Create Your Own walkSTEM® Guide

for Middle and High School Teachers and Out of School Educators

talkSTEM
Share. Engage. Inspire.™

walkSTEM®

Building 21st century skills of critical thinking, communication, collaboration, and creativity

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Create Your Own walk**STEM**®

Introduction:

Welcome to the Create Your Own walk**STEM**® project (CYOW)! We are excited that you have chosen this program to engage your students. This project is proposed for four to five blocks, each 30 minutes and up.

ONLINE TEACHING TIP!

These blocks can occur in person or online. Throughout this document, you will find tips and suggestions for facilitating the CYOW project virtually.

walk**STEM**® is a place-based strategy that helps children to recognize STEM concepts outside of the classroom and to recognize themselves as people who can do STEM. By making explicit connections to places that your students are comfortable in - at home, in their neighborhoods, on campus or elsewhere - this project validates their questions, understandings, and lived experiences. Your role as an educator for the Create Your Own walk**STEM**® project is important for providing constructive feedback that guides them to create good observations and questions, and providing support that allows them to build confidence. More information on Create Your own walkSTEM programming is here.

You will find a Create Your Own walk**STEM**® Framework to help you get started in Appendix D. We also encourage you to browse the information and guidance available here:

During this project, students will:

- Watch 7 walkSTEM videos where they view specific locations on school campuses, public artworks, and a campground through a STEM lens
- Create their own walkSTEM stop in their homes, campuses or neighborhoods
- Work together to create their own walkSTEM Tour with at least 3 walkSTEM stops

(optional) The opportunity to be published on YouTube by submitting the group walkSTEM tour to the talkSTEM organization (info is included in this packet)

Let's get started!
In this document, you will find a timeline that outlines the proposed objectives and assignments for each **block of instructional time**. At the start of each block, we recommend showing the students a short walkSTEM video as a warm up to re-engage their minds in the project. We also included discussion questions that have suggested answers for you to use as talking points. You will find these points **bolded** throughout the document.

If you are facilitating virtually, you may wish to ask students to watch the videos and answer the discussion questions before meeting. This approach is particularly useful if you are short on time. See Appendix B for a list of videos in this document.

Timeline
We suggest taking the first 3 to 4 blocks to create, brainstorm and rehearse the 3 walkSTEM stops. The last block should be reserved for them to present their own walkSTEM tour. Towards the end of the document, there are some additional options for further engaging your students after the project.

Final Products
The CYOW program is flexible for your schedule and your needs. There are multiple options available for this program:

- You can conduct this as a group project or individual work.
- You can focus on themes, (art, nature, architecture, etc.) or you can focus on concepts you are covering in class (fractions, estimations, arrays, etc.).
- You can focus on an object or place, e.g. an artwork, plant, or building element OR you can focus on an activity or phenomenon, e.g. walking/running, color mixing, or cooking.
- You can have the topics related to the stops be entirely up to your students (as long as they relate to math, science, etc) or you can decide to focus on one or more specific topics.
- You can ask the students to submit photographs and text, or video clips.
- The final product can be in the form of
    a. Short videos (filmed on location at each stop or created using software such as iMovie, Premiere, or any other.)
    b. Collection of photos and text (questions and responses) that can be displayed on bulletin boards, poster boards, brochures, etc
    c. Live guided tours conducted by student docents, volunteers, teachers, or others.

d. app-guided walkSTEM tours. Learn more here.
e. Some combination of the above or some other format you and your students come up with
f. Our YouTube channel has hundreds of short videos of walkSTEM stops created by us as well as by our growing walkSTEM community, including elementary and high school students, teachers, and more! The talkSTEM YouTube channel is a nonprofit channel that is commercial-free. We continually add new content as our community submits content. Subscribe to stay in the loop! You can find walkSTEM videos and tours in these 3 sections within our YouTube channel: walkSTEM Academy, STEM in the Real World, and Create Your Own walkSTEM

The remainder of this document will walk you through the timeline of 4 block periods. There will be several versions of instructions for each block period depending on your chosen parameters for the project. Before getting started, take a moment to decide what will work for your class. Use the following document to guide you. Also refer to the **Teacher Planning Sheets** located in Appendix Aof this booklet.

Overview of Create Your Own walkSTEM®

YOU CHOOSE

GROUP OR INDIVIDUAL

PHOTOS OR VIDEOS OR APP- GUIDED

CAMPUS-BASED OR IN-CLASS OR ONLINE

PLACE-BASED OR ACTIVITY-BASED OR CONCEPT-BASED

School Park Home

Dance, soccer, cooking, and more!

What is covered in class:
- estimation, measurements, fractions, Newton's Laws of Motion, velocity, etc.

✓Build connections to the real world
(artworks, natural and built environments)
✓Get creative
✓Grow STEM mindsets
✓No kits, no expensive tools, no background knowledge required

BLOCK 1 : Introduction to the walkSTEM program

Part 1 : Introduce the walkSTEM community, walkSTEM tours and stops, and STEM mindsets

Discussion:

Q: What is STEM to you? (take responses)

A: Explain that art, design and humanities are connected in STEM as well. And necessary to solve problems.

B: Explain that there is a growing community that wants to see the world through the lens of STEM, meaning to see everyday environments using STEM mindsets. And that they are joining this (talkSTEM) community! The talkSTEM community has a YouTube channel where many students and others share their STEM mindsets by guiding viewers on a walk through their favorite spaces or ideas. Let's watch a few quick examples now.

Watch the video: How Tall Are the Gateway Arches? (2:50)

Ask & Discuss:

1. What did you think about how they measured the height of the arch?
2. How is this video different from other math or science videos you have seen (ex: Khan Academy, classroom videos)?
3. How do you think they came up with the script?
(The **goal** is to get students to appreciate that a walkSTEM stop (whether you film or not) is NOT like a straight lecture and that **observations and questions based on their observations are the raw materials** for designing a walkSTEM tour)

Try it out quickly: As a whole group, ask them to look around and find an everyday object to observe. **If virtual, choose an object in your workspace that you can show the students, or find a digital image to share on your meeting platform.**

ONLINE TEACHING TIP!

- Stay in the room/space for this - we want to keep attention spans intact!
- Examples of everyday objects: Cubbies, cabinets, ceiling tiles, floor tiles, windows. Projectors, bulletin board patterns, etc.
- We highly suggest avoiding objects that aren't permanent, or are small (ex: pencils, books)
- Facilitate whole group discussion: **2 minutes** to gather as many observations as they can about the object.

ONLINE TEACHING TIP!

- **Take 2-4 minutes** to **brainstorm** questions. (Explain what is meant by brainstorm: no judgements, no need to focus on whether the question is STEM-related or not at this point)
  If virtual, this is an opportunity to utilize the whiteboard or annotation feature of your meeting platform, if available. Students can type, write, or draw on the screen together, and even elaborate on each others' ideas. Be sure to take a screenshot or save the whiteboard for future reference.

Watch the video: How High Does it Climb? (2:30)

This video is an example of an observation based on artwork.

Ask & Discuss:
1. What do you think about the sculpture, *Venture*?
2. Do you think there is another way to measure how high the sculpture is?
(The **goal** is for the students to understand that a **quantitative answer is not always needed**, and to acknowledge **the limitations and restrictions** that apply when answering a question)

Try it out quickly: Follow the same steps as above but instead ask them to make observations of an artwork or a plant. We find that observations made of artwork are similar to those made for natural objects, like trees, potted plants, flowers, etc.

Discussion: What is a STEM walk and why should we go on them? By going on STEM walks, we are growing our **STEM mindsets**.
Question: What do you think is a STEM mindset? Who has one? What is the value of such a mindset? What are some important qualities?
(The **desirable response** is that **we all have STEM mindsets and that we can grow them through practice.** When we ask questions, wonder, estimate, figure out, try something new, fail and try it again….**we all do it our own way**.)

Introduce the Create Your own walkSTEM project: We will design a STEM walk right here in this building this week and will be using and growing our STEM mindsets as we do this. At the end of the project we will have a few special invited guests that you will take on your guided STEM tour of our campus (floor, hallway, playground, or whatever space you have selected). As walkSTEM community members, we will be looking at our environment through our unique STEM lens.

We can make STEM connections in all areas of our environment - everyday, natural and built environments and artworks . The videos we watched are examples of 'walkSTEM stops' that were part of a walkSTEM tour - one at Camp Whispering Cedars (the Girls Scouts of NE Texas campgrounds) and at Dallas Love Field Airport. There are over a hundred other short videos on the YouTube channel.

Question: **So what is a walkSTEM stop?**
It is a location or object **where we ask a question and then answer it**. The question must be based on **observation** (and not just something you can look up). You need to be able to figure out the answer.

Question: **How is this different from most other videos you have seen?**
Our stops will be based on varied science, engineering, and/or math ideas. Our goal is to create a short 2 min. video at each stop (or you can use photos + captions, live presentations, bulletin board displays, etc.).

You will notice that we tend to focus on math in many stops. We think about **Mathematics** very, very broadly when we create a walkSTEM tour. Math includes thinking about measurements, shapes, patterns, and more. It is really the science of patterns and is a great language for asking questions and for describing what we see. When we use math in this way, we also can talk about science, art, architecture, engineering, etc. Given our constraint of posing questions in the real world that we need to figure out quite quickly, math ends up being really useful and helps us uncover ideas that are important in science, engineering, and even art. We will work together to make **3-4 walkSTEM stops** here and together they will make up our 'walkSTEM@_____ tour'. **(instructor decides on number; minimum is 3 total)**

PART 2 : Learn How to Ask the Question
Watch this video : 'What is the Slope?' by students at The Hockaday School-Dallas ISD (1:38)

Discussion:

Q: What do you think the purpose of their walkSTEM stop is?
A: The purpose is to notice the STEM around you - STEM is everywhere! It's a fun way to see the world through a STEM lens.

Q: Was the video effective in sharing STEM they saw at their school?

A: Take responses from students.

Q: Do you think you have to be an expert in a STEM subject to make a walkSTEM tour?
A: No! Anyone at any age can observe and reflect on the things around them.
Every space can become a STEM space.

Q: Did you think of any questions they did not?
A: Take responses from students. Emphasize that there are always many
possibilities of a question to focus on at each stop.

Q: What other responses do you have to their question? Is there another way
to solve it?
A: Take responses from students.

Q: Do you think we could create a walkSTEM tour in our space?
A: For the next 3 to 4 blocks our class is making our own walkSTEM tour of our space! We will also take **virtual field trips** to different places, and on the last day you will all be docents or guides who will take guests on a live walkSTEM tour of our space that we design together. *(Or - we will create app-guided walkSTEM tour that everyone at this campus will be able to go on and we'll make signs about it in the school lobby, etc. Or - we will make a video-based tour and submit to talkSTEM so they can share on their YouTube channel and we can share with other students at our school too.)*

Note: Teacher will decide how this project will be executed (many options, decide what works best for your setting). We have included a couple of options (italicized) above.

BLOCK 2: Notice and Question

For the Instructor: BEFORE BLOCK 2
When preparing for brainstorming of the walkSTEM stops, we highly recommend reviewing the walkSTEM Design Frameworks and flow chart in the appendix. Also, look through some of our sample categories of walkSTEM stops:

Really Big Number: Using numbers and other strategies to figure out a really big number of something, such as the number of bricks, tiles or windows in a building. Or how many tiles are on the wall/floor.

Color: Artists create different color variations and patterns using different math-related techniques. E.g. How many different color variations or patterns are there?

Trees: Take a look at a collection of trees to measure the girth, look at angles of branches or study leaf size and patterns.

Estimating: Consider height, volume, area and units involving everyday items like bathtubs, minivans, or building story height. (e.g. What is the volume of water in a lake or pond, and how many bathtubs is that equivalent to? How tall is this skyscraper?).

Relationships: Consider questions about whether two (2) characteristics go together or correlate (e.g. does the number of segments in a bamboo increase with circumference of the stalk?).

Speed or slope: What's the slope of a ramp and why do you think it was designed this way? Consider how the slope of a ramp or slide affects speed of movement, or look for the steepest slide you can find.

Environmental science/sustainability: Consider how public places are designed for a particular use. Look closely at the design and consider environmental impact. What are the most common pollutants by the river and which ones are most likely to have an impact on life in the ocean, based on density, etc?

Urban design/architecture: How are spaces designed for their function? How was intuitive wayfinding used to get you to where you needed to go?

Miscellaneous: Perhaps consider how an artist made you feel about a subject in a painting (if the answer involves mathematical concepts like scale or density). Or, "Why does the size of the tree appear to change depending on my position and distance from the tree?"

INSTRUCTIONAL TIME: Assigning, Brainstorming Questions, etc.
Warm Up
Watch 2 more videos from the Hockaday walkSTEM tour: 'How Many Sections Are There' (2:49) & 'How Long is the Spiral?' (1:07)

Discuss:
Q: Do you have a sculpture or statue at your school? Or is there one that you have seen in your neighborhood, a park, or a place you visit? What questions would you ask about it?

Continuing from Block 1:
Part 3: What makes a walkSTEM tour great?
Discussion:
Q: Have you ever gone on a guided tour? What makes for a really great interactive experience? (take responses) Then: What makes a good or great walkSTEM tour?
A:

1. They are **ENGAGING**

- Your tour participants (guests, parents, siblings, public) need to find the tour interesting!
  Question: What would make a tour interesting for you?
- walkSTEM tours should invite anyone to observe, measure, calculate, discover and relate to an experience.
  - Ex: make it relatable! - look at objects on playgrounds, schools, malls, etc.
- The questions you ask will make or break your walkSTEM tour, spend quality time making your questions - they are the most important part!!

2. The docents **COMMUNICATE** well

- walkSTEM tour leaders speak clearly, loudly and are excited about what they are doing.

- To engage your tour further, you should be familiar with the content (know your stuff!), be well practiced and have a good time!

3. They are well curated and **DIVERSE**
- Your walkSTEM stops should be unique and different from each other. Avoid doing the same thing at each stop.
- They can be from similar locations/close to each other, but you should avoid asking the same question over again.

Q: Anything else you think we should think about?

Part 4: Create the walkSTEM stop groups
Preselect 3-4 stops / locations (you can decide the total number of stops based upon class size and number of students you think would work well within each group) that your students can conveniently visit each day OR Work with your students to brainstorm stops they would like to include.

- Break your class into groups (2-4 students per group).
  If virtual, you can use the breakout room function of your meeting platform, if available. Be sure to pop into each room periodically to make sure students are engaged and on task.

- Assign each group 1 walkSTEM stop.

- Once you assign the groups, pass out the **Student Design Worksheet**, found in Appendix C. Every student should get their own copy.

- **Designate** roles in the groups (feel free to modify roles).
  Explain to the students that the most important role, in addition to whichever role they have from the below list, that each person has is to be **active and engaged group members** (listening to each other, ask questions, add your thoughts and contribute).
  - **Recorder/ Writer**- notes all observations made by group and fills out the worksheet
  - **Facilitator** - makes sure everyone is working together and all voices/ideas are heard and respected.
  - **Time keeper**- makes sure the group is on task and reports how much time is left to work.
  - **Photographer** - will take photographs/ videos of their walkSTEM stop for submitting after the presentation (***instructor to decide if you want to use only photos or a combination of photos and videos***)

Designing Your Stop:

Start working on the ***first 2 sections*** of the worksheet.
Remind them:

- These are the **most important** parts, and they need to spend quality time on them
- Emphasize: The observations do not have to be clearly STEM related because you do not want to miss out on an idea that could be really unique and interesting.
- Emphasize: For the questions they brainstorm, you do NOT have to know the answer right away

- When they finish each section, they should get your approval/feedback before moving on to the next section. Once you've approved a group, that group can move on to the **3rd question** (which question they want to select). It's important that each group has spent enough time and energy generating observations and questions since these represent the **raw materials** of their walkSTEM stop content.
  - While they are working on the worksheet, we recommend floating around the room to guide them as needed.
  - You may help to make sure they are picking an effective question.

If students are struggling to think of effective questions, you may find easier to explain **what walkSTEM questions are NOT**:

- Your walkSTEM stop questions should not be answered by a textbook. We are trying to pull away from the textbook and engage the students in observation.
- Avoid questions that are answered by a definition. We are not looking for videos that describe gravity, succession, etc. These are all topics that can be found in a textbook.
- We suggest focusing on the math in the observation, because we find that this is the easiest way for students to ask observation based questions.
- Everyone should have Parts 1, 2 & 3 of the worksheet completed. Have them move on to Part 4 and describe how they visualize their walkSTEM stop looking like. In other words, they need to respond to their question. Do they need any tools (e.g. measuring tape, ruler) or props (e.g. a printout of an image or a drawing) that would help make the stop more engaging? What would they like their tour participants to do (e.g. listen, look, describe, talk, figure out…)? **If meeting and/or sharing walkSTEM stops virtually, digital tools such as EdPuzzle, Kahoot, FlipGrid, and ThingLink can provide interesting options for**

ONLINE TEACHING TIP!

students to use in developing their stops. You can find more information on these technologies in Appendix E.

- **Collect** the worksheets at the end of the day.

BLOCK 3: Creating the walkSTEM stops

Before students arrive, display these warm up questions on a board to prompt student planning:

1. What did we do last time?
2. What do we need to get done today?
3. What questions do we have that we need to check in with the teacher about?

Warm Up

Watch 'What Can You Measure in Bamboo?' at the Dallas Arts District (1:12)

Discuss:

Q: Look around you, what patterns do you see?

Q: What do you think of this statement: 'math is the science of patterns?'

Review & Plan: Hand out the worksheets to the groups and have them get together in their groups. Have them discuss questions within their respective groups.

Note: this is teaching them about planning, collaboration, time management. These are critical higher order thinking skills that they practice as part of this project.

- Have them finish designing their stop. They should all be at part 4 of the worksheet.
- Tell them to work on their "scripts". They should have a plan for what to say, what they will do at the stop, etc.
- When each group is finished, give them the self-evaluation sheet so they can provide feedback to themselves. **Note:** this is another important higher order thinking skill they can practice as part of this project.
- For the **rest of the time**, they should practice, decide if they need to bring/make props such as images or objects, and get feedback from each other and from you. The photographer of the group should be taking pictures or videos to share with you by your deadline.
- Highlight the criteria discussed earlier during Block 2
- At the end of class, **pick up all worksheets (2 per student - Design of stops and Self-evaluation)**

Note: this step can be stretched over 2 block periods.

BLOCK 4: Rehearse and Present Your walkSTEM Tour!

Before students arrive, display these warm up questions on a board to prompt student planning:
1. What do we need to get done today?
2. What questions do we have that we need to check in with the teacher about?

Warm Up: Watch 'How Do Trees Function' (3:33)
Quick Discussion:

Q: Do you think this video could apply to any tree?
A: Yes, this method applies to ANY tree.

Q: What do you think of this walkSTEM stop now that you have designed your own?

Q: Do you think it was a good question? What other questions could you think of?

- **Hand out** their worksheets and ask them to prepare and rehearse.
- Students should take turns presenting their walkSTEM stops to their tour participants (any guests, parents, families, etc.).

Student Self-Evaluation

The following worksheet on the next page is a helpful resource that should be provided to each group member so that they can keep in mind the spirit of their work in this project. You can use this worksheet repeatedly over the course of the project as a reminder of what they are doing, and how things are looking with their project planning.

walkSTEM® Self Evaluation for Students

What makes for a *great* walkSTEM® tour?

1. **The question and other content at each stop is ENGAGING.**
   - Is your question interesting?
   - On a scale from 1 to 5 (5 is "This is amazing, I want to learn more", and 1 is "What is this? Change the channel"), how engaging is your question? How could you make it better?

   Circle your score: 1 2 3 4 5

2. **Group members COMMUNICATE well.**
   - Does your question make sense? Would others understand your question and presentation?
   - On a scale from 1 to 5 (5 is "I understand every word", and 1 is "I have no idea what they are saying"), how easy is it to understand your question?

   Circle your score: 1 2 3 4 5

3. **Use of TOOLS and PROPS**
   - Are you using tools, props, images, or other materials to make your walkSTEM stop fun and interactive? Tools and props are not required, but they can help you make connections to big ideas related to your question!
   - On a scale from 1 to 5, (5 is "I have considered how tools and props can support my question"), and 1 is "I have not thought about using tools and props"), how thoroughly have you considered using tools, props, images or other materials in your walkSTEM stop?

Circle your score: 1 2 3 4 5

You did it! You created your own walkSTEM stop. Now what?

There are two additional options for you and your class to participate in.

1. **Submit your CYOwalkSTEM Tour**

You can choose to submit your CYOwalkSTEM to talkSTEM to be published on our YouTube channel! ***We hope you will do this.*** This gives students a sense of pride knowing that their project could be used as an example for future students, globally. You can utilize the photographs taken by your students to create a simple video file/ slide show. Here are our Submission Guidelines that can be found here.

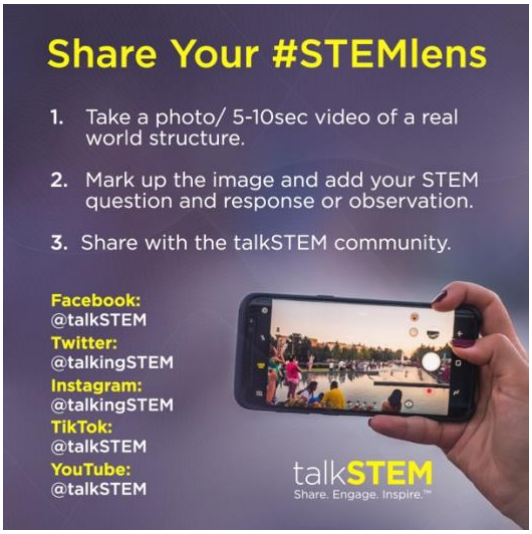
We hope you enjoyed your experience and that you will share your walkSTEM tour with us. We are growing our community of walkSTEM explorers globally. We'd have great use for your playlist consisting of short 1-2 minute videos, animations, and/or photos. We will select all playlists that meet our criteria to share on our YouTube channel for everyone to enjoy and learnPlease use software that will help the video feel dynamic and personalized (such as Adobe Spark). We want your walkSTEM tour to be YOURS. Feel free to email us with questions of any type: koshi@talkSTEM.org
Click here to submit.

You can submit anytime after the presentation, although we highly suggest submitting it soon after so that you may share the published YouTube video with the students and their parents. We included in the sample parent letter an option to include a link to their CYOwalkSTEM video.

Why should I submit our CYOwalkSTEM tour?

- You will be sharing with other groups like yours, helping them create their own walkSTEM projects. You and your students will serve as role models for other interested groups.
- This could motivate your students further if they know that their projects will be published, just like the MASA students, for everyone to see. They could inspire future students to create walkSTEM tours, too.
- The practice of creating a video, in itself, is practicing technology skills. They can sharpen their presentation and technology skills through this submission process.
- For Advanced Placement students, the walkSTEM project is a WE Service Learning project.

2. #STEMLens



You can continue to foster your students' STEM mindsets through an abbreviated version of walkSTEM tours, called #STEMLens. If you liked engaging your students with the CYO walkSTEM project, but are not able to commit to the time on a continual basis or if you simply love the idea of building connections to students' lived experiences and environments, do this. Join us to build a visual library of "STEM in the Real World" images. A #STEMlens image is simply a photo of a real world structure or place together with an original question based upon what you see or sense. #STEMLens invites everyone to share the STEM observations they see in their own daily environments. More information is here.

Assessment Rubric

Assessment is not evaluation, rather it is a means by which teachers can sit with their students and see where they are in their thinking. In fact, the word comes from the Latin "assidere" meaning to sit beside. Assess your students in a fun yet valuable way using the quick and easy personalized STEM image - #STEMlens. We've even developed a rubric you can use! Have students find real-world examples of fractions, ratios, forces, geometry, and more in their own homes, campuses, and neighborhoods. This can be a quick homework assignment, a unit assessment, group assessments or anything else you come up with!

CATEGORY	5 Excellent	4 Good	3 Satisfactory	2 Needs Improvement	1 Below acceptable standards
Image + Markup	Image is clear and eye-catching. It is easy to see what aspect of the photo is the subject of the #STEMlens. The markup helps the viewer understand the photographer's perspective.	The image is clear and eye-catching. It is easy to see what aspect of the photo is the subject of the #STEMlens. The markup is unclear or unspecific.	The image is clear and has some markup but the markup is messy and doesn't add any value to the photo.	Photo is clear but has no markup.	Photo is blurry or non-specific and has no markup.
Observation or Question	The observation or question is specific and refers to something that can be seen in the photo itself. It does not involve any processes or concepts that are invisible or not present in the photo.	The observation or question relates to the photo but is not specific (it is a more general observation or question). It still involves a concept that can be readily seen.	The observation or question relates to the photo but is non-specific. It may involve concepts that are invisible or not present in the photo.	The observation or question does not relate to the photo at all and the observation or question is unclear.	The observation or question is missing or clearly lacking in thought or planning.

We hope that you enjoyed creating a walkSTEM tour with your students and that you will consider to continue fostering their STEM mindsets by submitting their walkSTEM tour or sharing #STEMLens observations. If you have any questions, comments, or ideas, please email koshi@talkSTEM.org.

Appendix A - Teacher Planning Sheets

As you plan, you will want to first think of what the final product would be. The planning sheets below were designed to help you in this regard. Place a check mark by the final product you would like to use:

What will the final product be?

	Option 1: Short videos (filmed on location at each stop or created using software such as Adobe Premiere or iMovie which would require photos but would not require on-location filming)
	Option 2: App-guided walkSTEM tour (more information here)
	Option 3: Collection of photos and text (questions and responses) that can be displayed on bulletin boards, poster boards, brochures, class scrapbook, etc
	Option 4: Live guided tours conducted by student docents
	Option 5: A collection of #STEMlens marked-up images and captions.
	Option 6: A blending of some of the options listed, or something different.
Notes:	

Now that you have a final product in mind, **circle your choices on the chart on the next page** to help you think through the parameters of your project. You can select combinations for each of the three rows. So you can, for example, assign a Geometry-based walkSTEM tour for student teams

(perhaps focusing on the last 2 units you have studied) with a minimum of four stops each but you can let them know that one of the four stops can be of their choosing, as long as it relates to Math. As the instructor, think about your learning goals and determine the parameters for this project accordingly.

What is the nature, content, focus, and format of the CYOW project in my class?
Circle one option each from each of the three rows in the chart.

Students	Individual Work	In Pairs	In Teams	
Content of walkSTEM tour	Theme-based *(computational thinking, data science, geometry, visual arts)*	Concept/skill based *(e.g estimation, measurement, ratios)*	Student Choice	
	Place-based *(each stop in the tour is a specific location on campus, at home, etc.)*	Object-based *(e.g artwork, tree, large piece of furniture, etc.)*	Activity-based *(e.g sports, cooking, etc.)*	
	Any academic topics/ students' choice *(e.g math, life science, physics, arts)*	Specific Topic(s) preselected by teacher *(e.g geometry, Newton's Laws of Motion)*	Combination	
Format	Photos with student-generated questions and responses	App-guided tour	Video clips containing student-generated questions and responses	Other
Notes				

For assistance, please email koshi@talkSTEM.org.

Appendix B - Videos

Below you will find a list of videos referenced throughout this document as well as their associated TEKS.

How Tall are the Gateway Arches?	Math TEKS - 6.1, 7.1, 7.9B, 8.1	
	Math TEKS - 6.1, 7.1, 7.3A, 7.3B, 7.5, 8.1	How High Does it Climb?
What is the Slope?	Math TEKS - 6.1, 7.1, 8.1, 8.4A, 8.4C	

	Math TEKS - 6.1, 7.1, 8.1, 8.4A, 8.4C	How Long is the Spiral?
How Many Sections are There?	Math TEKS - 6.1, 7.1, 8.1	
	Math TEKS - 6.1, 7.1, 7.4D, 7.7; 8.1 Science TEKS: K.10.C, 1.10.B, 2.10.B, 5.10.B	What Can You Measure in Bamboo?
How do trees function?	Math TEKS - 6.1, 7.1, 7.8, 8.1	
	Science TEKS: 2.5A, 3.5A, 4.5A, 7.6A	What Effect does Temperature have on Brewed Starbucks Coffee?

Appendix C - Student Worksheets

You can freely download sample student design worksheets or adapt them for classroom use:
https://talkstem.org/create-your-own-walkstem-schools/

Create Your Own walkSTEM®

Design Worksheet : **Design a walkSTEM® Stop**

Use for each walkSTEM stop that makes up your walkSTEM® experience. If you are planning a theme-based walkSTEM tour, under #2 below, make sure to address how each stop will help participants gain valuable experience that relates to your selected theme.

Object and Location:

1. **Notice** — What do you observe?

2. **Questions** — What do you wonder based on what you observed?

3. **Curate** — If this were a stop on a walkSTEM tour, which question from #2 above would you focus on? Rephrase, if needed.

4. **Design** — What will your tour participants do while at this stop? Would you like to include some simple "props" to help make connections or provide examples (such as photos or models)? In other words, how will they answer your question in #3.

Create Your Own walkSTEM®

Design Worksheet : **Design a walkSTEM® Tour**

Use for Curating and Designing the whole walkSTEM® experience (3 or more stops)

1. **Curate** — Make sure the activities required to address your questions at all your walkSTEM stops are varied. For example, if most of the stops focus on the same concept or involve very similar strategies like solving a multi-step math problem, you may want to modify.

2. **Design** — Take a final look at the entire experience. This is your time to look at the whole experience and make sure it flows the way you want it to flow. Decide on how you will make your tour available and produce. Options include live, guided experience, series of short (approx 2 min) videos that can be viewed off site as well as on-site using QR codes, photos and text (we suggest using simple software such as Adobe spark so it runs easily), combination of photos and videos (as well as other media including animations).

Appendix D - Create Your Own walkSTEM Framework

You can freely download the design frameworks for a single walkSTEM stop and for a walkSTEM tour as a whole here:
https://talkstem.org/create-your-own-walkstem-schools/

Create Your Own walkSTEM®

walkSTEM® Design Frameworks

The two frameworks below are guides you can use once your team has selected 3 or more objects or locations as walkSTEM® stops that will make up your walkSTEM® tour. These stops should be permanent and can be located in any space in the natural or built environments. Framework A refers to the steps you will go through in the design of a single walkSTEM® stop and framework B refers to the steps you will go through in designing the walkSTEM® tour as a whole.

A. Design a walkSTEM® Stop

Notice

Observing and discovering

- Regardless of whether the space / object at this stop is familiar or unfamiliar, get comfortable and spend some time observing.
- Try to record your observations
- Try not to make assumptions about what you see

Question

Inquiring

- Draw questions from your observations. What do you wonder based on what you have observed?
- Make sure your questions are based on the specific site or object you are at as opposed to a generalized version
- Don't force STEM connections
- No judgments
- Be open to varied questions
- **Note:** if you are interested in a theme-based walkSTEM® tour, that is definitely an option, too. For example, our friends at UT Dallas designed a walkSTEM® tour of their campus around the theme of Computational Thinking (No Coding Required). Visit our YouTube channel, walkSTEM Academy to view.

Curate

Evaluating

- Identify the questions that:
  - connect in some way to STE(A)M in an interesting manner (having something be a little unexpected or having some dramatic flair is always a plus)
  - would allow the most people to engage without needing a lot of prior knowledge
  - are based on your observations
- Select one question that resonates for each stop
  - **Note:** if there are two questions that you feel you must select, you can do so and decide later if you will make them alternates in live, guided tours and separate videos for virtual walks.

B. Design a walkSTEM® Tour

Curate

Collecting and comparing

- After selecting the most powerful questions for each stop, look through all the questions your team has selected. Consider:
  - What will the tour participants (or viewing audience if you plan on also making some videos) need to DO to answer these questions?
  - Are the questions different from each other in terms of STE(A)M concepts and ideas being used?
  - **Note:** if you are planning a theme-based walkSTEM tour, you will want to make sure that the activities are not too similar.
  - Would a simple prop or tool help make the activity at each stop more engaging?
- Make sure there is diversity in question and nature of activity across the stops so your walk experience is interesting to your participants.

Design

Collaborating and Producing

- Identify the format for your walkSTEM® experience, such as live-guided, app-guided, video-based, photographed, or other.
- Identify the skillsets in your team and form your plan.
- Write up some scripts or text boxes as needed. If you plan to submit your walkSTEM tour to talkSTEM (and we hope you will), you can submit videos, video-like slideshows, and other creative representations or your walkSTEM® tour.
- Lead with the specifics — the goal is to share a personalized and unique, guided tour of your tour site!

Appendix E - Useful Technologies

Below you will find an index of useful technologies, particularly for virtual CYOW walkSTEM programs.

- Google Slides / Bitmoji classrooms
  - Easily create interactive slides
  - Examples of "doorways" and "picture frames" leading you to walkSTEM experiences: Where will you go with math?
- Google Tours
  - Plot out walkSTEM stops using Google Maps. Integrate videos, questions, and other supplemental information relating to stops.
  - Example: Virtual walkSTEM - Dallas Arts District
- EdPuzzle
  - Imbed questions into videos and track responses
  - Read this blog post written by middle school teacher and talkSTEM Teacher Fellow.
  - Example: What is the Area and Circumference?
- Flipgrid
  - Connect with students and walkSTEM participants through video questions and activity prompts.
  - Examples:
    - STEM's All Around Us
    - Basketball Spectators
    - Are All Slopes the Same?
- ThingLink
  - Make photos interactive by embedding photos, videos, text, and audio.
  - Examples:
    - Math All Around You
    - Where's the Data?
    - Math in Nature
    - Physical Science
- talkSTEM Youtube Channel
  - Examples of walkSTEM projects from other schools and ideas for engaging walkSTEM stop questions.
  - Useful playlists:
    - walkSTEM Academy: Go on a virtual walkSTEM Tour
    - STEM in the Real World: walkSTEM Stops Organized by Theme
    - Create Your Own walkSTEM: Go on a virtual walkSTEM tour created by our growing community
    - Additional Educator Resources

Appendix F – Publications & Press

- Chávez, S. (2016, November 1) Want To Teach Kids About Math And Science? Take A Stroll Through The Dallas Arts District. *KERA*. https://www.keranews.org/education/2016-11-01/want-to-teach-kids-about-math-and-science-take-a-stroll-through-the-dallas-arts-district

- Dhingra, K. (2019, December 4). Using the Outdoors to Teach STEM. *Edutopia*. https://www.edutopia.org/article/using-outdoors-teach-stem

- Southern Methodist University Research (2017). Math is All around Us. https://www.youtube.com/watch?v=CO5g6S9s3DY&feature=youtu.be

- Wang, M., Walkington, C., & Dhingra, K. (2021). Facilitating Student-Created Math Walks, *Mathematics Teacher: Learning and Teaching PK-12*, *114*(9), 670-676.

Other articles and press here.

Thank you for your interest!

talkSTEM's mission is to grow STEM mindsets in all children and we are here to help all educators interested in broadening participation in STEM — that's teachers in prek-12 classrooms who teach science, math, engineering, STEM, and STEAM as well as out of school educators.

We hope you will join the talkSTEM community.

Visit talkSTEM.org/contact if you'd like to sign up to join our community and receive notifications about new content.

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