NOTE: The original teacher edition and student guide for this unit can be found at the Stanford link above and also in the MS Orientation to Groupwork Unit Google Folder.

Getting Started

Add a new folder in your Google Drive called **Groupwork Unit**. Using the link below, which allows you to view the original folder, open the folder, highlight all the files, right click and select **Make a copy**. This will put a copy of all the files into the main folder of your Google Drive. Now, select all the files that start with "Copy of", right click, and select **Move to**. Navigate to the **Groupwork Unit** folder you created and select **MOVE HERE**. Now, you should have copies of all the files you need in your own folder. Link to originals folder: https://bit.ly/MSorientationToGroupwork

Walkthrough Video: A walkthrough of the entire unit giving the nuts and bolts of what to expect along with some hints and tips about how you might manage the activities. https://bit.ly/WalkthroughMSGroupworkUnit

Unit Timing: This entire unit should take ten 45-minute class periods.

Unit Background (taken from original Stanford unit)

Groupwork is an instructional strategy that helps to promote more equitable classrooms, provides opportunities for student interactions, and increases science discussions with the goal of improving student learning. Unfortunately, some students are perceived by their peers as having low academic performance and/or linguistic abilities. Our goal is to equalize rates of participation so all students are able to contribute to the learning of the whole class. One effective method of doing this is to help students understand that they need the intellectual abilities of their group members to successfully complete the tasks throughout this curriculum. To promote the idea that all students have something to contribute, we suggest that you use the following two statements when introducing each task.

- No one is good at all the abilities.
- Everyone is good at some of the abilities.

This Groupwork unit will help students learn two important components of productive and efficient groupwork. The first component is that each member has a role and plays their role throughout the task. These roles are Facilitator, Harmonizer, Reporter, Recorder, Materials Manager, and Resource Person.

The second important component of groupwork is that there are general Behavior Norms that every member must adhere to. These Behavior Norms are introduced in different groupwork tasks.

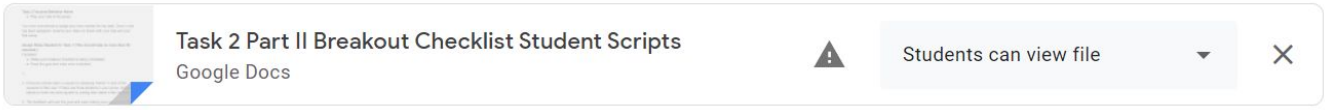
Intro to Groupwork Behavior Norms and Role-Playing Descriptions & Task 1 - Broken Squares

Timing: one 45-minute class period

Google Classroom:

WARNING: If you ever see this symbol ⚠ when adding documents to an assignment in Google Classroom (see image below), your students will not be able to access the file. This means you don't have a local copy in your Google Drive. Make a copy of whatever the file is and ensure it is in your Marana Drive.

Students won't be able to access the document!



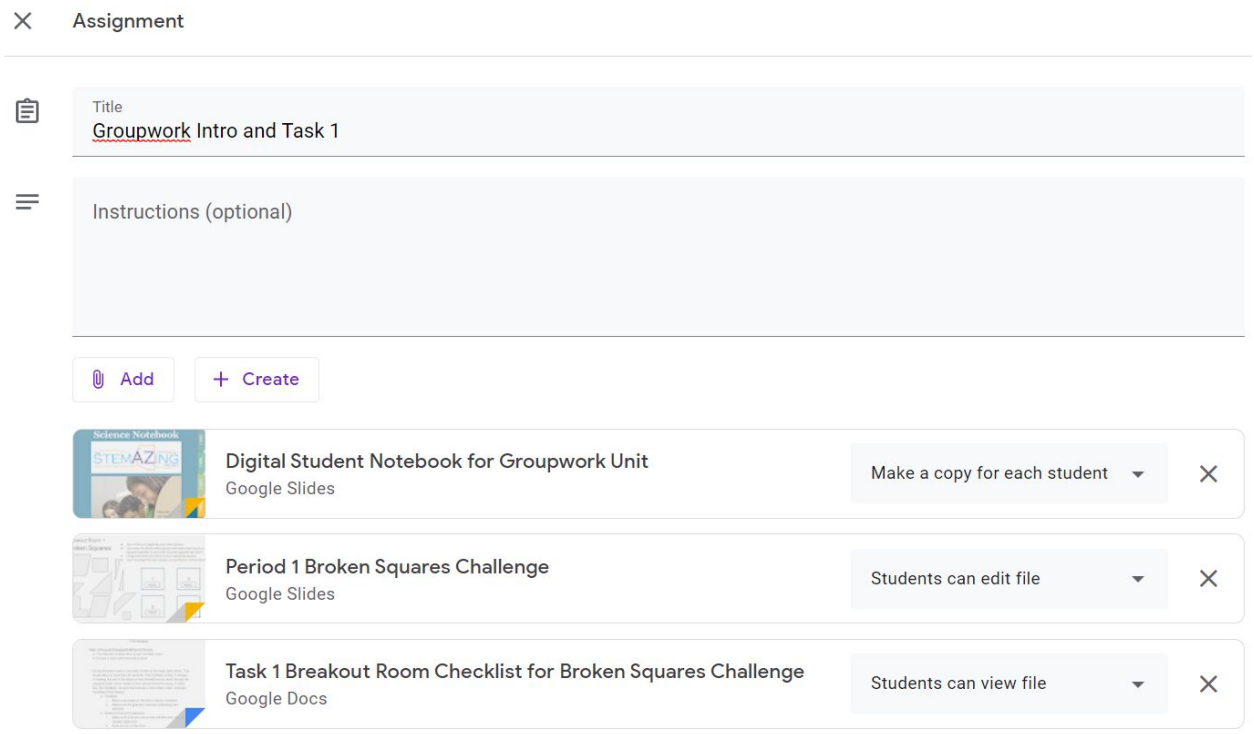
NOTE: Any files with "Original" in the title need to have copies made for each class period using them. Do not assign the original to students.

❏ Students will be manipulating the actual file for the Broken Squares Challenge. Because of this, you will need to make a copy of the **Task 1 Original Broken Squares Challenge** file for each of your classes. Rename the copies to indicate which class period is using them by replacing "Copy of Task 1 Original" with the class name. Example:

Period 1 Broken Squares Challenge; **Period 2 Broken Squares Challenge**… and so on. If you are only using this in one section, then you will just need to make one copy of the original.

❏ Before beginning Task 1, you need to create an assignment for all students in each class called **Groupwork Intro and Task 1**.

- You can decide if you want this assignment to be assigned points or if it is Ungraded.
- Add a copy of the file **Digital Student Notebook for Groupwork Unit** and select **Make a copy for each student**.
- Add a copy of the Broken Squares Challenge file specific for that class (example **Period 1 Broken Squares Challenge**) and select **Students can edit file**. Again, because students in each class will be editing the file, you need to have a separate copy for each class.
- From the Task 1 folder, add a copy of **Task 1 Breakout Room Checklist for Broken Squares Challenge** and select **Students can view file**.
- You can either put this assignment in the Stream by assigning it before classes start or Schedule it to post right before classes start.



Virtual Engagement:

INTRO (about 20 minutes)
The first part of this lesson is meant to let students become familiar with the groupwork behavior norms and also the roles you will use when having them work in groups. You could do this part in many ways from jigsawing the roles to just assigning this as asynchronous work. Below is our suggestion for one way to engage students to get to know the norms and roles.

1. After sharing your perspective on the importance of groupwork and the importance of having strategies and roles for group members to take on to make groupwork more productive and efficient, start presenting the Teacher Slide Deck for MS Orientation to Groupwork Unit, screenshare, and navigate to the slide (4) in the teacher slide deck with the Groupwork Behavior Norms. Have students read through them and prompt them to think about which ones they are good at and which ones they could improve.
2. Go to the next slide (5) and either verbally with volunteers, in the chat, or using annotation stamps on Zoom, let students share the norms they are good at with each other. You could also ask which norms they appreciate most when they have worked in groups in the past.
3. Go to the next slide (6) and either verbally with volunteers, in the chat, or using annotation stamps on Zoom, let students share the norms they need to improve. Let students suggest ways they could improve norms they need to work on improving. You could also ask which norms they find most annoying when others in groups they are working in don't follow them.
4. Go to the next slide (7) titled Additional Groupwork Behavior Norms. Have students read through them and prompt them to think about which ones they are good at and which ones they could improve.
5. Go to the next slide (8) and either verbally with volunteers, in the chat, or using annotation stamps on Zoom, let students share the norms they are good at with each other. You could also ask which norms they appreciate most when they have worked in groups in the past.
6. Go to the next slide (9) and either verbally with volunteers, in the

chat, or using annotation stamps on Zoom, let students share the norms they need to improve. Let students suggest ways they could improve norms they need to work on improving. You could also ask which norms they find most annoying when others in groups they are working in don't follow them.

7. Go to the next slide (10) title Roles and explain that these are the six roles that will be assigned when students are doing groupwork throughout the year.
8. Go to the next slide and let students read more the Facilitator role. You could prompt them with discussion questions to answer in the chat or verbally:
    - How would you summarize this role in one sentence?
    - What other statements or questions might someone in this role say or ask?
    - Why do you think someone taking on this role is important for a group to work productively and efficiently?
    - How will the role be different during virtual groupwork compared to when we are back together in the classroom together?
9. Repeat Step 8 for each of the remaining five roles on slides 12-16.
10. Go to the next slide (17) and either verbally with volunteers, in the chat, or using annotation stamps on Zoom, let students share which role they think will be their favorite to be assigned. You can have a discussion about why they like the roles they are calling out.
11. Go to the next slide (18) and either verbally with volunteers, in the chat, or using annotation stamps on Zoom, let students share which role they think will be their least favorite to be assigned. You can have a discussion about why they do not like the roles they are calling out. You can also talk about the importance of taking on roles they might not like as a means of getting better at them.
12. Explain to students that these same norms and roles are in their Digital Student Notebooks. Part of their extended learning between now and next class period will be to respond to the discussion questions individually in their notebooks. You could toggle over to a copy of the notebook to show them the notebooks and show them the indicator for responses is ___. Any place they see ___ is a place they will eventually type in a response.
13. Go to slide 19 to begin Task 1.

TASK 1 (about 25 minutes)

Introduction to Task 1 (taken directly from Stanford unit)
Learning to work with others is an important step in becoming a good scientist or engineer. Today's questions and problems are very complex and require many people with different types of expertise to generate possible answers or solutions. Engineers and scientists need to

- Work together to solve problems.
- Communicate by sharing their ideas and asking clarifying questions.
- Critique each other's work.
- Generate new knowledge or products.

To be a good group member, students must learn to increase their ability to be sensitive and responsive to the needs of others. They must learn that they are part of an interdependent group. Each group member's contribution is important to the success of the whole group.

In this task, students will be trying to make a complete square from puzzle pieces on slide. They will be the only ones allowed to complete their square. They can try to help others but there will be no talking (everyone will be muted) during the activity. Students will need to **pay attention to what other group members need** if the group is going to successfully complete all of their squares. By the end of the task, students should have a better understanding of what it means that **no one is done until everyone is done**.

Virtual Engagement:

14. After providing an intro to this task while on slide 19, go to the next slide and discuss why working in groups is such an advantage using the idea that no one is good at all abilities and everyone is good at some abilities. You could also discuss the diverse experiences group members will bring to the table which improves the products a group produces.
15. Go to the next slide (21) and quickly share the Essential Question and the Task 1 Objectives. Let students know that they will be responding to each of the objectives in their Digital Student Notebooks as part of the extended learning between now and next

class period to indicate if the objectives were met and how they were met.

16. Go to the next slide (22) and call out the groupwork behavior norms this task focuses on.
17. Go to the next slide (23) and explain that students will be put into random breakout rooms in a bit and they will be working on completing squares like the one shown here. Exit present mode and show students how they will complete the square by grabbing the pieces and moving them into place overtop of the square. (NOTE: if you are using the slide deck again with another class, move the pieces back off of the square before going to the next slide.)
18. Go to the next slide (24) (still in edit mode and not present mode) and explain that this is what the slides for each of their breakout rooms will look like. Point out the importance of making sure they are on the slide that corresponds to their breakout room number. Explain that each slide has enough pieces to complete all four squares and that some pieces might have slight gaps between them when put in place. Demonstrate how they will claim a square by putting their name in it and then explain the rules.
    - When ready to start the activity, everyone will mute their audio.
    - You must put together your own square.
    - You may not show other group members how to put a square together or put their square together for them.
    - Don't change the size, shape, or orientation of the pieces.
19. Ask "What questions do you have?" to see if any clarification is needed.
20. Go to the next slide (25) and have students go to Google Classroom and open up the **Groupwork Intro and Task 1** assignment and make sure they can open both documents.
21. Go to the next slide (26) and review breakout room tasks. The facilitator will read and ensure the group follow the Task 1 Breakout Checklist and the Timekeeper will watch the time remaining and let the group know when they have two minutes left. Let them know if they finish the task early, there are discussion questions they should chat about as a group until the whole class comes back together.
22. Ask "What questions do you have?" to see if any clarification is needed.
23. Put students into as many breakout rooms as you need to ensure there are 3-4 students in each group. Set the breakout room timer for

15 minutes and send them off.
24. Go to the next slide (27) and then drop into breakout rooms to see how things are going.
25. Once the whole class is back together, have the reporters from each breakout room share their groups experience.
26. Go to the next slide (28) and assign the extended learning.

Task 1 Early Finish: If you finish early, you can share the tangrams link (https://mathigon.org/tangram) with the students and let them try to solve some of the puzzles. This will familiarize them with the user interface as they will be using these online tangrams during Task 3. Solving puzzles on the tangram site can also be assigned as part of a flipped lesson.

Task 2 - Role Playing

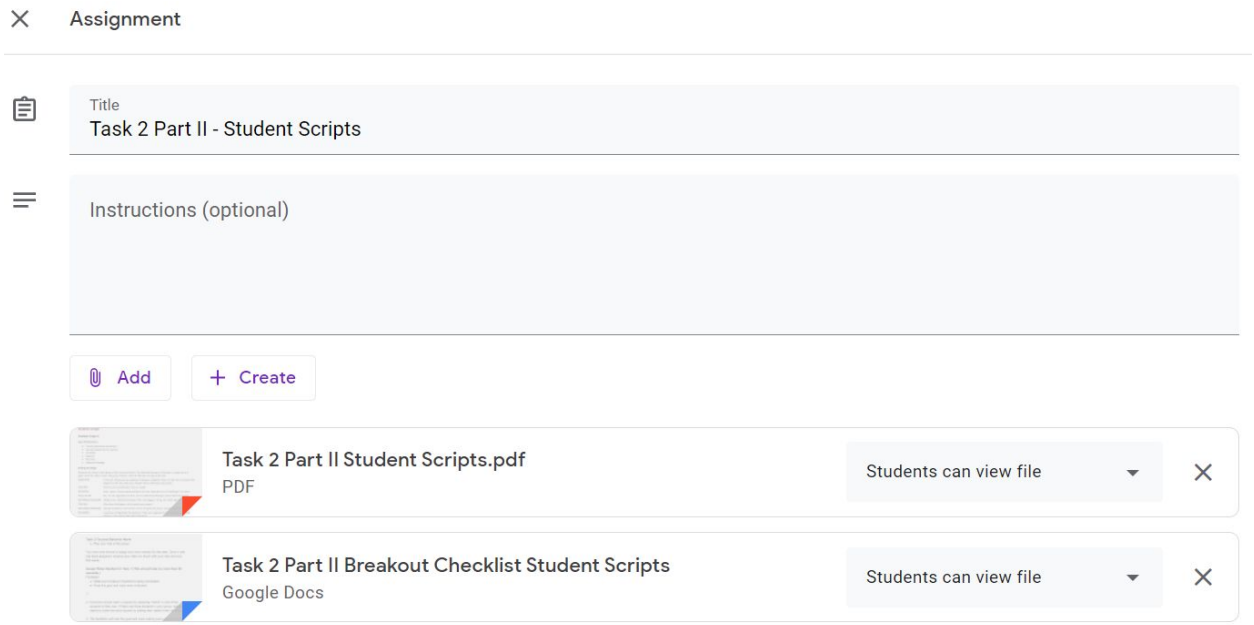
Timing: four 45-minute class periods

- **Part I:** Orientation Script (one class period)
- **Part II:** Student Scripts (two class periods)
- **Part III:** Script Rewrite (one class period)

Google Classroom:

❏ Before beginning Task 2 Part II, you need to create an assignment for all students in each class called **Task 2 Part II - Student Scripts**.

- You can decide if you want this assignment to be assigned points or if it is Ungraded.
- Add a copy of the file **Task 2 Part II Student Scripts.pdf**. It should already be set to **Students can view file**.
- Add a copy of the file **Task 2 Part II Breakout Checklist Student Scripts**. It should already be set to **Students can view file**.
- You can either put this assignment in the Stream by assigning it before you get to Task 2 Part II or Schedule it to post on the day you expect to get to this part.

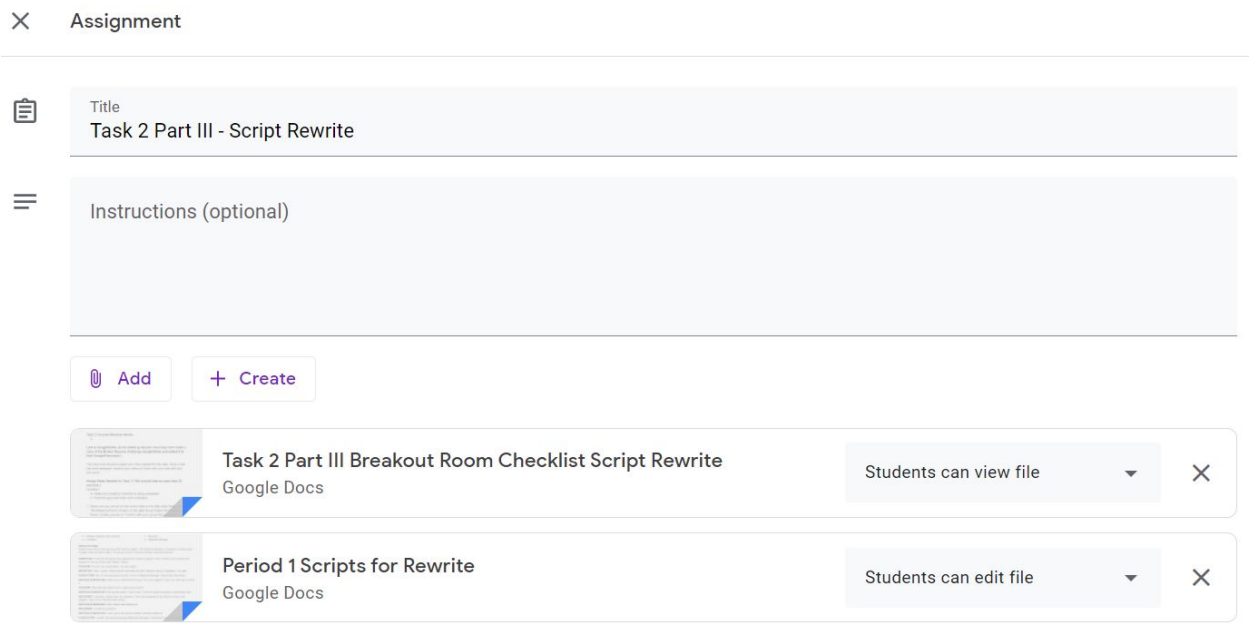


❏ Each class period will be manipulating the actual file for the Script Rewrite. Because of this, you will need to make a copy of the **Task 2 Part III Original Scripts for Rewrite** file for each of your classes.

Rename the copies to indicate which class period is using them by replacing “Copy of Task 2 Part III Original” with the class name. Example: **Period 1 Scripts for Rewrite**; **Period 2 Scripts for Rewrite**… and so on. If you are only using this in one section, then you will just need to make one copy of the original.

❏ Before beginning Task 2 Part III, you need to create an assignment for all students in each class called **Task 2 Part III - Script Rewrite**.

- You can decide if you want this assignment to be assigned points or if it is Ungraded.
- Add a copy of the file **Task 2 Part III Breakout Room Checklist Script Rewrite**. It should already be set to **Students can view file**.
- Add a copy of the Scripts for Rewrite file specific for that class (example **Period 1 Scripts for Rewrite**) and select **Students can edit file**. Again, because students in each class will be editing the file, you need to have a separate copy for each class.
- You can either put this assignment in the Stream by assigning it before you get to Task 2 Part III or Schedule it to post on the day you expect to get to this part.



Introduction to Task 2 (taken directly from Stanford unit)
Researchers have found that people work well together in groups when each person knows what to do. In other words, when people are assigned a specific role and responsibility, it helps the whole group work better together.

Students might have a difficult time learning roles and remembering to perform them during groupwork. In this task, students will practice roles that are expected of them when they work in groups. Students will perform a series of skits that will provide them with an opportunity to focus on the expectations of each groupwork role.

Virtual Engagement:

TASK 2 PART I: Orientation Script (one 45-minute class period)

1. Start presenting the Teacher Slide Deck on slide 29. You can also click on the Task 2 tab on the right which will take you directly to this slide when you are in Present mode.
2. Summarize the importance of assigning roles during groupwork as explained in the Introduction to Task 2 above.
3. Go to the next slide (30) and again share how working in groups can be advantageous when you take advantage of everyone's unique strengths.
4. Go to the next slide (31) and review the essential question (always the same) and the objectives for Task 2 which will take four 45-minute virtual classes.
5. Go to the next slide (32) and discuss how (surprise, surprise) **play your role in the group** is the norm this task focuses on.
6. Go to the next slides (33-38) one at time to review the six roles students may be assigned when doing groupwork. You can bring up questions from their extended learning in their notebooks or use questions from the intro you may not have used previously to further familiarize students with each role.
    - How would you summarize this role in one sentence?
    - What other statements or questions might someone in this role say or ask?
    - Why do you think someone taking on this role is important for a group to work productively and efficiently?
    - How will the role be different during virtual groupwork compared

to when we are back together in the classroom together?

7. Go to the next slide (39) and explain that you need volunteers who are willing to read parts of a script which will pop up on the slides. They don't have to memorize their lines. They simply have to read their part when it comes up. The lines are only one or two sentences long
8. As students volunteer, they should rename their video box to include their role. (If Erin is the Facilitator then she would change her name to Facilitator Erin and so on.)
9. Ask the rest of the students to turn their videos off. This will put the role players at the top of the video grids.
10. Once the roles have all been assigned, go to the next slide (40) and set the stage by reading the slide. Encourage the role players to do their best to take on their roles.
11. Go to the next slide (41) and read the Narrator lines. Then the role players should take over reading their lines with encouraged enthusiasm. You also play the Teacher role.
12. Continue through the Orientation Skit (slides 41-43) and then go to the next slide (44). Facilitate a discussion with the whole class using the discussion questions on the slide.
    - **Moral of the Story:** Using roles effectively allows groups to proceed efficiently through a task.
    - **Key Roles:** All roles are essential in this skit and should be highlighted.

Task 2 Part I Early Finish: If you finish early, you can share the tangrams link (https://mathigon.org/tangram) with the students and let them try to solve some of the puzzles. This will familiarize them with the user interface as they will be using these online tangrams during Task 3. Solving puzzles on the tangram site can also be assigned as part of a flipped lesson.

Virtual Engagement:

TASK 2 PART II: Student Scripts (two 45-minute class period)

1. Start presenting the Teacher Slide Deck on slide 45.
2. Go to the next slide (46) and explain that over the next two virtual classes groups will perform different scripts, they will have time to practice, and then as a whole class each script will be discussed. Again, mention they will not have to memorize lines but hopefully they will have fun making the scripts as dramatic as they can given you are not in a classroom together.
3. Go to the next slide (47) and review breakout room details.
4. Have students navigate to the **Task 2 Part II - Student Scripts** assignment in Google Classroom and open up both documents attached to the assignment - **Task 2 Part II Breakout Room Checklist Student Scripts** and **Task 2 Part II Student Scripts**.
5. Put students into as many breakout rooms as you need to ensure there are 4-5 students in each group - four in a group is best. Set the breakout room timer for 10 minutes and send them off.
6. Go to the next slide (48).
7. When the students return from the breakout room welcome them back and explain that Student Script A role players will be up first. The students playing roles in Skit A should keep their videos on and every other student should turn off their videos. This will bring the role players to the top of the grid of videos on Zoom.
8. Go to the next slide (49) and explain to students that you will have a discussion after each skit reading to discuss the questions listed.
9. Go to the next slide (50) and read the setting the stage to the class.
10. Let the skit begin by clicking through the two script slides (51-52).
    - **NOTE:** You may or may not have to play the role of Narrator and Teacher in the skits. If there is a group of 5 students, someone may have claimed those roles.
11. Go to the next slide (53) and facilitate a class discussion of Skit A.
    - **Skit A Moral of the Story:** This script shows the problems a group can have if group members fail to plan their presentation. This group may have spent too much time in discussion (either on or off task), or they may have divided up the tasks without any overall coordination and cooperation. Students need to see that it is not sufficient to just assign everybody a task without any idea of how to bring the whole project together.

- **Skit A Key Roles:** The **Reporter** has the responsibility of organizing the group's presentation and should see that all the individual efforts are coordinated.
  The **Facilitator** should also see that the Groupwork Behavior Norms "no one is done until everyone is done" and "you have the right to ask for help and you have the obligation to give help" are enforced.
- **Skit A Extension Questions:** Why does no one seem to know their role in the group presentations?
  What happens to the quality of the presentation when group members are confused about their roles?

12. Continue through the reading and discussion of the other scripts in the same way you did Skit A. Reference the moral, key roles, and extension questions for each skit provided below. You will have to continue the reading and discussion of the skits during a second class period.
    - **NOTE:** Be sure to have the students who are role playing turn their videos on and everyone else turn off their videos.

Skit B

- **Skit B Moral of the Story:** In this script the Facilitator has become the "boss" or the "dictator" rather than the coordinator. Students need to realize that an authoritarian approach is never successful in cooperative activities because it causes resentment when the needs of other members of the group are not being met. Groups need to learn how to form consensus so that all members genuinely buy in.
- **Skit B Key Roles:** The **Facilitator** needs to remember to act as a coordinator and guide rather than a boss. This person should make sure that everyone's needs and concerns are considered.
  The **Harmonizer** should also be alert to the needs and concerns of all the members of the group. It is the Harmonizer's role to try to help the group reach a consensus so that an impasse such as we have here can be avoided.
  The **Reporter** also should take a more active role in determining how the group's presentation is going to be put together. Brainstorming of alternatives is one way to go about this.
- **Skit B Extension Questions:** What can you say to someone who is bossing other group members?

Skit C

- **Skit C Moral of the Story:** Because of its accusations and put-downs, this script should be assigned to students who are unlikely to take them personally or to have hurt feelings. The Reporter has tried to take over the group and has become abusive and insensitive to the needs of some of the others. Not only are the roles being ignored, but many of the Groupwork Behavior Norms as well. Contributions and requests for help are overlooked or met with put-downs. The group falls apart with accusations and acrimony. Conflict management strategies become very important in this kind of situation.
- **Skit C Key Roles:** The **Harmonizer** is desperately needed here to defuse the situation during the early stages. This person should take an active role in acknowledging the Recorder's request for help and contributions later in the scene.
  The **Facilitator** starts well and makes a few tentative attempts to restore cooperation but needs to play a much stronger part in recognizing the Recorder's needs and neutralizing the Reporter. Instead, the Facilitator becomes frustrated and begins to blame the Recorder for the group's problems.
- **Skit C Extension Questions:** Something important for good groupwork is the freedom and trust that allows every member to say what they need. By saying what students need, they can prevent frustrations from building and ultimately turning into put-downs (as we saw in the skit). What were the needs of each person in this group?

Skit D

- **Skit D Moral of the Story:** This group is having a problem because they don't have the information they need to complete the individual reports. The Recorder has the information but is not sharing it and did not make sure that everyone had notes and diagrams ahead of time.
- **Skit D Key Roles:** The **Recorder** is expected to keep an official record of the group's proceedings and to make sure that all other members have the notes and information that the group needs. The Recorder is right in saying that they cannot just give the others the answer.

- **Skit D Extension Questions:** Why can't the Harmonizer "just copy"?
  This group skit gives us a hint about what to do if someone misses a day of groupwork. Who is responsible for telling that person what they missed?

Skit E

- **Skit E Moral of the Story:** The script portrays the problems of a group that is "stuck" but fails to use roles properly in order to resolve its difficulties. The group is overly dependent on the teacher for help. In addition, the open-ended nature of the activity has left them confused. The students must utilize their roles in order to solve their conflict as well as their confusion. They must also begin to accept that the activities will not tell them step for step what they are to supposed to do; rather, it is their job to interpret and design a solution and product.
- **Skit E Key Roles:** The **Facilitator** is the only one who can ask the teacher for help if everyone in the group is stuck or if no one in the group knows how to resolve the problem.
  The **Resource Person** should look up words if no one knows their meaning.
- **Skit E Extension Questions:** What are some alternative ways students in the group could have expressed their frustration with the group's lack of progress?

Skit F

- **Skit F Moral of the Story:** The script portrays a group problem not uncommon in very heterogeneous classrooms. The two students are ignoring two other students in the group. In turn, these students who are ignored are disengaged and refuse to participate when they are finally included: a vicious cycle has been started. The students must capitalize on two key roles, the Facilitator and the Harmonizer, in order to turn the tide and balance the participation and involvement of all the students.
- **Skit F Key Roles:** The **Facilitator** must make sure that everyone in the group understands the task. This person must make sure everyone has a chance to participate, look and handle the materials, and make decisions.

The **Harmonizer** in this group could stop the group and discuss what is happening. It is obvious the two disengaged students are feeling angry and left out. On the other hand, the Facilitator and Harmonizer probably feel like the burden of the activity is on them.

- **Skit F Extension Questions:** What Groupwork Behavior Norms is this group forgetting to use?
  Why do you think the Recorder and Resource Person are not participating?
  In the first part of the skit, why do you think the Facilitator and Harmonizer are doing all the work?

Skit G

- **Skit G Moral of the Story:** The script portrays a group that falls apart when they need materials to complete the project. They do not discuss and decide as a group that they need materials to start building their castle; instead, the Materials Manager makes this decision alone and sets off to collect supplies. When the Materials Manager leaves, the group begins to disintegrate. The Reporter gets up to join the Materials Manager, the Harmonizer wanders off to another group, and the Facilitator is all alone. Two students, who should be seated, are wandering. The students must make better use of the Materials Manager.
- **Skit G Key Roles:** The **Materials Manager** is the only person who goes to get materials. This person may take an additional student if absolutely necessary, but the group should try to limit the number of people moving around.
- **Skit G Extension Questions:** Which of the Groupwork Behavior Norms does this group seem to be ignoring? (Discuss and decide.)
  While the Materials Manager is getting supplies, what could the others have been doing?

Skit H

- **Skit H Moral of the Story:** The script portrays an important group problem: The Facilitator is not playing their role, and someone else has taken over the role. Several possibilities may explain the Facilitator's position on the sideline: (a) the Facilitator is low status or not well liked, so no one listens to this person or assumes that

they can properly facilitate the group; (b) the Facilitator does not take responsibility because they don't like the task or the group; (c) the Reporter is bossy and has usurped the Facilitator's role. In this skit, as the responses to the teacher's questions suggest, no one in the group is trying to encourage the Facilitator to play their role or even to be a member of the group. They say "We can't make the Facilitator participate."

- **Skit H Key Roles:** In this case, the **Harmonizer** can alert the group to the fact that the Reporter has been taking over the Facilitator's role.
- **Skit H Extension Questions:** Which of the Groupwork Behavior Norms might help this group? (Everyone participates.)

Task 2 Part II Early Finish: If you finish early, you can read through any scripts your class didn’t use and discuss them.

Virtual Engagement:

TASK 2 PART III: Script Rewrite (one 45-minute class period)

1. Start presenting the Teacher Slide Deck on slide 89.
2. Have students rename themselves with their role and student script letter and first name from the script reading.
3. Go to the next slide (90) and review their task of rewriting their scripts.
4. Have students navigate to the **Task 2 Part III - Script Rewrite** assignment in Google Classroom and open up both documents attached to the assignment - **Task 2 Part III Breakout Room Checklist Script Rewrite** and **[Class Name] Scripts for Rewrite**.
5. Put students into their breakout rooms using their video box names which should have been changed to indicate their student script letter. Set the timer for 15 minutes and send them off.
6. Got to the next slide (91).
7. When the students come back, you can ask the Reporters from each group how the rewriting process went.

- **NOTE:** Student Script F does not have a reporter so if you are using that script you will have to pick another person to report.

8. Go to the next slide (92). At this point, you could either have every group perform their new scripts or you could ask for volunteer groups to perform.
9. Stop presenting the Teacher Slide Deck and open the copy of Scripts to Rewrite for this class. You can scroll through the scripts as the students perform them. Remember the videos on for role players and off for others rule.
10. After each performance, ask if anyone has constructive criticism for the group.
    - I really liked how you ___ and I think the script could be even better if ___.
11. Go back to the Teacher Slide Deck and present slide (93) which assigns their extended learning.

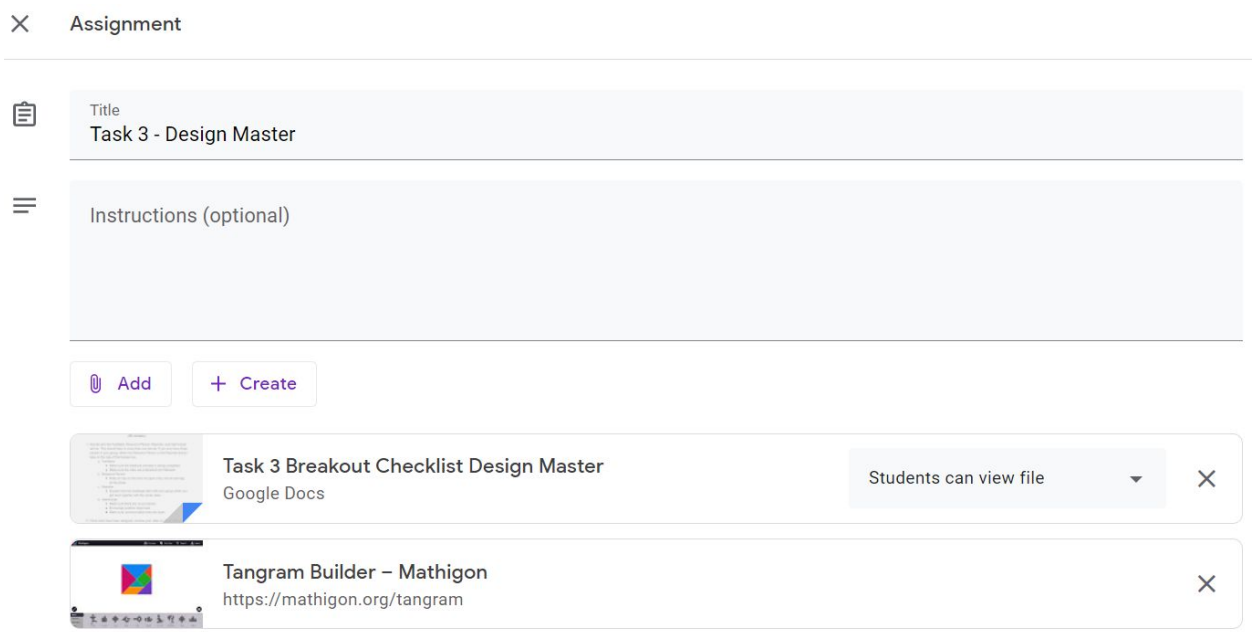
Task 3 - Design Master

Timing: one 45-minute class period

Google Classroom:

❏ Before beginning Task 3, you need to create an assignment for all students in each class called **Task 3 - Design Master**.

- You can decide if you want this assignment to be assigned points or if it is Ungraded.
- Add a copy of the file **Task 3 Breakout Room Checklist Design Master**. It should already be set to **Students can view file**.
- Add a link to the tangrams: https://mathigon.org/tangram
- You can either put this assignment in the Stream by assigning it before you get to Task 3 or Schedule it to post on the day you expect to get to this part.



Introduction to Task 3 (taken directly from Stanford unit)
As a student in school or an employee in the workforce, it is necessary to communicate and collaborate well when working in groups. Each member of a group needs to be able to explain their ideas and to ask questions to learn more about what other group members are thinking. It is also important to learn how to help other team members learn how to do things for themselves.

The Design Master activity illustrates three new Behavior Norms that help groups work together efficiently and effectively.

- Explain by telling how/why.
- Listen and pay attention to what others are saying.
- Help group members do things for themselves.

During the Design Master activity, each group member is using a set of seven geometric shapes known as tangrams. One student is the Design Master who creates a design with the shapes. The Design Master then explains to the other students how to replicate the design without showing the design to them. Builders cannot see what the other members are doing, but they may ask questions of the Design Master until their design is correct. After the Design Master determines that a Builder has successfully replicated the design, that Builder can also help explain the design to other Builders. Then another student becomes the Design Master and the rest of the group tries to replicate a second design.

Virtual Engagement for Task 3:

1. Start presenting the Teacher Slide Deck on slide 94. You can also click on the Task 3 tab on the right which will take you directly to this slide when you are in Present mode.
2. Summarize the importance of communicating during groupwork as explained in the Introduction to Task 3 above.
3. Go to the next slide (95) and again share how working in groups can be advantageous when you take advantage of everyone's unique strengths.
4. Go to the next slide (96) and review the essential question (always the same) and the objectives for Task 3 which will take one 45-minute virtual classes.
5. Go to the next slide (97) and discuss the importance of **helping group member do things for themselves, listening and paying attention to what others are saying,** and **explaining by telling how/why.**
6. Go to the next slide (98) and briefly describe how the Design Master challenge will work.
    - You may want to exit Present mode and go to the Tangram Builder website to show a demo (https://mathigon.org/tangram).
    - You can decide if you want to allow them to rotate pieces or not.
7. Have students navigate to the **Task 3 - Design Master** assignment in

Google Classroom and open up both the **Task 3 Breakout Room Checklist Design Master** and the link to the tangrams. You can also put the link to the tangrams site in the Chat.

8. Put students into Breakout Rooms randomly of 3-4 per group, set the breakout room timer for 30 minutes, and send them off.
9. Check into the breakout rooms to see how things are going.
10. When the class returns to the main room, facilitate a debrief with the whole class based on the prompts on slide 99.
11. Go to the next slide (100) to assign students their extended learning in their Digital Student Notebooks.

Task 4 - Off Like a Rocket

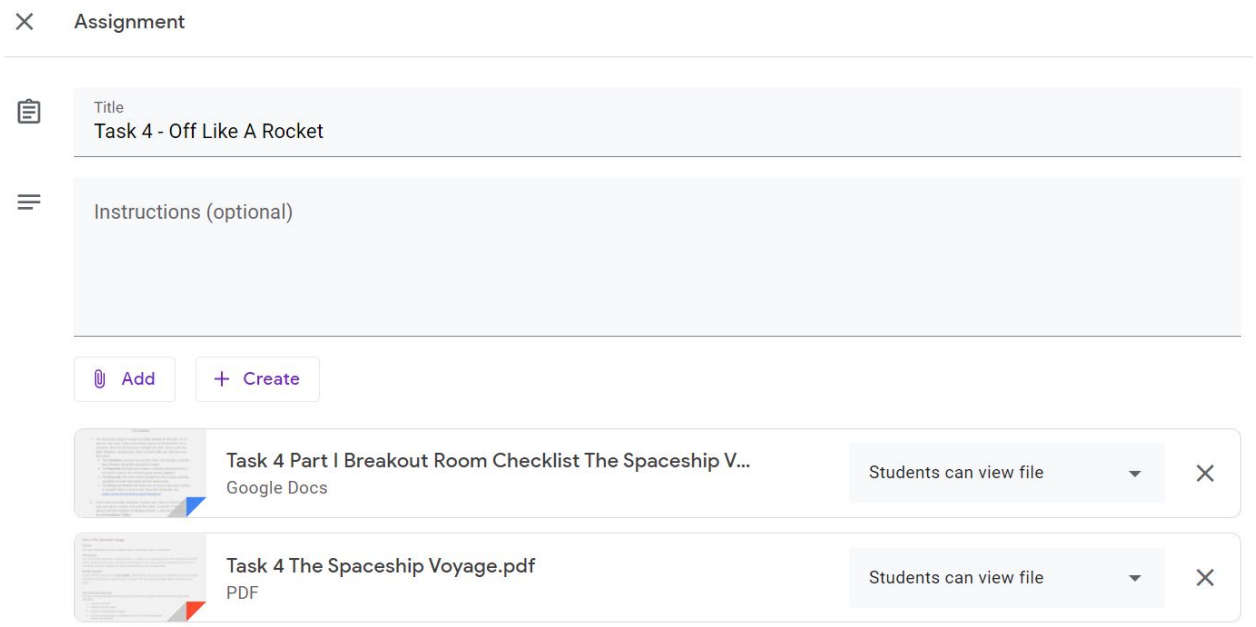
Timing: two 45-minute class periods

- **Part I:** The Spaceship Voyage (half a class period)
- **Part II:** Four-Stage Rocket Process (one and a half class periods)

Google Classroom:

❏ Before beginning Task 4, you need to create an assignment for all students in each class called **Task 4 - Off Like a Rocket**.

- You can decide if you want this assignment to be assigned points or if it is Ungraded.
- Add a copy of the file **Task 4 Part I Breakout Room Checklist The Spaceship Voyage.** It should already be set to **Students can view file**.
- Add a copy of the file **Task 4 The Spaceship Voyage.** It should already be set to **Students can view file**.
- You can either put this assignment in the Stream by assigning it before you get to Task 4 or Schedule it to post on the day you expect to get to this part.



Introduction to Task 4 (taken directly from Stanford unit)
Just as it is important to prepare students for working together in groups, it is also critical that they learn, experience, and label the behaviors that they needed for a productive discussion. The Four-Stage Rocket task is based

on work conducted by Charlotte Epstein in her book *Affective Subjects in the Classroom*. Epstein proposed having students conduct a discussion in which they go through four stages in order to engage in behaviors that facilitate products discussions. The exercise has become been used extensively by the Stanford Program for Complex Instruction (Cohen and Lotan, 2015) and is a general favorite among practitioners of cooperative training to help individuals think about the things they can all do to have the best discussion possible.

Virtual Engagement:

PART I: The Spaceship Voyage (half a 45-minute class period)

1. Start presenting the Teacher Slide Deck on slide 101. You can also click on the Task 4 tab on the right which will take you directly to this slide when you are in Present mode.
2. Summarize the importance of using structures and strategies during groupwork as explained in the Introduction to Task 4 above in order to make a group more efficient and productive.
3. Go to the next slide (102) and again share how working in groups can be advantageous when you take advantage of everyone's unique strengths.
4. Go to the next slide (103) and review the essential question (always the same) and the objectives for Task 3 which will take one 45-minute virtual classes.
5. Go to the next slide (104) and discuss the importance of **being concise, listening and paying attention to what others are saying, rephrasing and adding on to others' ideas,** and **everyone in the group participating.**
6. Go to the next slide (105) and explain that Part I of the task will introduce them to the scenario and get their discussion started.
7. Go to the next slide (106) and review the key points listed.
8. Have students navigate to the **Task 4 - Off Like A Rocket** assignment in Google Classroom and open up **Task 4 Part I Breakout Room Checklist The Spaceship Voyage** document and **Task 4 The Spaceship Voyage** document.
9. Put students into Breakout Rooms randomly of 4-5 per group, set the breakout room timer for 10 minutes, and send them off.
10. Go to the next slide (107). When students come back to the main room, facilitate a class discussion using the questions listed.

Task 4 Part II - Four-Stage Rocket (one and a half 45-minutes class periods)
NOTE: You will be able to start this part of Task Four but you will have to decide when to quit for this class period and finish during the next class period. You should be able to get one or two stages done.

11. Go to the next slide (108) and explain that we will now add some structure to the group discussions and fully utilize the groupwork behavior norms to make their groups more productive and efficient.
12. Go to the next slide (109) and talk through the four stages they will use to help their discussions take off like a rocket. Tell them this diagram is also in their Digital Student Notebooks for when they need to use it for future discussions.
13. Have students keep the **Task 4 The Spaceship Voyage** document open.
14. The Resource Person who is the timekeeper should have the stopwatch link still open. If not, put this link in the Chat for them. **https://www.timeanddate.com/stopwatch/**
    - **NOTE:** if the Resource Person feels like they are struggling to share their own thoughts and keep track of time, they can give the role of timekeeper to someone else in future stages.
15. Go to the next slide (110) and review the rules for this stage.
16. Change the timer to 5 minutes for the Breakout Rooms and then send them off to discuss.
17. After everyone returns from the Breakout Rooms, go to the next slide (111) and facilitate a whole class discussion about Stage 1 using the prompts given.
18. Repeat steps 15-17 for each of the stages and for the takeoff. Slides 112-119.
19. When done with the debrief of the whole process, go to the next slide (120) and assign students their extended learning.

Task 5 - Practicing Groupwork Skills to Construct Scientific Explanations

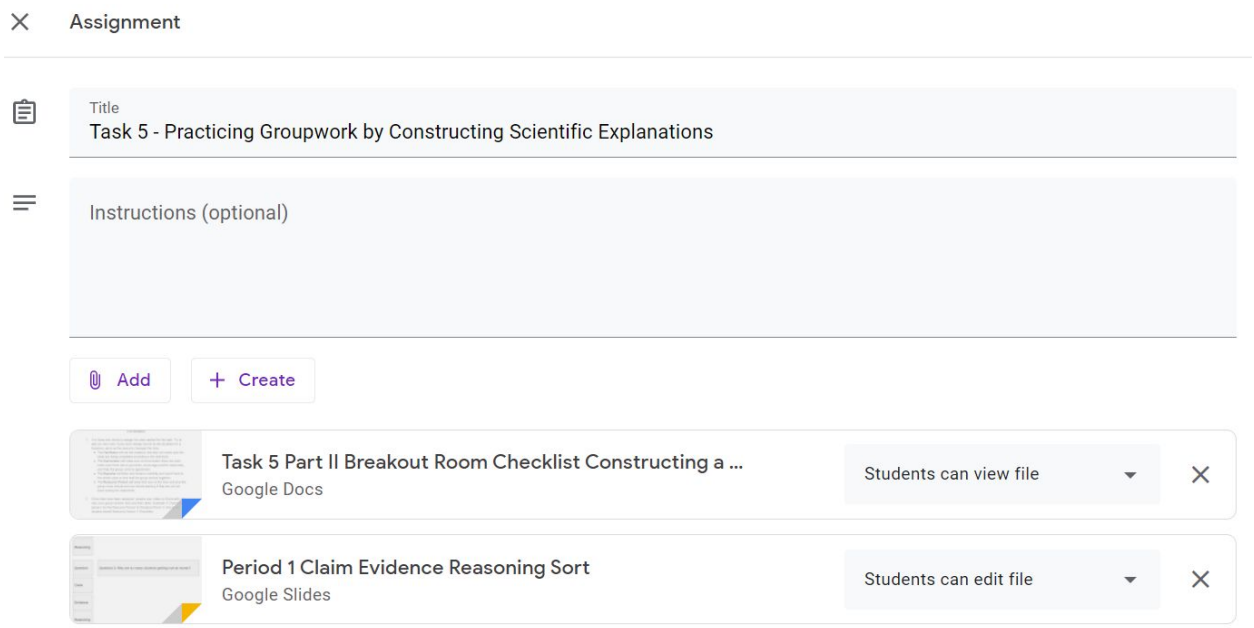
Timing: two 45-minute class periods

Google Classroom:

❏ Each class period will be manipulating the actual file for the Claim Evidence Reasoning Sort. Because of this, you will need to make a copy of the **Task 5 Original Claim Evidence Reasoning Sort** file for each of your classes. Rename the copies to indicate which class period is using them by replacing "Copy of Task 5 Original" with the class name. Example: **Period 1 Claim Evidence Reasoning Sort**; **Period 2 Claim Evidence Reasoning Sort**… and so on. If you are only using this in one section, then you will just need to make one copy of the original.

❏ Before beginning Task 5, you need to create an assignment for all students in each class called **Task 5 - Practicing Groupwork by Constructing Scientific Explanations**.

- You can decide if you want this assignment to be assigned points or if it is Ungraded.
- Add a copy of the file **Task 5 Part II Breakout Room Checklist Constructing a Scientific Explanation.** It should already be set to **Students can view file**.
- Add a copy of the Claim Evidence Reasoning Sort file specific for that class (example **Period 1 Claim Evidence Reasoning Sort**) and select **Students can edit file**. Again, because students in each class will be editing the file, you need to have a separate copy for each class.
- You can either put this assignment in the Stream by assigning it before you get to Task 4 or Schedule it to post on the day you expect to get to this part.



Teacher Demonstration Materials:

- Two clear cups
- One bucket or container containing 10 cups of water
- Empty bucket or container of the same size as the one above

Introduction to Task 5 (taken directly from Stanford unit)
Science is about understanding the natural world. Scientists try to explain how and why things happen in nature. To answer questions, scientists gather evidence by observing carefully, conducting tests, and gathering information. Scientists ask questions and work on problems like these:

- Why are polar bear populations rapidly declining?
- How and why does a star burn out?
- How can we combat the Zika virus?

In this task, students will apply the productive Groupwork Behavior Norms learned in the previous four tasks to understand how scientists explain phenomena and events that occur in the natural world. Students will practice constructing scientific explanations using simple questions and predetermined claim, evidence, and reasoning statements. The practice of making claim, evidence, and reasoning statements is not an easy task. Students will have many opportunities to practice using claim, evidence, and reasoning statements over the course of the year.

Background for Task 5 (taken directly from Stanford unit)
In this task, students are introduced to constructing scientific explanations.

- Scientists start by making a claim that can be tested.
- To test their claim, scientists gather evidence through careful observations and controlled experiments. They also review data collected by other scientists. Scientists evaluate and organize the evidence and combine it with their prior knowledge.
- This process enables scientists to use their powers of reasoning to show how the evidence supports or refutes their claim.
- The end result is a scientific explanation scientists can share with the world.

It is important to note that scientists often discover their initial claim was incorrect and is not supported by the data they gathered. When this happens, scientists revise their claim and conduct additional research to see if they can find a more reasonable explanation for what they are observing.

NOTE: For many students, using reasoning to defend a claim is often the most challenging part of learning to think like a scientist. Reasoning requires students to connect specific claims and evidence with overarching science concepts. The practice of identifying a science concept and then tying evidence to it takes practice.

Virtual Engagement:

Task 5 Part I: Constructing a Scientific Explanation (one 45-minute class period)

1. Start presenting the Teacher Slide Deck on slide 121. You can also click on the Task 5 tab on the right which will take you directly to this slide when you are in Present mode.
2. Summarize the importance of working in groups and constructing scientific explanations as explained in the Introduction to Task 5 above.
3. Go to the next slide (122) and again share how working in groups can be advantageous when you take advantage of everyone's unique strengths.
4. Go to the next slide (123) and review the essential question (always

the same) and the objectives for Task 5 which will take two 45-minute virtual classes.

5. Go to the next slide (124) and discuss the importance of **everyone helping.**
6. Make sure your teacher demonstration is set up and ready to use. You will need two clear cups and a bucket containing at least 10 cups of water. Have an empty bucket available to dump the used water into.
7. Go to the next slide (125) and introduce the concept of scientific explanations. Scientific explanations help us understand how the world works and include evidence so we can decide if the explanations are valid.
8. Go to the next slide (126) and present a claim that needs to be evaluated. The claim is that reduced-fat peanut butter is healthier than regular peanut butter.
9. Go to the next slide (127) and allow students to find evidence to support or refute the claim that the reduced-fat peanut butter is healthier by examining the food labels on the back of the containers. Have them put any evidence they find to support or refute the claim into the Chat.
10. Go to the next slide (128) and identify information on the labels to refute the claim. The uninformed consumer may think, “Great, I will buy the reduced-fat peanut butter because it is healthier.” The label supports the claim that the reduced-fat product has less fat than the regular product, but the label does not support the claim that the reduced-fat product is healthier. In fact, the label clearly shows that the reduced-fat product is actually higher in sugar and salt. So, the evidence suggests that it may actually be less healthy.
11. Slides 129 and 130: Summarize the parts of a scientific explanation, which may be different from an everyday explanation.
12. Lead students through an interactive construction of a scientific explanation using the cup of water demonstration. You should exit Present mode and have students open their Digital Student Notebooks. They should go to slide 31 and see they have the claim, evidence, reasoning explanations there.
13. Have students go to the next slide (32) and show them that you have a full cup of water in one hand held up in the air and another full cup of water sitting on the table.
14. Ask students to type their claim into their notebook about what will happen when you turn the cup you are holding upside down.

- **NOTE:** It is okay if you tell them that this will be a super easy one to figure out. You are not trying to trick them, just provide a simple example for practice.

15. Ask students to go to the next slide (33). Discuss the possible evidence that could be gathered.
    - Students know from experience what will happen when you turn a cup of water upside down: it will spill out. That is a valid observation. We can add validity to the observation by systematically collecting data. Lead students to the idea that to gather evidence, one should turn over the cup of water a number of times. The “control cup of water” is the one sitting on the desk. This cup proves that the water does not fall out of the cup by itself.
    - Discuss the meaning of the words observation, data, and evidence.
16. Have students complete the first prompt about what evidence they need to support their claim.
17. Perform the experiment dumping water out of the cup into the empty bucket below. Then fill the cup up with water from the supply bucket, hold it over the waste water bucket, and pour again. Repeat this 10 times making a big deal about how you can use the same water each time. It needs to be a full cup of fresh water to control variables.
18. Students should type their observations in at the second prompt on slide 33 in the their notebooks.
19. Have students go to the next slide (34) and have them complete the sentence starter. This should read something like: “When the cup was turned over 10 times, all ten times the contents spilled out and into the bucket below.
20. Have students go to the next slide (35) and discuss the possible reasoning that links the evidence to the claim.
    - What do you know about how the world works that explains why this happens?
        - Things typically fall down, not up.
    - What is the science concept that explains why the water spills out?
        - Students should say something about gravity, the force that attracts a body toward the center of Earth or toward another physical body having mass.
21. Have students go to the next slide (36) and type out their complete scientific explanation using the fillable sentence.
    - The statement should read something like “Water will spill out of an overturned cup is supported by it falling 10 out of 10 times from a

cup that was overturned by my teacher because when the cup is overturned gravity causes the water to fall downward."

22. Return to the Teacher Slide Deck and go to Slide Slide 131. Ask students the following questions:
    - Do you agree or disagree with this scientific explanations? Why or why not?
    - What might be some other interpretations of the evidence?
    - Are there other reasons or factors in the study that may impact the accuracy of the scientific explanation?
23. Discuss the validity of reasoning made from a claim. For example, in this slide (131), the experiment may not have controlled for socioeconomic issues. Children who eat a lot of leafy greens may live in areas with more access to fresh vegetables. Maybe some children can afford the vegetables and maybe some cannot. Also, some children may be getting more of other things, like more food in general, more nutritional food (less junk food), and more exercise.

Virtual Engagement:

Task 5 Part II: Practicing Constructing Scientific Explanation (one 45-minute class period)

1. Go to Slide 132 in the Teacher Slide Deck and start Present mode. Explain to students that today they are going to be practicing putting together claim, evidence, and reasoning statements.
2. Go to the next slide (133) and review the Groupwork Behavior Norms. Explain to students that they are going to be sorting claim, evidence, and reasoning statements which are all mixed up when they go into their breakout rooms. Ask them which norms they think will be most important to complete the task.
3. Go to the next slide (134) and show students how they are going to move the statements around when they go to their breakout rooms to take on the next groupwork task. Drag and drop the statements next to their labels as students tell you where to put them.
    - **Claim:** Pill bugs prefer to live in damp places.
    - **Evidence:** In our investigations, after 20 minutes, 25 out of 30 pill bugs…
    - **Reasoning:** Pill bugs prefer a damp environment because they need…
4. Talk through the claim, evidence, and reasoning that make up the scientific explanation about pill bugs.
    - The claim provides a possible answer to the question.
    - The evidence is data from an investigation and from reading materials.
    - The reasoning provides a justification that links the claim and evidence. It notes the science of the gills needing moisture to capture oxygen.
5. Go to the next slide (135) and review key points about this groupwork challenge.
6. Have students navigate to the **Task 5 - Practicing Groupwork by Constructing Scientific Explanations** assignment in Google Classroom and open up **Task 5 Part II Breakout Room Checklist Constructing a Scientific Explanation** document and **[Class name] Claim Evidence Reasoning Sort** document.
7. Put students into Breakout Rooms randomly of 3-4 per group (4 is preferred), set the breakout room timer for 15 minutes, and send them off.

8. Go to the next slide (136). When students come back to the main room, facilitate a class discussion using the questions listed about how their groups worked and what norms they noticed people using.
9. Go to the next slide (137) and discuss the three parts of a scientific explanation again.
10. Go through each of the next slides (138-141) and facilitate a discussion about the strength and validity of the scientific explanations the students just sorted.
    - Question 1 Scientific Explanation: This is a fairly strong scientific explanation because it uses multiple data points from what seems like a well controlled experiment to support their claim. It then references the need for energy from light for plants to grow which gives a scientific reason for what they found in their experiment.
    - Question 2 Scientific Explanation: This is a weak and invalid scientific explanation. It goes to correlation not necessarily indicating causation. That is to say, the fact that most the children getting hurt are drinking milk is likely not related to why they are getting hurt.
    - Question 3 Scientific Explanation: This is a replica of the experiment Galileo did off the leaning tower of Pisa. It would be stronger if there were more data points in the evidence and if the reasoning cited some science about why it might be the same time for them to fall.
    - Question 4 Scientific Explanation: The claim and evidence are fairly strong though more lines of evidence could be included. The reasoning should include the claim and evidence as part of the reasoning statement to make it stronger.
    - Go to the final slide (142) and assign students their final reflection pages in their Digital Student Notebooks.