STEMscopes™
THE LEADER IN STEM EDUCATION

USING STEMSCOPES FOR REMOTE INSTRUCTION

Synchronous & Asynchronous Strategies

Synchronous. Asynchronous. Applying these terms to distance education might be somewhat new to you, but you have probably already been practicing them when teaching in person. As a classroom teacher, you're used to working with one group of students while other students work independently. Now, STEMscopes hopes to make this same practice easier for you to implement in your virtual classroom.

What's the difference between these instructional strategies?

Synchronous Instruction	Asynchronous Instruction
Students and teachers Sharing the learning. Think working together in Sync.	**Students working Alone, without their teacher. Think Assignments.**
The teacher facilitates learning in real time, responding directly to student needs as they occur, through live teacher-student interaction.	The teacher facilitates learning by pushing instructions and resources out to students for them to work on independently with no direct or immediate interaction with the teacher. This requires teachers to anticipate needs and make instructions as comprehensive as possible.
• Lead hands-on activities that are too complex for students to do independently or that require materials they do not have at home (these activities could also be recorded and provided asynchronously)	• Assign hands-on activities that are easy for students to do at home with materials that are readily available
• Facilitate student sensemaking via teacher-guided questioning and peer-to-peer discourse	• Facilitate student sensemaking via independent thinking, reading, and research
• Provide opportunities for direct one-on-one and small group intervention	• Provide opportunities for students to self-assess and autonomy to choose between independent remediation activities or enrichment activities

In the following pages, you'll find suggestions for using each of the components in the STEMscopes curriculum during synchronous and asynchronous instruction for distance learning. These suggestions are organized by the elements of the 5E model and, within each of them, by specific STEMscopes components and resources.

Please remember that teachers are not expected to use every resource within every component of every scope. Multiple resources are provided so teachers have ample materials to choose from in order to meet their students' needs. While it's important to follow the 5E model for lesson design, we leave it up to you to choose the STEMscopes resources necessary to help your students achieve their learning goals.

Component	Synchronous Instruction	Asynchronous Instruction
HOME		
Teacher Background Describes the scientific content addressed in the scope, meant to help teachers recall key concepts.	Reviewed by teachers as needed prior to facilitating synchronous learning sessions in the virtual classroom.	This resource is not meant to be used by students, but can be shared with parents to assist them in helping their child's learning at home.
CCC and SEP Scoring Rubrics Formative assessment questions with sample student answers that assess student mastery of the target SEP and CCC.	Students discuss these formative assessment questions during whole-group discussion or in breakout rooms. Use collaborative tools like Google Docs so that you can observe student thinking while they are in different breakout rooms. Rubrics also clarify expectations for learning.	Assign these questions independently to students or in small groups during asynchronous time. They are not directly assignable to students, so you will need to communicate them to students in a different manner.
Teacher Scope Presentations (Middle and High School) Google Slide presentations that highlight instructions and questions from the various scope components.	Use these as visual aids to guide or maximize synchronous instruction. Teachers can expand the slide presentations into digital notebooks to guide students through both synchronous instruction.	The slide presentation can be expanded into digital notebooks to guide students through asynchronous instruction. Also consider distributing to students after synchronous instruction as a reference and/or review.
ENGAGE		
Investigative Phenomena Stimulate student curiosity and motivate students to want to learn more.	Show a video or demonstrate the phenomena in action followed by guided discourse. Have students brainstorm ideas/questions as a whole group using chat, polling, or other communication tools. Students can work in smaller groups using breakout rooms. Use collaborative tools like Google Docs to increase student accountability and observe student thinking during these group activities.	Assign a photo or video for students to view independently. You might use a shared Google Doc so students can share ideas collaboratively. Share the guiding questions with students so they can focus their thinking and record their thoughts as they explore and examine phenomena.
Accessing Prior Knowledge (APK) Pre-assess student background knowledge and help students recall prior knowledge.	Teachers facilitate students' completion of the APK individually or in small groups working in breakout rooms. This is a great time for teachers to probe for misconceptions. Teachers will want to capture, and often share students' responses through an online collaboration tool.	Some APKs can be assigned or adapted as an independent task for formative or pre-assessments. APKs are also a tool for student self-assessment, allowing students to choose a remediation or enrichment assignment during asynchronous time to fill in missing background or to deepen their learning.
Graphic Organizer Students record their learning as they build upon scientific concepts throughout the scope.	Use student responses from the graphic organizer to facilitate conversations that help students connect learning from each hands-on activity and better understand scientific concepts related to the target standards.	Students complete independently to organize their understanding or demonstrate their learning (formative assessment). Graphic organizers can be used throughout the scope to help students self-assess their progress and choose between remediation and enrichment assignments during asynchronous time.

Component	Synchronous Instruction	Asynchronous Instruction
ENGAGE CONTINUED		
Hook Pre-assess student background knowledge and help students recall prior knowledge, as well as introduce new concepts, around the target Performance Expectation(s) in the scope.	Assign students the hands-on Hook activity during synchronous instruction if it lends itself to students using materials they have at home and discussing the activity in breakout rooms or as a whole class. Alternatively, the Hook can be a demonstration by the teacher followed by peer-to-peer discussion in breakout rooms.	Assign students the hands-on Hook after the Investigative Phenomenon if it can be easily adapted to use common materials they have at home and/or if a STEMscopes Virtual Learning video that guides students through the activity is available. Use a Google Doc for students to share ideas collaboratively. The Hook can be used throughout the scope to help students self-assess their progress and choose between remediation and enrichment assignments during asynchronous time.
EXPLORE		
Activity Students engage in hands-on activities that stimulate questions and exploration.	Facilitate students' completion of the hands-on activities during synchronous instruction if they lend well to materials students may have at home. Facilitate whole or small group discussion during the process. Use virtual breakout rooms to support small group discussions. Alternatively, these activities can be demonstrated by the teacher, followed by whole or small group discussion.	Assign these activities to students if the activities can be easily adapted to use materials students have at home and/or if a STEMscopes Virtual Learning video that guides students through the activity is available. Use a Google Doc for students to share data and ideas collaboratively.
Research Students practice SEP 8: Obtaining, Evaluating, and Communicating Information in order to learn more about a particular topic (DCI).	Use synchronous learning time to model and "think aloud" with students as you guide them in strategies for obtaining, evaluating, and communicating information using NGSS support tools embedded in the curriculum. Students' independent research will typically be done asynchronously.	Students conduct research either individually or in small groups without direct teacher support and use the NGSS support tools embedded in the curriculum. The Explores include resources to help students learn how to assess the credibility, accuracy, and possible bias of sources, and gather and synthesize information.
Inquiry Investigations Students practice SEP 1: Asking Questions and SEP 3: Planning and Carrying Out Investigations. This type of Explore activity engages students in planning their own investigation.	Teachers guide student group collaboration via breakout rooms to plan the investigation using materials they have at home. Students will carry out the investigation during asynchronous time. Group work may be facilitated one step at a time, with the teacher pulling groups back together for feedback during the synchronous session. Teachers may want to use a gradual release model, including meta cognition strategies, as a way to help students better understand the teacher's thinking and reasoning.	Students can plan the investigation on their own during asynchronous time, but it is preferable for them to work in groups. It is helpful if teachers show students how to plan the investigation during synchronous instruction. Students carry out the investigation using materials they have at home with support from the guidance and strategies modeled during synchronous instruction.

Component	Synchronous Instruction	Asynchronous Instruction
EXPLORE CONTINUED		
Scientific Investigation Students practice SEP 3: Planning and Carrying Out Investigations. Typically these engage students in carrying out a prescribed investigation.	Monitor students while they complete the investigations (assuming investigations can be done with at-home materials). Facilitate whole class or small group discussions using questions provided in the curriculum designed to elevate students' critical thinking. Use a Google Doc for students to share data collaboratively. Alternatively, if the investigation does not involve materials students may have readily available at home, these can be demonstrated by the teacher, followed by peer-to-peer discussion in breakout rooms.	Assuming investigations can be done with at-home materials, students complete investigations at home using a guide, criteria, or prompts provided by the curriculum. When available, use a STEMscopes Virtual Learning video in place of an Explore to guide student investigations. Use a Google Doc for students to share data collaboratively.
Engineering Solution Students practice SEP 1: Defining Problems, SEP 6: Designing Solutions, and SEP 4: Analyzing and Interpreting Data, in order to plan, design, test, and refine an engineering solution.	Demonstrate for students the specific planning, building, or testing criteria they should use in creating engineering solutions. Monitor students as they implement these strategies and criteria in student breakout rooms.	Students can plan, build, test, and refine their own solution. However, it is best that preparation is a collaborative effort with their group during synchronous instruction. Students can come back together during synchronous time to discuss their data and how to refine their designs. Use Google Docs or other communication tools to facilitate collaborative group work during asynchronous time.
TUVA Students practice SEP 4: Analyzing and Interpreting Data and SEP 5: Using Mathematics and Computational Thinking to analyze real-world data.	Review the TUVA instructions with students during synchronous time and assign the TUVA activity during asynchronous time. Alternatively, if students need more guidance, work through the TUVA activity as a whole-class activity.	Review the TUVA instructions with students during synchronous time and assign the TUVA activity as an asynchronous activity. There may also be a STEMscopes Virtual Learning video available to guide students through a TUVA activity.
EXPLAIN		
Picture Vocabulary Reinforces vocabulary introduced in context during the Explore activities. You may use a STEMscopedia resource from a lower grade level that addresses the same DCI if students are missing background knowledge and need further scaffolding to complete activities independently (available when a school has subscriptions to multiple grade levels).	As a whole class, use the slides to formally introduce and review vocabulary terms used in context throughout Explore activities. Some activities suggested at the bottom of the Picture Vocabulary page may be appropriate for synchronous time.	Assign students to review the vocabulary slides during asynchronous time. Some of the activities suggested at the bottom of the Picture Vocabulary page may be appropriate for asynchronous time.

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EXPLAIN CONTINUED		
STEMscopedia Nonfiction text aligned to the target DCI that supports sensemaking of the hands-on explorations.	The STEMscopedia is to be read and paired with the Linking Literacy resources. As students complete an Explore activity, guide students in using relevant sections of the STEMscopedia to support their understanding. If the level of STEMscopedia text does not meet students' reading proficiency, consider reading parts of the STEMscopedia together, modeling the use of our text support features such as read aloud, magnification, text annotation, and "just in time" vocabulary support.	If students are relatively proficient in reading nonfiction text, assign students to read sections of the STEMscopedia and answer the reading review questions during asynchronous time. Use STEMscopedia resources from a lower grade level if students need further scaffolding to meaningfully complete activities independently (possible when a school has subscriptions to multiple grade levels).
Linking Literacy Graphic organizers and activities for students to complete before, during, and after reading the STEMscopedia to build literacy skills that support students' ability to comprehend increasingly difficult science content.	These resources can be displayed on screen during synchronous time to model how students can independently select literacy building tools to help them better understand complex text. Debrief these activities completed asynchronously in small groups. Guide students in thinking about how a particular literacy tool helped their understanding of the science content.	Assign the pre-reading activity at the start of the scope, just prior to reading the first assigned section of the STEMscopedia. Assign the during-reading activity throughout the scope, in tandem with reading the STEMscopedia. Assign the post-reading activity at the end of the scope as a formative assessment after students have read all parts of the STEMscopedia.
Communicate Science Students engage in communication and critical thinking related to the target DCI. Additional support is provided in the Teacher Toolbox.	Students create a verbal or written product (speech, debate, creative piece, or dialogue) related to the target DCI. Some activities are meant to be completed individually, while others are meant to be completed collaboratively in groups. For the latter, facilitate and monitor small group work via breakout rooms.	Activities can be used, or adapted for use, as independent, asynchronous learning projects. Allow students to share and provide structured feedback for projects completed asynchronously.
Concept Review Game A quiz-game review of vocabulary and key concepts.	Do these game-show-style activities as a whole class review, or allow groups of students to do it together in breakout rooms.	Assign the review game for students to do on their own for independent review. Assign some students to work on reviewing concepts independently, while you work synchronously with other students.
Content Connections Video Documentary style videos aligned to the target DCI that connect meaning to the hands-on explorations.	Show this video to students after they complete the last Explore activity. Read the discussion questions prior to starting the video and facilitate a whole class discussion. Students can also discuss the questions via breakout rooms. Consider pausing the video at key points to discuss the questions more interactively. Alternatively, have students watch assigned sections independently as you facilitate the lesson.	Assign the video for students to watch independently after completing all of the Explore activities. Consider providing students organizers in advance for capturing key ideas while watching the video. Students can answer the questions independently or in small groups during asynchronous time. Teachers can debrief the video to check for misperceptions and elevate student understanding during synchronous learning.

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EXPLAIN CONTINUED		
Science Rock Fun music videos with lyrics that reinforce the target concepts in the scope.	Play the videos for students as they enter or exit a session to liven things up. Young students can sing Science Rock together as a guided reading and community building activity. (Yes, 1st graders still love this kind of activity!)	Assign songs to students to listen to while working on their own. You may even challenge students to learn the lyrics or teach them to a younger family member.
ELABORATE		
Math Connections A math worksheet that allows students to practice grade-level math skills applied to the target DCI for the scope.	The worksheets are leveled for grades K-5 and provided in Middle and High School as one activity. Level A provides the most support to help students figure out the solutions, while level C provides the least amount of support. Consider working with Level A students synchronously to complete this activity while Level B and C students work collaboratively in breakout rooms. Ensure that students have the requisite math background knowledge before assigning students this work independently.	Consider working with Level A students synchronously while Level B and C students complete the worksheets independently. Ensure that students have the requisite math background knowledge before assigning students to work on these asynchronously.
Reading Science A science passage relevant to the target DCI for the scope. Lexile Conversion charts and additional Leveled Reading Passages are available in the Teacher Toolbox.	Reading Science is leveled for grades K-5 and provided in Middle and High School as one reading activity. These articles can be utilized as Explain resources to help students make sense of one or more Explore activities. Use the articles to reinforce reading comprehension tools or graphic organizers previously modeled through Linking Literacy. For grades K-5, Level A is below grade level, Level B is at grade level, and Level C is above grade level.Consider working with Level A students synchronously using literacy acquisition strategies to help them read and comprehend the article, while Level B and C students read it asynchronously.	For grades K-5, Level A is below grade level, Level B is at grade level, and Level C is above grade level. Allow Level B and C students to read the article asynchronously.
Science Today A current event article or video relevant to the DCI for the scope.	These articles are used to strengthen the relevance of the scientific content. Watch or read the current event together as a class and discuss and answer the questions. Students can work in small groups via breakout rooms or assign a section of the class to complete the activity independently while you work with students who need additional support.	Assign the activity to students to watch or read and answer the questions independently. Can be assigned as homework, extra credit, or enrichment.

Component	Synchronous Instruction	Asynchronous Instruction
ELABORATE CONTINUED		
Career Connections Videos about careers relevant to the target DCI.	Career Connections videos strengthen the relevance of science content and expand students' knowledge of possible careers paths in science. Watch the video together as a class. Guiding questions are provided for the teacher to facilitate a whole-class discussion.	Assign students to watch and answer the questions independently or assign a section of the class to work independently while you work with other students. Can be assigned as homework, extra credit, or enrichment.
Scientist Spotlight A reading passage about a scientist who works in a field relevant to the target DCI.	Strengthen students' real-world connections and expand their understanding of what scientists have accomplished. Could be paired with a virtual class speaker who works as a scientist in a relevant field. Read and discuss together as a class.	Can be assigned for students to read as homework, extra credit, or enrichment. Consider having students research the scientist and submit a summary of additional information they learned.
SEP Simulations (Available in some scopes) Online interactive simulation activities relevant to the target DCI and/or SEP.	Work through the SEP Simulations as a whole class or assign part of the class to complete these independently while you work with small groups. Review SEP Simulations completed asynchronously as a class.	SEP Simulations can be assigned as homework, extra credit, or enrichment.
EVALUATE		
Claim-Evidence-Reasoning An assessment requiring students to develop an explanation or argument using evidence and reasoning they developed over the course of the scope.	Model and facilitate forming and supportng a claim with students throughout the scope; allow students to make an initial attempt after introducing the scope's Investigative Phenomenon. Facilitate discussion that helps students revise their thinking during synchronous time and allow students to revise their CER during asynchronous time after each hands-on activity (the Hook and Explores). This especially works well as a debrief for the Explore activities that you assign to students as independent work.	Assign the CER as a summative assessment at the end of the scope. Consider assisting students with the initial formulation of the assignment during synchronous time before having them complete it asynchronously.
Open-Ended Response A fill in the blank and short answer summative assessment.	Complete this assessment with students as a review before assigning them a different assessment option.	Assign to students as a summative assessment at the end of the scope. Can be used as a tool for students to self-assess their progress and choose between remediation and enrichment assignments during asynchronous time.
Multiple Choice A set of multiple choice summative assessment questions.	Complete this assessment with students as a review before assigning them a different assessment option.	Assign to students as a summative assessment at the end of the scope. Can be used as a tool for students to self-assess their progress and choose between remediation and enrichment assignments during asynchronous time.

Component	Synchronous Instruction	Asynchronous Instruction
INTERVENTION		
Guided Practice An activity or discussion intended to help students who need extra support.	Work on guided practice in small groups with students in need of extra support and remediation. These may involve hands-on activities that lend themselves to students doing them with materials they have at home with your support. Use guiding questions to reinforce key concepts. Alternatively, the teacher can demonstrate the activity incorporating guiding questions into the demonstration.	This activity is not intended to be assigned to students independently. However, you could download and print the instructions as a PDF and share with parents to assist their student at home.
Independent Practice Worksheets that provide additional support around key vocabulary concepts within the scope.	Consider assigning as an independent enrichment activity to students who have demonstrated mastery of the scope's vocabulary while you complete the activity with students in need of support and remediation in small groups.	Assign to students as an independent review, enrichment activity, or to students who are struggling with key vocabulary within the scope.
Concept Attainment Quiz This quiz is intended as a formative or summative assessment for struggling students as a remediation or modification strategy and resource.	As a whole group, use the quiz as a review before assigning students one of the Evaluate assessment options. Work through the quiz one-on-one with struggling students in order to assess their knowledge verbally, since many students struggle with written tests.	Assign students to complete this as a summative assessment at the end of the scope. This can be used an intervention tool for struggling students. Assign the quiz to students to complete as a formative assessment to gauge their level of understanding after working through the Guided and Independent Practices. Can be used as a tool for students to self-assess their progress and choose between remediation and enrichment assignments during asynchronous time.
ACCELERATION		
Science Art (available grades K-8) An art project relevant to the target DCI for a scope.	Projects vary. Typically students will work on their project asynchronously. Consider allowing students to share their finished project during synchronous time.	Projects vary. Some involve materials that students have at home and can do independently with little or no modification.
Project-Based Learning (available in some scopes) A multi-step, collaborative project relevant to the target DCI for a scope.	Can be used as an alternative phenomenon and project that students work on throughout the scope or as an Elaborate activity after students have completed the Explore activities. Teachers generally facilitate the overall project synchronously. Students work on research, planning, building, etc. asynchronously, but debrief their progress during synchronous meetings. Students present their final projects synchronously.	Students work on components of their projects asynchronously (research, planning, building, etc.) and present their final projects synchronously via a live session or asynchronously via an alternative mode (e.g., a slide show, video).

Component	Synchronous Instruction	Asynchronous Instruction
ACCELERATION CONTINUED		
Extensions Additional miscellaneous activities related to the scope's scientific concepts.	Extension activities are varied and can include hands-on projects, art, research, games, or even virtual field trips. Many zoos, museums, and other organizations have developed resources to provide students exciting virtual field trips. These activities are best assigned asynchronously for students to complete at home with the support of parents and family.	Some Extension activities are hands-on projects or games that students can do at home. Consider making the instructions for these available to parents to do at home with their student.
Books on Topic A list of fiction and nonfiction literature relevant to the target DCI for a scope. A master list of fiction and nonfiction Books on Topic can be found in the Teacher Toolbox.	These books provide read aloud opportunities during asynchronous time, especially if the book supports sensemaking after completing a hands-on Explore activity.	Consider sharing the book titles with families to read with their child, or for older children to read independently. Many libraries have a wealth of audiobooks that can be checked out online and/or pickup services for the community to access library books in print format.