn't be surprised if they tried to take other things too."**

While ForgePoint Heavy Movers has a reason to steal the dinosaur, police still do not know how the dinosaur was stolen or where the dinosaur is now. With such a big dinosaur, the biggest tyrannosaurus rex ever found in the United States, it can't stay missing forever. Hopefully, the missing dinosaur will be found soon.

ForgePoint Heavy Movers did not answer when asked to comment.

Source 4

Meet Ash Science Center's Newest Team Member, Tim the T. rex

September 18, 2022

By Marcellus Reed, Collections Manager



Paleontologists from Ash Science Center just made the discovery of a lifetime! On their current paleontology trip to Elk Ridge, Montana, Alejandra Solís, Curator of Paleontology, and Soren Kade, Fossil Preparator, found a complete *Tyrannosaurus rex* fossil.

Finding a complete fossil does not happen every day and makes this find a big deal! Complete skeletons can teach us a lot about dinosaurs, where they lived, what they ate, and more. The more complete a fossil is, the more paleontologists are usually able to learn.

Source 5

After the fossil was uncovered by Solís and Kade, they dug a trench around the fossil and covered the fossil and matrix, the rock and dirt around the fossil, with burlap and plaster. Eventually, they dug all the way under the fossil, wrapping the whole fossil in a burlap and plaster jacket. The *Tyrannosaurus rex*, who they named "Tim," was put in 15 jackets. Most of these jackets were small, weighing only about half a ton (~1,100 pounds). The largest fossilized bones needed to be put in biggest jackets, so Tim's skull and hips were both put in jackets that weighed over one ton (~2,000 pounds). These jackets will protect Tim as it travels from Montana to Ash Science Center in Florida. The journey is over 4,023 kilometers (2,500 miles) and the jackets will be carried in three trucks.

Once Tim arrives at Ash Science Center, all of the jackets will be taken to storage and will be added to collections. After the paperwork is done and the Collections Manager, Marcellus Reed, has finished adding the jackets to collections, Reed will work with Solís and Kade to take one jacket from collections to the fossil preparation lab in Ash Science Center. Once the jacket is taken to the fossil preparation lab, the jacket will be opened and Kade will begin to uncover the rest of the fossil. Kade will then use chemicals to protect the fossil and help the fossil stay together. Hopefully, with the right chemicals and enough luck, Tim will one day be able to stand on his own.

Follow Ash Science Center's social media to keep up to date on Tim's progress as he travels from Elk Ridge, Montana to Sunnyside Harbor, Florida!



[Subscribe to our monthly newsletter](#)

Source 5



November 11, 2022

The Continental Times

U.S. WORLD BUSINESS ARTS LIFESTYLE OPINION VIDEO AUDIO GAMES COOKING WIRECUTTER

Lawsuits Filed after Dinosaur Discovery

Two lawsuits have been filed against Ash Science Museum after they found a complete *Tyrannosaurus rex* fossil in Montana

By Jasper J. Thornwell

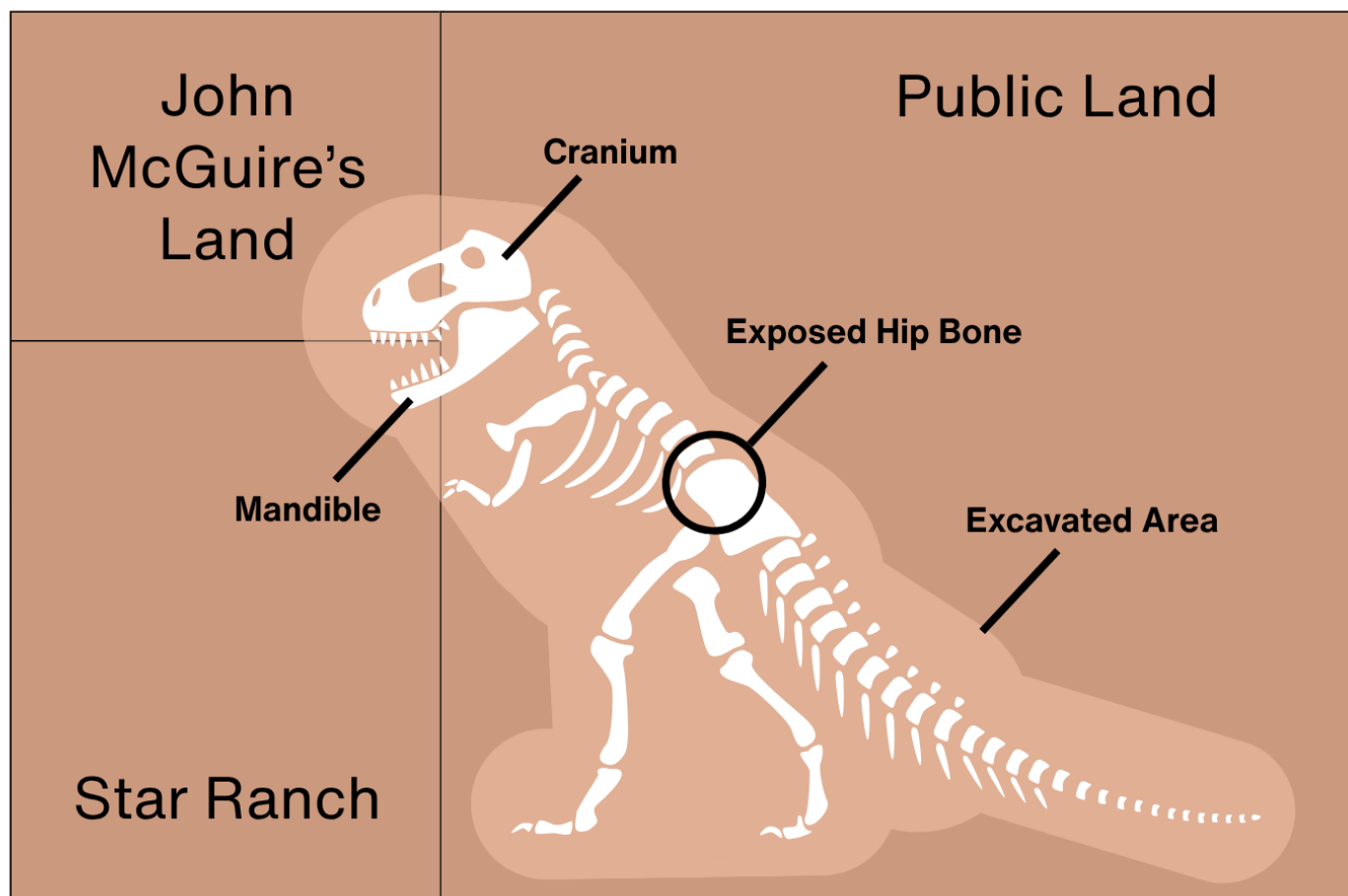
November 11, 2022, 11:11 AM EST |  GIFT THIS ARTICLE

Diagram courtesy of Lawsuit Art, Inc.

Vertebrate fossils found on public land can only be removed by permit holders and fossils found on private land do not require a permit and belong to the landowners. So, what happens when a fossil is found on more than one property?

This is exactly what happened when paleontologists from Ash Science Center went on their last trip to Elk Ridge, Montana. While looking for fossils in a remote area 40 miles outside of town, they found part of a dinosaur hip bone sticking out of the soil.

Source 6

Usually when paleontologists find fossils, they only find parts and pieces of the dinosaur. Finding a complete skeleton is very rare. However, as the paleontologists continued to look at and uncover the fossil, they realized that what they were working on was a complete *Tyrannosaurus rex* skeleton. The problem came when they realized that only part of the skull was on public land.

The skull was located on three different properties, split between the public land, land owned by Star Ranch, and land owned by John McGuire. In this case, the large bones that form the top and the bottom of the skull were both located on two properties. The top of the skull, the cranium, was found on public land and on McGuire's property and the bottom of the skull, the mandible or jaw, was found on public land and on Star Ranch. As soon as Ash Science Center saw that some of the *Tyrannosaurus rex* skeleton was on private property, they talked with Star Ranch and McGuire. Star Ranch and McGuire agreed to donate the part of the fossils on their land to get a tax break. The fossils were then removed by paleontologists from Ash Science Center.

During the removal, Ash Science Center damaged Star Ranch's fences, causing them to lose their prize-winning bull, who was able to escape. Star Ranch is now suing Ash Science Center for the cost of damage to their fenceline and for lost profit caused by the loss of their bull. The escaped bull has not yet been found.

McGuire is also suing Ash Science Center and the US Government for ownership of the cranium. He claims that when he was talking with Ash Science Center, they said that only a small part of the cranium was on his property. After watching Ash Science Center remove the rest of the fossil, he now says that the whole cranium was on his property. If McGuire wins the lawsuit and becomes the owner of the cranium, Ash Science Center would have to remove the plaster jackets that protect the fossil to remove the cranium. This could damage the mandible and would make the skeleton incomplete.

While both lawsuits are being processed, Ash Science Center cannot move the fossils out of the state of Montana.

Join the conversation

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Anyone can read the comments, but you must be a subscriber or logged in with a registered account to contribute. If you do not have a registered account, you can sign up for one below (it's free).

LOG IN

SIGN UP



Source 6



AI Overview

In March 2025, a complete Tyrannosaurus rex fossil was stolen as it was being transported from Elk Ridge, Montana to Ash Science Center in Sunnyside Harbor, Florida. The bold thieves stole all 15 plaster jackets from the trucks while they were parked at Cedar Ridge Rest Stop overnight. The locks on each truck were cut, and the thieves have not yet been arrested. [KTRK 8](#)

Ash Science Center was sued by two parties over the excavation and ownership of the fossil. [The Continental Times](#)

How the robbery happened

The drivers transporting the fossil pulled into Cedar Ridge Rest Stop for the night to get some sleep. [KTRK 8](#)

All trucks were parked in the back of the Cedar Ridge Rest Stop parking lot overnight. The locks on each truck were broken. [The Daily Shockwave](#)

What was stolen

Over ten plaster jackets containing a Tyrannosaurus rex fossil. [KTRK 8](#)

Each plaster jacket weighed at least half a ton. [Ash Science Center](#)

Investigation and aftermath

Police on the scene found evidence of tampering with the locks on the truck. The locks were cut off of the vehicles. The police also found broken plaster from the stolen dinosaurs. [Elk Ridge Police Department](#)

Ask anything



Source 7



Fossil Collections

[Posts](#)[Shared](#)[Page](#)[Notes](#)

Alejandra Solís Wednesday 8:13 AM

AS

Bad news guys...

Soren Kade Wednesday 8:15 AM

SK

What's up?

Alejandra Solís Wednesday 8:16 AM

AS

Someone robbed our trucks. Tim is gone.

Marcellus Reed Wednesday 8:16 AM

MR

WHAT??

Soren Kade Wednesday 8:17 AM

SK

Who could've done that?

Alejandra Solís Wednesday 8:18 AM

AS

I have no idea. We didn't have cameras on our trucks. I didn't think anyone would steal it.

Marcellus Reed Wednesday 8:19 AM

MR

Yeah, that dino was HEAVY!!! Wasn't the skull alone over a ton? How could they steal the whole dinosaur?

Source 8

Soren Kade Wednesday 8:21 AM

SK

I bet it was Star Ranch. The owner was really mad that we had to take down his fence to get the rest of the skull. One of his cows even got out! He kept yelling about how the cow was his prize-winning bull and that he lost thousands of dollars because of us.

Marcellus Reed Wednesday 8:22 AM

MR

It could've been John too. He also wasn't happy about us shipping Tim back here for research.

Alejandra Solís Wednesday 8:23 AM

AS

Idk. I don't want to point fingers if we don't have any proof.

Soren Kade Wednesday 8:25 AM

SK

Those two have been nothing but trouble for the past few years. They slowed EVERYTHING down.

Marcellus Reed Wednesday 8:27 AM

MR

Honestly, if they hadn't caused such a mess, Tim would've been here by now.

Soren Kade Wednesday 8:28 AM

SK

And I would've started preparing Tim! Think of all the things we could've already learned! We would be getting ready to publish new research papers at this point!

Alejandra Solís Wednesday 8:30 AM

AS

Guys, calm down. I'm just as upset as you are, but being mad isn't going to help them find Tim quicker. Let's just wait and see what they can find.

Source 8

Marcellus Reed Wednesday 8:34 AM

MR

You're right. Sorry, I'm just frustrated.

Soren Kade Wednesday 8:36 AM

SK

Me too. Sorry guys. I was just really excited to start working on this fossil. It's such a rare opportunity.

Alejandra Solís Wednesday 8:37 AM

AS

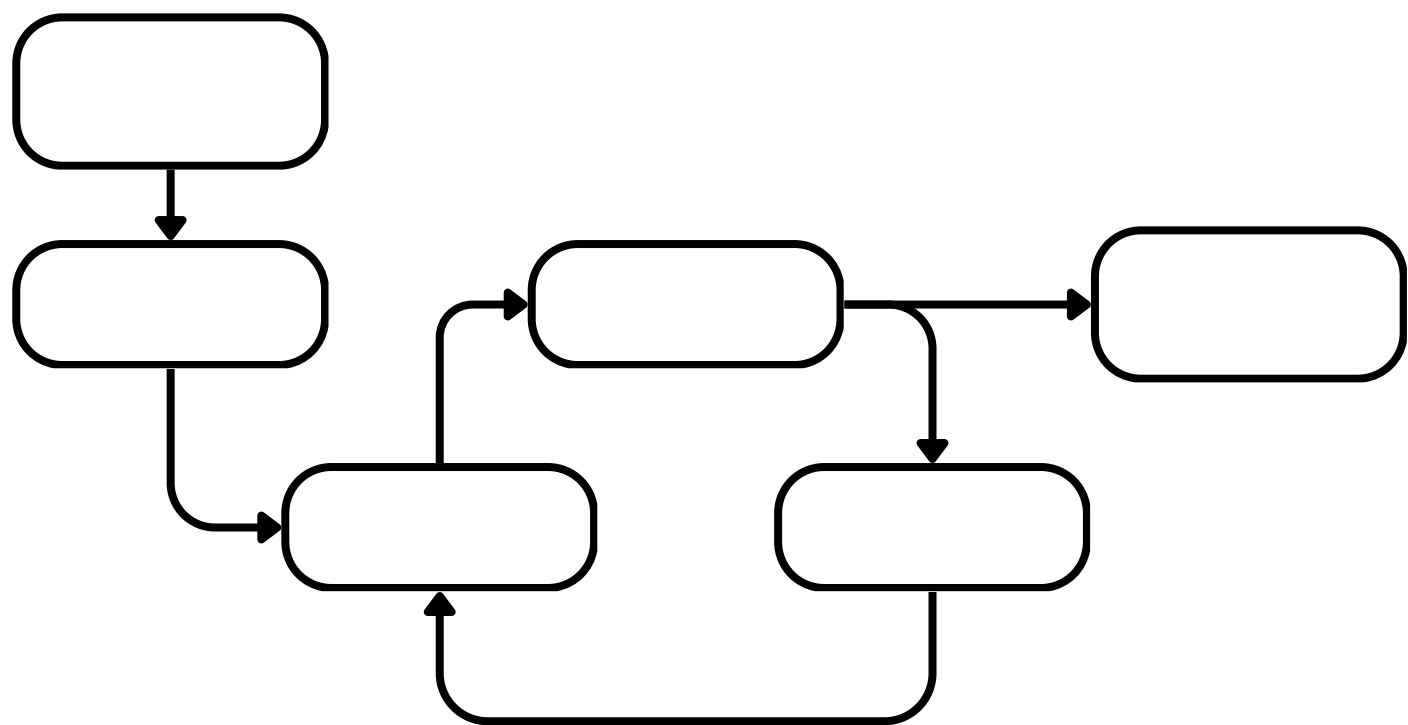
We're in this together. It's a huge fossil, so it can't have gone too far. I'm sure they'll find it soon. We've just gotta hang in there. Plus, there isn't too much we can do from Florida. I'll let you know as soon as I hear anything new.

Type a message



Source 8

Activity 3: Out with the Old



Use your computer to look up similar items online and record the design characteristics you notice in the table below:

Describe the Characteristic	What Does This Characteristic Do?	Does Your Prototype Include This Characteristic?

How can you implement some or all of these characteristics into your design while still keeping the design unique and different from the items you saw online?

Use the guide below to create either a Scale Drawing, a Digital Model, or a Physical Model.

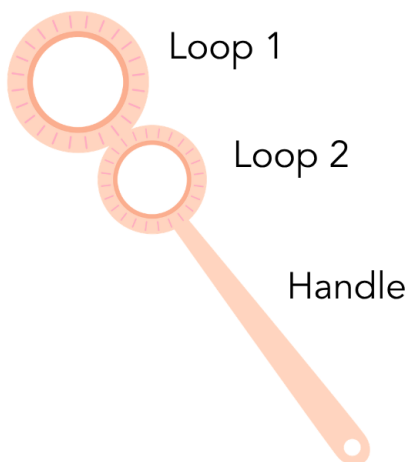
Scale Drawing

Use the table to record your measurements as you follow steps 1-7, listed below.

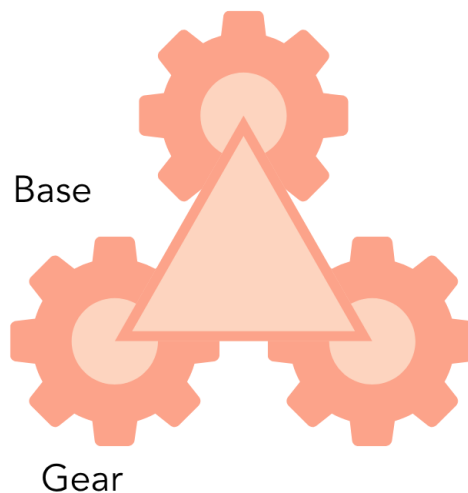
1	2	3
		Scale:_____
Item Component	Measurements	Scaled Measurements (Measurement×Scale)
Example A: Handle	Length: 15 Top Width: 1.5 Bottom Width: 2	Length: 11.25 Top Width: 1.125 Bottom Width: 1.5
Example B: Gear	Outer Hole Diameter: 3 Inner Hole Diameter: 1 Tooth Width: 0.5 Tooth Height: 0.5	Outer Hole Diameter: 4.5 Inner Hole Diameter: 1.5 Tooth Width: 0.75 Tooth Height: 0.75

1. Name each part of your item and write them in section A of the table. These are your Item Components.

EXAMPLE A

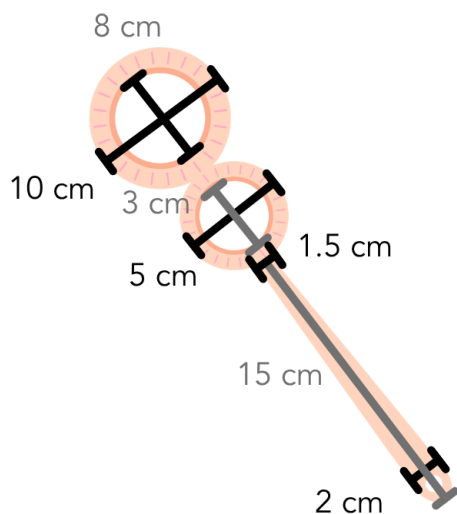


EXAMPLE B

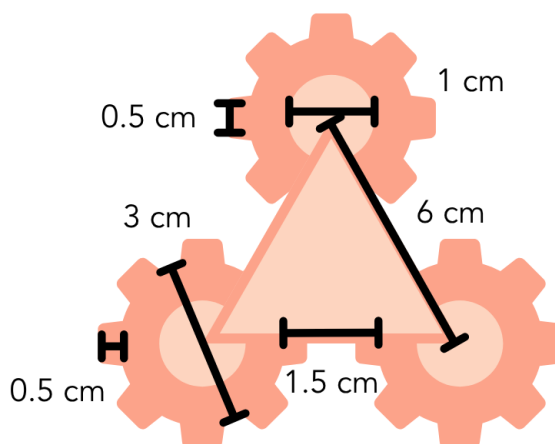


2. With your group, identify how long and wide you want each Item Component to be. You can have more than one measurement for each Item Component. All sizes should be measured in centimeters. Record the sizes of each item in section B of the table.

EXAMPLE A



EXAMPLE B



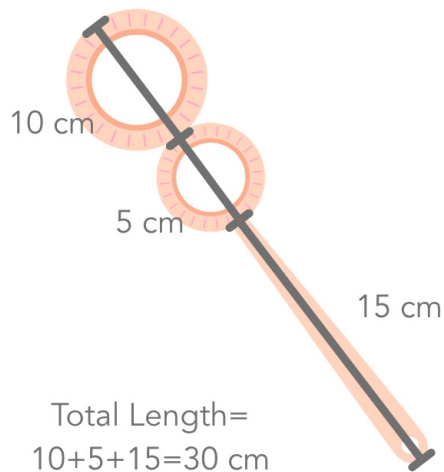
3. Look at your updated design and add up the size of each Item Component to find your Total Length and Total Width. For example, if you are making a bubble wand, you would add together the length of the handle and the loop.

For some designs, you may only need one measurement.

Total Length = _____ centimeters

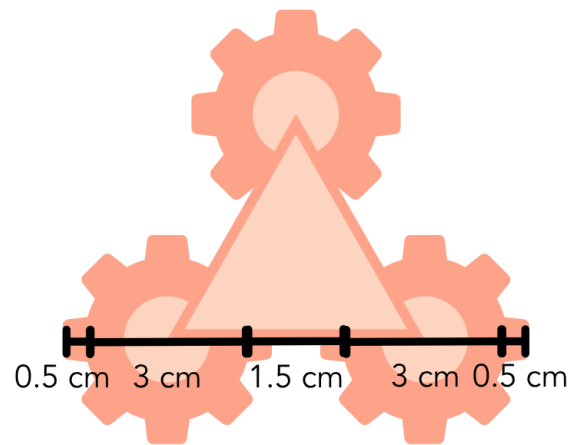
Total Width = _____ centimeters

EXAMPLE A

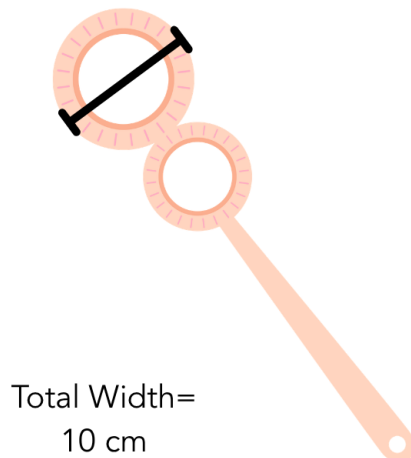


Total Length=
 $10+5+15=30$ cm

EXAMPLE B



Total Width=
 $0.5+3+1.5+3+0.5=8.5$ cm



Total Width=
10 cm

4. Your drawing needs to fill a ~25×20 centimeter area (this is slightly smaller than a blank sheet of paper). Multiply your Total Length and Total Width by different fractions to find the scale that makes your item fill a 25×20 centimeter area.

If you need to make your item smaller by scaling it down, multiply your Total Length and Total Width by fractions less than 1.

Example A (Scaled Down/Smaller):

Scale	Total Length	Total Width
1/2	$30 * 1/2 = 15$	$10 * 1/2 = 5$
3/4	$30 * 3/4 = 22.5$	$10 * 3/4 = 7.5$
1/1	$30 * 1/1 = 30$	$10 * 1/1 = 10$

A scale of 3/4 will make the item fill up most of the paper (22.5 out of 25 centimeters). The scale of this drawing would be 3:4 because it is 3/4 the size of the original item.

If you need to make your item look larger by scaling it up, multiply your Total Length and Total Width by fractions greater than 1.

Example B (Scaled Up/Larger):

Scale	Total Width
4/1	$8.5 * 3/2 = 12.75$
5/1	$8.5 * 2/1 = 17$
6/1	$8.5 * 5/2 = 21.25$

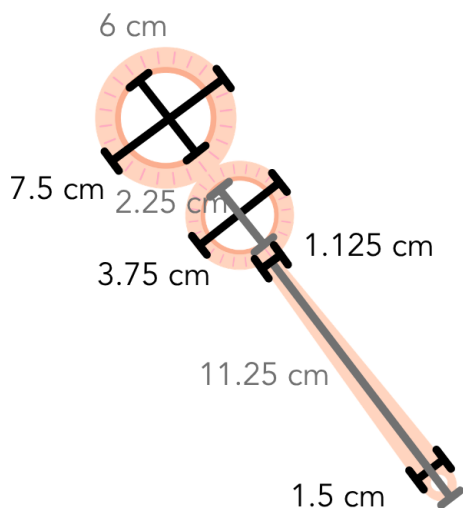
A scale of 5/1 will make this item fill up most of the paper (17 out of 25 centimeters). The scale of this item would be called 5:1 because it is 5 times bigger than the original item.

5. Write your scale in the space below:

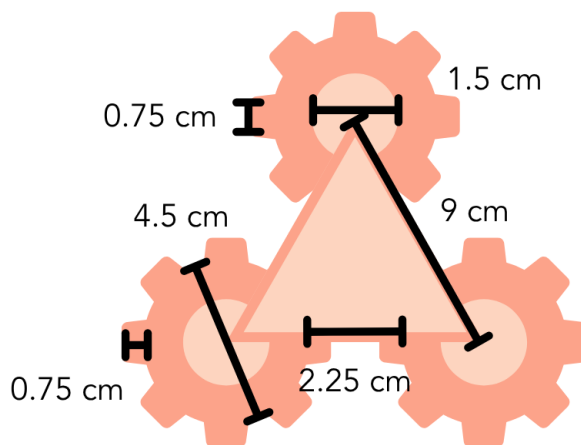
_____:

6. Multiply the measurements for each Item Component by your scale (e.g. 3/4, 5/1, etc.). When you draw each Item Component in your scale drawing, they should be this new, scaled size.

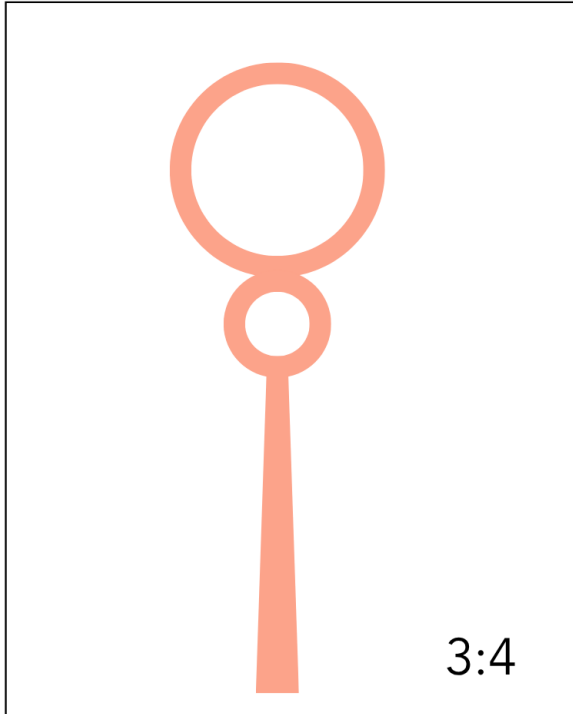
EXAMPLE A



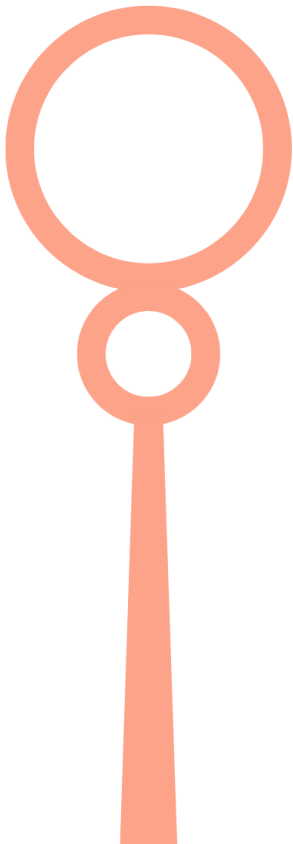
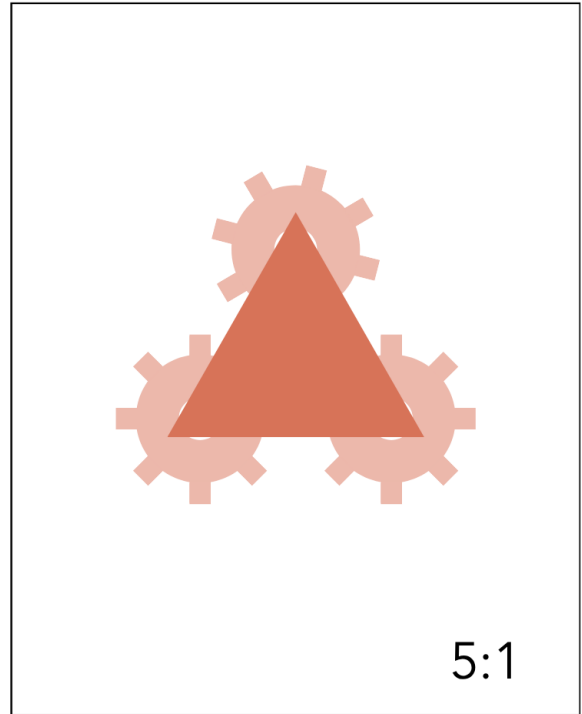
EXAMPLE B



7. Use a ruler to create your scale drawing on the next page!
Make sure to write your scale (e.g. 3:4, 5:1, etc.) in the corner of the page.

EXAMPLE A

**ACTUAL
SIZE**

EXAMPLE B

**ACTUAL
SIZE**



Scale

_____ : _____

Activity 4: Engineer That!

Look at the Problem and Solution listed below and read each example presentation. These presentations explain how the solution fixes the problem. Put each presentation in order from the “Weakest” presentation to the “Strongest” presentation.

Problem: Lost Hiker

Solution: Map with Live Data

Example 1: Satellites look for movement on the mountain that could be the lost hiker and puts the location of each movement on the map. People can go to each location to look for the hiker.

Example 2: The hiker has a tracker that shows up on the map.

Example 3: Rescuers use a map that updates with trail cam activity to go look for the hiker.

Example 4: An AI uses satellites with thermal cameras to make a heat map of the trail where the hiker disappeared. AI identifies any odd “hot spots” on the map and sends the coordinates to the rescue team.

Weakest	←	→	Strongest

Activity 5: Mix-it-up

Instructions: Answer the questions below about constructive criticism to prepare for today’s activity.

1. For each piece of feedback below, label it as “constructive criticism (CC),” which is helpful criticism, or “destructive criticism (DC),” which is unhelpful criticism.

Feedback	Feedback Type (CC or DC)
You look bad and so I couldn’t pay attention to your project.	
Your project is bad.	
I can’t tell what your model is showing. You should add labels.	
Your solution won’t work.	
I don’t understand how your solution works. Can you give me more details?	
I would be able to pay attention to your presentation more if you stopped looking at your phone.	

2. What do you think constructive criticism means?

3. How is constructive criticism different from other kinds of criticism?

Virtual Meet the Museum Scientist

Instructions: Answer the questions below to get ready for a Meet the Museum Scientist opportunity. As you answer each question, think about questions that might help you with your Junior STEM Challenge project.

1. Write 3 questions for the scientist about how they got into their field. This could be about their first science job, their college degree, etc.

2. Write 3 questions for the scientist about how they teach people about hard scientific topics.

3. Why is it important to learn how to teach people about scientific topics as a student in the Junior STEM Challenge? How can you use what you learn in your project?

Section 3

Student Resources



“Knowing is the key to caring, and with caring there is hope that people will be motivated to take positive actions. They might not care even if they know, but they can’t care if they are unaware.”

—Sylvia Earle

Junior STEM Challenge Planner

Use the planner to record due dates for the STEM Challenge. Each page is one Quarter of the M-DCPS 2026-2027 school year, excluding December 21 – January 1.

AUGUST

SEPTEMBER

OCTOBER

MON	TUE	WED	THU	FRI
10	11	12	13	14
17	18	19	20	21
24	25	26	27	28
31	SEPT. 1	2	3	4
7	8	9	10	11
14	15	16	17	18
21	22	23	24	25
28	29	30	OCT. 1	2
5	6	7	8	9
12	13	14	15	16
Legal holiday		M-DCPS Teacher planning day, professional learning day or recess day.		

	MON	TUE	WED	THU	FRI
OCTOBER	19	20	21	22	23
	26	27	28	29	30
NOVEMBER	NOV. 2 	3	4	5	6
	9	10	11	12	13
	16	17	18	19	20
	23 	24 	25 	26	27 
DECEMBER	30	DEC. 1	2	3	4
	7	8	9	10	11
	14	15	16	17	18 
JANUARY	JAN. 4, 2027	5	6	7	8
	11	12	13	14	15 
	Legal holiday		 M-DCPS Teacher planning day, professional learning day or recess day.		

JANUARY

FEBRUARY

MARCH

MON	TUE	WED	THU	FRI
18	19	20	21	22
25	26	27	28	29
FEB. 1	2	3	4	5
8	9	10	11	12
15	16	17	18	19
22	23	24	25	26
MAR. 1	2	3	4	5
8	9	10	11	12
15	16	17	18	19
22	23	24	25	26
Legal holiday	M-DCPS Teacher planning day, professional learning day or recess day.			

MARCH

APRIL

MAY

MON	TUE	WED	THU	FRI
29	30	31	APR. 1	2
5	6	7	8	9
12	13	14	15	16
19	20	21	22	23
26	27	28	29	30
SATURDAY, MAY 1, 2027				
STEM CHALLENGE				
EXPO AT FROST SCIENCE				
Legal holiday	M-DCPS Teacher planning day, professional learning day or recess day.			

Models

In the Junior STEM Challenge, students will have to create a model of their solution. This model can be anything that shows part of their solution or their whole solution. The model can also be physically made or made on a computer.

Students cannot buy their model and must create it on their own. If students buy something for their model, they must change it in some way. For example, if a student buys a toy car, they must change or add something onto the toy car. They cannot use the toy car as their model without making any changes.

When the model is placed next to a display, people should be able to figure out how the model shows the solution. People should not need students to explain the model to understand it. To help people understand the model without an explanation, students can use labels. For example, if students wrote code for their model, they would need to write a one to two sentence explanation to go with the code. This is because most people looking at the model would have trouble understanding what the code does without a description.

Students must create a Engineering Notebook to go with their model.

Examples of Acceptable Models	Examples of Unacceptable Models
A robot arm next to a sketch of a robot	Only a sketch of a robot
A small version of a robot	A small robot bought from the store
A robot arm with labels that explain what it does	A robot arm with no labels
A robot arm bought from the store that runs using code created by students	A robot arm bought from the store that runs using code students downloaded online
3D model of a robot	3D model of a robot that is distorted and glitched
Code for a robot with a short description that explains what it does	Code for a robot that has no description

The examples listed above do not include every type of model. Students should use their creativity when creating their model. As long as their model makes sense when placed next to their display and has not been bought from the store, it meets the requirements of a Junior STEM Challenge model.

Engineering Notebook

All Junior STEM Challenge models must have a Engineering Notebook. The Engineering Notebook should show how students created, fixed, and improved their model. Engineering Notebooks can be a journal or slideshow with pictures or screenshots of the model over time. Each time students add to or change their model, they should take a picture or screenshot for their Engineering Notebook.

Engineering Notebooks in the Junior STEM Challenge are simple and will be used by judges reviewing student models.

What to include in a Engineering Notebook

Notes used to plan the model

Sketches used to plan the model

Pictures or screenshots of the model as it was being built

Pictures or screenshots of any changes made to the model

Pictures or screenshots of problems with the model

Pictures or screenshots showing problems, or error messages, are very important for your Engineering Notebook

- Pictures or screenshots of your problems can help show the judges how you fixed your problems or made your model better!

One to two sentence descriptions

- Everything in your Engineering Notebook must have a short description explaining what the notes, sketches, pictures, or screenshots show.

Engineering Notebook: Examples

Look over the Engineering Notebook examples below. These Engineering Notebooks are for a color pencil-sorting robot. Example 1 is for code, Example 2 is for a 3D model, and Example 3 is for a physical model.

Example 1: Code

[Screenshot of code downloaded online]

We downloaded this code from GitHub to start creating code for our color pencil-sorting robot.

[Screenshot of code, first line highlighted]

We changed the first line of code so that our robot uses a camera to look for different colors.

[Screenshot of code, hex code is highlighted]

The hex code is highlighted in this screenshot. Hex is used to code for different colors, so we added hex codes for each color: red, orange, yellow, green, blue, and violet.

[Screenshot of code, last 3 lines highlighted]

We changed the end of the code so that the robot knows to grab, move, and place one color pencil at a time until they are in ROYGBV order.

[Screenshot of error message]

There is a problem with the last three lines of code.

[Screenshot of code, last 7 lines highlighted]

We split the end of the code into six steps. Step 1 is to look for red color pencils and move them to the left. Step 2 is to look for orange color pencils and move them to the right of the red color pencils. Step 3 is to look for and move yellow color pencils, Step 4 is to look for and move green color pencils, Step 5 is for blue color pencils, and Step 6 is for violet color pencils.

Example 2: 3D Model

[Sketch of robot]

This sketch shows a color pencil-sorting robot. The robot has a camera to look for color pencils and a robotic arm to pick up and move the color pencils.

[Screenshot of 3D model]

We added a cube, a cylinder, and a sphere to make the base of our robot. The sphere represents the robot's camera.

[Screenshot of 3D model]

We merged the basic shapes to make the base of our robot.

Example 2: 3D Model (Cont.)

[Screenshot of 3D model]

We added the basic shapes for the robot's arm.

[Screenshot of 3D model]

We merged the basic shapes for the robot's arm.

[Screenshot of 3D model]

We realized that the robot arm needs to be able to move left and right, so we added another sphere to the bottom of the robot's arm. The robot's arm can use this sphere to move up, down, left, and right.

Example 3: Physical Model

[Sketch of robot]

This sketch shows a color pencil-sorting robot. The robot has a camera to look for color pencils and a robotic arm to pick up and move the color pencils.

[Picture of cardboard]

We drew the shapes we need for our robot on cardboard. Each piece is labeled

[Picture of cardboard shapes]

We cut out each piece of cardboard for the base of our robot.

[Picture of cardboard 'cube']

We taped the pieces of cardboard together and one side of the robot's base is bigger than the other side. We will have to cut some of the cardboard shapes again.

[Picture of cardboard cube]

We cut a new piece of cardboard for the base of our robot. The base is now the right size.

[Picture of cardboard shapes]

We cut out the rest of the cardboard shapes for our robot's arm.

[Picture of cardboard robot]

We taped the pieces of cardboard together to make the robot's arm and attached it to the base.

[Picture of cardboard robot]

We painted the cardboard robot and labeled each part of the robot.

Presentation Displays

Students have to make a display for their Junior STEM Challenge project. Students should be creative with their display and can make a poster, slideshow, or anything else they imagine!

Even though displays can be any format, they all must:

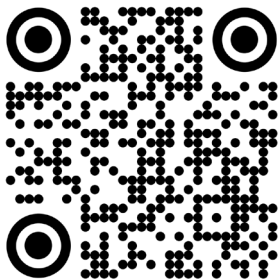
- Have a title
- Have student names
- Have the prompt
- Have background information
- Describe the problem
- Describe the solution and how it works
- Show the Engineering Notebook
- List sources in the references section

If students want more information about what they should have in their display, they should look at the Project Completion Judging Rubric found on **page 60** in the Student Guidebook.

For step one of judging, teachers will submit digital copies of student displays as photos, videos, or other file types. Students that pass the first round of judging will have to bring their display in-person to Frost Science for the STEM Challenge Expo. If students do not have a poster and instead have a slideshow, video, or another type of digital display, they will have to bring their own computer and computer charger to the STEM Challenge Expo.

Posters are one of the easiest displays students can make and can even be created online using free programs like Canva. Students can use the template linked below to help create a poster layout for a 48×26-inch tri-fold poster. Students will need a Canva account to access this template. After designing their poster in Canva, Pages 3-13 can be printed on standard US Letter (8.5×11-inch) paper.

Canva Display Template: <https://tinyurl.com/3wm8zc6p>



Evaluating Solutions

Use the questions below to check your solution. Your answers to these questions will help you figure out what part of your solution you need to keep working on.

Does your solution talk about sustainable energy?

The theme of the 2026-2027 Junior STEM Challenge is “Sustainable Energy Generation and Use.” If your problem or solution does not talk about sustainable energy, you need to change your problem and solution.

Does your solution talk about one of the four prompts?

Your solution needs to talk about one of the four prompts of the Junior STEM Challenge. It should be easy to tell which prompt your project, and your solution, are about. If it is not easy to see which prompt your solution is about (marine science, astronomy, paleontology, or health), change your solution.

Is your solution engineered? Remember that the Junior STEM Challenge is an engineering design competition.

Your solution must be something that can be physically built or made. It cannot be a solution that is all about people. For example, if your solution has people making and installing a device, it is engineered and is a good solution for the Junior STEM Challenge. If your solution has people volunteering to do an ocean cleanup or share flyers, it is not engineered and is not a good solution for the Junior STEM Challenge.

If you do not know if your solution is engineered, ask the questions below:

- ♦ **If you had enough money and time, could you build and test your solution?** If you could, it is probably engineered!
- ♦ **Does your solution need people to help fix the problem?** If so, it may not be engineered. Change your solution.
- ♦ **Can you measure if your solution works?** This could be with a ruler, scale, counter, etc. If so, it is probably engineered.
- ♦ **Can you make a model for your solution?** If you cannot model your solution, it may not be engineered. Change your solution.

Does your solution fix your problem?

Your solution does not have to fix your whole problem, but it should fix at least part of your problem or make your problem better. If your solution does not fix any of your problem, change your solution.

Is your solution something new, or has it been done before? If it has been done before, is your solution any better at solving your problem?

Your solution should be able to fix your problem more, or in a different way, than the solutions scientists and engineers are already using to fix your problem. If your solution is not any better than current solutions, change your solution.

Does your solution cause any problems?

No solution is perfect, so think about the problems your solution might cause. Maybe your solution is expensive, uses materials that are bad for the environment, takes up a lot of space, or could accidentally hurt people. If your solution causes more problems than it fixes, change your solution.

Have you already changed your solution?

Remember, the Junior STEM Challenge is an engineering design competition. Engineers use the engineering design process to change their solutions over and over again. If you have not changed any of your solution, go look at your solution again. Change part of your solution to make it better.

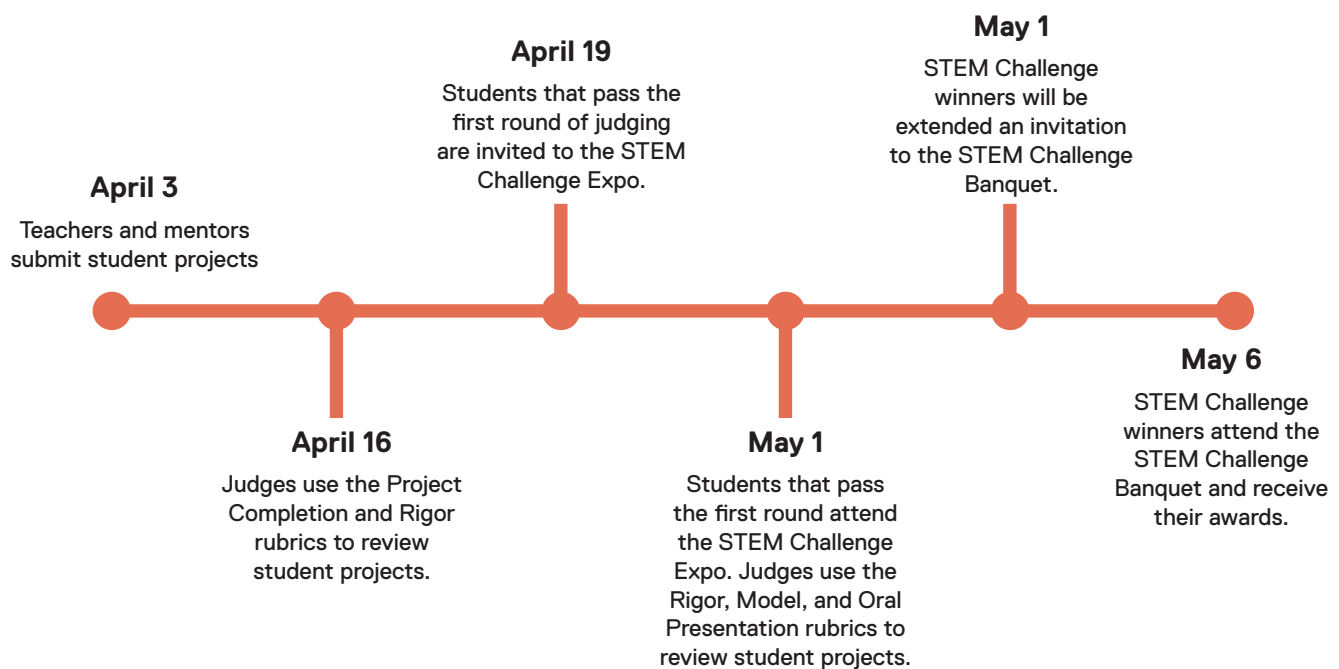
Judging Guidelines

Teachers will submit Junior STEM Challenge projects online as pictures or other file types. Judges can then review and score each project as part of a two-step judging process. First, judges will score the projects online using the Project Completion and Rigor rubrics. The judges will then meet to discuss student projects and select which projects will be invited to the STEM Challenge Expo at Frost Science.

Students that are invited to the STEM Challenge Expo will get notes from the judges and can fix any problem the judges noticed. Students can keep working on their projects until the morning of the STEM Challenge Expo.

Invited students will go to the STEM Challenge Expo in person on May 1, 2027 to present their project. Junior STEM Challenge students will then give judges a 5 minute-presentation on their project. The judges will be using the Rigor rubric to evaluate student projects. Groups of judges will come by each project several times to listen to student presentations and judge them using the Rigor rubric.

After all judges have listened to student presentations, they will meet to discuss student scores and pick 1st, 2nd, and 3rd place Junior STEM Challenge winners.



Frost Science Junior STEM Challenge Rubric for Assessing Project Completion: Digital Submissions

Criteria	Starting (0-3)	Growing (4-6)	Pro (7-10)	Score (0-10)
TITLE AND PROMPT	The project does not have a title and the prompt is not written on the display.	The project has a title, but it is not creative. For example, the title of the project might just be, "Astronomy" or "Paleontology." The prompt may or may not be written on the display.	The project has a creative title and the prompt is written on the display.	
PROBLEM	Students do not pick problem related to their prompt.	Students pick a problem related to their prompt, but the problem is too big to be solved with one solution.	Students pick one small problem related to their prompt that could be solved with one solution.	
BACKGROUND INFORMATION	Students do not have any background information on their display.	Students have background information about their prompt on their display. The background information is partially correct.	Students have background information about their prompt on their display. All of the background information is correct.	
SOLUTION: DESCRIPTION	Students did not create a solution for their problem or students did not describe their solution.	Students created and described a solution for their problem. Parts of the solution are confusing and it is hard to tell if the solution could help fix their problem.	Students created and described a solution for their problem. This solution is clearly explained and students identify how the solution could be used to help fix their problem.	
SOLUTION: SET UP	Students do not describe how the solution is set up or installed.	Students describe when, where, and how the solution is set up or installed, but do not describe the set up or installation plans in detail.	Students describe when, where, and how the solution is set up or installed. As part of their plans, students describe a set up or installation timeline.	
SOLUTION: COST	The display does not talk about how much the solution costs.	The display talks about how much the solution costs, but the costs are missing material cost, set-up cost, or worker cost.	The display talks about how much the solution costs and includes material cost, set-up cost, and worker cost.	

Frost Science Junior STEM Challenge Rubric for Assessing Project Completion: Digital Submissions (continued)

Criteria	Starting (0-3)	Growing (4-6)	Pro (7-10)	Score (0-10)
MODEL	Students did not make a model.	Students made a model of their solution. The model is hard to understand and does not look like any part of the solution.	Students made a model of their solution. The model is easy to understand and looks like at least part of the solution.	
SOURCES	Students have 0-2 sources in their references section. Only some of the sources are trustworthy.	Students have listed 3-4 sources in their references section. Some or all of the sources are trustworthy.	Students have listed 5+ sources in their references section. All of the sources are trustworthy.	
CONTENT	There are lots of grammatical or spelling errors.	There are a few grammatical or spelling errors.	There are no grammatical or spelling errors.	
DISPLAY	The display is not organized and looks messy and thrown together.	The display looks well done but is not organized.	The display looks well done and is organized.	
Overall Score:				/100

Frost Science Junior STEM Challenge Rubric for Judging Rigor: Digital Submissions and In-Person Judging

Criteria	Starting (0-3)	Growing (4-6)	Pro (7-10)	Score (0-10)
ENGINEERING DESIGN	Students do not explain how they came up with their solution.	Students explain how they came up with their solution, but do not describe any problems they found with their solution or describe how they fixed these problems.	Students explain how they came up with their solution. Students describe the problems they had with their solution and how they fixed these problems.	
SOLUTION: PROOF	Students do not explain why their solution would work.	Students explain why their solution would work, but do not share any data, examples of how similar solutions worked, or other information to help explain why their solution would work.	Students share data, examples of how similar solutions worked, or other information to help explain why their solution would work.	
SOLUTION: NEW	The solution is not a new solution, or the solution does not work to fix the problem.	The solution is new but does not fix the problem much more than other solutions.	The solution is new and fixes the problem much better than any of the other solutions that are being used to fix the problem.	
MATERIALS AND TECHNOLOGY	Students do not identify the materials or types of technology they used in their solution.	Students identify the materials or types of technology the used in their solution, but are not specific. Example 1: Plastic instead of Polyvinyl Chloride (PVC) Example 2: Artificial intelligence (AI) instead of predictive AI Example 3: Drones instead of fixed-wing drones	Students identify the materials or types of technology the used in their solution. Students are specific when identifying each component. Example 1: The solution uses a cellulose-based composite (a plant-based plastic substitute) Example 2: The solution uses stereolithography (3D printing that works using resin and ultraviolet light) Example 3: The solution uses 95% ethanol (a type of alcohol)	
ENTHUSIASM	The presentation and/or display does not show off the solution and project. The solution and project do not look strong.	The presentation and/or display shows off the solution and project. The solution and project are strong, but the students and/or display could do more to convince the viewer that their solution would work.	The presentation and/or display shows off the solution and project. The solution and project are strong and the students and/or display makes the viewer believe that the solution would work .	
Overall Score:				/100

Using Artificial Intelligence

About Artificial Intelligence

Artificial intelligence (AI) is a technology that helps computers learn over time. AI can be used to collect information, guess results, and create stories, pictures, and more. While AI is a great tool, it is important that we use AI the right way.

How to Use Artificial Intelligence

To use AI the right way, you need to make sure you are not using AI to do all the work for you. Everything that AI makes needs to be double checked because AI pulls information from lots of different places. This means that even the best AI can get things wrong and give you bad information. Because of this, you should only use AI to help you brainstorm ideas and find information, not write things for you or tell you how to create your solution for the Junior STEM Challenge. Even if you are just using AI to brainstorm ideas and find information, you will still need to double check the information it gives you to make sure it is correct.

If you are using AI for the Junior STEM Challenge, you cannot use AI to create your solution. AI can only tell you what we already know. This means that it can only tell you what scientists and engineers are already doing to fix the problems in the Junior STEM Challenge and cannot come up with any new ideas. While we cannot use AI to come up with a new solution, we can use AI to figure out what scientists and engineers are already doing to fix these problems. This can give you a good starting place for the Junior STEM Challenge. Remember, AI is a tool and cannot come up with new, creative solutions.

How to use AI (OpenAI, 2025)*:

Step 1: Figure out what you want the AI to help you with.

Step 2: Write your prompt. Use the following prompt examples to help create prompts for the Junior STEM Challenge:

Example 1: Describe what tools scientists have designed to... in the last 5 years.

Example 2: Identify five problems associated with...

Step 3: Add information to your prompt so that the AI understands exactly what you want. This can be your audience, how you want it formatted (a paragraph, a list, etc.), and more.

Example 1: Provide your response in a bulleted list with at least one reliable resource supporting each bullet.

Example 2: Provide your response in paragraph format.

Step 4: Read the response and make sure it matches what you asked for.

Step 5: If the answer does not make sense, go back and fix your prompt.

Step 6: If you fixed your prompt, try your new prompt to see if it gives you a better response.

Step 7: If the answer still does not make sense, repeat steps 5-6 until you get a better response.

Step 8: Review the final response to make sure it is correct and makes sense before using it for schoolwork or projects.

Checking Artificial Intelligence Responses

Reviewing AI responses to make sure that the information it gives you is correct is one of the most important steps when using AI. We all know that AI can pull information from bad sources, but it can also completely make sources up! When using AI to give you information about a topic, always ask AI to give you its sources. Once it gives you the sources, you need to go check out the website yourself. AI will try to make up sources that sound perfect! If you do not check the AI responses and read the sources yourself, it can be very easy to use information that may not be true.

Good vs. Bad Artificial Intelligence

There are a lot of different free AI tools that can be used to collect information, guess results, and create stories, pictures, and more. Not all AI tools are good at the same thing, so you should decide what you want to create before picking your AI tool. Be super careful when using AI to make pictures. Some AI tools create pictures using art without the artist's permission. Because of this, a lot of AI tools are being sued by the artists who have had their work stolen. Each of the AI tools listed below are safe to use, but students in M-DCPS should only use Gemini (Gemini, 2025)**:

- **Gemini:** This tool answers questions and helps you think of new ideas. It makes written answers, summaries, fun stories, and helpful plans.
- **ChatGPT:** This is a computer program that can write about anything you ask it to do. It makes stories, emails, poems, and helpful facts.
- **Perplexity:** This tool finds information on the internet and then gives you a clear summary, showing where the facts came from. It makes quick facts and easy-to-read summaries of research.
- **Canva (Magic Studio):** This design tool uses AI to help you create great-looking pictures quickly. It makes posters, drawings, presentations, and images created from text.
- **Adobe Firefly:** This is a creative tool where you type what you want, and the AI makes it into an image or helps you fix photos fast. It makes new digital art, picture edits, and quick illustrations.

Citing Artificial Intelligence

Whenever you use AI, you have to add the AI you used as a source even if you did not copy exactly what the AI said. If you pull any information from AI, you will have to list it as a source just like anything else.

**The tips for this section of the Guidebook were created using ChatGPT. ChatGPT was given the prompt, "Create a 'how to' guide for AI designed for middle school students. This guide should be listed as a series of steps (Step 1, Step 2, etc.) and should be no longer than 8 steps. Each step should be 1-2 sentences. The guide should cover building a specific prompt, refining the prompt (if needed), and checking the results generated by the AI." The ChatGPT response was then edited.*

***The definitions for each AI tool was created using Gemini. Gemini was given the prompt, "Create a 1-2 sentence descriptor of each AI tool. Each description should be written for a 6-8 grade audience and should identify the types of products each AI tool can produce." Gemini was given a few more prompts to help the answers make more sense. Responses remain unedited.*

Sources:

OpenAI. (2025). ChatGPT (GPT-5.1) [Large language model]. <https://chatgpt.com/>

Google. (2025). Gemini (2.5 Flash) [Large language model]. <https://gemini.google.com>

Student Tips

The Junior STEM Challenge was not made to be easy. Whenever you feel like you are struggling with the STEM Challenge, turn to this page for some tips and tricks.

How to Take a Break

Do not forget to take breaks while working on the Junior STEM Challenge! When taking breaks, try to switch project tasks and keep using your brain. For example, if you are working on your solution, maybe you can use your break to sketch your model, organize your sources, or work on another part of your project. If you scroll social media or play a video game during your break, your brain will have a harder time getting back to work. By using your break to work on another part of your project, you can feel productive, get work done, reduce your stress, and make it easier to go back to your original task (“Taking Breaks,” 2024).

Finding Sources

If you are having trouble finding good sources for your project, you can use websites like Wikipedia. While you cannot use Wikipedia as a source for your Junior STEM Challenge project, you can use it to get ideas or find other good sources. The bottom of each Wikipedia page has a list of sources at the bottom. You can look through these sources to see if any are good sources that you can use for your Junior STEM Challenge project.

Too Many Options

In the Junior STEM Challenge, you can pick any problem, solution, display, and model that you want. This can give you choice overload, which happens when you have so many options you cannot decide what to do.

If you have trouble picking your problem or solution, you should learn more about your topic, list all your ideas, and pick one problem and solution that everyone in your group likes. Even if you are not sure about your solution, remember that you can still change things as you go—that is part of the engineering design process and part of the Junior STEM Challenge (Chernev et al., 2015; Pilat & Krastev).

If you have trouble picking your model and display, you should read the examples in your Student Guidebook. It is one hundred percent okay to make something similar to these examples.

It’s Too Hard

The Junior STEM Challenge is not easy. There might be times when you feel like finishing your project is impossible. When this happens, take a break and look at how much you have already done. Remember that the problems you are trying to solve are the same problems that scientists and engineers are still trying to solve. It makes sense that if scientists and engineers find it hard, you will too! Also, remember that your solution does not have to fix your entire problem. As long as your solution makes the problem a little bit better, it is a great solution for the Junior STEM Challenge.

Due Dates

During the Junior STEM Challenge, your teacher might give you due dates for different parts of your project. While due dates can help you finish your project on time, they can also be stressful. If a due date stresses you out, make a list of everything you have to do before your due date. Then, work on finishing each item on your list one at a time. Do not worry about making everything perfect – just worry about getting them finished. Once they are all done, you can always use whatever time you have left to make them better.

If you know that no matter what you do you will not be able to meet a due date, talk to your teacher ahead of time. Do not wait until the day it is due. When talking to your teacher, you need to be honest and explain why you do not think you will be able to meet the due date. During this conversation, give your teacher a new due date that you think you will be able to meet. You can then talk with your teacher to figure out what works for both of you. Use the following example to see how you can have this conversation with your teacher:

The due date is in three days and you go up to your teacher before or after class.

“Hi. I know that my group’s model is due in three days, but we don’t think we will be able to meet that due date.”

“I didn’t manage my time well and I didn’t realize I have two more projects due this week. One of the projects is for my English class and it’s a big part of my grade, so I need to finish it first. The rest of my group can keep working on the model, but I have some of the things they need to finish it.”

“Could we have one more day to finish the model? We can all meet after school on the due date and can bring the model in the next morning at the start of school.”

“If we can’t have one more day, I understand, but is there anything else I can do? I want to make sure that my mistake doesn’t hurt my group’s project grade.”

You can have a similar conversation with your teacher for any due date and for any problem. While the example conversation is for a student who did not keep track of their assignments, you can have the same conversation about other problems and emergencies. If you do have an emergency that is making you miss a due date, you may need to give your teacher proof of the emergency. Always try to talk to your teacher as soon as you realize you might not be able to meet a due date and remember that your teacher can always say no to your request for more time. Your teacher is also more likely to say no if you wait until the last second to ask them, if you are always asking them for more time, or if you always turn in your assignments late.

Other Tips

Do not procrastinate: It sounds easy, but it can be hard to not procrastinate on your project! If you know that you procrastinate on a lot of assignments, use these tips and tricks to help you get work done. Set one or more mini-due dates before your due date for class. Then, tell a teacher, friend, or family member about your new mini-due dates and ask them to make sure you are finishing your work before each mini-due date. For example, you can set one or several completion goals for your project or project components. If you finish your work before each mini-due date, you will finish everything before the real due date and will still have time to go back and make things better. This works even if you procrastinate on your work before each mini-due date!

Keep every source: Write down every source that talks about your problem, even if you do not need them right now. You can always throw away the sources you did not need at the end of your project. If you throw away the sources you think you do not need early, you might have trouble finding them again if you need them later.

Do a little at a time: Try to work on the Junior STEM Challenge a few times a week or little bit every day. If you spread out the work, you will not have to do a ton of work right before each due date.

Take care of yourself: Like with all schoolwork, you need to take care of yourself during the Junior STEM Challenge. If you are having trouble with the Junior STEM Challenge, tell your teacher. Remember, even though the Junior STEM Challenge and school are important, you are more important.

Sources:

Chernev, A., Böckenholt, U., & Goodman, J. (2015). Choice overload: A conceptual review and meta-analysis. *Journal of Consumer Psychology*, 25(2), 333-358.

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Saunders, E. G. (2016, May 11). *If you dread deadlines, you're thinking about them all wrong*. Harvard Business Review. <https://hbr.org/2016/03/if-you-dread-deadlines-youre-thinking-about-them-all-wrong>

The University of North Carolina at Chapel Hill. (2024, February 19). *Taking Breaks*. The Learning Center. <https://learningcenter.unc.edu/tips-and-tools/taking-breaks/#:~:text=For%20this%20reason%2C%20while%20it,studying%20can%20even%20improve%20recall!>

Additional Resources

Sustainable Energy Data



Data Bank, Sustainable Energy for All

<https://databank.worldbank.org/source/sustainable-energy-for-all/preview/on>

The Data Bank can be used to see the sustainable energy consumption of different countries around the world. This data can be filtered by year.



Geospatial Energy Mapper

<https://gem.anl.gov/>

The Geospatial Energy Mapper (GEM) website can be used to generate maps of the United States that show sustainable energy potential and current energy infrastructure locations.



International Energy Agency

<https://www.iea.org/>

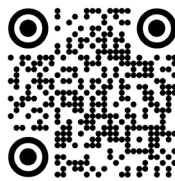
The International Energy Agency (IEA) website contains global data on different energy generation methods. This data is displayed across the site in different reports and graphs.



Our World in Data, Renewable Energy

<https://ourworldindata.org/renewable-energy>

Our World in Data has visualizations for different datasets related to sustainable energy consumption. The visualizations can be viewed as tables, maps, line graphs, bar graphs, and area graphs and the data can be adjusted to view sustainable energy consumption over time.



United States Energy Information Administration, Renewable & Alternative Fuels

<https://www.eia.gov/renewable/>

The United States Energy Information Administration (EIA) website contains data for different energy production methods across the United States. These datasets are often broken down by state. Many data sets are viewable only as tables. The Hourly Electric Grid Monitor shows the energy draw of each power company across the US in real time.

Model Resources

While some modeling software can be expensive or otherwise difficult to access, there are many high-quality free alternatives. As a reminder, creating a digital 3D model is not required for the STEM Challenge as models may include any physical or digital project component that represents the project solution.



Frost Science

<https://www.frostscience.org/>

Frost Science will print 3D models for students participating in the STEM Challenge. These models will be printed on a small scale, and model files must be sent to Frost Science 2 months prior to the necessary in-hand date. If you are interested in printing your STEM Challenge models for free, please send your STL files to education@frostscience.org.



AutoDesk

<https://www.autodesk.com/education/home#students>

The AutoDesk Suite provides a wide variety of different software that range from simple 3D modeling to infrastructure design. Software provided in the AutoDesk suite are free for students with a valid school email address.



Tinkercad

<https://www.tinkercad.com/>

Tinkercad is a web-based AutoDesk software that allows users to create 3D models, circuits, and code. The circuits are compatible with Arduino and Micro:Bit and utilize block and Python coding. Tinkercad cannot be used to design circuits compatible with Raspberry Pi. Tinkercad is considered an easy-to-use software.



Blender

<https://www.blender.org/>

Blender is a 3D creation suite that has more capabilities than other 3D modeling software, like Tinkercad, and can create styled and photo-realistic 3D models, animations, simulations, and more. Because Blender has a lot of tools and settings, it also has a steep learning curve.



Resources: STEM Challenge Website

<https://www.frostscience.org/frost-science-stem-challenge/>

Additional resources can be found on the STEM Challenge website. Resources listed on the STEM Challenge website may be modified over time.

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