The Tech Interactive at Home

Educator Tips for Remote STEM Learning

Engage your students during virtual learning with design challenges and science projects. These activities exercise creativity and critical thinking and combine online and offline experiences. Use these tips and your own innovator mindset to adapt any STEM challenge to your teaching environment and learning tools. For more information on design challenges and facilitation tools visit thetech.org/resources.

STEP 1: "Assign" the challenge.
Use the tools and resources you have available to share the challenge with your students. Make sure their caregivers receive all the necessary information so they can support their children from home. This Parent Guide will help them get started.

STEP 2: Encourage students to use the Innovation Design Process [PDF] [Video].
This means focusing on the process rather than a final solution, and giving opportunities to share prototypes and peer feedback even though students are working remotely. Journals of brainstorm notes, build attempts and revisions are great ways to capture the design process as it unfolds.

STEP 3: Encourage collaboration.
Despite physical distance, remote learning often allows for student collaboration. If they are unable to work with each other, this is a great opportunity for them to work with family members or others in their household.

STEP 4: Provide opportunities for authentic sharing and feedback.
Celebrate the accomplishments of your students and give them a chance to share their work with the rest of the class as well as a larger audience. If possible, make space for feedback and sharing of drafts and iterations as well as the final solution.

Tip: Add a fun spin to the introduction of the challenge. Share photos or videos of your own attempts at the challenge or use an engaging "hook" or story to make it even more relevant to students.

Materials Tip: For ideas on the types of recyclable/easy-to-find materials to use in Design Challenges, check out our Parent Guide for Learning at Home.

This might seem daunting, but remember the design process is iterative and all of this is a work in progress. So make sure you celebrate your own small accomplishments and focus on the process rather than the final solution! You've got this!

Here are some more ideas on how to do virtual STEM challenges!

Since we know your technology resources vary, we've included tips for *low*, *some* and *lots* of tech.

STEP 1: Assign STEM Challenge		
Low Tech	**Some Tech**	**All Tech**
Leave families a voicemail or send a text with instructions for a simple design challenge. **Idea:** Have a "kit" or packet of some essential design challenge materials for pick-up at the school.	Send families an email with the design challenge and directions. **Idea:** Set up a shared documents folder for families/students and post activity ideas and directions.	Use your school's learning management system to communicate daily or weekly challenges. **Idea:** Make and share a fun video to inspire your students.
STEP 2: Use the Design Process		
Low Tech	**Some Tech**	**All Tech**
Have students use artifacts and evidence like journals to capture their process. Remind them that you are looking for multiple versions or iterations rather than a final fully functioning solution. **Idea:** Send prompts to scaffold journaling. Encourage them to reflect on what is working, challenges and next steps as well as real-world applications of their ideas.	Use shared documents to capture ideas and steps in the process. Have shorter deadlines that encourage students to share drafts or iterations rather than waiting until a final submission. **Idea:** Share different brainstorming techniques with students. Have them brainstorm and share their ideas with each other.	Encourage revision and iteration. Have students create a "blog" or online journal which includes photos and videos to share their process. More technologically savvy students could even design a team website to share their work. **Idea:** If students are online at the same time, have them work on a piece of the process at the same time. Ex: a timed prototyping session where they can share ideas as they work.
STEP 3: Encourage Collaboration		
Low Tech	**Some Tech**	**All Tech**
Caregivers and family members can do the challenge together as a team. Older siblings can help coach and support younger ones. **Idea:** Set up a way for students to communicate ideas with each other. A classroom penpal process might be a fun way for them to share ideas and also stay connected.	If students cannot "meet" at the same time, have them share and respond to each other's ideas in a collaborative space (folder/document). **Idea:** Pass around a shared document and have students take turns uploading and responding to ideas. This "telephone" format works for any stage in the process: brainstorming, prototyping, sharing and feedback.	Have students use the platform and tools to give each other feedback and share ideas. Create smaller teams within a class and encourage students to use shared documents and video conferencing to work together. **Idea:** Each student builds and tests a certain component separately. They share results and combine ideas for the final device.

See next page for Step 4.

STEP 4: Sharing and Feedback		
Low Tech	**Some Tech**	**All Tech**
Have students text images or videos of their work to you. This can include answering some Sharing Questions. **Idea:** Print and mail a collage/ newsletter of student work so everyone can see each other's solutions.	Set up a social media channel/group or hashtag where parents or students can post and share their results. **Idea:** Remote conferences: Schedule a phone or video check-in with students and parents to find out what they've been learning and doing. Encourage students to share and explain their work in their own words.	Have students share their ideas on a digital platform. They should both share and comment on another person's ideas. This is a great opportunity to teach positive social media interaction. **Idea:** Find an authentic external audience for student work. For example, set up a video conference or letter writing project with a community stakeholder.

Opportunities for Reflection

Reflection is a critical component of the innovation design process and can be used throughout the various stages from prototyping and experimenting to sharing. Through reflection, students begin to make sense of what they have experienced.

Journals

Journals are a great way to track student progress and learning and can also target and emphasize specific ELA/Math skills. Depending on their resources, students can capture their notes with paper and pencil, online documents or within an e-learning platform.

Sample Journal Prompts

- What did you do today/this week?
  - Make notes about your experiment or challenge, materials you tried, draw/take a picture.
- What happened during testing?
  - Why do you think this happened?
  - How was your device/experiment intended to work?
- What are some of the changes you made?
  - Take notes, draw or take a picture.
  - Why did you make these changes?
- What do you want to try next? What would you change?
  - Are there parts of your prototype or materials you want to experiment with next?
- What was challenging?
- What are you proud of?

Tips:

- **Younger students:** provide sentence prompts or focus on drawing what they did and having a parent write a sentence explaining their drawing.
  - My design uses (*fill in material*), it will (*fill in action*). When I tested it my design (*fill in action*).
  - Draw an emoji of how you are feeling about the design (use a real or made-up emoji).
- **Older students:** include specific data collection depending on the experiment. For example, tracking the conditions, materials and testing locations. If possible, have them use graphs or tools like Google Science Journal to collect data on speed or other factors with their phone.

See our Data Collection Tech Tip for more ideas.

More Opportunities for Reflection

Prototyping Prompts for Reflection

As students are working on design challenges, they may encounter roadblocks or issues during testing and building. Provide these open-ended questions or use them during feedback and "live" prototyping to guide students to reflect on their process.

Starting to Build	Problem-Solving	Pushing Designs Further
Which parts of this prototype are you still trying to understand or imagine? Which parts of the device can you test to inform the overall design?	What components are working in your design? Where are the failure point(s)? What caused the failure? How can you start to alter that part of the design?	What can you try to make this design even better? What is a different way to solve the problem?

Sharing Solutions

To guide student reflection and sharing, use these questions in addition to the tips we've outlined throughout this guide.

- Tell us how your design works.
- What was your original idea?
- What changes did you make as you were building?
- Demonstrate your device (photo/video if possible).
- What changes would you make if you had more time?

See our Sharing Solutions Tech Tips for more ideas on how to support student reflection.

Sample Implementation Overview

Now that you've got some ideas for the components of remote STEM learning, here's a sample schedule for how to implement this yourself. This roll-out is designed to demonstrate how with a few simple steps, your students can engage in hands-on STEM activities from home!

Educator introduces and assigns activity.

Students do activity. *(Optional: Check-in with Educator)*

Students share solutions and receive feedback.

(Optional): Iteration, content connections or new criteria/ constraints.

Sample Implementation Details

This detailed sample implementation is designed for students of all levels, from Grades K-12. Journals, artifacts and activities will vary by age, level of technology and parent interaction.

<table>
<tr><th></th><th>Students</th><th>Educator</th></tr>
<tr><td colspan="3">Day 1: Beginning of the Week</td></tr>
<tr><td>Assign the Activity</td><td>Receive the assignment and expectations. Ask questions and follow up as needed.</td><td>Introduce and assign the activity to students.
Use an engaging technique to build their interest (ex: video, story, images).
Keep instructions simple for both students and parents.
Let them know they will work on it all week and outline the expectations.
(See Tech at Home for parent guides, tips and resources to assign.)</td></tr>
<tr><td colspan="3">Days 1-3:</td></tr>
<tr><td>Students Do the Activity</td><td>Students do the activity by experimenting, prototyping or designing.

For design challenges, they should build, test, and iterate on their design.

Most activities will take at least 30 minutes. Larger projects with older students can be completed over a few days.</td><td rowspan="2">Optional: Check-In
Depending on technology and resources, the educator can check in with students throughout this process. This can include:
Small group video sessions.
Virtual office hours.
Text messages with parents.
Modeling prototyping and journaling with educator updates.
Content connections or thought provoking questions to spark student work.
Extension resources for students who want to learn more.</td></tr>
<tr><td>Students “Journal”</td><td>Collect artifacts and reflect on their work. Depending on age and technology this can include a written journal, photographs or video.</td></tr>
<tr><td colspan="3">Day 4 or 5: End of the Week</td></tr>
<tr><td>Sharing Solutions</td><td>“Submit” journals and share designs with educator and peers. Depending on technology, this can be a text message with photo/video, email, online document or learning platform.

If possible, find a way for students to give feedback on each other’s designs.</td><td>Provide students with some feedback on their designs. Ideas for this include:
Message students directly.
Share examples and observations on prototypes/work you have seen from the entire class.
Virtual class meeting for entire class/small groups to debrief and share together.</td></tr>
</table>

Additional Learning Opportunities

As with any project-based activity, it's important to remain flexible. Respond to your students and the situation. If students become passionate and interested, don't be surprised to see an activity roll over into multiple iterations and extensions. If the schedule allows for additional time, we recommend extending the design process so that students have a chance to deepen content connections, iterate and improve upon their designs.

Options for the second week of implementation include:

- **Iterate and Improve:** Instead of providing new instructions or content, have students use the feedback they received at the end of the first week to improve and revise their designs.

- **Content Connections:** Introduce new concepts and deepen students' understanding of the mechanics of their designs or the real world application of them. Examples for "Roller Coaster" include:
  - *Students measure velocity during prototyping.*
  - *Students read about famous roller coaster designs while iterating.*

- **New Criteria and Constraints:** Adjust the criteria or constraints for the challenge, providing students with an added challenge or having them expand on and explore more with their designs. Examples for "Zipline" include:
  - *Slowing down the speed of the device.*
  - *Adding another "passenger" to the criteria.*
  - *Using Google Science Journal to collect data during prototyping.*

Reminder:

Provide families with the information they need to support students during activities. Share our Parent Guide with specific tips on how to empower student autonomy and creativity.

Activity Spotlight

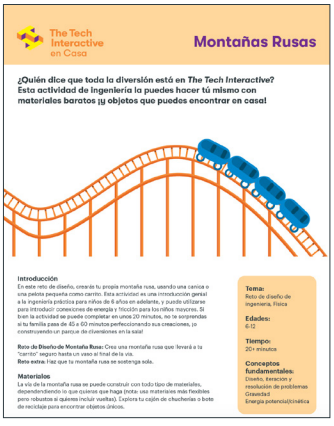
We've customized a few activities for families to facilitate easily at home in English or Spanish. These STEM resources are ready to assign to students and use materials that can be found around the house. For deeper learning, add in reflections that connect the activities to your curriculum, concepts and vocabulary.

Design a DIY inflatable!

Create a wind-powered vehicle!

Make your own zipline!

Design your own roller coaster!



Share Your Results! Keep us posted about your design challenges on social media with **#TheTechatHome.**

The Tech Interactive at Home

thetech.org/athome