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# **Remote Learning in Secondary Science & Technology/Engineering**

Using remote learning, additional challenges arise in maintaining student learning in science and technology/engineering and supporting opportunities for collaborative sense-making and design work for students. This document outlines an example of an instructional sequence that may help educators to plan and facilitate coherent learning opportunities that support two-way communication between teacher and student and between students, and can be implemented over a flexible timeline.

We recommended that during remote learning, educators focus on those standards that are the most [critical prerequisites](http://www.doe.mass.edu/covid19/learn-at-home/secondary-prerequisite.docx) for success in the next grade. Students should interact with the natural world or with models to produce data, and use data to model and make sense of the natural or designed world.

**Remote Learning: Top Tips**

1. **Align** to the MA Curriculum Framework standards. Students should engage in the [science and engineering practices](http://www.doe.mass.edu/frameworks/scitech/2016-04/AppendixI.pdf) to make sense of [grade-appropriate content](http://www.doe.mass.edu/frameworks/search/).
2. **Keep it simple.** Prioritize learning experiences that are simple to explain and to organize, and that students can complete with less adult support.
3. **Make it engaging**. Prioritize topics and tasks that will interest students. Consider how to build upon students’ home languages, experiences, and identities, within learning experiences and over time.
4. **Attend to access and equity.** Provide all academic, language, and social-emotional supports that students normally need or receive to the extent possible. Provide multiple modes of access and response to academic work, including for students who lack access to technology.
5. **Provide pacing and structure.** Each week, provide students a structure for the week and a plan for how much time they should spend on various activities and tasks.

***Planning considerations:***

1. Start by adapting activities in your curricular materials for engaging remote learning. Select a standards-aligned science [phenomena or engineering problem](http://www.doe.mass.edu/stem/ste/qrg-phenomena.docx) (e.g., videos, live web-cameras, photographs, outdoor experiences) to engage in learning around. You may also want to connect phenomena to household activitieslike cooking, fixing things, or the outdoors; or engineering design problems to address relevant problems in their lives. [Additional [STE remote planning resources](http://stemteachingtools.org/news/2020/guidance-for-supporting-science-learning-during-covid-19), [OpenSciEd Remote learning resources](http://www.doe.mass.edu/stem/ste/qrg-phenomena.docx).]
2. Identify the relevant learning tasks (e.g., simple experiments done with objects in the house, utilize online simulations like [PhET](https://phet.colorado.edu/) or [Concord Consortium](https://concord.org/ngss/), outside exploration, research). This may include developing predictions, collecting and organizing data (qualitative or quantitative), or engaging in design cycles.
3. Prepare scaffolds, accommodations, modifications, and/or language supports for students who typically need these supports in science and technology/engineering.

***Facilitating remote learning:***

1. Instruct students to observe the selected science [phenomena or engineering problem](https://www.nextgenscience.org/resources/phenomena). Have students submit and share their observations (noticings) and questions (wonderings). Support students in responding to each other’s observations and questions.
   * Online approaches: Observe video demos/simulations; host a video chat for students to observe and discuss together; shared online docs for students to record their thinking or as a space for students to post pictures of their work; students create individual posts and responses.
   * Offline approaches: explore the outdoor environment, students record in science notebooks, provide a call-in number for students to leave voice messages, questions, or feedback.
2. Have students draw an initial concept model to explain what they think is happening (or initial engineering solution) and share with you and other students. Develop and share a “class model” based off the students’ initial understandings to share with students. Plan to reference and revisit these models.
   * Include student choice among multiple modes of representation and with varying access to technology to increase engagement and accessibility.
3. Based on students’ questions and ideas, and existing curricular resources, support students to do further investigation to learn more about the phenomena or problem in order to improve their design. Depending on the topic and students’ grade level, this will vary. Plan to check-in and support students in differentiated ways during this phase (e.g., providing guiding questions, data tables, graphic organizers).
   * Online approaches: additional videos and/or readings, [online simulations](https://phet.colorado.edu/), data collection activities
   * Offline approaches: guided outside exploration and observations, simple experiments done with objects in the house, hard copies of texts sent home
4. Have students communicate the new information they learned about the topic to you and the class (e.g., submitting data, pictures from students’ notebooks, completed graphic organizers) along with an explanation of how it furthers their thinking of the phenomena/problem. Engage students in a discussion (in synchronous or asynchronous ways) of how that additional information changes their initial models or initial designs. Provide some guidance, support, and clarifications during this time as students try to make new sense of what they are learning.

* Online approaches: Host a real-time video chat, shared online documents, guided questions/prompts to push student thinking
* Offline approaches: Students record in journal/notebook. Provide a call-in number for students to leave voice messages, questions, or feedback.

1. Have students individually revise and improve their initial models/solutions and submit with an explanation of the relevant science concepts. Revisit the initial model “class model” by adding new understandings to the model and check for student understanding or additional questions.