**Facilitator Guide to Hosting a Real-Time STEM + Families Science Festival**

This guide is designed to help your PTA facilitate a real-time STEM + Families Science Festival. This accompanies the slide deck.

Approximate event length: 1 hour

Event goals:

* Increase access to STEM education and careers
* Develop and share effective ways to inform and engage families in STEM experiences
* Work with our partners to improve access to STEM school and community learning environments

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| **#** | **Facilitator notes** |
| 1 | **[Note:** Add school name, date, and school branding]  **Say:** Welcome to tonight’s live virtual STEM Science Festival. |
| 2 | **[Note**: Add pictures and names of all facilitators. These pictures help connect people].  **Say:** Before we dive in, we want you all to get to know each other too! Let’s see who is here.  *PTA facilitators should introduce themselves by unmuting themselves and saying their names.*  **Say:**Now, let’s see who has joined us.  **[Note:** If you have 10-15 people, participants can introduce themselves].  **Say:** If you’re able to unmute yourselves, I will call on you all one at a time so you can introduce yourself. Have one representative from your family share who is participating with you tonight. If you aren’t able to unmute, you can type your names in the chat pod.  [**Note**: If there are *more* than 15 people, ask people to quickly type their names in the chat box. Watch the time–this should be quick]. |
| 3 | **Norms**  [**Note**: Here are some “virtual” norms, but feel free to adjust if your PTA uses different ones].  **Say:** Also, before we start, it’s important that we take a few minutes to set some norms for our work together tonight. Here they are: Actively participate, be open minded and respect other’s ideas, use technology responsibly, limit sidebars and please mute when not speaking. Are you ready? |
| 4 | **What is STEM and Why We Are Here?**  **Say**:   * STEM = Science, Technology, Engineering and Mathematics. * STEM careers in the United States are growing faster than other professions. * The demand for qualified professionals is high, but the supply of workers to fill these positions is low—especially among women, minorities and students from low-income families. * Not all STEM careers require a four-year degree; many well-paid careers are accessible with a two-year degree or certificate.   We are now going to watch a video that explains a little more about STEM and shows potential careers which all use part of STEM.  *\*Click on image to play video:* [*https://www.youtube.com/watch?v=eIy6wK-3dng&feature=youtu.be*](https://www.youtube.com/watch?v=eIy6wK-3dng&feature=youtu.be)*.*  **Say**: And so tonight, we are going to start experimenting with STEM. We are going to try some experiments. And you will try them at home. |
| 5 | **Activating Question**  [**Note**: Make sure that [JamBoard](https://jamboard.google.com/d/16DQyz8sEbjVeTwDZPUgjsm8iw3jX1836U0a6qJV1OZc/viewer?f=0) is set up prior.]  **Say:** To get us started, let’s think about what makes a rocket lift-off.  *\*Click on link for* [*JamBoard*](https://jamboard.google.com/d/16DQyz8sEbjVeTwDZPUgjsm8iw3jX1836U0a6qJV1OZc/viewer?f=0)  **Say:** I am going to add a link in the chat. Click on it. This is a JamBoard. Add post-its to the JamBoard to answer the question. You will see other people’s post-its and answers too.  *\*Give them 1 minute to respond on JamBoard*  **Say:** Great! Let’s see if you are right. |
| 6 | **Alka Rockets**  **Say:** Let’s get started! Put on your safety googles and watch this video. As you watch, think about this question: What makes rockets go?  *\*Click on image. Play the video or do the alka rocket experiment live.* |
| 7 | **Science Behind the Fun**  **Say:** Alka-Seltzer tablets are made up of citric acid and sodium bicarbonate that react to form carbon dioxide when dissolved in water. When Alka-Seltzer is added to the water in the film canister, carbon dioxide is released, which builds pressure inside it. When the pressure builds high enough, it blows the canister apart from its lid, thus launching the rocket into the air. |
| 8 | **Real World Application**  **Say:** Actual rockets use the same concept. In an actual rocket engine, hot gas is produced by the burning of fuel. The gas is accelerated to the rear of the rocket. This produces a thrusting force, which makes the rocket “lift-off.” |
| 9 | **Expand Your Knowledge**  **Say:** Talk as a family and answer the following questions:   * What happens if you change the size of the tablet? * Does it make any difference in how quickly and how high the rocket launches if you change the amount of water?   *\*Give families 2 minutes to talk.*  **Say:** Does anyone want to share? Respond in the chat or unmute yourself. |
| 10 | **Let’s Try It**  **Say:** Now you will get a chance to try 3 different experiments. You should have all of the materials ready at home for each of the experiments. To do this, I will send you to a breakout room. In the breakout room, you will work with the facilitator and try each experiment at home with your family. |
| 11 | **Experiments**  **Say:** The 3 experiments are:  [Sticky Icky](https://www.youtube.com/watch?v=RQDlW1IFkT0&feature=youtu.be)  [Martin Jelly](https://www.makingsciencemakesense.com/static/documents/Experiments/martian-jelly.pdf)  [Bubbling Lava Lamp](https://drive.google.com/drive/u/1/folders/1CUniE72WuR9xIN66Dl17PNlRw9ST728k) |
| 12 | **Sticky Icky** |
| 13 | **Sticky Icky: Materials**  **Say:** Here are the materials that we will need for this experiment. Make sure that you have everything ready. If you don’t have it all, take a minute to gather it.   * White school glue * Food coloring (various colors) * Borax (found in the laundry aisle) * Two pitchers: One labeled “Borax Solution,” one labeled “Water Only” * Warm tap water * Plastic Tablespoons (some for water, some for glue) * Plastic Teaspoons (for Borax solution) * Six-ounce plastic cups (one for each student-adult pair) * Popsicle sticks (one for each student-adult pair) * Safety glasses |
| 14 | **Sticky Icky: Instructions**    **Say:** Here are the instructions for this experiment. Let’s try it together. |
| 15 | **Sticky Icky: Vocabulary**  **Say:** Before we begin, let’s look at some vocabulary.  *\*Click*  **Say:** Polymer. Has anyone heard that word before?  Unmute to guess what it means.  Give 1 min for people to guess what it means.  *\*Click to show definition*  **Say:** Polymer is a natural or synthetic (man-made) substance made from joining together many small molecules or units. ‘Poly’ means many and ‘mer’ means units.  *\*Click*  **Say:** What about solution? Does anyone know what that means?  Give 1 min for people to guess what it means  *\*Click to show definition*  **Say:** A solution is two or more substances mixed evenly together |
| 16 | **Sticky Icky: How it works**  **Say:** Let’s talk about how this experiment works. The glue and water mixture contains chains of molecules called “polymers,” which move relatively freely as a liquid.  When the Borax solution is added it adds crosslinks to the polymer chains, restricting their movement. It is this molecule in the Borax solution that causes the liquid to turn into slime. |
| 17 | **Sticky Icky: Questions to ask**  **Say:** Families, based on the age of your children, discuss these questions at home.  Give 3 min to talk  **Say:** Does anyone want to share what you learned? Unmute and answer one of the questions that you and your family discussed. |
| 18 | **Sticky Icky: Real world application**  **Say:** One characteristic of polymers is that—like Sticky Icky—they can easily take a variety of shapes.  We see polymers all around us: in our plastic toothbrushes, cell phone cases, rubber soled shoes and even synthetic fabrics made into clothes and sheets!  Knowing about polymers is useful in many STEM jobs from understanding DNA to designing smartphones. |
| 19 | **Martian Jelly** |
| 20 | **Martian Jelly: Materials**  **Say:** Here are the materials that we will need for this experiment. Make sure that you have everything ready. If you don’t have it all, take a minute to gather it.   * 1 tablespoon grape jelly * 1/8 teaspoon baking soda (not baking powder) * 1 tablespoon vinegar * 1/2 cup of warm water * Popsicle stick to stir solution |
| 21 | **Martian Jelly: Instructions**  **Say:** Here are the instructions for this experiment. Let’s try it together. |
| 22 | **Martian Jelly: Vocabulary**  **Say:** Before we begin, let’s look at some vocabulary.  *\*Click*  **Say:** Basic. Has anyone heard that word before? Unmute to guess what it means.  Give 1 min for people to guess what it means.  *\*Click to show definition*  **Say:**A solution is *basic* if it has a low concentration of hydrogen ions, or a pH of greater than 7. Some examples of basic things are soap, bleach, ammonia and toothpaste.  **Say:** Acidic. Has anyone heard that word before? Unmute to guess what it means.  Give 1 min for people to guess what it means.  *\*Click to show definition*  **Say:**The opposite of basic is *acidic*—acidic solutions have a high concentration of hydrogen ions and a pH of less than 7. Some examples of acidic things are lemon juice, coffee, and soda. |
| 23 | **Martian Jelly: How it works**  **Say:** Let’s talk about how this experiment worked. Chemical reactions occur when one chemical meets another. For example, when you added the baking soda (a base), a reaction occurred and it made the solution basic, changing the color of the grape jelly to a greenish-black. When you added vinegar (an acid), a reaction occurred, and the color of the grape jelly solution changed back to purple. |
| 24 | **Martian Jelly: Questions to ask**  **Say:** Families, based on the age of your children, discuss these questions at home.  *\*Give 3 min to talk*  **Say:** Does anyone want to share what you learned? Unmute and answer one of the questions that you and your family discussed. |
| 25 | **Martian Jelly: Real world application**  **Say:** Neutral pH (not basic or acidic) is best for most living beings. The more acidic or basic a liquid becomes, the more irritating it is to our skin, eyes, and organs. For example, most household cleaners (bleach, oven cleaners and tub and tile cleaners) are basic.  Many things we like to eat are acidic but can harm our stomach or damage our teeth in large quantities, like coffee, soda or citrus juice.  Knowing how to combine acids and bases is very helpful for baking and cooking and for scientists working with dangerous acids and bases. |
| 26 | **Bubbling Lava Lamp**  **Say:** Next, we’re going to do the bubbling lava lamp experiment. |
| 27 | **Bubbling Lava Lamp: Materials**  **Say:** Here are the materials that we will need for this experiment. Make sure that you have everything ready. If you don’t have it all, take a minute to gather it.   * Water * A clear plastic bottle with cap * Vegetable oil * Food coloring * Effervescent antacid tablets |
| 28 | **Bubbling Lava Lamp: Instructions**  **Say:** Here are the instructions for this experiment. Let’s try it together. |
| 29 | **Bubbling Lava Lamp: Vocabulary**  **Say:** Before we begin, let’s look at some vocabulary.  *\*Click*  **Say:** Intermolecular polarity. Has anyone heard that word before?  Unmute to guess what it means.  Give 1 min for people to guess what it means.  *\*Click to show definition*  **Say:**Intermolecular polarity means water molecules are attracted to other water molecules; oil molecules are attracted to other oil molecules. The structures of the two molecules do not allow them to bond together.  *\*Click*  **Say:** What about density? Does anyone know what that means?  Give 1 min for people to guess what it means  *\*Click to show definition*  **Say:**Density. Density describes how much space an object or substance takes up (its volume) in relation to the amount of matter in that object or substance (its mass). If an object is heavy and compact, it has a high density. If an object is light and takes up a lot of space, it has a low density. |
| 30 | **Bubbling Lava Lamp: How it works**  **Say:** Let’s talk about how this experiment worked. Oil and water do not mix. The oil and water separate in the bottle, with oil on top because it has a lower density than water. The food coloring falls through the oil and mixes with the water at the bottom. The antacid “fizzy” tablet creates bubbles of carbon dioxide which is a gas and is less dense than both oil and water so it will move to the top and bring some of the colored water with it. |
| 31 | **Bubbling Lava Lamp: Questions to ask**  **Say:** Families, based on the age of your children, discuss these questions at home.  *\*Give 3 min to talk*  **Say:** Does anyone want to share what you learned? Unmute and answer one of the questions that you and your family discussed. |
| 32 | **Bubbling Lava Lamp: Real world application**  **Say:**When oil spills in the ocean, it floats on water, spreads out and forms a “slick.” This oil slick can coat and damage birds who dive for food, as well as destroy beaches and other homes for coastal animals. Understanding density and polarity is essential for people who help clean up oil spills and care for the animals. |
| 33 | **What Did You Learn?**  [**NOTE:** Make sure the JamBoard works prior: <https://jamboard.google.com/d/16DQyz8sEbjVeTwDZPUgjsm8iw3jX1836U0a6qJV1OZc/viewer?f=1>]  **Say:** What did you learn? Go to the JamBoard, and share what you learned for each of the 3 experiments. Add sticky notes to share what you have learned. Read what others have learned. |
| 34 | **Learn More**  **Say:** We haven’t finished experimenting and learning about STEM. At home, you and your family can continue learning and having fun together.  *\*Click on* [*Making Science Make Sense website*](https://www.pta.org/home/programs/stem/STEM-Families-Bayer-Science-Festivals)*:* [*https://www.pta.org/home/programs/stem/STEM-Families-Bayer-Science-Festivals*](https://www.pta.org/home/programs/stem/STEM-Families-Bayer-Science-Festivals)  **Say:** Look at this website. There are many opportunities to continue learning and experimenting as a family.  *\*Click on* [*Additional Experiments*](https://www.makingsciencemakesense.com/science-library/experiments/)*:* [*https://www.makingsciencemakesense.com/science-library/experiments/*](https://www.makingsciencemakesense.com/science-library/experiments/)  **Say:** Here are many other opportunities for you and your family to try. |
| 35 | **[NOTE:** Add survey link and place to share pictures from tonight, whether that’s by tagging your PTA on social media or sending them (and media release forms) via email]  **Say:** Thank you so much for joining us tonight. We had a great time learning with you and experimenting with you. Remember, STEM is fun and everything we do is connected to science. We hope you had fun tonight! Thanks to the National PTA and Bayer for helping guide our evening. Be sure to send photos here. |