



UNIVERSAL GUIDE

The ASCD STEM by Choice Universal Guide aims to support STEM integration in classrooms using [Spark 101 STEM Skills Videos](#). Spark 101, a program of the [114th Partnership](#), engages students in authentic problem solving and features real “on-the-job” professional challenges in a format that allows students to apply their own creativity and skills. Students learn how real challenges are addressed in business, government, nonprofits, and academic institutions. The videos meet national and state education standards and use a format proven to be effective in schools.

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STEM by Choice Universal Guide

Directions:

1. Visit <http://www.spark101.org> to sign up and create a free account.
NOTE: If you do not sign up for an account, you will not be able to access the resources and videos on the site.
2. Watch [Spark101 - Teacher Implementation](#). While watching the video, follow along with the **STEM by Choice Universal Guide: Sample** (pages 3–4).
3. Click “Find Videos” along the top navigation bar on the Spark 101 website.
4. Search for a video that you would like to use in your classroom that best connects with your content area and standards. This will be the video you will use in conjunction with the **STEM by Choice Universal Guide: Template** (pages 5–6) for your lesson.
5. Complete the **STEM by Choice Universal Guide: Template** to develop and implement a lesson with your students. NOTE: There are additional classroom resources on the Spark 101 site, such as lesson plans and student engagement resources, that you can also use for your lesson.

How to Use This Guide

- Spark101 videos are designed to be a part of a larger learning experience of encountering a real-world problem and a solution developed by various STEM professionals. The videos are not intended to be complete lessons, but rather a part of a learning progression.
- The framework supports lesson design as a tool for engaging students.
- The videos are intended to provide a framework for student engagement in which students solve a real-world problem or challenge. As a supplement to a lesson plan, each video is intended to provide a context through which students can problem solve and work in small groups.

STEM by Choice Universal Guide: Sample

Gain Interest/Essential Question (Below are generic lesson starters to begin this lesson):

Ignite students’ excitement and curiosity. How does your lesson connect to the real world?
What problem do you want students to solve?

Connect your lesson to real-world applications with videos, essential questions, guest speakers, and so on.

Phenomena/Real-World Connection:¹

The initial hook should either spark students’ interest or create a context through which students can problem solve in small groups.

Time for Inquiry: Spark kids’ curiosity by providing them individual time to develop questions based on the real-world connection and problem that is presented. These questions will serve as the basis for student-led collaboration in teams and provide students with the big picture of what they are learning and how it connects to the real world.

Engage: Place students in teams to share the questions they developed when being introduced to the challenge.

Collaborate: Have teams discuss these questions and develop any new questions or insight based on the real-world application, problem, or challenge that is being presented.

Instructional Sequence Prework: How will you design your lesson? Teachers may want to obtain and provide students access to data (print or digital) or local scenarios by contacting local or state government agencies, such as the rural water department or district, conservation district, department of transportation, state geology department, or nonprofits that may work in the subject area of the video in order to make the content or data sets more relevant and connected to local issues for the students.

Connections to Crosscutting Concepts

- **Part 1: Instructional Sequence—Engage and Develop Interest**

(Below is an example of how one teacher chose to launch this lesson.)

- The teacher activates prior knowledge and integrates NGSS Crosscutting Concepts. (Systems and System Models/Patterns)
- In this lesson, the teacher selects two videos from YouTube to help set the stage and activate prior knowledge.
- The students watch the first video, focus on the phenomena, and develop three real-world connection questions.
- Student groups share out their top questions and then watch the second video.
- Student groups discuss possible answers for the previously selected real-world connection questions for the first video and begin developing questions related to the second video.

¹ May connect to Next Generation Science Standards (NGSS), National Science, Technology, Engineering, and Math frameworks, or both.

• **Part 2: Instructional Sequence—Apply Previous Skills to New Context**
(Below is an example of how the teacher chose to transition from the launch.)

- The teacher poses a transition question; for example, “How do you measure the speed of the wind?”
- The students offer possible answers.
- The teacher hands out data sheets that help facilitate the solution development without giving away any answers to the driving questions.
- The students work in their groups for **15–20 minutes** in order to formulate a final conclusion (Team Problem-Solving Time).
- Teams report out their solution steps on large white boards, and then the students do a gallery walk of all of the solutions in the room.

• **Part 3: Instructional Sequence—Make Real-World Connections**

• **Section 1: Spark 101 Video—Design Challenge and Problem Framing**

- » The teacher shows the first segment of the Spark 101 video (this is where the problem is described).
- » Once it is time to pause the video, the teacher provides each student group with a folder for of the six solution images referenced in the Spark 101 video.
- » The student groups collaborate to select the most appropriate solution of the six or offer another potential solution, citing evidence from the Spark 101 video to support their claims **(approx. 10 minutes)**.

• **Section 2: Spark 101 Video—Design Solution Explained**

- » This segment of the Spark 101 video shows professional designers explaining how they solved the problem.
- » The video is paused and students are given time to reflect on the professional designers’ solution and then discuss in their team how their solution compared. **(3–4 minutes of group reflection time)**.

• **Section 3: Spark 101 video—STEM Connections**

- » The last segment of the video gives insight to career pathways and STEM connections that were used in this specific design challenge.
- » For this video, the teacher chooses to use the formative assessment technique of having students create a one-page brief connected to a topic from the video. The brief must include two images labeled with figure numbers and include meaningful captions with proper citation of the images.
- » Feel free to create your own formative assessments that support your phenomena or real-world connection learning targets and connect with your students’ interests.

Teacher Reflection:

- How did you spark curiosity in students?
- What worked? What didn’t work?
- How would you modify your instruction moving forward?

Student Reflection:

- How did you connect the lesson to the real world, your community, or both?
- Did you enjoy learning?
- Are you excited about a STEM career pathway?

STEM by Choice Universal Guide: Template

Gain Interest/Essential Question: <hr/> <hr/>	
Phenomena/Real-World Connection: ¹ <hr/> <hr/>	Engage: <hr/> <hr/>
Time for Inquiry: <hr/> <hr/>	Collaborate: <hr/> <hr/>
Instructional Sequence Prework: <hr/> <hr/>	
Local Connections (optional): <hr/>	
Connections to Crosscutting Concepts <ul style="list-style-type: none">• Part 1: Instructional Sequence—Engage and Develop Interest <hr/> <hr/> <hr/> <hr/>	

¹ May connect to Next Generation Science Standards (NGSS), National Science, Technology, Engineering, and Math frameworks, or both.

- **Part 2: Instructional Sequence—Apply Previous Skills to New Context**

- **Part 3: Instructional Sequence—Make Real-World Connections**

- **Section 1: Spark 101 Video—Design Challenge and Problem Framing**

- **Section 2: Spark 101 Video—Design Solution Explained**

- **Section 3: Spark 101 Video—STEM Connections**

Teacher Reflection:

Student Reflection:
