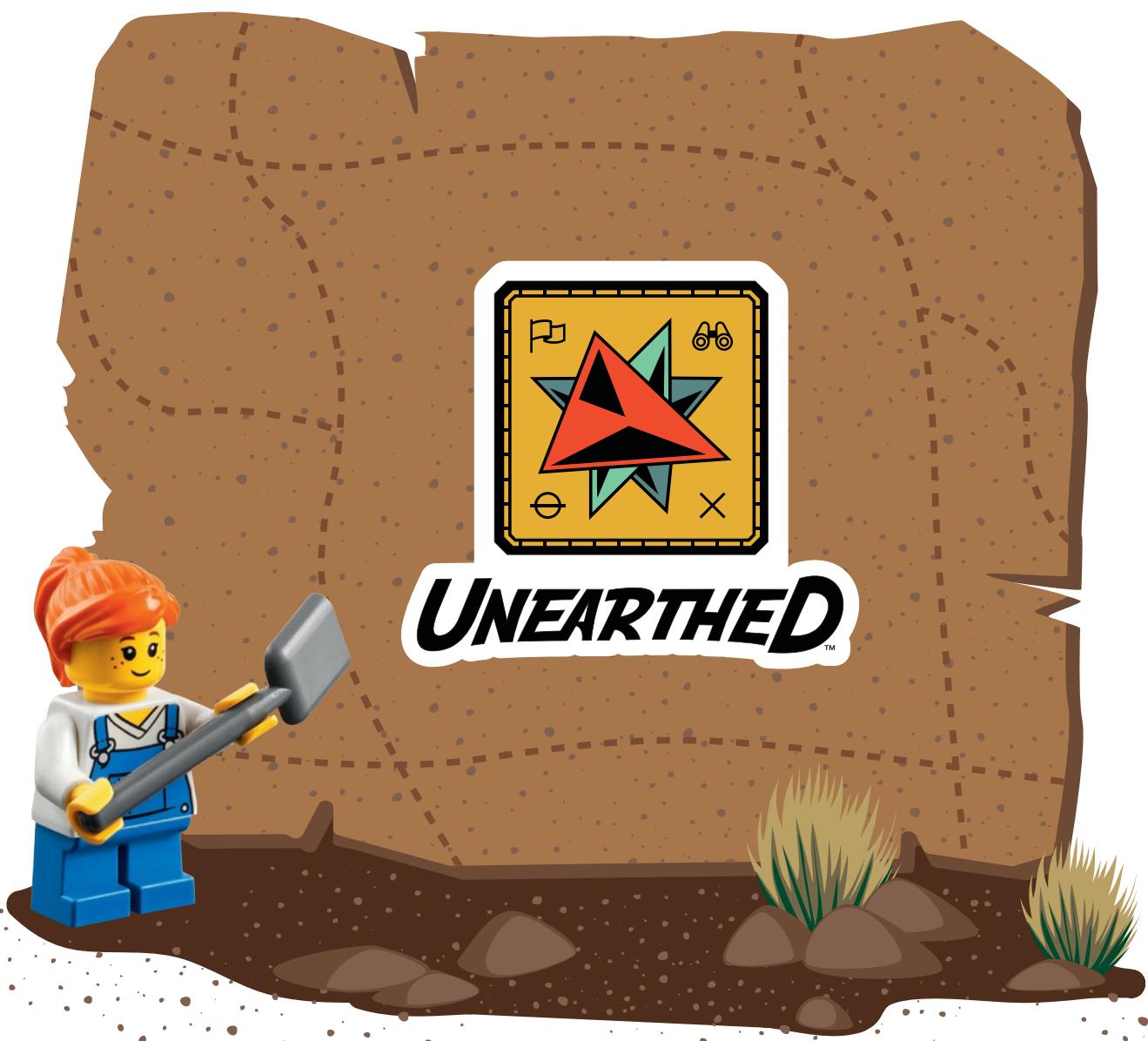


**FIRST®
LEGO®
LEAGUE**
EXPLORE

ENGINEERING NOTEBOOK



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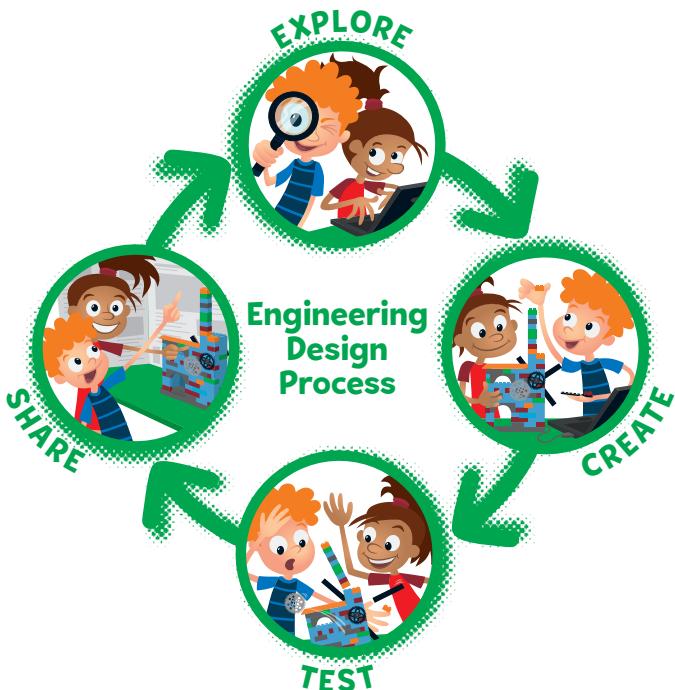


Welcome!

Team Members:

- 1.
- 2.
- 3.

- 4.
- 5.
- 6.



Get ready for an archaeology adventure! This season, you and your team of junior archaeologists will help solve mysteries about the past. As a group, you will explore dig sites and study cool artifacts left by people who lived long ago.

Use your LEGO® Education SPIKE™ Essential set to develop your coding skills, create awesome models, and share what you learned on your team poster at the festival!



Explore Story



What Do Archaeologists Do?

Learn about more jobs and technology related to archaeology on pages 28-29.

Archaeologist

Archaeologists are storytellers of the past. Archaeologists do lots of different jobs to help people learn about the past. They may do research, excavate or dig up treasures from underground, study in a lab, or manage collections of ancient artifacts.



Lab Technician

Lab technicians help organize the things that archaeologists find. They carefully clean and measure the objects, and they sometimes put broken pieces back together like a puzzle. Microscopes, cameras, and 3D printers are some of the things that might be used in the lab.



Learning about how people used to live can help us make better decisions in the future. Archaeologists might want to know:

- Who lived there?
- What kind of houses did they build?
- What did they eat?
- What tools did they use?
- What games did they play?

Team Progress

Come back to these pages throughout your season to update your team's goals and your own and to share your progress.

My goals for this season are...

**START
HERE!**

So far, I have learned...
I want to learn more about...

What has been the most surprising thing you have learned?

**HALFWAY
THERE!**

I am proud of my team because we...

**FESTIVAL
TIME!**

What is your favorite feature of your team model?

Core Values

Draw or write an example of your team using each Core Value when directed in the sessions.

You will develop new skills as you work together.

DISCOVERY

We explore new skills and ideas.

INCLUSION

We respect each other and embrace our differences.

INNOVATION

We use creativity and persistence to solve problems.

TEAMWORK

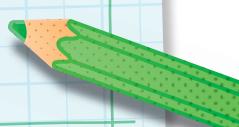
We are stronger when we work together.

IMPACT

We apply what we learn to improve our world.

FUN

We enjoy and celebrate what we do!



Session 1

Activity 1 Tasks

- Gather with your team and pick a team name for the UNEARTHED™ season.
- Look at the Explore story on page 4. Look closely at each picture and think about what the characters might be thinking or doing.
- Share what you know about archaeology with your team.
- Write or draw what your team shared.
- List your team goals on page 6.

Your team needs:

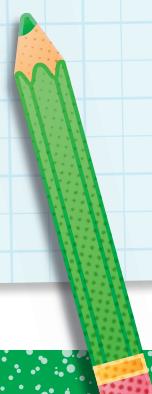


What words do you know that relate to archaeology?

What happened in the Explore story?



Archaeologists are scientists that study how people lived in the past!

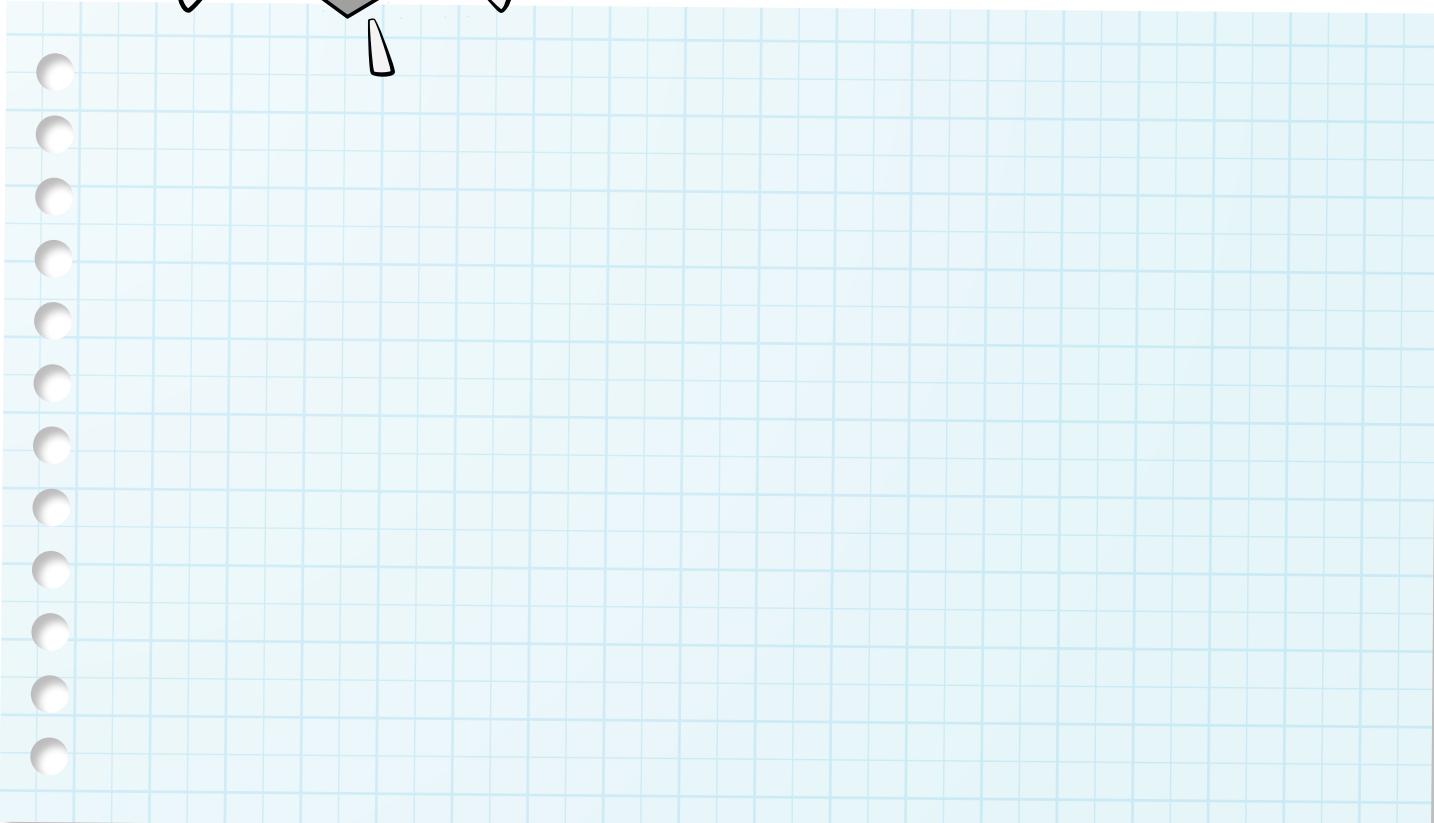


Your team needs:



The prototyping pieces from the Explore set are in Bags 7-12. They will be used in building activities.

Sometimes archaeologists don't have all the information they need to rebuild an artifact. Technology can be used to imagine what artifacts looked like in the past.



Archaeology Adventure

Activity 2 Tasks

- Divide your team into two groups and share the prototyping pieces.
- Build a small artifact. What did your teammates build?
- Put the artifact on the mat.
- Draw a picture of the artifact you built.

Challenge

- Take the artifact apart and trade your pieces and drawing with another group.
- You are an archaeologist who made an amazing discovery. The artifact you found is in many pieces and needs to be put back together. A drawing of the artifact was found. Will it help you put it back together?
- Rebuild the artifact based on the drawing. Did your group rebuild the artifact correctly?

Session 2

Activity 1 Tasks

- Look at the archaeological process on page 30.
- Talk to your team about how archaeologists choose where to dig.
- Use Bag 1 and Book 1 to build the radar model.
- Place the radar model on the mat.
- Take turns moving the model to different locations on the mat. What kind of artifacts could be detected by radar?
- Talk to your team about other tools used by archaeologists. What tools are needed for digging? What tools are used to document or study artifacts?
- Write your ideas below.

Your team needs:



A dig site is a place where archaeologists remove, or excavate, artifacts from the ground.

Tools like radar help find artifacts that are lost or buried deep underground. An excavator might be used to dig up a large area.



Some tools used by archaeologists are ...



Your team needs:



Leave the excavation model assembled at the end of the session.

Page 31 shows pictures of the model being taken apart.

Archaeologists search for items from long ago, like artifacts or relics. They might find pottery, coins, tools, or even old toys.

Relic Rescue

Activity 2 Tasks

- Use Bags 2-5 and Book 2 to build the excavation model.
- Place the model on the mat.
- Explore the layers of the excavation model. Use the archaeology tools to remove pieces. What artifacts can be found inside?
- Talk with your team about the artifacts inside the excavation model. How do you think these were used?
- Practice removing layers and excavating the model. Can you put it back together?
- Look at the different rooms within the model and discuss with your team how they were used.

Challenge

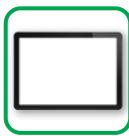
- Excavate the model carefully to retrieve one of the artifacts.
- Put the model back together and challenge another team member to excavate another artifact. Make sure everyone has a turn.
- Share what you learned about artifacts and excavating.

Session 3

Activity 1 Tasks

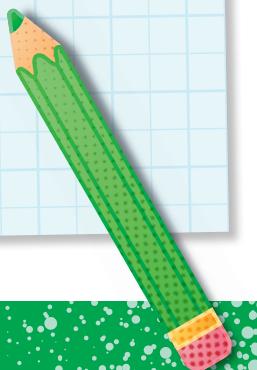
- Open the SPIKE App on your team's device.
- Complete Coding Lesson 1 in the *FIRST® LEGO® League Explore Unit – Classic Carousel*.
- Change the program so the carousel rotates in the opposite direction.
- Talk with your team about how this model could help an archaeologist. What changes would you make?
- Write your ideas below.

Your team needs:



Archaeologists look for clues to find the best places to dig. They use old maps and technology to learn where people lived a long time ago.

- An archaeologist could use this to...
-
-
-
-
-
-
-
-
-



Your team needs:



Surveys help map the locations of sites and artifacts to understand how the people that once lived there used the land.

Drones can be flown above an excavation site to help create maps or to find new places to dig.

Site Surveyors

Activity 2 Tasks

- Change the carousel model so an archaeologist can use it at an excavation site. You could build one of the ideas you had in Activity 1.
- Select an artifact on the mat that interests your team.
- Place the model on the mat near the artifact.

Challenge

- Open the SPIKE App on your team's device.
- Change the program so that the model rotates and stops above the artifact you selected.
- Share what you built and explain how you coded the model.

Write your program here:

A large sheet of graph paper with a grid pattern, intended for students to write their program code on.

Session 4

Activity 1 Tasks

- Open the SPIKE App on your team's device.
- Complete Coding Lesson 2 in the FIRST® LEGO® League Explore Unit – Animal Alarm.
- Change the program so that a different color will display on the alarm.
- Talk with your team about how this model could help an archaeologist.
- Write your ideas below.

Your team needs:



Sensors can help archaeologists detect things that can't be seen with our eyes.

How can sensors help us learn more about artifacts?

Sensors can help an archaeologist...



Your team needs:



Archaeologists use sensors to study artifacts without damaging them. Some sensors can detect what materials are present or if something is hidden inside.

Dirt Detectives

Activity 2 Tasks

- Change the **Animal Alarm** model so that it can be used to inspect artifacts. You could build one of the ideas you had in the previous task.
- Select an artifact on the mat or any object your team will investigate.

Challenge

- Change the program so the model will play a sound when your artifact is detected by the sensor. You could also change the light pattern.
- Share what you built and explain how you coded the model.

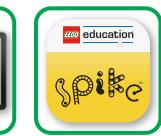
Write your program here:

Session 5

Activity 1 Tasks

- Open the SPIKE App on your team's device.
- Complete Coding Lesson 3 in the *FIRST® LEGO® League Explore Unit – Arctic Ride*.
- Change the program so that the model will drive in reverse.
- Talk with your team about how this model could help an archaeologist.
- Write your ideas below.

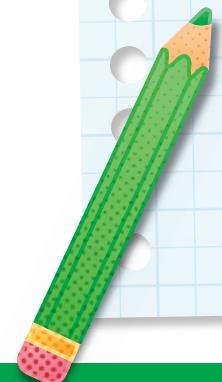
Your team needs:



Trucks, cars, excavators, and cranes are all vehicles you might find at an excavation site.



An archaeologist could use this to...



Your team needs:



Archaeologists use vehicles to carry away dirt or to move old artifacts.



Excellent Excavators

Activity 2 Tasks

- Change the **Arctic Ride** model so that it represents a vehicle used by an archaeologist. You could build one of the ideas you had in the previous task.

Challenge

- Select two artifacts on the mat.
- Change the program so your model will drive between the two artifacts. Try to stop your model on the artifact.
- Share what you built and explain how you coded the model.

Write your program here:



Session 6

Activity 1 Tasks

- Talk to your team about tools used by archaeologists. What tools are needed for digging? What tools are used to document or study artifacts?
- Write your ideas below.
- Select a tool to build with your team.
- Use the prototyping pieces to create a tool used by archaeologists.
- Put the tool on the mat.

Challenge

- Build a total of three tools that your team thinks an archaeologist would use at an excavation site.
- Talk to your team about how each of the tools are used.
- Share what you built with your team.

Your team needs:



Look at the jobs on pages 5, 28, and 29 to see what tools and technology are used in archaeology.



Some tools used by archaeologists are...



Your team needs:



Signal Seekers

Activity 2 Tasks

- Locate the radar model from Session 2 or use Bag 1 to build it.
- Use the building instructions in Book 1 to attach the hub and the sensor to the radar model.
- Open the SPIKE App. Try the program you used in Session 4 on the radar model.
- Take turns moving the model to different locations on the mat. What kind of artifacts could be detected by radar?

Challenge

- Program the model to display a different light pattern.
- Talk to your team about other tools used by archaeologists. What tools are needed for digging? What tools are used to study artifacts?
- Write your ideas below.



Some tools for digging and studying artifacts are...



Session 7

Activity 1 Tasks

- Explore the archaeology jobs on pages 5, 28, and 29.
- Pick a job that interests you. What kind of training does it require? What kind of tools are used?
- Write or draw your ideas below.
- Use the pieces in the Explore Set to build an example of the job you selected.
- Share your ideas with your team.

Your team needs:



Archaeologists carefully study ancient artifacts and solve real-life puzzles to uncover the stories of people from long ago!



My ideas:



Your team needs:



Archaeologists work as a team and must rely on good communication and teamwork to be successful.



History Helpers

Activity 2 Tasks

- Locate excavation site model from Session 2 or use Bags 2-5 and Book 2 to build it.
- Use the building instructions in Book 2 to attach the hub and motor to the excavation site model.
- Open the SPIKE App. Try the program provided in Book 2 to activate the millstone inside the excavation site model.

Challenge

- Pick a job for each person on the team and imagine you are all working at the excavation site.
- Program the model to move in a different way.
- Use the prototyping pieces to add to the model so that it represents your team.
- Talk to your team about your role at the excavation site.
- Share what you built with your team.

Session 8

Activity 1 Tasks

- Talk to your team about what you have learned about archaeology.
- Check the required parts of the team model on the next page.
- Design a team model that shows a team of archaeologists excavating artifacts on the Explore mat.
- Draw your ideas for your team model below. Label the different parts.

Activity 2 Tasks

- Create your team model together on the Explore mat.
- Talk about the different parts of your model.

Your team needs:



It's time to build your team model! Your team model will be presented to reviewers at the festival.

Draw and label your team model:



Team Model

Requirements

Include an archaeologist, an excavation site, tools, and a special artifact.

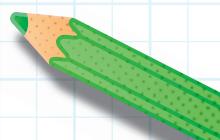
Think about what the archaeologists have found. What was life like for the people that once lived here?

Include all parts of the Explore Set and mat.



Use only LEGO® elements.

Use SPIKE™ Essential to motorize any part of your model.



Session 9

Activity 1 Tasks

- Talk to your team about what you will include on your team poster.
- Use the next page to draft your ideas.

Activity 2 Tasks

- Decide how your team will create the poster and determine what supplies you will need.
- Gather your poster board and supplies.
- Create your team poster. The whole team should help create it.

Your team needs:



Your team poster should describe your team's journey throughout the sessions.



Team Poster

Team Poster Idea Page

Include how you worked together as a team, what you learned about archaeology, what you built as your team model, and anything else you want to share!



In the next session,
you will prepare for
the Explore Festival.
You should have your
team model and team
poster completed.

Session 10

Session Tasks

- Gather your completed team model and team poster.
- Talk about how your team will share what you learned with the reviewers.
- Complete the next page.

It's almost time for the
FIRST® LEGO® League
Explore festival!

At the festival,
reviewers will ask you
about what you learned
and give you feedback.
They will ask questions
about your team model
and your team poster.

Sample Festival Roles

I'm going to
share what we
explored.

I will
describe the
team model.

I will explain
the program and
how it motorizes
the team model.

We will show how the
poster captures our
team journey!

I can reflect on
how our team used
Core Values.



Prepare for Your Event

What I Will Share with Reviewers

- Can you describe your team model?
- Explain how your team used innovation and creativity to explore archaeology.

- What did you learn about the season theme?
- How did you use Core Values?

- What part of your team model is motorized?
- How did you code your motorized part?

- What did you include in your team poster?
- How does the poster show your team journey?

Let's celebrate how well
your team worked together!
It is much more fun when
everyone on the team is
included.



Jobs and Technology



Anthropologist

Anthropologists are interested in how people lived in the past. They work closely with archaeologists to study human history and how people have changed over time. They study human-made artifacts and use clues from the site to interpret how the objects were used long ago.



Site Manager

The site manager makes sure everything runs smoothly at the dig site. They help keep the people and supplies organized so the team can work efficiently. If something exciting happens, the site manager might be the first person called. They also take care of the vehicles and help get people to and from the site.

Exploration Questions:

(Recommended to use during Session 7.)

Look at the jobs on these pages. Choose a job, learn about it, and discuss the questions below with your team.

- What are some of this job's daily tasks?
- What education or training is required?
- What makes this job exciting?
- What kind of tools or technology are used?



Conservator

A conservator is an expert in fixing and protecting artifacts so they can be studied for a long time. When artifacts are found by archaeologists, they may be dirty, damaged, or in multiple pieces. Conservators may have to work quickly because some artifacts can fall apart if they are not treated carefully.



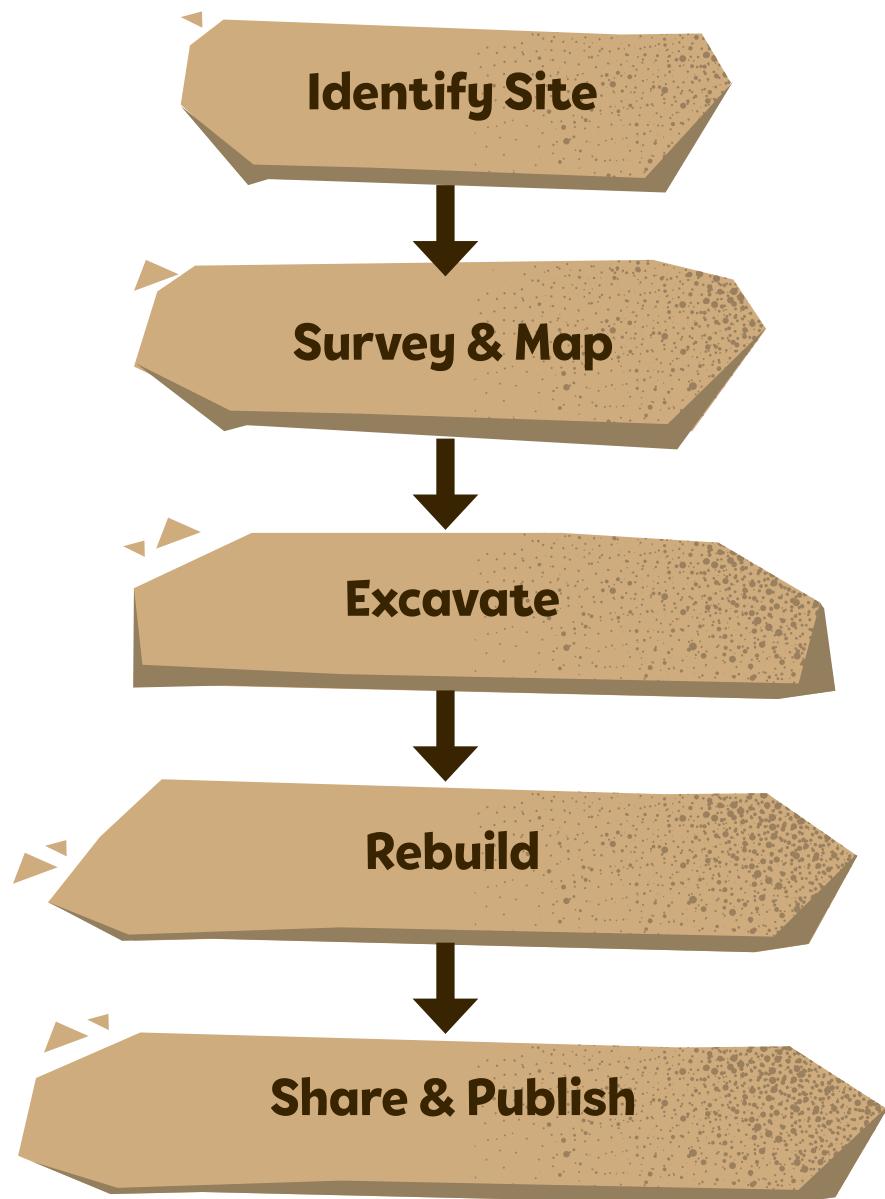
Geologist

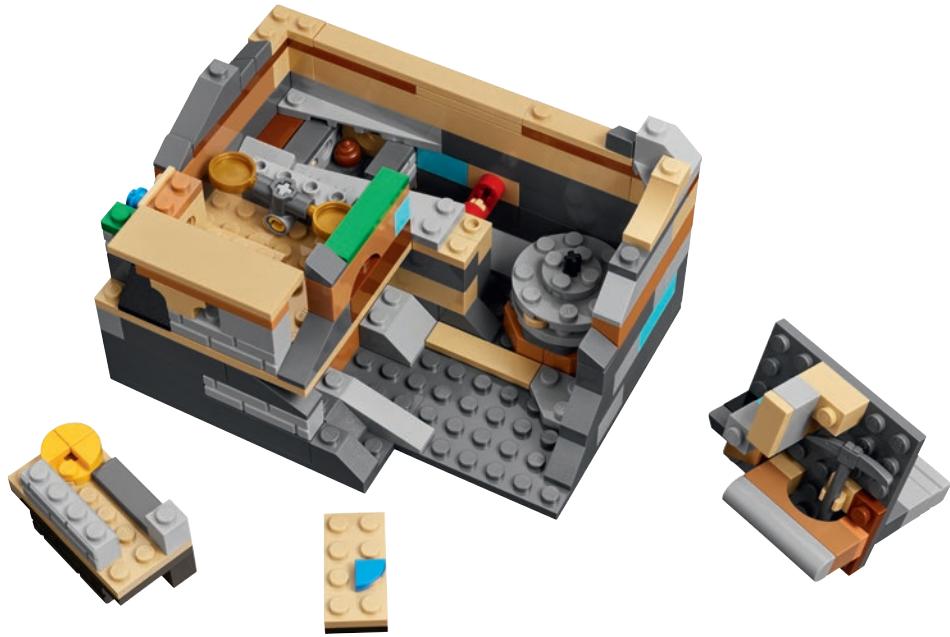
Geologists help at dig sites because they are experts in rocks and soil. They can figure out how old the rocks are to help understand how the site has changed over time. Geologists can help the team know where to dig and what tools might be necessary.

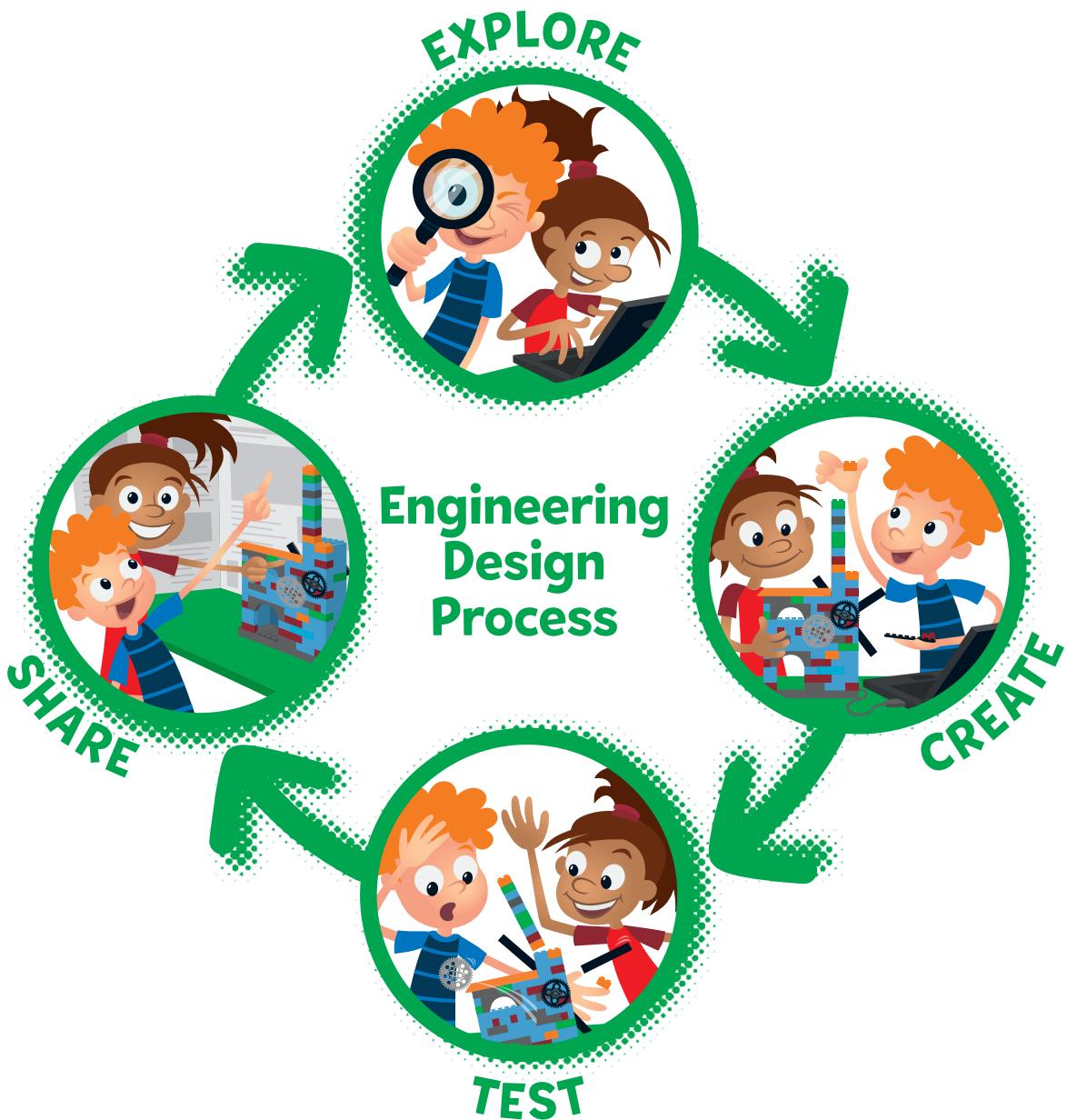
Other jobs related to archaeology:

- Paleontologist
- Museum Curator
- Historian
- Conservationist
- Illustrator
- Educator

The Archaeological Process







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