

## Rice Final Reflection Paper

### Project Overview

The title of my project was *Reaching All Learners - Exploring the 5E Lesson Model: Engage and Explore*. My professional development centered around an introduction of the 5E Model of lesson planning. I focused on the first initial phases: Engage and Explore. All professional development attendees were from my school, Berkeley Preparatory School.

### Audience

I was given the opportunity to give my professional development to a group of new faculty members at my school. These faculty members ranged from classroom teachers to specialists throughout our elementary school (K-5). I wanted my topic to embody the exploratory nature of STEM while also remaining applicable to a wide range of educators, backgrounds, and classroom settings. Here is a breakdown of my audience:

- a. New Faculty Cohort (9)
  - i. P.E. teacher (grades Pre-K and Kindergarten)
  - ii. Three instructional aides (grades 2-4)
  - iii. Two Pre-K teachers
  - iv. Two Kindergarten teachers
  - v. Music Teacher (grades 1-5)
- b. Administration (3)
  - i. Lower Division Director
  - ii. Lower Division Assistant Director
  - iii. Lower Division Learning Specialist

Here is contact information for four of the attendees:

- a. Lower Division Director: [davismel@berkeleyprep.org](mailto:davismel@berkeleyprep.org)
- b. Lower Division Learning Specialist: [schmijac@berkeleyprep.org](mailto:schmijac@berkeleyprep.org)
- c. Kindergarten teacher: [haynesvic@berkeleyprep.org](mailto:haynesvic@berkeleyprep.org)
- d. Instructional aide: [leavykat@berkeleyprep.org](mailto:leavykat@berkeleyprep.org)

### Standards Addressed

See Appendix A for a list of the NGSS Standards addressed in my professional development training.

### Project Summary

The goal of my professional development was to introduce a new lesson structure to my audience of new faculty. I chose to highlight the 5E Model that I used in many of my Endeavor courses. The 5E Model is a framework that organizes teachers' lessons in phases of engagement, exploration, explanation, elaboration, and evaluation. For this particular session, I concentrated on the first two phases: Engage and Explore. These are the initial phases and are crucial as they

set the stage for inquiry-based learning. These two steps help students develop a deeper understanding of the subject matter at hand. While the 5E Model was originally designed for science teachers, it was important to emphasize that it can be used cross-curricularly and across ages and subject areas because the 5E model helps align teaching with how people learn. This includes the fact that students must be interested in what they are learning and find it useful and meaningful, students must be actively involved in the process of teaching and learning, and students need opportunities to apply what they have learned to new situations, check the completeness of their understanding, and to evaluate their own learning. The purpose of my professional development was to get teachers familiar with the framework, model the first two phases, and provide resources that they can use in their classrooms to implement the 5E model.

### **Pre-workshop Survey Questions & Responses**

The pre-workshop survey results indicated that all of the attendees were either unfamiliar or very unfamiliar with the 5E lesson model. Additionally, there was some variability across the attendees in regards to the frequency and comfortability in incorporating hands-on exploration, inquiry-based learning activities, and student-led sessions. See Appendix B, Figure B.1 for the complete survey data including all questions and responses.

### **Professional Development Training**

My professional development training consisted of an overview of the 5E lesson model, the importance of the Engage and Explore phases, strategies to implement the Engage and Explore phases, and example activities. The first part of the training set the foundation for the 5E model, and included definitions of the model, as well as a discussion on how the model aligns with how people learn. The next two parts were deep dives into the two phases, Engage and Explore. The Engage phase included a discussion on the importance of the Engage phase as well as strategies for implementation. These strategies consisted of the following: 1) Introduce a problem that students might not be able to solve yet, 2) Show and inquire about a series of images or play a video, 3) Ask thought-provoking questions to start a class discussion, 4) Share a current event or tell a story, and 5) Conduct a brief demonstration or experiment. I then shared and led activities that demonstrated examples of each of these strategies. The next part of the training followed a similar format, which included the importance of the Explore phase followed by strategies and activities to implement in the classroom. These strategies consisted of: 1) Hands-on activities, 2) Small group discussions, 3) Problem-solving tasks, 4) Exploration stations, 5) Videos, and 6) Guided inquiry. In the last part of the training, I gave the audience an opportunity to practice planning activities that incorporate strategies of Engage and Explore across multiple subjects such as math, physical education, music, and reading.

## Activities

### Engage:

When teaching about the engage phase, it was important for me to model how truly immersive the engage phase can make learning for students. The purpose for the engage stage is to pique student interest and get them personally involved in the lesson, while pre-assessing prior understanding. Many consider this a hook or a teaser. I used this section of my professional development to do just that. My goal as the facilitator was to pique interest and get the audience involved with my “lesson”. The activities that I modeled during the professional development session were: introduce a problem that students might not be able to solve yet, show and inquire about a series of images or play a video, ask thought-provoking questions to start a class discussion, share a current event or tell a story, conduct a brief demonstration or experiment. During the first activity (introducing a problem that students might not be able to solve yet) I started with a Three-Act Math task which is designed to be an engaging way to begin a math unit (See Appendix C, Image C.1). The specific activity that I used was about Girl Scout Cookies and asks the overarching question: How many boxes of Girl Scout Cookies will fit into the trunk of a Nissan Rogue (Meyer, 2016). A small video is played showing a box of Girl Scout cookies and the truck. Participants were asked to make their best educated guesses. A small group discussion at each table followed a short thinking time. This activity served as a way to launch a lesson on volume while also incorporating a real-world connection that most students know (and love!) - Girl Scout Cookies. I also introduced a NASA Graphing Mystery Picture for this activity (National Aeronautics and Space Administration, 2023). I modeled this as I would use this with a group of students. My participants were given a blank graph and a list of the coordinates provided for the mystery picture (See Appendix C, Images C.6-7). They were asked what these numbers might mean and how we could use them to find the mystery picture. Most participants know how to graph coordinates, however, we looked at this through the lens of a student who had not been introduced to graphing before.

The next activity demonstrated how to use a series of images or videos to engage students at the beginning of a lesson. I utilized a resource called Which One Doesn't Belong? (Bourassa, n.d.). This resource gives 4 photos and students need to identify which one doesn't belong within the group and provide justification for that choice (See Appendix C, Image C.2). The interesting thing about this resource is that each photo within the group has a reason that it does not belong. This website has a range of categories like shapes, numbers, incomplete sets, and more. I showed 3 different groups of images and simulated how I could use them in a lesson setting. For example, we began by looking at a series of coin images. Each table talked about which image didn't belong. Almost every group had multiple answers and eventually recognized that there were multiple “correct” answers. If a teacher was using this coin image to introduce a lesson on money, they would be able to see a few things such as number sense, prior knowledge of money/cents, pattern recognition, or even visual cues. Some participants noticed the actual number value of each set of coins, some participants noticed the color of the coins, some

participants noticed the coins sitting on heads or tails. This variety of answers is exactly what they would see in their classroom. I also used the Google Earth Engine to show a series of time lapse videos (Google Earth Engine, n.d.). We looked at images of glaciers decreasing in Alaska and urban growth/construction around the world (See Appendix C, Image C.3 for screenshot of timelapse). Audience members were asked 1. What do you think is happening in these photos? 2. Why? Just as I would use in a traditional classroom setting with students, the engage phase teaches us to let kids do their own thinking first instead of imposing information on them.

For the next activity (asking thought-provoking questions to start a class discussion), I utilized a NASA article about ocean sounds and if the ocean can be turned into music (Blumberg, n.d.). Scientists used data from satellite images, found patterns of red, green, and blue channels, then assigned musical notes to the changes. Scientists then merge the data from ocean color into sound (See Appendix C, Image C.4). I began this activity by asking the question: What sound does the ocean make? This question started a discussion where participants gave examples of ocean waves crashing or even animal noises being made. I modeled that you can also choose to first play the sound clip from NASA and have students guess what the sound is.

The next activity (sharing a current event or telling a story) is one that can be naturally incorporated throughout multiple activities. I used real-world connections in many of my previous activities. For this activity, I chose to focus on the upcoming solar eclipse that was happening in the next month. I modeled that this could be used as a math lesson because there were timestamps and measurables on NASA's solar eclipse website (National Aeronautics and Space Administration, 2024) (See Appendix C, Image C.5). To align this activity with the engage phase, I began by asking general questions like: How long does a solar eclipse last? What time should I be outside to see the solar eclipse?

Explore:

Once students have engaged in the lesson, they need time to explore their ideas. Explore activities are designed so all students have common, concrete experiences which can be used later when formally introducing and discussing technical concepts and explanations. As a result of their mental and physical involvement in these activities, students question events, observe patterns, and establish causal relationships. The teacher's role in the explore phase is to facilitate learning. They initiate activities and allow time and opportunity for students to do the rest. My goal during this part of my professional development was to model ways that teachers can lead students through the explore phase. This included hands-on activities, small group discussions, problem-solving tasks, exploration stations, videos, and guided inquiry. For my professional development, I modeled the first three. To model hands-on activities and problem-solving tasks, I re-introduced the Girl Scout cookie Three-Act Math problem (See Appendix C, Image C.1). During the explore phase, a teacher doing this lesson would introduce an activity where they ask students how they could determine the number of boxes in the trunk and have them record their

responses on chart paper. In addition, teachers would need to ask students what information they needed to solve the problem, then provide students with that information. For this example, participants brainstormed and discovered that they would need the dimensions of a cookie box and the dimensions of the Nissan Rogue.

In the next activity, we jumped back into the NASA Mystery Picture Graphing activity (National Aeronautics and Space Administration, 2023). Participants received a blank graph and we simulated plotting a point together (See Appendix C, Images C.6-7).

### **NASA Resources**

As described above, I used several NASA resources during my professional development training. See Appendix C for image examples.

### **Post-workshop Survey**

I used a post-workshop survey to gauge comfortability with the 5E Model after the professional development training and measure overall success. See Appendix B, Figure B.2 for the complete survey data including all questions and responses.

### **Outcomes**

In addition to the post-survey data that I collected, I also conducted a few one-on-one check-ins and interviews with my participants. These were conducted throughout the three weeks following the professional development session. The goal of these check-ins was to see if participants had any follow-up questions or were able to implement the 5E Model into their daily content. Of the four interviews conducted, three teachers had said they had planned to implement an engage strategy. All four teachers mentioned that the professional development session encouraged them to think of ways to engage their students in the content they were learning.

After reviewing the data from the post-survey and one-on-one interviews, I would conclude that my professional development session was successful. I measured the success of my professional development by seeing if the teachers were able to take something back to their own classrooms from what I taught. The survey data showed that all participants would try a new strategy with the goal of implementing student-led investigations and all participants found the strategies valuable. I was also encouraged to see that all participants would be interested in learning more about the 5E Model. This showed me that they enjoyed what they learned and saw the value in the model itself.

I structured my professional development to highlight the engage and explore phases across multiple content areas for my audience in order to make it meaningful and useful. For example, I included many math examples because a lot of the teachers are responsible for teaching math in their own classrooms. I also touched on music content because I had a music teacher in

attendance. The goal of doing this was so that my participants felt confident bringing tools back into their classrooms.

A core objective of my professional development training was to ensure that the teachers could leave with example activities and resources to implement the 5E Model in their own classrooms. One of our course readings by Darling-Hammond et al. (2017) noted that one principle of effective professional development sessions is that they incorporate active learning which engages teachers directly in designing and trying out teaching strategies. The activities I shared and facilitated throughout my professional development as well as the practice round at the end both relate back to this principle of effectiveness.

Another piece of knowledge that I took from our course readings to create this professional development was from Berry et al (2010) that mentioned and highlighted the value of collaborative professional development experiences in the process of strengthening their own effective teaching practices (p. 6). Offering a professional development that is interactive in nature allows teachers to build social support and deepen relationships with colleagues (Berry et al, 2010). Knowing this research, I was able to build in these collaboration segments of my professional development, as well as partnering teachers up in order to help facilitate these connections.

### **Reflection**

The professional development provided teachers with deepened content knowledge related to the topics being covered in the engage and explore phases of the 5E Model. Teachers mostly gained insights into common student misconceptions related to the content and learned strategies to address them during the engage and explore phases. They also learned strategies to use in their classrooms that solidified their understanding of the 5E Model through activities or discussions. This hands-on practice helped them deepen their own understanding of the concepts being taught. My professional development also emphasized how utilizing activities in the engage and explore phases align with specific curriculum and content areas. This ensured that teachers understand the relevance and importance of these activities for student learning. As seen in the pre-survey data, many of the participants were not familiar with the 5E Model or felt uncomfortable implementing student-led learning in their classrooms. The professional development session helped my audience assess the pedagogy that they employ by looking at the ways they currently engage students and look for ways to deepen the connection between content and student learning. Learning about the importance of engaging students in what they are learning became the basis of our session and guided us through the importance of the 5E Model.

## References

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## **Appendix A**

This appendix contains a list of the NGSS standards addressed in the professional development training.

NGSS Standard: Science and Engineering Practices (SEP) - Asking Questions and Defining Problems (K-2-ETS1-1, 3-5-ETS1-1)

SEP - Developing and Using Models (K-2-ETS1-2, 3-5-ETS1-2)

NGSS Standard: Crosscutting Concepts (CCC) - Cause and Effect (K-2-ETS1-3, 3-5-ETS1-3)

SEP - Constructing Explanations and Designing Solutions (K-2-ETS1-3, 3-5-ETS1-3)

NGSS Standard: DCI - PS2.B: Types of Interactions, LS2.A: Interdependent Relationships in Ecosystems

SEP - Engaging in Argument from Evidence (K-2-ETS1-4, 3-5-ETS1-4)

NGSS Standard: DCI and CCC - ESS3.C: Human Impacts on Earth Systems, CCC - Stability and Change

SEP - Obtaining, Evaluating, and Communicating Information (K-2-ETS1-1, 3-5-ETS1-1)

## Appendix B

This appendix contains the survey data for the pre- and post-workshop surveys I conducted for my project.

Figure B.1  
Pre-workshop Survey Questions & Responses

What is your current knowledge of the 5E Lesson Model?	How often do you incorporate hands-on exploration and inquiry-based learning activities in your lessons?	How much of your lesson time is student-led?	How comfortable are you in facilitating student-led investigations and hands-on exploration during lessons?	What are some challenges you face when attempting to engage students in lessons?
Very unfamiliar	Sometimes	Occasionally	Neither uncomfortable or comfortable	Time
Very unfamiliar	Often	Sometimes	Very comfortable	Behaviors and predicting what behaviors will arise in my students
Unfamiliar	Rarely	Sometimes	Uncomfortable	Differentiation
Very unfamiliar	Often	Occasionally	Neither uncomfortable or comfortable	Behavior and focus
Very unfamiliar	Often	Often	Comfortable	Attention span of students, time to complete a lesson
Very unfamiliar	Often	Sometimes	Comfortable	Activating prior experiences/knowledge that stay on topic
Unfamiliar	Sometimes	Sometimes	Comfortable	I find it challenging at times as we get stuck on certain topics, or talking over each other.
Very unfamiliar	Often	Occasionally	Neither	Student behavior

			uncomfortable or comfortable	
Very unfamiliar	Rarely	Often	Comfortable	Schedule

Figure B.2  
Post-workshop Survey Questions & Responses

On a scale of 1 to 5, with 5 being the most valuable, how valuable did you find the strategies and examples provided for engaging students using the Engage and Explore phases of the 5E Model?	How likely are you to try new strategies for facilitating student-led investigations in your classroom?	Would you be interested in attending a professional development session on the remaining steps of the 5E Model?
5	Very likely	Sure!
5	Likely	Sure!
5	Very likely	Sure!
5	Likely	Sure!

## Appendix C

This appendix contains examples of the activities addressed in the professional development training.

Image C.1.

Girl Scout Cookies (Meyer, 2016)



Act One

Dan Meyer

March 01, 2016

How many boxes of girl scout cookies will fit into that trunk?

1. What's a number of boxes you know is too high?
2. What's a number of boxes you know is too low?
3. What's your best guess?

Image C.2.

Which one doesn't belong? (Bourassa, n.d.)



Image C.3.  
Google Earth Engine (Google Earth Engine, n.d.)

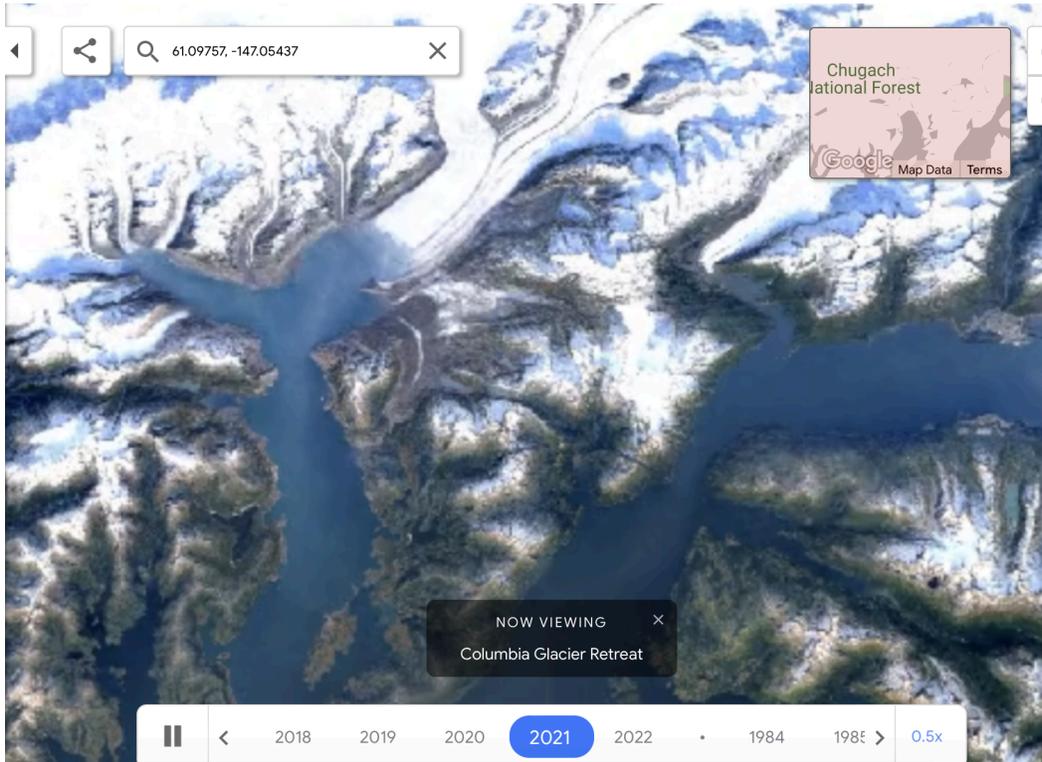
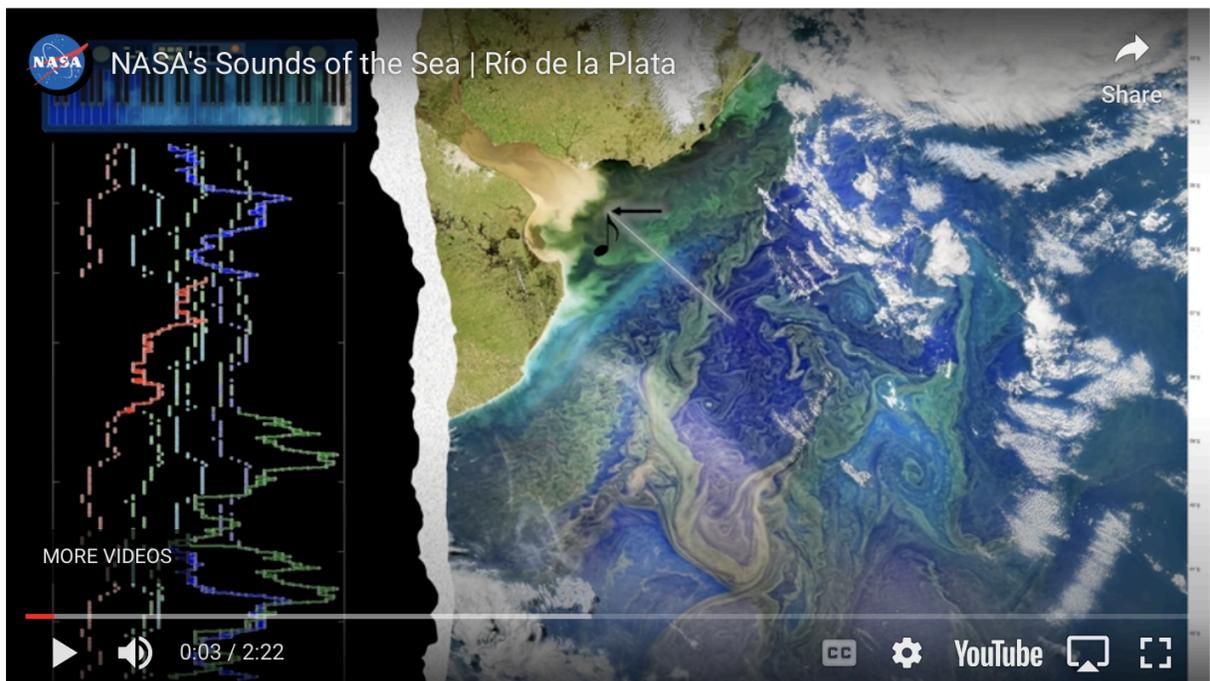


Image C.4  
NASA Sounds of the Sea (Bumberg, n.d.)



# Image C.5

Eclipses (National Aeronautics and Space Administration, 2024)

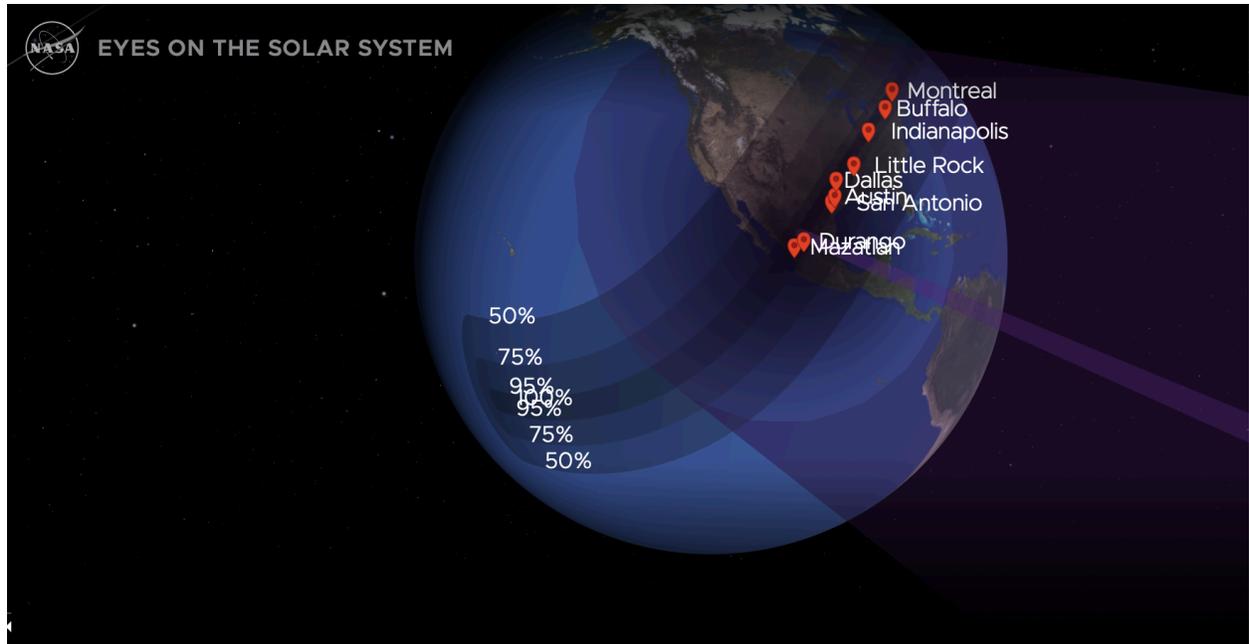


Image C.6

## Mystery Picture Graphing Activity (National Aeronautics and Space Administration, 2023)

Aeronautics Research Mission Directorate



# Mystery Picture Graphing Activity 1

On the graph found on the third page, plot and connect the points found in groups 1-7 to reveal a mystery picture. Once you have the picture, read through the information on the second page to determine which aircraft is pictured.

Points to be plotted:

<b>Group 1:</b> (23, 0) (5, 3) (3, 5) (2, 5) (2, 3) (1, 3) (-4, 6) (-7, 10) (-9, 10) (-12, 6) (-12, 4) (-14, 4) (-15, 6) (-16, 6) (-17, 5) (-21, 7) (-21, 8) (-22, 8)	 (-23, 7) (-24, 5) (-23, 5) (-22, 6) (-20, 4) (-20, 1) (-24, -2) (-22, -2) (-17, 0) (-15, 0) (-19, -2) (-24, -7) (-22, -7) (-5, -1) (-1, -2) (23, -1) (23, 0)	<b>Group 2:</b> (-5, -1) (-1, 1) (-12, 1) (-13, 0) (-15, 0)	<b>Group 5:</b> (4, 1) (1, 1) (-2, -1) (-1, -1) (4, 1)
		<b>Group 3:</b> (1, 3) (-2, 4) (-10, 2) (-12, 4)	<b>Group 6:</b> (-17, 5) (-16, 4) (-20, 4)
		<b>Group 4:</b> (5, 3) (2, 3)	<b>Group 7:</b> (-22, 6) (-21, 7)

Image C.7

Mystery Picture Graphing Activity (National Aeronautics and Space Administration, 2023)

*Answer:*

