Lesson 4: Tool Makers

2 million years ago, East Africa

Today, we are learning that humans made stone tools two million years ago and showed each other how.

Welcome back, Time Traveler! Today, you are traveling to East Africa about two million years ago. More than a million years have passed since you met Lucy.

Touch your Time Travel Passport. Close your eyes. Ready? Let's go.

Open your eyes. You are standing on wide grasslands. The sun beats down, hot and bright. The air feels dry. Golden grass stretches in every direction.

The world has changed since the time Lucy lived. In many places, grasslands have spread, and forests are not as thick as they once were. There are fewer fruits hanging within easy reach.

What problem might that cause for a family living here?

Look around carefully. Do you see them? There, near the rocks. They look a little like Lucy, but also different. The adults are taller, about four feet tall. Their faces do not stick out as much. Their teeth are smaller.

This is a special moment in history. These are some of the earliest known members of *Homo*. Scientists call them *Homo habilis* (HO-mo HAB-ill-iss). The name means "handy human."

Homo habilis forensic facial reconstruction.

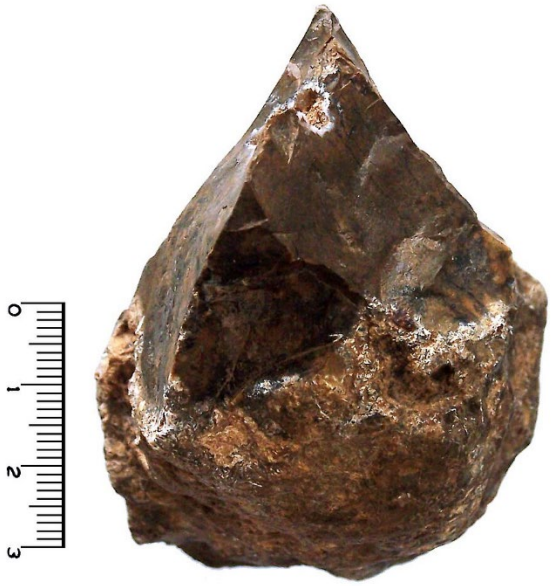
Now, imagine you are one of these humans, walking across the grasslands on a hot afternoon. Your stomach growls. You are hungry. In the distance, you spot something. It is the remains of an antelope left behind by a big cat. There is still meat clinging to the bones.

There is a problem, though. Your teeth and nails are not strong enough to cut through the thick hide. You cannot crack open the bones to reach the food inside. Most animals would give up and walk away.

As a *Homo habilis*, you can notice a problem, imagine a solution, and act on it. The tools you leave behind are how anyone will know it.

There are rocks within your arms' reach. You grab two of them. CRACK! You hit one rock against the other and a flake falls away. Look at the edge of the rock. It is sharp enough to cut. You use the new edge to slice meat from the bones. You then crack the bones open to get to the marrow inside.

This is the kind of carefully made stone tool *Homo habilis* and their close relatives used. Tools like these are called Oldowan tools. Oldowan tools are named for Olduvai Gorge in Tanzania, where scientists first identified and named this style of stone tool. Oldowan tools also helped scrape a hide clean, or crack open a hard nut, or dig stubborn roots from the ground.



A tool is something a person makes or shapes to do a job. Tools like this one that was found in Olduvai Gorge are called Oldowan tools.

Over many years, *Homo habilis* used certain kinds of rocks again and again, especially rocks that broke into good sharp edges. When scientists look at these tools, they can see that the stones were struck in careful, repeated ways. That tells us these humans had learned which stones worked best and how to strike them. But did these humans have to figure everything out alone?

Scientists cannot know exactly who taught whom. No one wrote it down. But making stone tools takes practice. A person has to choose the right stone, hold it at a good angle, and strike it in just the right place. Because tools like these were made again and again, these humans learned by watching others, copying what they did, and practicing with their own stones.

Look over by the rocks. A small girl, maybe six or seven years old, is sitting next to her grandmother. Her grandmother has one stone in each hand. The girl is watching closely. Her grandmother turns the stone, looking for the right angle. She taps it gently, then strikes harder.

Tap. Tap. CRACK!

A flake falls away. Her grandmother holds up the new sharp edge. She places a stone in the girl's small hands and guides her fingers into position. She shows the girl where to strike. The girl tries, but her first hit does nothing. Her second hit knocks a tiny chip loose. She looks up. Her grandmother nods.

This is something humans do. They show what they know. The grandmother learned from her elders, who learned from hers. One day, the girl will teach others what she has learned. Knowledge passes from one generation to the next, hand to hand, stone to stone.

Why might it matter if older people showed younger people how to make tools instead of each person having to figure it out all alone?

How do we know *Homo habilis* and their relatives really made tools like this? At a place called Gona, in Ethiopia, scientists found stone tools even older than the time in our story. Some were about 2.6 million years old.

The scientists looked closely at the stones. Some were cores, the larger rocks that sharp pieces were knocked from. Others were flakes, the sharp pieces that broke away. The sharp flakes fit back onto the cores like puzzle pieces. That tells us something important. These stones did not just break by accident. Humans or their close relatives made them on purpose.

These tools are artifacts. They help us understand what humans made and how they lived.

Lucy lived more than a million years before this. In all that time, the bodies of some hominins slowly changed. The taller bodies, the smaller teeth, the bigger brains you saw today did not appear all at once. They came about very slowly, across a long stretch of time. *Homo habilis* belongs to the same group modern humans belong to, the group scientists call *Homo* meaning human. They were one branch in the long human story. The *Homo* group has had many kinds of humans in it.

Touch your Time Travel Passport again. Close your eyes. Open them. You are home, but now you know that two million years ago, humans made stone tools and showed one another how.

Meanwhile, across the world…

Around two million years ago, in France, a kind of mammoth called the southern mammoth walked through warm forests. It was big and slow, with long curved tusks for reaching and stripping branches.

Far to the east, in China, wide grasslands were spreading where forests once stood. Ancient horses ran across these open plains. The grasslands looked a little like the ones where *Homo habilis* was learning to make tools.

In the cold north, in Russia, winters were long and hard. The ground was frozen most of the year. Reindeer moved across the open land in big groups. It would be a very long time before any human stood on that frozen ground.

Two million years ago, humans were only in one part of Africa, learning to crack stones into sharp edges. Most of the planet did not know we were here yet.

Lesson 4: Tool Makers

In This Lesson

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☐ Think Like a Historian

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☐ Writing About History

The Dig Site

Tool Discovery

Part 1: The Hands That Make Tools

Pick up a button using only your thumb and one finger.

Now try it with no thumb, using only your four fingers. Much harder.

Your thumb presses against your fingers so you can pinch, grip, hold, and turn things. *Homo habilis* had hands that could do this too. It helped them make and use stone tools.

Part 2: Tool Hunt

Go outside and find three natural objects that might work as tools:

- A sharp stick with a pointed end.
- A flat rock, smooth and wide.
- A pointed rock with edges or a sharp tip.

As you search, think: Could *Homo habilis* have used something like this?

Part 3: Test Your Tools

Put your cardboard on the ground.

- Sharp stick: Try poking, try scraping.
- Flat rock: Try pounding, try crushing.
- Pointed rock: Try scraping, try a light cut.
- Try each one for digging.

If you were *Homo habilis* and needed to cut meat or scrape a plant, which tool would work best? Did any tool not work the way you expected?

Tool Discovery Worksheet

Draw each tool you found. Write what it is good for.

Tool	Drawing	What it is good for
Sharp stick		
Flat rock		
Pointed rock		

Which tool worked best for cutting or scraping?

_____

Which tool worked best for digging?

_____

Think Like a Historian

Thinking Tool: Evidence

Evidence is a clue that helps answer a question.
Strong evidence is a clue that answers the question more directly, so you can trust it more.
Weaker evidence is a clue that helps a little but leaves more uncertainty.

While out hiking, you found a sharp rock. It made you wonder: Is this a tool? Scientists have to ask that same question carefully. A sharp rock is not always a tool. Some rocks break sharply all on their own.

So here is the question:

Did a hominin make this rock into a tool?

A detective asks two things about every clue. Does it help answer the question? And how much can I trust it?

1. Here are four clues. For each one, decide.

Clue	Does it help?	If it helps, how strong?
The rock has one sharp edge.	☐ Helps ☐ Does not help	☐ Strong ☐ Weak
Many flakes were knocked off the same way, all around the edge.	☐ Helps ☐ Does not help	☐ Strong ☐ Weak
The rock was found next to bones with cut marks.	☐ Helps ☐ Does not help	☐ Strong ☐ Weak
The rock is a pretty color.	☐ Helps ☐ Does not help	☐ Strong ☐ Weak

2. One sharp edge is a weak clue. Why?

○ A. Sharp edges are boring.
○ B. Rocks can break sharply on their own, so one sharp edge does not tell you a hominin did it.
○ C. The rock is too small.

3. Which would make scientists more sure a hominin made the tool?

○ A. Finding one sharp rock.
○ B. Finding many flakes knocked off the same way, and cut-marked bones nearby.

4. Write it or say it.

You found one sharp rock on your hunt. Is that enough to know a hominin made it? Why or why not?

Words to Know

Homo

A group on the human family tree. Every member of *Homo* is a human.

Homo habilis, *Homo erectus*, and *Homo sapiens* all start with the word *Homo*. Say one thing you know about all three because of that.

_____

Homo habilis

A kind of human who lived about 2 million years ago. The name means "handy human."

Scientists named *Homo habilis* for something they kept finding beside the bones. Say what it was, and why it earned that name.

_____

tool

An object used to do a job. A person can make it, shape it, or choose it because it works for that job.

You need to dig a hole and you have no shovel. Name something outside you could use as a tool, and say what makes it work for the job.

_____

archaeologist

A scientist who studies places where people from long ago left things behind, like tools, bones, and buildings, to find out how they lived.

An archaeologist digs up your kitchen one thousand years from now. Name one thing they would find, and one thing about your life it would tell them.

_____

Writing About History

In this lesson, you met *Homo habilis*, the toolmakers whose name means handy human. **Add the detail each sentence asks for. Then, write an expanded sentence that includes the detail.**

Homo habilis lived.

when: _____

_____

_____

- When asks about a time.
- The when part goes at the start of the sentence. A comma comes after the when part.

Homo habilis used tools.

why: _____

_____

_____

- Why asks about a reason.
- When expanding with why, use because.

Write a statement that answers the question below.

If you could travel back 2 million years, what is one question you would ask these toolmakers?

_____

_____

- A question starts with a capital letter and ends with a question mark.

Unit 2: Your Cousins and You

Lessons 3 to 8, from 3.2 million to 80,000 years ago.

Unit 1 established that your learner and their family belong to history. Unit 2 extends that history millions of years into the past and introduces two forms of change that shaped the human family. Biological change occurred across generations through inherited traits. Skills and knowledge could be learned, taught, shared with people outside a biological family, and passed to later generations.

The unit begins with biological adaptation. Lucy's skeleton and the Laetoli footprints provide evidence that *Australopithecus afarensis* walked upright. Walking on two feet left the hands available to carry food, stones, and young children. Lesson 4 then moves to learned skill as *Homo habilis* makes stone tools and a grandmother guides a girl's hands while teaching her where to strike the stone. Lesson 5 follows a *Homo erectus* family maintaining a hearth, banking the fire at night and building it up again in the morning.

Lesson 5 makes explicit the distinction the preceding lessons have been developing. Biological adaptations develop across generations through inherited traits. Toolmaking, firekeeping, and other skills must be learned. Because knowledge can be taught, it can spread among people living at the same time and pass from one generation to the next. Later generations can preserve, modify, and add to what other people learned.

The lessons proceed in chronological order. The human family branches. Different hominins lived in different places, sometimes at the same time, and some branches ended while others led to later humans. When the earliest known *Homo sapiens* appear in Africa about 300,000 years ago, the human family is already millions of years old. Other hominins had walked upright, made tools, maintained fire, and shared knowledge long before our species appeared.

Lesson 7 introduces another way knowledge could be shared and preserved. At Blombos Cave, someone grinds ochre and draws a crosshatched design on a stone flake. Other people select small shells, pierce them in similar places, and string them as beads. These finds provide evidence of symbolic thinking. People could make marks and objects whose importance depended on meaning, although the evidence cannot recover what the design meant or what the beads communicated to the people who wore and saw them.

Lesson 8 then shows learned knowledge being used to organize life in different ways. One family moves with migrating animals because important sources of food move. Another

remains where fish, reeds, water, and other resources are dependable throughout the year. Both ways of living require detailed knowledge of the land and seasons, and the two communities trade with each other. They are different responses to different conditions.

Your learner works with the evidence for this history and learns that each kind answers some questions while leaving others open. Bones and footprints establish that *Australopithecus afarensis* walked on two feet, but the smallest Laetoli footprint does not establish that its maker was a child. One sharp rock is weak evidence of toolmaking because rocks can break sharply on their own, while many flakes struck in consistent ways beside cut-marked bones provide much stronger evidence. The Blombos finds establish deliberate drawing and beadmaking and provide evidence of symbolic thought, but they do not reveal the meanings people gave them.

Both inherited biological change and learned knowledge shaped the branching human family. Knowledge could be taught, preserved, represented through symbols, and used to organize life in different ways. These are your learner's relatives, and the deep past is not a story about someone else. Unit 3 follows *Homo sapiens* communities as some move beyond Africa.

LESSON 4: Tool Makers

2 million years ago, East Africa

Objective

In this lesson, your learner hunts for natural objects that could work as tools and tests what each one does, and uses Evidence to weigh four clues about whether a hominin shaped a rock. Your learner also expands sentences with when and with why using because.

Materials

For The Dig Site:

- Crayons or colored pencils

For Tool Discovery:

- Access to outdoors, a yard, park, or natural area
- Thick cardboard or an old magazine to test tools on
- A small object for the grip test, such as a button, coin, or pebble
- Pencil

Suggested Schedule

Advance Prep: Before Session 2, choose a safe outdoor location and gather the cardboard and grip-test objects.

Session 1	Read the lesson. The Dig Site. Time Travel Passport.
Session 2	Tool Discovery. Think Like a Historian.
Session 3	Words to Know. Writing About History.

Using the Time Travel Passport

Map: Find Gona and color it. **Write**: Homo habilis, 2 million years ago. **Stamp**: Early Tool Makers. **Leaf**: *Homo habilis*.

Teaching Note

In this course, members of the genus *Homo* are called humans.

The Dig Site

The picture shows an archaeological dig site. Archaeologists study places where people or ancient relatives left things behind. The scene includes parts of the natural environment, modern tools used by archaeologists, and possible finds from the past. Have your learner color the scene and examine the numbered finds. Then circle one object that might be an artifact.

Tool Discovery

Caution: Your learner should not pick up glass, metal, thorns, rusty objects, or extremely sharp rocks. Test objects gently on cardboard, never on skin, clothing, furniture, plants, or living things.

Follow the directions in the workbook. Give particular attention to Part 1. Before your learner goes outside, have them try the button both ways and say what the thumb is doing that the four fingers cannot.

As they test, ask why a tool worked or failed rather than which one won. A tool that did not work the way they expected is the more useful result, and the Think Like a Historian page builds on it.

Think Like a Historian

This page asks your learner to decide how strongly each clue supports the claim that the rock is a tool. One sharp edge is weak evidence because a rock can break that way naturally. Repeated flakes beside bones with cut marks are strong evidence of deliberate toolmaking. The rock's color does not help answer whether a hominin shaped it.

1. Sharp edge: helps, weak. Many flakes knocked off the same way: helps, strong. Found beside cut-marked bones: helps, strong. Pretty color: does not help.

2. B. 3. B.

4. No. A rock can break that way with no hominin involved. Look for the reason, not just the no.

A sharp edge feels like the obvious clue, but rocks break sharply on their own, so by itself it leaves too much uncertainty. Repeated flakes and cut-marked bones answer the question more directly.
The pretty-color clue is true, and it is interesting, but it has nothing to do with the question. A learner who marks it "helps" is being pulled by an interesting fact instead of the question.

Words to Know

***Homo*:** They are all humans and members of the group *Homo*.

***Homo habilis*:** Scientists kept finding stone tools beside the bones. The tools made *Homo habilis* seem "handy," so it was named "handy human."

tool: *Example*: a strong, pointed stick because the point could push into the ground.

archaeologist: Accept any object likely to survive together with a reasonable conclusion about the learner's life.

Writing About History

This exercise asks your learner to expand sentences by adding when and why. A why detail uses because to state a reason. This is useful in history because a claim should be followed by the evidence or reason that supports it.

when: 2 million years ago.

Expanded sentence: Two million years ago, *Homo habilis* lived.

why: because they needed to cut meat, scrape plants, or dig.

Expanded sentence: *Homo habilis* used tools because they needed to cut meat, scrape plants, or dig.

Question: Answers vary.

Watch for: a when sentence with no comma, or when placed in the middle instead of the front.

Watch for: a why answer that drops because. *Homo habilis* used tools to cut meat is a fine sentence, but it is not the skill on the page.

What Is Deep History?

You just traveled back ten thousand years, and you are about to go much farther.

Before you do, there is a word you should have.

History is the story of what happened to people. You know that from Lesson 1. Some of that story is easy to reach. You can ask a grandmother about the house she grew up in. You can read what someone wrote down two hundred years ago, or two thousand.

But writing is new. People have been on Earth for a very long time, and for almost all of it, nobody wrote anything down. There are no letters. There are no lists. Almost all of their names have been lost.

That part of the story is called deep history. It is the part we reach through evidence instead of writing, and it is most of the story. If you could stretch the whole human story across the floor of a room, the part with writing would fit into one corner. Deep history would cover almost everything else.

How can there be a story with no writing?

The same way you worked it out in the last lesson. People leave things behind.

They leave the tools they made and the stones they broke to make them. They leave the bones of the animals they ate. They leave ash where a fire burned and shells where a family ate by the sea. They leave marks on cave walls, beads with holes drilled through them, and footprints pressed into mud that turned to stone. They leave their own bones, and inside those bones, sometimes, their DNA.

None of it is writing. All of it is evidence.

A historian reads it the way you read a story, one clue at a time, careful about what the clue can say and careful about what it cannot. That is the work you will do all year.

A word this book does not use

You may hear people call this time prehistoric.

Pre- means before. Preschool comes before school. Preheat means to heat something before you start. So prehistoric means before history.

This book does not use that word, and here is why.

Some people use the word history to mean only the part that got written down. If you use it that way, then prehistoric makes sense: it means before writing.

But that is not what history means in this book. Here, history means what happened to people. And people were already here. They were carrying babies and burying their dead. They were making art and making music. They were crossing open water to reach land nobody had ever seen. They were sitting around the fire and telling their stories. They were learning a whole world and teaching it to their children.

That is not before anything. That is history, happening, for hundreds of thousands of years.

It is worth noticing what a name does. Call it prehistoric and it sounds like the waiting room, like the real story had not started yet. Call it deep history and it sounds like what it is: the longest part of your family's story.

Where you are going

You will meet relatives who lived three million years ago and relatives who lived last week, which is to say, your own. You will visit people who kept fire alive, people who painted animals by torchlight deep inside a cave, people who walked into a land no human had ever entered, and people who put a seed in the ground on purpose for the first time.

Deep history runs right up until people began to write things down. This book ends before that happens. Everything you will learn in this course is deep history.

You will meet relatives who lived three million years ago and relatives who lived last week, which is to say, your own. You will visit people who kept fire alive, people who painted animals by torchlight deep inside a cave, people who walked into a land no human had ever entered, and people who put a seed in the ground on purpose for the first time.

Not one of them wrote a word.
We know them anyway.

When Did People Start to Talk?

You cannot dig up a voice.

Bones can turn to stone. Stone tools last for millions of years. Fire leaves ash behind. Footprints harden and stay, but a word is gone the moment it is spoken. The soft parts of the body that make speech possible almost never become fossils, so scientists cannot answer the question directly. Instead, they ask two different questions, and each one has its own clues.

Did they communicate?

For this question, the clues are the things people did.

Homo habilis and their close relatives made stone tools in the same careful way , over and over, for hundreds of thousands of years. That does not happen by accident. Someone had to learn it from someone else. *Homo erectus* kept fire alive, hunted together, carried good stone far from where it was found, and walked into lands no one had ever seen. Every one of those takes more than one person, working with other people, sharing what they know.

Scientists have tested how that knowledge passes. They taught volunteers to make stone tools three ways: by watching only, by watching someone point and gesture, and by being told in words. Watching was enough for the simplest tools. The harder the tool was to make, the more the words helped.

None of that proves anyone spoke. A person can teach by showing. But it does mean these were not quiet lives. The people who did these things communicated with one another. As their work became more complicated, better communication would have become more valuable.

Could they use spoken language?

For this question, the clues are in the body, and they are rarer.

One is a small bone in the throat called the hyoid. It does not make sound. It anchors muscles that move your tongue and help control your throat when you speak and swallow. Scientists found a Neanderthal hyoid, and it looks like yours, even on the inside, where bone changes over a lifetime in response to how it is used.

Another is the ear. Making speech is only half of talking. You also have to hear it. You have to hear the difference between one sound and the next. Scientists used CT scans to build a model of a Neanderthal ear. It could hear the sounds that speech is made of.

The hyoid points one way. The ear points the same way. Two different kinds of evidence, found by different scientists asking different questions, agree. Neanderthals had the body a person needs in order to speak.

Earlier members of the human family left far fewer clues, and none are strong enough to show that they could speak.

Why the people in this book talk

Lucy does not speak in this course. Like all social primates, she almost certainly communicated, but historians cannot say whether she used spoken language. *Homo habilis* and *Homo erectus* also do not speak. Their behaviors show that they communicated with one another, but historians still cannot say whether they used spoken language. Neanderthals and *Homo sapiens* do speak because several different kinds of evidence all point in the same direction: they had the biological ability to speak.

Historians follow the evidence. Where it is strong, we show speech.
Where it is not, we do not guess.

Lesson 13: Island Innovators

More than 65,000 years ago, Southeast Asia

Today, we are learning that people who lived by the sea for many generations learned to build boats and explore new islands, with each generation improving on what came before.

Welcome back, Time Traveler! Last time, you watched as families crossed the narrow waters from Africa into Arabia. They did not stop there. Over thousands of years, those families and their descendants kept migrating east, following coastlines, gathering shellfish, catching fish, and learning the ways of the water. Now, many generations later, their descendants have become something new: people of the sea.

Ancestors, Generations, and Descendants

These three words all follow a family line through time. Your ancestors are the people who came before you: your parents, your grandparents, and back and back. Your descendants are the people who come after you: your children, their children, and on and on. A generation is one step in that line, from parents to their children, so your grandparents, your parents, and you are **three** generations. Here is what ties them together: You are a descendant of your ancestors, and one day you will be an ancestor to your descendants.

Touch your Time Travel Passport. Close your eyes. Ready? Let's go.

Open your eyes. You are standing on a beach in Indonesia, in Southeast Asia. Here, hundreds of islands sit close together in the water between the mainland and Australia. They rise from the sea in every direction.

Just offshore, people are out on the water. Some float on simple rafts, pulling up fishing lines. Others paddle close to shore, checking fish traps set among the rocks. Children splash in the shallows, gathering shellfish into baskets. These people do not just live near the water. They live on it.

A girl sees you watching and waves. She splashes over. "Come," she says. "My grandfather is building something. You should see."

The girl leads you along the beach to where her grandfather works in the shade of palm trees. He is building a raft that is larger and stronger than anything else out on the water. He kneels beside it, tying thick bamboo poles together with strong plant ropes, wrapping

and knotting them over and over, pulling each knot tight and testing it. His hands are rough from years of this work. His eyes are sharp from years of watching the sea.

"The small rafts are fine for fishing close to shore," the girl says. "But Grandfather wants to go farther."

Watercraft: something people make to travel on water. A raft is one kind of watercraft.

She points to the horizon, where a shadow of land rises in the distance. "We have been to the nearby islands. But that one? No one in our family has ever been there. It is too far for our small rafts, and the winds and waves can be dangerous out there."

Her grandfather looks up from his work. "I have been working on this for a long time," he says. "I want to see what is out there."

Why do you think people kept pushing farther, even when they had enough food and shelter where they were?

It had taken years of innovations over many generations to get to this moment. Scientists call this cumulative cultural evolution: People pass knowledge forward, and later generations build on it. Long ago, the ancestors of these people discovered that light hollow wood floats well, that a bundle of logs tied tightly together does not roll the way a single log does, and that a paddle gives you control. People crossing water in deep history used simple bundles of reeds, rafts, or other watercraft made from materials nearby. The generations that followed built stronger rafts. Each generation tried something, watched what happened, changed what did not work, and improved it. The girl's grandfather had spent a lifetime doing the same, using longer poles, tighter knots, and a flat platform that could hold more people and more supplies.

Innovation
A new or better way of doing something. People innovate when they improve on what came before, keeping what works and changing what does not.

Days later, the big raft is ready. The family loads it carefully: paddles, fishing lines, bamboo tubes filled with fresh water, and food wrapped in leaves. Everyone climbs aboard: Grandfather, the girl's parents, the girl, her little brother, and you.

The adults paddle steadily. The island you left grows smaller behind you. The water beneath you is deep and blue, and the raft rises and drops with the waves. The sun is hot. Arms grow tired. The girl's little brother grows quiet and leans against his mother. This is the longest journey any of them have made. The girl watches her grandfather. He studies the waves, the clouds, and the direction of the wind. He tells the paddlers when to push

harder and when to wait. After many hours, the island ahead grows larger. Trees become visible. Birds circle above a white beach. The raft scrapes against sand.

Grandfather is the first to step onto the beach. He stands very still, looking around. The rocks along the shore are dark. He picks one up and strikes it against another. It breaks into sharp edges.

"This stone is good," he says. "Very good. It will make sharp tools."

The girl runs ahead, exploring. She finds coconut palms, tide pools full of shellfish, and a freshwater stream running down from the hills. There is food here, water, and stone for tools.

"We could come back here," she calls. "We could bring others!"

Her grandfather smiles. "Yes. Now that we know the way, we can return." He looks out at the horizon, where more islands shimmer in the distance. "And maybe we can go even farther."

The grandfather says, "Now that we know the way, we can return." How does knowledge passed down through generations make each new journey possible?

How do we know people were crossing the open sea this long ago? No one has ever found one of these early rafts. Wood, bamboo, and plant rope rotted away long before our time. The oldest boat archaeologists have found is about 10,000 years old, made long after the day you just visited. No one knows what the rafts of these families looked like. The one you rode on was built for this book, out of what grew within reach of their beaches.

Scientists are still sure that people were crossing open water, however, and they know it from where the people ended up. Some of these islands were never joined to the mainland, not even when the seas were at their lowest. The only way to reach them was across deep water, and people were there. Their artifacts are there too: tools, fireplaces, and the bones of their meals, found on island after island. Reaching the islands is the proof that they crossed, even if we do not yet know exactly how they crossed.

Touch your Time Travel Passport again. Close your eyes. Open them. You are home, but now you understand that people who lived by the sea for many generations learned to build boats, explore new islands, and pass their knowledge forward, with each generation adding to what came before.

Meanwhile, across the world...

The islands of Indonesia were full of animals found nowhere else on Earth. On the western islands, orangutans moved slowly through the forest canopy. Farther east, stegodons,

elephant relatives smaller than the elephants of Africa, pushed through the undergrowth. Giant rats the size of small dogs scurried through the leaf litter. In the shallower waters between islands, fish, sea turtles, and dugongs moved through the warm coastal shallows, where the people who had learned to read the tides found food.

In the mountains and valleys of Asia, Denisovans lived. Scientists have found only tiny fragments of their bones. But the Denisovans are not gone completely. A trace of them lives on in DNA. Some people living today, including Aboriginal Australians and the Indigenous peoples of Papua New Guinea, carry a small amount of Denisovan DNA. That small amount is there because, long ago, *Homo sapiens* and Denisovans had children together. The trace of that meeting is still carried in the bodies of their descendants today.

Lesson 13: Island Innovators

In This Lesson

☐ Read Lesson 13

☐ Find Your Path

☐ Time Travel Passport

☐ Build and Test a Raft

☐ Think Like a Historian

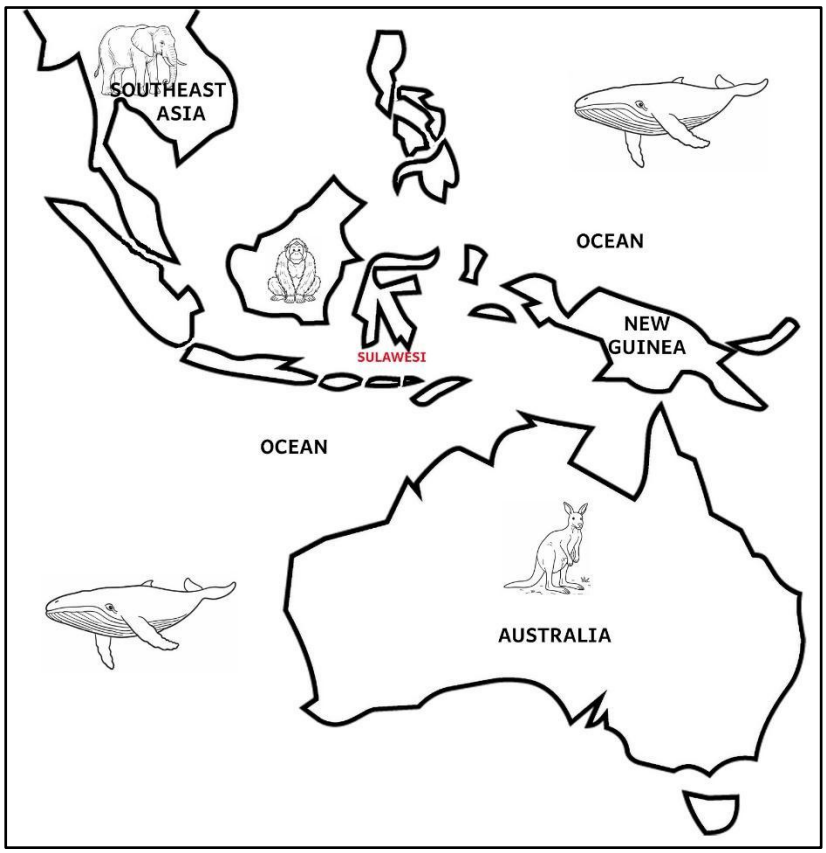
☐ Words to Know

☐ Writing About History

Find Your Path

These two maps show the same part of the world at two different times. The land and ocean look different because sea levels were much lower 65,000 years ago and before. As you color and compare, look for what changed and what stayed the same.

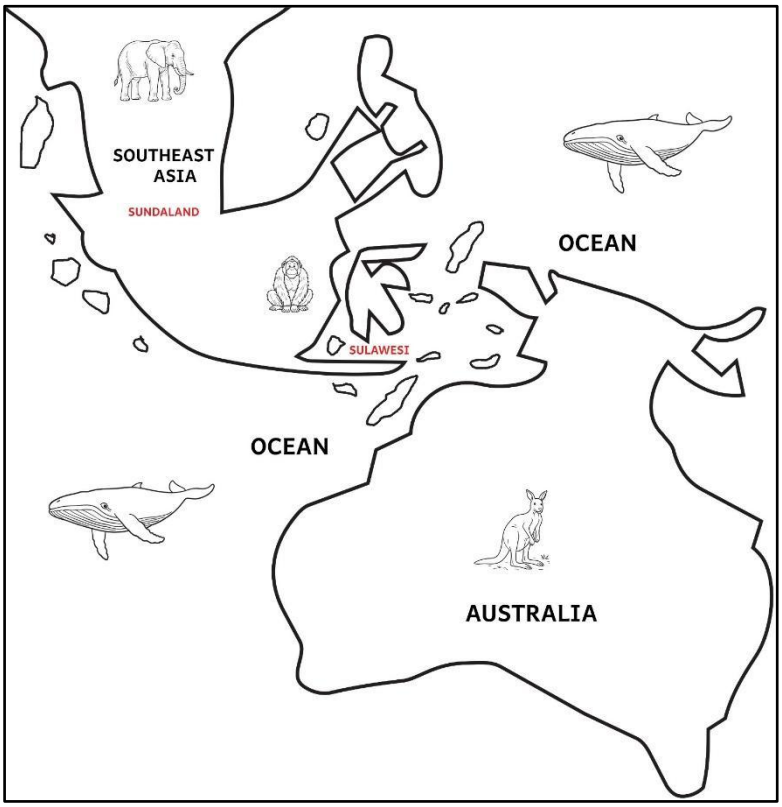
1. Color the land light green or brown. Color the ocean blue. The animals will help you tell land from ocean.
2. Look at the large land area labeled Sunda. It formed when lower sea levels connected islands that are separate today. The families in this lesson began their journey here.
3. Now look at Australia. Notice the large shape attached to its northern edge. Find that same shape on the "today" map. What is it called?
4. **Find your path.** The families who reached Australia had to cross open ocean. Even with lower sea levels, there was no land bridge all the way to Australia. They had to island-hop, keeping each crossing as short as possible. Find Sunda. Find Australia. Find the red label **Sulawesi**. Use a pencil to draw your path.
   - *Option A: Follow the route.* Start in Sunda. Cross to Sulawesi. Hop east through the small islands. Reach Australia.
   - *Option B: Plan your own route.* Study the map. Is there another way to get from Sunda to Australia using the islands as stepping stones? Draw the route you think makes the most sense.
5. **Compare the maps.** Look at the land labeled Sunda on the older map. Find those same islands on the "today" map. What is different about them today?



Map 1: Today

I made these maps and the ones in the previous lesson using PS and Illustrator, doing trace to vector image, We have our illustrator remaking these.

Map 2: 65,000 years ago, Southeast Asia



Build and Test a Raft

The raft the grandfather built had to be strong enough to reach a new island. He used what he had learned from everyone who came before him, and then he improved on it. Today, you will be an inventor. You will build a small raft, test whether it floats, and make it better, just like the families in this story did.

Part 1: Gather and Plan

The people in this lesson did not have stores. They used what they found. Collect sticks, twigs, bark, and anything else that might float.

Before you build, test your materials. Do they float? Which float best? What shape will your raft be? How will you hold the pieces together?

Part 2: Build Your Raft

Build! Try one of these:

- **Basic raft:** Lay sticks side by side. Lash them together with string or rubber bands.
- **Platform raft:** Make a frame of four sticks in a square. Fill the middle with smaller sticks laid across.
- **Layered raft:** Lay one layer of sticks one direction, then another layer the other direction. Lash them together.

As you build, think about whether your knots are tight, whether your raft is flat or wobbly, and where the weak spots are.

Part 3: Test Your Raft

Fill your basin or tub with water. Gently set your raft on the surface. Does it float? Does it stay flat or tip over? Does water come over the top?

Now test the limits. Add a pebble or coin. Does it still float? Add another, and another. How much can it hold before it sinks? Push down on one side. What happens?

If your raft sinks or tips, think about it. What went wrong? How could you fix it?

Part 4: Improve Your Design

Humans did not build perfect rafts on the first try. They watched what worked and what did not, then tried again. Look at your raft. What worked well? What could be stronger? Build a second raft using what you learned. Test them both and compare. Which held more cargo? Which stayed flatter?

Think Like a Historian

Thinking Tool: The Testing Cycle

The testing cycle is a way to check an idea when you are not sure about it. It has five steps:

Observe: Notice what is happening.

Decide: Say what you think is happening.

Predict: Say what should happen if your idea is right.

Test: Go find out what happens.

Revise: Change your idea to fit what you found.

Your Raft Ran the Cycle

1. Your first raft tipped over in the water. Was that a failure?

○ Yes. A raft that tips is a failed raft.

○ No. A tip is information. It shows you what to change.

2. Which step is happening when you set your raft on the water and add cargo to see what it holds?

○ Observe

○ Predict

○ Test

3. Your raft tipped, so you moved the heavy cargo to the middle and built a new one. Which step is that?

○ Decide

○ Test

○ Revise

4. The grandfather's raft was better than the ones his grandparents built, because each generation kept what worked and changed what did not. If every family had started over from nothing each time, would the rafts have kept getting better?

○ Yes. Each family would invent the best raft on its own.

○ No. The rafts got better because each generation built on what the last one learned.

5. Write it or say it.

When your first raft tipped, what did that tell you to change? How did testing your new raft show whether your change worked?

Words to Know

watercraft

Something people make to travel on water.

Draw a watercraft:

raft

One kind of watercraft, made flat from pieces tied together so they float as one.

What did you tie your raft together with?

_____

innovation

A new idea or a new way of doing something.

The families built better watercraft over many lifetimes. Why was building better watercraft an important innovation?

_____

Writing About History

In this lesson, you built and tested a raft, the way families in Sunda improved theirs over many lifetimes.

Complete each sentence to tell what happened earlier and what happened later.

Before the grandfather built the bigger raft, _____

_____

After the family reached the new island, _____

_____

Before each generation built new rafts, _____

_____

After each generation built new rafts, _____

_____

➢ Before tells us what happened earlier. After tells us what happened later.

Unit 3: Great Journeys

Lessons 9 to 14, about 74,000 to 50,000 years ago.

Unit 3 follows *Homo sapiens* from Africa to Sahul and explains the conditions and knowledge that made those journeys possible. Changing climate made water sources less dependable, contracted lakes, and shifted grasslands. Falling sea levels exposed continental shelves, expanded coastal plains, and narrowed some water crossings. The first set of changes is why people had reason to move. The second is why there were routes to take. Climate changed what was possible. People decided what to do about it, and they did it with knowledge built over generations.

Lesson 9 comes first because no single artifact records a migration across thousands of miles and many generations. Before your learner can follow that movement, they need to understand how evidence from different places can be placed in time. Ash from the Toba eruption fell across enormous distances and can be matched through the chemistry of its volcanic glass, making it a marker shared across sites. Material below it is older than the eruption, while material above it is younger. Lesson 9 also puts a famous claim against the evidence. Toba is often described as nearly ending humanity, but records from Lake Malawi show no major ecological disruption associated with the eruption, while the stone-tool sequence at Dhaba in India continues from before the eruption to after it without a significant break.

Lessons 10 and 11 stay in East Africa and establish that the same climatic shifts did not have the same effects everywhere. Conditions that made one region harder to live in could make another more productive. Lower seas exposed coastal plains where shellfish, fish, and seabirds provided dependable food. That is why the unit spends two lessons on changing conditions before anyone leaves Africa.

Lesson 12 follows the dispersal from Africa, and Lessons 13 and 14 follow what it took to continue across island Southeast Asia to Sahul. People crossed channels that remained open water even when sea levels were at their lowest. That required watercraft, an understanding of winds and currents, food and fresh water for the passage, and the decision to launch. No watercraft from these crossings has survived. Wood and plant fibers decay, so what the watercraft looked like remains unknown. Geography and archaeological evidence together establish that the crossings occurred. Wallacea lies between the exposed Sunda and Sahul shelves, its channels stayed deep even at the

lowest sea levels, and people left evidence on islands and landmasses they could reach only by crossing open water.

Your learner works with evidence that answers some questions and leaves others open, and this unit asks them to hold both at once. Genetic evidence establishes that a lasting dispersal left Africa and constrains when it occurred, but it cannot name a single departure point, route, or group of travelers. A southern crossing at Bab el-Mandeb and a northern route through the Levant both have support. Much of the shoreline that could hold evidence now lies underwater. Historians can establish that people crossed open water without knowing what their watercraft looked like. Learning to state what the evidence establishes while leaving other questions open is the habit this unit builds.

Lesson 14 reaches Sahul. At Madjedbebe, excavated with Mirarr Traditional Owners, the earliest occupation layers hold grinding stones, ground ochre, and ground-edge hatchet heads. Charred plant remains from the same period include fruits, nuts, pandanus kernels, roots, tubers, and palm stem. Together, these finds show people processing plant foods, making and using pigments and tools, and learning how to use a wide range of local plants. Aboriginal and Torres Strait Islander peoples have lived in Australia continuously since, and their cultures are living and changing, maintained by communities today.

Your learner carries into Unit 4 an understanding of human communities spread from Africa to Sahul and of journeys made possible by changing conditions, human decisions, and knowledge built over generations.

LESSON 13: Island Innovators

More than 65,000 years ago, Southeast Asia

Objective

In this lesson, your learner traces a route from Sunda to Australia across open water, builds and tests a raft, and uses the Testing Cycle to name what a tipped raft tells a builder. Your learner also writes sentences beginning with before and after.

Materials

For Find Your Path:

- Pencil
- Crayons or colored pencils

For Build and Test a Raft:

- Sticks, twigs, and bark
- String, yarn, rubber bands, or twist ties for lashing
- A basin, bathtub, or large container of water
- Small objects to test as cargo, such as pebbles, small toys, or coins
- A towel for cleanup

Suggested Schedule

Advance Prep: Before Session 2, gather the raft materials. Straight sticks and dry bark work best. Fill the testing basin.

Session 1	Read the lesson. Find Your Path. Time Travel Passport.
Session 2	Build and Test a Raft. Think Like a Historian.
Session 3	Words to Know. Writing About History.

Using the Time Travel Passport

Map: Find Sunda and color it. **Write**: Island Innovators, 65,000 years ago. **Stamp**: People of the Sea.

Find Your Path

The shape attached to Australia's northern edge, found on the "today" map, is called New Guinea. At low sea level it was joined to Australia into one landmass; today the two are separate, with water between them.

Find your path. Any route from Sunda east through Sulawesi to Australia is fine, as long as each crossing is kept short. The key idea: there was no land bridge to Australia, so every route still required crossing open water.

Today they are separate islands (such as Sumatra, Java, and Borneo), with ocean between them. At the lower sea levels of 69,000 to 65,000 years ago, that shallow sea floor was above water, joining them into one landmass called Sunda.

Build and Test a Raft

Follow the directions in the workbook. When the raft tips or sinks, do not repair it for your learner. **Ask**: What did you observe? What do you want to change? What do you predict will happen after the change?

Building and comparing a second raft completes the testing cycle.

Think Like a Historian

This page asks your learner to identify the steps of the testing cycle in the raft activity. A raft that tips or sinks provides information about the design. The builder uses that information to decide what to change and then tests the revised raft. Question 4 applies the same process across generations.

1. No. 2. Test. 3. Revise. 4. No. The rafts got better because each generation built on what the last one learned.

5. Answers vary. Any real observation and change from their own raft.

Words to Know

Answers vary. Look for:

watercraft: any drawing of a raft, a boat, or a canoe.

raft: whatever they used. String, yarn, rubber bands, twist ties.

innovation: Better watercraft could cross longer stretches of open water and help families reach new islands.

Writing About History

This exercise asks your learner to complete four sentences using before and after. These words show the order in which events happened. Two sentences describe one grandfather's work, and two describe changes made across many generations.

Before the grandfather built the bigger raft, he learned from the rafts his family had built before.

After the family reached the new island, they found stone, food, and fresh water.

Before each generation built new rafts, they watched what the last generation had built.

After each generation built new rafts, the rafts were a little better.

Watch for: a before or after answer that does not put the events in time order.

Lesson 15: Neanderthals, Meeting Your Cousins

50,000 years ago, the Levant

Today, we are learning that Neanderthals were close human cousins who lived in Europe and Western Asia for hundreds of thousands of years.

Welcome back, Time Traveler! Last time, you watched the first families reach Australia. But not all *Homo sapiens* families traveled toward Australia. Some walked north, too, into lands with cooler winters. In some of those lands, another kind of human was already there.

Touch your Time Travel Passport. Close your eyes. Ready? Let's go.

Open your eyes. You are standing in a valley in the Levant, where Africa and Asia meet, with Europe across the Mediterranean Sea. A winter wind moves through the oak trees. Across the stream, smoke rises from a cave.

As you walk closer, you hear voices. A child laughs. Near the cave mouth, a woman strikes one stone with another, making a sharp tool. Children watch as an old woman works an animal hide with a smooth bone tool. Beside her are strips of sinew that can tie pieces of hide together. Looking carefully, you realize they are not *Homo sapiens*. They are a different kind of human called Neanderthals (say it: nee-AN-der-tahls), close cousins of

Homo sapiens on the human family tree. Neanderthals were shorter and stockier than most *Homo sapiens*. Their broad bodies and relatively short lower arms and lower legs helped them hold on to heat in cold climates. Heavy ridges sat above their eyes, their faces pushed farther forward than ours, and their noses were large. Scientists are still working out why.

***Try this**: Neanderthal bodies helped them hold warmth in cold weather. Make yourself short and compact, like a Neanderthal, by curling up tight in a ball. Now stretch out long and tall like a Homo sapiens. Which shape keeps more warmth close to your body?*

Neanderthals and their ancestors had lived in Europe and Western Asia for a very long time before *Homo sapiens* arrived there. *Homo sapiens* evolved in Africa. Neanderthals and their ancestors evolved in western Eurasia, the broad region that includes Europe and parts of Western Asia. Long before either group existed, though, they shared ancient ancestors in Africa.

A girl notices you standing near the cave. She looks at you up and down. “You are so tall and thin,” she says. “You must be cold.” She waves you over to the fire. She points to the man making the stone tool. “That is my father,” she says. “He makes the best scrapers.”

She points to a woman. “My grandmother made the coat I am wearing. It keeps me warm even when the snow comes.”

How is this family like families you know?

The girl uses sounds and gestures, and in our time-travel story, you understand her. But Neanderthals lived long before writing, so scientists must ask a careful question: Could Neanderthals speak? To answer this, scientists look at body clues. Neanderthals had a small bone in the throat called the hyoid bone, the same kind of bone that helps your tongue and throat make speech sounds. Their ears were shaped in a way that helped them hear many of the sounds used in speech. The parts for speaking and for listening were both there.

Because Neanderthals had parts for speaking and listening similar to what *Homo sapiens* have, scientists think Neanderthals could speak. Scientists do not know if their words sounded like ours, but the body clues for speaking and listening were there. For many older kinds of humans, these clues are missing, broken, or too incomplete for scientists to tell.

The grandmother looks up. Around her neck hangs a beautiful necklace made of eagle talons tied together on a cord. At Neanderthal sites in other places, scientists have found eagle talons with cut marks, smooth worn places, and notches. They have also found shells colored with red ochre. Artifacts like these are clues that Neanderthals made and

decorated things. The marks and objects may have even carried meaning for these humans.

You saw symbolic thinking at Blombos Cave, where people made beads and marks that stood for something. This necklace took work to make. It does not catch food or keep anyone warm. Do you think it is evidence that Neanderthals had symbolic thinking too? What makes you think so?

Near the back of the cave, an old man sits wrapped in furs. One of his arms is thin and hangs at a strange angle. It does not work anymore. The girl sees you looking.

“My grandfather,” she says quietly. “He was hurt while hunting, many seasons ago. He cannot hunt now, but he remembers everything. He tells us where to find water, where the deer go in deep snow, and stories from long ago. We take care of him now.”

Scientists have found Neanderthal bones that had broken and then mended. Some people with serious injuries lived for years, which means others likely helped them survive. At a few Neanderthal sites, scientists have found bodies that seem to have been carefully laid in the ground, a likely sign that they treated their dead with care.

Homo neanderthalensis, Neanderthal-Museum, Germany

The sun is getting lower. The girl points across the stream. A small group of nomadic hunter-gatherers are walking along the water. They are built differently from the Neanderthal family. Most have flatter faces and taller, more slender bodies. The Neanderthal family grows still. The people across the stream stop too. You are seeing two kinds of humans meet: *Homo sapiens* and Neanderthals.

We know these meetings happened, the same way we know *Homo sapiens* and Denisovans met. There is proof in DNA. When *Homo sapiens* left Africa and traveled into Western Asia and beyond, some *Homo sapiens* and Neanderthals had children with each other. Those children grew up and had children of their own, and tiny pieces of Neanderthal DNA were passed down through thousands of generations.

Today, many people carry a small amount of Neanderthal DNA. It is most common in people with recent family roots outside Africa, often about 2 percent. Some people with family roots in Africa may carry small traces too, because human families have moved in many directions over time. Neanderthals themselves disappeared about 40,000 years ago.

What was passed on was not Neanderthals. It was small scattered pieces of their DNA, and two people who both carry it usually carry different pieces.

Touch your Time Travel Passport again. Close your eyes. Open them. You are home, but now you know that Neanderthals were close human cousins who lived in Europe and Western Asia for hundreds of thousands of years.

Meanwhile, across the world…

Far to the west, at a place called Grotte Mandrin in southern France, archaeologists found a child's tooth and a set of stone tools in a land where Neanderthals had lived for ages. Some scientists think *Homo sapiens* had reached Europe once before, and left them.

Back in Africa, people were connected across distances much greater than any one family could walk. And yet, people living more than a thousand miles apart wore ostrich eggshell beads cut and shaped in the same styles. A bead made in one place matched a bead made in another, far away. Matching styles like these are a sign that people were trading, visiting, and passing news and ideas throughout Africa.

In the hills of Sulawesi, in Indonesia, people were painting on cave walls. In one cave, they painted a wild pig with human-like figures nearby. Much later, scientists dated the thin mineral layer that had grown over the painting. Because that layer formed after the painting was made, the picture underneath had to be even older, at least 51,000 years old. Alongside everything else they did, these people were making images, and perhaps telling stories, in paint.

Lesson 15: Neanderthals, Meeting Your Cousins

In This Lesson

☐ Read Lesson 15

☐ A Neanderthal Grandmother

☐ Time Travel Passport

☐ Same, Different, Both

☐ The DNA Thread

☐ Think Like a Historian

☐ Words to Know

☐ Writing About History

A Neanderthal Grandmother

Look carefully at the picture. Circle the clues that show this Neanderthal grandmother was part of a human family. Can you find:

- something she wore for warmth
- something she wore for beauty or meaning
- a cave that could be a home
- smoke from a fire
- a valley where people could find water, animals, and plants

Then, color the picture.

Same, Different, Both

Today, you are going to think carefully about what Neanderthals and *Homo sapiens* shared and what made them different. Read each statement below. Each one describes Neanderthals only, *Homo sapiens* only, or both. Check one box in each row. Discuss any you need help with.

Statement	Neanderthals	*Homo sapiens*	Both
Made stone tools.	☐	☐	☐
Cared for injured group members.	☐	☐	☐
Had heavy brow ridges.	☐	☐	☐
Walked on two feet.	☐	☐	☐
Made or wore ornaments.	☐	☐	☐
Buried some of their dead.	☐	☐	☐
Used fire.	☐	☐	☐
Had short, stocky bodies that conserved heat.	☐	☐	☐
Evolved in Africa.	☐	☐	☐
Lived in Europe for hundreds of thousands of years.	☐	☐	☐
Had children together.	☐	☐	☐
Used spoken language.	☐	☐	☐
Reached Australia.	☐	☐	☐
Evolved in Europe and Western Asia.	☐	☐	☐

Now count the boxes you checked in the Both column.

How many statements are true of both Neanderthals and *Homo sapiens*? _____

The DNA Thread

You will need one piece of yarn about 12 inches long, and two or three short pieces of thinner thread in a different color. The yarn stands for all the DNA in one person living today. The short pieces stand for the small sections of DNA that came from Neanderthal ancestors.

- Tie or twist the short pieces onto the yarn in two or three places. Leave the rest of the yarn bare.

Look at what you made. Almost all of it is one color. Only small pieces of the other color are there, and they are in a few separate places, not running all the way through.

If a friend made one too, their short pieces would sit in different spots than yours. People who carry Neanderthal DNA do not all carry the same pieces of it.

Neanderthals became extinct about 40,000 years ago. What was passed on?

Unit 4: Finding Home

Lessons 15 to 26, about 50,000 to 14,000 years ago.

Unit 3 followed people out of Africa and across water to Sahul. Unit 4 follows them as they make homes across more of the world. Capable, innovative humans spread throughout the world and began figuring out how to live, survive, and thrive in many different environments. Finding home can mean learning a rainforest well enough to hunt among its trees, moving across the mammoth steppe with the seasons, returning to the same coast each year, or living for generations on land that later disappeared beneath the sea. People learned to live in each environment by learning its plants and animals, developing tools for local problems, exchanging materials and knowledge with other communities, and teaching what they knew to their children.

The lessons proceed in chronological order and move around the world, from 50,000 years ago in the Levant to 14,000 years ago in the North Sea basin. Lesson 15 opens with Neanderthals and *Homo sapiens* living alongside one another. Neanderthals belonged to another branch of the human family. Cut-marked eagle talons, pierced and colored shells, and ochre provide evidence of symbolic thinking, the same kind of evidence your learner examined at Blombos, and the Kebara hyoid supports their capacity for speech. DNA establishes that Neanderthals and *Homo sapiens* had children together, so at the beginning of this unit, finding home sometimes included meeting another kind of human and having children together, some of whose descendants inherited ancestry from both groups. The lessons that follow move among rainforests, cold steppes, caves, coasts, and continental plains, and in each place people use knowledge suited to the conditions they live in.

In Unit 3, falling seas exposed the Sunda and Sahul shelves and shortened some of the water crossings people made on their way to Australia. They also exposed Beringia and Doggerland, large inhabited landscapes where generations lived, hunted, gathered, exchanged materials, and raised children. As the climate warmed and the ice sheets retreated, rising seas gradually submerged their lowlands and covered former coastlines in many parts of the world.

The loss of those landscapes shapes what archaeologists can recover, and materials survive differently depending on the conditions around them. At Fa-Hien Lena in Sri Lanka, small bone projectile points remain after wooden shafts, bows, and cords have decayed. The stable conditions inside Chauvet Cave protected paintings. Shells and fired clay

survived after meat, baskets, and wooden objects disappeared from Jomon middens. Waterlogged peat preserved wood and other organic material at Monte Verde and preserved bone and antler objects from the North Sea landscape. By Lesson 24, your learner is ready for the harder problem: when a coastline has been submerged or eroded, the absence of a known campsite does not establish that people were absent.

Unit 4 also introduces domestication. In Lesson 21, wolves that lived near people changed across many generations until their descendants were dogs. No individual wolf became a dog. Populations changed over time as wolves and people formed a new relationship. Dogs were the first domesticated animals. Domestication of other animals, and of plants, runs through Unit 5.

The unit is called Finding Home because people made homes in many different environments. Some communities moved often, some moved seasonally, some returned to the same places, and some remained in one place for longer periods. Climate later transformed or submerged some of those homes, and the archaeological record preserves only part of what happened there. By the beginning of Unit 5, *Homo sapiens* were living across much of the world, ice sheets were retreating, sea levels were rising, and dogs had become part of human camps.

LESSON 15: Neanderthals, Meeting Your Cousins

50,000 Years Ago, the Levant

Objective

In this lesson, your learner compares Neanderthals and *Homo sapiens*, models how small sections of Neanderthal DNA remain in many people today and uses Fact and Interpretation to examine how ancient DNA changed scientists' understanding of the human family tree. Your learner also practices writing sentences that begin with when.

Materials

For A Neanderthal Grandmother:

- Crayons or colored pencils

For Same, Different, Both:

- Pencil

For The DNA Thread:

- One piece of yarn about 12 inches long
- Two or three short pieces of thinner thread in a different color

Suggested Schedule

Advance Prep: Before Session 2, cut two or three pieces of thin thread, each about one inch long, for The DNA Thread.

Session 1	Read the lesson. A Neanderthal Grandmother. Time Travel Passport.
Session 2	Same, Different, Both. The DNA Thread. Think Like a Historian.
Session 3	Words to Know. Writing About History.

Using the Time Travel Passport

Leaf: Neanderthals, *Homo sapiens*, Denisovans. **Write**: Neanderthals, 50,000 years ago. **Stamp**: Two Kinds of Humans Met. **Family tree**: draw a dotted line from *Homo sapiens* to Neanderthals, and a second from *Homo sapiens* to Denisovans, to show that both groups had children with *Homo sapiens*.

A Neanderthal Grandmother

Clues to find: her warm coat (warmth); her eagle-talon necklace (beauty or meaning); the cave (a home); the smoke from the fire; the valley with water, animals, and plants.

Same, Different, Both

Your learner checks one box per row on the workbook page: Neanderthals only, *Homo sapiens* only, or Both. Read the rows aloud if your learner needs it.

Answers in workbook row order:

Stone tools: both. Cared for injured: both. Brow ridges: Neanderthals. Two feet: both. Ornaments: both. Buried dead: both. Fire: both. Stocky bodies: Neanderthals. Evolved in Africa: *Homo sapiens*. Lived in Europe hundreds of thousands of years: Neanderthals. Children together: both. Spoken language: both. Reached Australia: *Homo sapiens*. Evolved in Europe and Western Asia: Neanderthals.

Both column total: 8.

The DNA Thread

Small sections of their DNA, passed to later generations through children Neanderthals and *Homo sapiens* had together.

Watch for: the Neanderthals themselves did disappear as a distinct group. Only part of their genetic ancestry remains. Do not let this become "Neanderthals never really went away."

Think Like a Historian

This page asks your learner to distinguish facts from interpretations and see how new evidence replaced an earlier interpretation. This distinction matters because new evidence can change an interpretation without changing the evidence that was already in the ground. The Neanderthal bones did not change; scientists gained the ability to recover and compare the DNA preserved in them.

1. F. I. F. I.

2. The interpretation that Neanderthals and Homo sapiens never had children together. The new fact was that scientists found Neanderthal DNA in people living today.

3. Scientists learned how to recover and read DNA from the bones.

4. No. Changing an interpretation when new facts appear is how science is supposed to work. Accept any answer along those lines.

Words to Know

Answers vary. Look for:

Neanderthals: a sentence using the word that says *Homo sapiens* met Neanderthals already living in Europe.

hyoid bone: any activity that used speech sounds. Talking, singing, humming, laughing, reading aloud.

***Homo*:** They are human and belong on the human family tree. Also accept: They are one of our relatives.

Writing About History

This exercise asks your learner to complete three sentences that begin with when. Adding when places a historical statement in time so it can be compared with other events and

dates. For example, *When Homo sapiens migrated to Europe, they met Neanderthals who had already lived there for hundreds of thousands of years* connects the meeting to the period when both groups lived in Europe.

Answers vary. Look for:

1. When Homo sapiens migrated to Europe, they met Neanderthals who had already lived there for a very long time.

2. When scientists compared Neanderthal DNA with DNA from people living today, they found matching sections.

3. When a Neanderthal family member was hurt, other group members may have cared for them and helped them survive.

When Did People Start to Talk?

You cannot dig up a voice.

Bones can turn to stone. Stone tools last for millions of years. Fire leaves ash behind. Footprints harden and stay, but a word is gone the moment it is spoken. The soft parts of the body that make speech possible almost never become fossils, so scientists cannot answer the question directly. Instead, they ask two different questions, and each one has its own clues.

Did they communicate?

For this question, the clues are the things people did.

Homo habilis and their close relatives made stone tools in the same careful way , over and over, for hundreds of thousands of years. That does not happen by accident. Someone had to learn it from someone else. *Homo erectus* kept fire alive, hunted together, carried good stone far from where it was found, and walked into lands no one had ever seen. Every one of those takes more than one person, working with other people, sharing what they know.

Scientists have tested how that knowledge passes. They taught volunteers to make stone tools three ways: by watching only, by watching someone point and gesture, and by being told in words. Watching was enough for the simplest tools. The harder the tool was to make, the more the words helped.

None of that proves anyone spoke. A person can teach by showing. But it does mean these were not quiet lives. The people who did these things communicated with one another. As their work became more complicated, better communication would have become more valuable.

Could they use spoken language?

For this question, the clues are in the body, and they are rarer.

One is a small bone in the throat called the hyoid. It does not make sound. It anchors muscles that move your tongue and help control your throat when you speak and swallow. Scientists found a Neanderthal hyoid, and it looks like yours, even on the inside, where bone changes over a lifetime in response to how it is used.

Another is the ear. Making speech is only half of talking. You also have to hear it. You have to hear the difference between one sound and the next. Scientists used CT scans to build a model of a Neanderthal ear. It could hear the sounds that speech is made of.

The hyoid points one way. The ear points the same way. Two different kinds of evidence, found by different scientists asking different questions, agree. Neanderthals had the body a person needs in order to speak.

Earlier members of the human family left far fewer clues, and none are strong enough to show that they could speak.

Why the people in this book talk

Lucy does not speak in this course. Like all social primates, she almost certainly communicated, but historians cannot say whether she used spoken language. *Homo habilis* and *Homo erectus* also do not speak. Their behaviors show that they communicated with one another, but historians still cannot say whether they used spoken language. Neanderthals and *Homo sapiens* do speak because several different kinds of evidence all point in the same direction: they had the biological ability to speak.

Historians follow the evidence. Where it is strong, we show speech.
Where it is not, we do not guess.

Lesson 24: A Melting World

15,000 years ago, British Columbia, Canada

Today, we are learning that as the Ice Age ended, families traveled south along the Pacific coast of North America. As the seas rose and the land lifted, the coastline changed, leaving many of their oldest camps hard to find.

Welcome back, Time Traveler. During the Ice Age, so much water froze into ice that the sea level dropped and more land was exposed. People used some of that land to travel to places such as Australia, Japan, and the Americas. But Earth did not stay in an ice age. As it warmed, ice melted and the sea level rose.

Touch your Time Travel Passport. Close your eyes. Ready? Let's go.

Open your eyes. You are standing on a rocky beach. The air smells of salt and kelp. Behind you, forested slopes rise into mountains. Above the mountains, you can see the white wall of a glacier. This is the coast of what is now British Columbia, Canada, about 15,000 years ago. Seals bark from the rocks. Salmon run in the river that flows into the ocean. Families have lived and traveled along this coast for a very long time. A boy is crouching beside the fire circle, looking at a line of wet gravel that reaches closer to the hearth than it used to. He looks up at you.

"We have to move again," he says. "Will you help?"

Everyone is already working. The boy hands you a roll of sleeping furs, then a heavy skin bag. Through the leather you feel the shapes of stone tools. You carry your load to a growing pile and come back for more. The boy's grandmother is directing the work. She stands a little apart, watching the water, sending someone in a new direction with a few quiet words. When the heaviest loads are stacked, you sit down beside her. You ask why the camp must move. She thinks for a moment.

"The shore has been changing since I was a girl," she says. "The highest tides come farther up the beach now than they did then, and the winter waves take more of the bank each year." She looks out at the sea. "Travelers say it is because the ice on the mountains is melting. All that water has to go somewhere."

She points up to the glacier above the camp, white and enormous. "There used to be more of it. You can see where it was. The rock it left behind is a different color, scraped clean."

The grandmother turns and looks down the coast, south, where the shoreline runs on between the mountains and the sea.

"My people did not always live here," she says. "Our grandmothers came down this coast from the cold lands in the north, following the shore. Our families found a good place and stayed. Others kept going south."

The grandmother is passing on her people's own history through oral tradition. Archaeologists have their own record of that journey: out of Beringia, generation by generation, families had been migrating south along the Pacific coast. Along this route, there was plenty to eat. Kelp forests stretched along the North Pacific coast from Asia to the Americas, with shallow waters thick with fish and shellfish. Seals hauled out on the rocks, and seabirds nested on the cliffs. The Kelp Highway Hypothesis proposes that this food-rich coast allowed families to travel south while feeding themselves along the way.

Kelp, like those shown here, can grow up to 18 inches per day. Kelp forests are home to many kinds of sea life.

There was another way south. Two enormous ice sheets covered much of what is now Canada. As they melted, a gap opened between them along the eastern side of the Rocky Mountains. Scientists call that gap the Ice-Free Corridor. The Ice-Free Corridor Hypothesis proposes that families traveled south through it.

Fifteen thousand years ago, the corridor was not yet a road anyone could travel. Only its southern end had begun to open, the way through from the north was still closed, and there was little to eat along it. The coast was open first. Later, the ice melted back along the whole corridor, plants and animals moved in, and families traveled it too. Most scientists now think both routes were used, and that the coast was the earlier one.

Why might a family choose to follow the coast south instead of turning inland?

The boy takes you to the water's edge while the others finish packing. The tide is low. Among the wet gravel you can see a scatter of old shells and a few fire-blackened stones.

He reaches down and lifts out a smooth flat stone, one side chipped carefully to an edge. A scraper, the edge still sharp after all its years underwater. He turns it over in his hand. "My great-grandfather made this," he says. "They lived here before the sea came."

The new camp sits higher, on a flat shelf of ground above the rocky outcrop. By late afternoon the new fire is lit, and the camp is a home again. The grandmother stands at the edge of the shelf, looking down at the water where the old camp used to be. The tide has come in, and water laps at the edge of the old fire circle. The grandmother remembers when the highest tides stopped well below it.

"Someday, the water will rise over this camp too," she says.

A tide rises and falls in a single day. The change the grandmother is describing is far slower than that. Sea level rose across years and lifetimes, a little at a time, until a place that had always been dry was not.

The old camps are almost gone. A few hard things remain, like the scraper in the shallows, but most of each camp has been swept out to sea or rotted away. But missing camps are not the same as missing people. We cannot find those camps because the sea covers them, not because no one was ever there. The oldest camps of all are the hardest to find, which is part of why the earliest days along these coasts are so challenging for scientists to date.

In a few places along this coast, the sea level did not change as much. At Triquet (tree-KEH) Island, on the Central Coast of British Columbia, the land rose about as much as the sea did, so the shoreline stayed close to the same place for thousands of years. Because the shoreline barely moved, people were able to live there over a very long time, and the things they left behind stayed in the ground.

Triquet Island is in the territory of the Haíłzaqv, also called the Heiltsuk, who still live in this area today. Working together with the Haíłzaqv, archaeologists dug down through the soil and found a large rock that people had used while making stone tools, with a pile of the sharp stone flakes still lying on it. In the same soil were tiny scattered bits of charcoal. They tested the charcoal with radiocarbon and found it was between 14,800 and 13,500 years old. Together, the stone flakes and the charcoal show that people were living on Triquet Island 14,000 years ago.

Haíłzaqv oral histories tell of ancestors who lived along a narrow strip of this coast that did not freeze, back when ice covered much of the land. When the tools and charcoal at Triquet Island were dated, the Haíłzaqv saw their own history in what the archaeologists had found.

This is important to keep in mind when we study the first migrations along the Pacific coast. Along a shoreline that has been submerged or eroded, an absence of evidence is not evidence of absence.

Touch your Time Travel Passport again. Close your eyes. Open them. You are home, but now you know that as the Ice Age ended, families lived and traveled along the Pacific coast of North America, moving south over many generations. The coastline changed as seas rose and land lifted, leaving many of their oldest camps hard to find.

Meanwhile, across the world…

In what is now western Montana, an enormous lake called Glacial Lake Missoula sat trapped behind a dam of ice. As the ice weakened, the dam broke, and a wall of water hundreds of feet high swept across eastern Washington, stripping the soil away and cutting canyons you can still see today. Those canyons are called coulees, and Grand Coulee, the largest, runs 60 miles. At Dry Falls, the flood poured over a rock face 400 feet high and three and a half miles wide, the largest waterfall anyone has found evidence of. The cliff is dry today, and you can stand at the top of it. Then the ice closed the dam again, the lake refilled, and it broke again, over and over for about two thousand years.

All around the world, the great ice sheets were melting faster than they had in a long time. Between about 14,600 and 14,300 years ago, so much water ran off them into the sea that the sea level rose roughly 50 feet in a little more than 300 years. Scientists call a burst of melting like this a meltwater pulse. Coastlines everywhere changed during those years, and shores that families had known for generations went under the water.

In central Texas, about 15,500 years ago, families camped beside Buttermilk Creek. They made blades, scrapers, and small stemmed spear points from stone they gathered nearby, leaving hearths and fire-cracked rock behind. Archaeologists have recovered more than fifteen thousand pieces of worked stone from the layers of that time, and those layers lie beneath the tools of people who camped there long afterward. Buttermilk Creek sits in the middle of the continent, far from any coast, and people were working stone beside it thousands of years before the Ice-Free Corridor opened.

In Florida, about 14,550 years ago, people used a watering hole where mastodons also came to drink. Their stone tools and the mastodon bones settled into the mud and were later covered by water at a place called the Page-Ladson sinkhole. Drowned and sealed away, they survived in a way the wave-battered coastal camps did not.

Lesson 24: A Melting World

In This Lesson

☐ Read Lesson 24

☐ People Were Already Here

☐ Time Travel Passport

☐ The Bouncing Earth

☐ Think Like a Historian

☐ Words to Know

☐ Writing About History

People Were Already Here

Thousands of years before the inland path between the great ice sheets opened, people were already living far to the south of the ice. This map shows four places where archaeologists found evidence that lasted. It also shows the coast you visited in this lesson, shaded along the edge of the sea.

- Color the land green or brown and the ocean blue.
- Five dates are printed on this map. Four are beside places where archaeologists found evidence of people. The fifth tells you when the inland path between the ice sheets opened. Find and circle that date.
- Compare the dates. Were people already living south of the ice before the inland path opened?
- Now, look at the shaded coast. Families traveled and camped along it for thousands of years, but only one star sits on it. At Triquet Island the land rose about as much as the sea did, so the shoreline stayed where it was and the things people left behind stayed in the ground. Along most of that coast, the sea rose over the old shoreline and covered the camps people had left behind. Why does a long stretch of coast with no stars on it not mean that no one lived there?

Map being made

The Bouncing Earth

When the great ice sheets sat on the land for thousands of years, their weight pressed the Earth's crust down, the way a heavy rock presses down the lid of a container. When the ice melted, the crust slowly bounced back up. Scientists call this isostatic rebound.

In some parts of Canada, the land is still rising today. It is still recovering from ice that melted thousands of years ago.

The demonstration: Press your palm firmly on the lid of a plastic container for thirty seconds. Feel it bow down under the weight. Now lift your hand. Watch the lid rebound.

That is a simple model of what Earth’s crust did as the ice sheets melted.

The measurement: In some parts of Canada, the land has risen about 1,000 feet since the Last Glacial Maximum. Go outside and pace off 1,000 feet. That is how far the ground has come back up since the ice melted, and in some places it is rising close to half an inch a year.

In some places, the land was rising while the sea level was also rising. What happened to the coastline in those places?

Think Like a Historian

Thinking Tool: Fact and Interpretation

A fact is something we can check using evidence.

An interpretation is an idea or explanation built from facts.

A strong interpretation fits all the facts we have.

A mystery: how did people get so far south so early?

On the map, you saw that people were far to the south of Beringia thousands of years ago: at White Sands 23,000 years ago, at Cooper's Ferry 16,000 years ago, and at Page-Ladson 14,550 years ago. Here is the puzzle. The inland path between the two great ice sheets did not fully reopen until 13,800 years ago, and for more than a thousand years after that it was still too bare to feed anyone walking through it. So how did people get so far south of the ice so early? Sort the clues below, then solve the mystery.

Part 1: Fact or Interpretation?

Write F beside each fact you could check. Write I beside each interpretation.

1. People left footprints at White Sands 23,000 years ago. _____
2. People camped at Cooper's Ferry 16,000 years ago. _____
3. The inland path between the two great ice sheets did not fully reopen until 13,800 years ago. _____
4. People used the kelp highway because food was plentiful along the coast. _____
5. People first reached the lands south of the ice by walking through the inland path after it reopened. _____

Part 2: Think about it

6. A strong interpretation fits all the facts. People reached White Sands 23,000 years ago, but the inland path between the ice sheets did not fully reopen until 13,800 years ago. Which interpretation fits the earliest sites?

○ People traveled south along the Pacific coast.

○ People first reached the lands south of the ice through the inland path after it reopened.

7. Suppose scientists find a camp on an ancient Pacific shore dated to about 20,000 years ago. Which interpretation would this new fact make stronger?

○ People first reached the lands south of the ice through the inland path after it reopened.

○ People traveled south along the Pacific coast.

Part 3: Solve the mystery. Write it or say it.

Based on the facts, how do you think people reached the lands south of the ice so early? Give one fact that supports your interpretation.

I think people reached the lands south of the ice by

_____

One fact that supports my interpretation is

_____

Words to Know

kelp highway
A possible route south along the Pacific coast. Scientists gave it this name because kelp forests grew along the whole way, full of food for travelers. Not everyone agrees this is how people came.

The inland path between the ice sheets did not fully reopen until later. Name one reason the kelp highway may have been possible earlier.

_____

sea level (review)
How high the ocean reaches against the land.

The grandmother's family moved to higher ground when the water came too close. Sea level is rising again today. Name one choice facing a town built right at the edge of the ocean.

_____

isostatic rebound (eye-so-STAT-ik REE-bound)
The slow rise of land after the heavy weight of an ice sheet melts away.

Draw the land pressed down under a heavy ice sheet. Then draw the same land after the ice has melted and the land has risen again.

_____

Writing About History

Each group below has a topic sentence and five details. Three details match the topic sentence. Two do not. Circle the three details that match.

Group 1

Topic sentence: Families had lived along the coast for a long time.

- Through oral tradition, the grandmother passed on that her grandmothers had come down this coast from the north.
- The boy found a stone scraper his great-grandfather had made.
- Old fire circles from earlier camps lay underwater.
- Seals barked from the rocks.
- The new camp stood higher than the old one.

Group 2

Topic sentence: The grandmother's family had learned to move with the rising sea.

- Every generation moved to higher ground as the water rose.
- The sleeping fur was soft.
- The grandmother's mother had moved twice before her.
- This was not the first time they moved.
- The salmon ran in the river behind the camp.

- A detail matches the topic sentence when it tells something specific about the same idea.
- A detail does not match when it tells about something different, even if it comes from the same story.

LESSON 24: A Melting World

15,000 years ago, British Columbia, Canada

Objective

In this lesson, your learner studies a map showing that people were already living far south of Beringia, models how land rises after the weight of an ice sheet is removed, uses Fact and Interpretation to determine which route best fits the evidence, and identifies details that support two topic sentences about families responding to a changing shoreline.

Materials

For People Were Already Here:

- Crayons or colored pencils
- Pencil

For The Bouncing Earth:

- A flexible plastic container with a lid

Suggested Schedule

Advance Prep: Find a flexible plastic container with a lid before Session 2.

Session 1	Read the lesson. People Were Already Here. Time Travel Passport.
Session 2	The Bouncing Earth. Think Like a Historian.
Session 3	Words to Know. Writing About History.

Using the Time Travel Passport

Map: Find British Columbia on the Pacific coast of Canada and color it. **Write**: A Melting World, 15,000 years ago. **Stamp**: Rising Seas, Lasting Stories.

People Were Already Here

The four stars are White Sands, Cooper's Ferry, Page-Ladson, and Triquet Island. Triquet Island is the only star on the shaded coast. Its shoreline stayed near the same place, while rising seas covered many old camps elsewhere along the coast.

Date to circle: 13,800 years ago, on the inland path. It is newer than all four sites.

Closing question: because the sea rose over those camps. Accept any answer meaning the evidence is gone, not that the people were absent.

The Bouncing Earth

The model shows the direction of the movement, not the speed or the material.

Closing question: The coastline stayed about where it was at Triquet Island, which is why charcoal from 14,000 years ago is still in the ground there.

Think Like a Historian

This page asks your learner to compare two interpretations with the known dates. White Sands is thousands of years older than the reopened inland route, so the earliest evidence does not support an inland-only explanation. The Pacific coast interpretation agrees with the dates on this page. This does not show that every group entered or traveled through the Americas by the same route.

1. F. 2. F. 3. F. 4. I. 5. I.

6. People traveled south along the Pacific coast.

7. People traveled south along the Pacific coast.

Part 3: Answers vary. Look for the Pacific coast, with White Sands at 23,000 years ago as the supporting fact. Also accept food along the coast, or the coast being open while the inland path was blocked.

Words to Know

kelp highway: The Pacific coast was open while the inland path was blocked, and coastal waters offered dependable foods such as fish, shellfish, seals, and seabirds.

sea level: move to higher ground, build a wall, or leave. Accept any answer that names a real choice.

isostatic rebound: The first drawing should show land pressed down beneath an ice sheet. The second should show the ice gone and the land risen higher.

Writing About History

This exercise asks your learner to circle three details out of five. Choosing matters in history because true and relevant are not the same thing, and everything on this page is true. *Example*: Seals barking from the rocks belongs in the story and not under “families had lived along the coast for a long time”.

Group 1: The first three. Oral tradition. The stone scraper. The old fire circles.

Group 2: The first, third, and fourth. Every generation. The grandmother's mother. Not the first time.

Lesson 33: Budj Bim

6,500 years ago, the wetlands of southern Australia

Today, we are learning that the Gunditjmara (gun-ditch-MAR-a) people of Australia built stone channels, ponds, and traps to manage the flow of water and harvest eels.

Welcome back, Time Traveler! In the last lesson, you climbed high into the Andes, where people made a life at different elevations. Today, you are going somewhere low and wet, to meet people who built a life out of stone and water.

Touch your Time Travel Passport. Close your eyes. Ready? Let's go.

Open your eyes. All around you, pools and narrow channels glint in the sunlight, threading between dark rocks and green grass. You are at Budj Bim (BUDGE BIM), on Gunditjmara Country, in southern Australia. The dark stones under your feet were left behind by a volcano. Long ago, lava flowed across this land and cooled into hard black rock. Water now moves through low places and cracks in the old lava.

But not every channel here was made by water. Some were built by people.

A boy comes around a low stone wall, carrying a woven basket trap.

“Would you like to check the kooyang (KOO-yang) with me?” he asks.

“Kooyang?” you ask.

“Eels,” he replies. “Come and see.”

You walk with him along a narrow path between two ponds. Now you begin to see the walls: long, low lines of dark volcanic stone curving along the edges of the water. Some walls hold water in place. Narrow channels link one pond to another. Here and there, a woven basket sits in a channel, ready to catch whatever swims through.

“My people built these,” the boy says. “The walls hold the water. The channels guide the water. The traps catch the kooyang. Some ponds keep eels alive until we need them.”

He kneels and lifts a basket from the water. Inside, three or four long, dark eels twist and coil.

"These are ready," he says. "We will smoke them tonight."

Kooyang are short-finned eels: long, smooth, slippery fish that hatch far out in the sea. When they are young, they swim into rivers and wetlands like these. They live in fresh water for many years, growing long and fat. When they are grown, they travel back toward the sea

to lay their eggs. The Gunditjmara know this journey well. They know when the eels arrive, where they travel, and where to set their traps.

“Do you keep kooyang year-round?” you ask.

The boy laughs. “No. The kooyang come and go on their own.”

He points to the stone walls and the channels. “We built places for the water to move,” he says. “We know where the kooyang swim, so we guide them into the ponds and baskets. We can keep them alive until we need them.”

This way of getting food from water is called aquaculture. The Gunditjmara designed the system and engineered the channels, ponds, walls, and traps that made it work. Building and caring for this system required many people to cooperate over many years. It helped them catch, hold, harvest, smoke, store, and trade kooyang.

How did the Gunditjmara use their knowledge of water and kooyang to make food more dependable?

The boy leads you up a small rise, and from the top you can see much farther across the wetlands to stone houses. They are small and round and sturdy, with low walls of stacked volcanic rock and roofs of wood and bark and woven plants. They are not crowded into one spot. The houses are spread across the wetlands near the channels and ponds, some alone, some in little clusters. You start to count them and lose track.

"My family's house is over there," the boy says, pointing. "My uncle's family lives near the big pond. We do not move with the seasons, the way some people do. We can hold the eels in the ponds until we need them, so we can stay here, near the homes we built."

The boy walks you to a small fire smoldering at the edge of a pond. An older woman, his grandmother, is laying split eels on a wooden frame above the smoke. The smoky smell curls through the air.

"Smoking the eels keeps them good for a long time," she says. "When the eels are not running, we still have food. Some we keep. Some we trade with people from other Countries for things we cannot get here.”

She looks out across the wetlands.

"This is our Country," she says. "Country is not just the land. It is the water, and the sky, and the eels, and the stones, and the stories, and the ancestors, all of it together. We belong to Country, and Country belongs to us. We care for Country, and Country cares for us."

The grandmother says, "We belong to Country, and Country belongs to us." What do you think it means to belong to a place? How is that different from owning it?

You look back at the stone walls. “How long have they been here?” you ask.

The grandmother smiles. “Longer than your counting can hold.”

Today, Gunditjmara knowledge-holders and archaeologists study Budj Bim together. The Elders bring knowledge of Country, the stories, and the places that matter. Archaeologists bring careful mapping, digging, and ways of dating what they find. Together, they have learned that some parts of this aquaculture system are at least 6,500 years old. They have mapped stone channels, weirs, ponds, traps, and many stone house sites. The old walls still show where people managed water, held eels, and made their homes.

The eels smoke over the fire. The grandmother turns them with care. Down at the channel, the boy rinses his basket in the cool running water. The water moves through stone walls his people built and cared for. The kooyang travel through the wetlands. The stones hold their shape. And the Gunditjmara are still here today, on this Country, caring for it.

Touch your Time Travel Passport again. Close your eyes. Open them. You are home, but now you know that the Gunditjmara people of Australia built stone channels, ponds, and traps to manage the flow of water and harvest eels.

Meanwhile, across the world...

In the dry heart of central Australia, the ancestors of the Pitjantjatjara crossed vast stretches of red sand, finding water in places others could not see, holding in memory the maps that let them live where almost no one else could.

On the islands off the eastern coast of Australia, the ancestors of the Ngaro lived with the sea. Over many generations, they became skilled seafarers, paddling wintas, light bark canoes, out to the reefs to hunt turtles and dugongs, reading the wind, the color of the water, and the stars to find their way out across the open sea and home again.

Most of Doggerland had vanished beneath the water. Britain was an island now.

In southern Iraq, at a place called Eridu, people farmed with river water and built mud-brick buildings that were rebuilt many times in the same location.

Research Instructions for Lessons 27 to 33

Answer the questions and write your responses in the spaces.

How to find and record the answers:

- **Start with the story.** Look back at the lesson you just read. Many of the answers are in the read-aloud.
- **Look it up.** If a question is not answered in the story, find it in a book about plants, animals, or ancient people, or look it up online.
- **Write what you find.** Put each answer on the line under its question. You do not need to write a lot. A sentence or two is plenty.
- **If you cannot find a sure answer,** that is alright. For some questions, scientists only know the oldest signs they have found so far, not the exact year. You can write "the oldest signs are from about..." and give your best answer.

Cooking Instructions for Lessons 27 to 33

The cooking pages are the activity for these lessons.
How to use the cooking pages:

- **Read the recipe first.**
- **Care is needed with heat and blades.** Get help from an adult when using them.
- **Ingredients can be changed.** Many are marked optional. Others can be traded for something your family already has or prefers. Cooks work with what is available to them, and so did the families in these lessons.
- **Some recipes take a long time.**

Lesson 33: Budj Bim

In This Lesson

☐ Read Lesson 33

☐ Time Travel Passport

☐ Kooyang: The Eels of Budj Bim

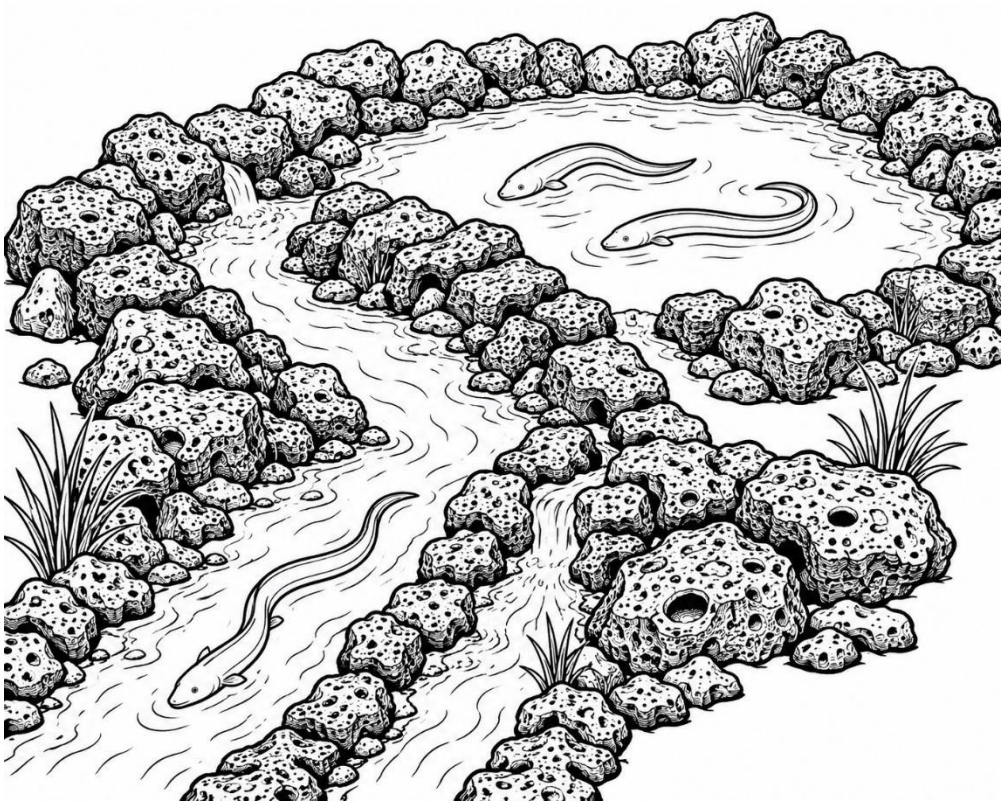
☐ Budj Bim Lava-Stone Channel Bread

☐ Think Like a Historian

☐ Words to Know

☐ Writing About History

Kooyang: The Eels of Budj Bim



What is the Gunditjmara name for eels?

What kind of eel is kooyang?

What did the Gunditjmara build to manage water and harvest eels?

What is the eel's life cycle?

Do the Gunditjmara continue their practice of aquaculture today?

Budj Bim Lava-Stone Channel Bread

This is a model, not a traditional food. You will build two rows of lava stones out of pieces of dough. The space you leave between the rows becomes a channel. After the bread bakes, you lay long noodles or green beans through the channel to show how fish could be guided through stone waterways.

Ingredients

- 1 can refrigerated biscuit dough or pizza dough
- 2 tablespoons melted butter or olive oil
- ½ teaspoon garlic powder
- ½ teaspoon dried Italian herbs
- 2 tablespoons grated parmesan, optional
- A small sprinkle of paprika, poppy seeds, or everything-bagel seasoning, for a stone look
- Cooked spinach linguine, green beans, or thin zucchini strips, for the eels

Directions

1. Heat the oven according to the dough package directions.
2. Cut the dough into small uneven pieces. These are your stones.
3. Toss the dough pieces with butter or olive oil, garlic powder, herbs, and parmesan.
4. Line a baking sheet with parchment paper.
5. Arrange the dough pieces in two uneven rows. Leave a narrow open space between the rows. That open space is the channel.
6. Sprinkle a little paprika, poppy seed, or everything-bagel seasoning over the dough to make the pieces look more like rough stone.
7. Bake until the bread is golden and cooked through.
8. After baking, lay cooked spinach linguine, green beans, or zucchini strips through the channel to show eels moving through the stone waterway.
9. Pull the bread apart and eat.

No-cook version. Use a shallow tray or baking dish instead. Lay small stones or blocks in two uneven rows with a narrow space between them, then pour a little water in at the high end and watch where it goes. Move your stones and pour again. See if you can make the water take a turn.

At Budj Bim, the Gunditjmara built with stone from ancient lava flows, making channels, ponds, and traps that guide water and hold kooyang. Whichever version you build, you are testing the same idea they worked out: Stone walls placed with care can decide where water goes.

Think Like a Historian

Thinking Tools: Fact and Interpretation, plus Evidence

A fact is something you can see, measure, or check.

An interpretation is what you decide the facts mean.

A fact becomes evidence when it helps answer the question you are asking.

Does the Name Fit?

You have traveled all over the world and deep into the past, watching people find new ways to make their food more dependable. People grew wheat in Southwest Asia, rice in China, and squash in Mexico. People herded cattle in the Green Sahara and grew potatoes high in the Andes. At Budj Bim, the Gunditjmara built stone channels and ponds to trap, hold, and harvest kooyang.

Historians often use the name Agricultural Revolution for the long change toward producing more food by growing plants and raising animals. In Lesson 27, you learned that a revolution is a big, lasting change. People did not make this change in one place, at one time, or in one way.

How well does the name Agricultural Revolution fit the evidence from this unit?

1. People in Southwest Asia grew wheat. People in China grew rice. The Gunditjmara trapped, held, and harvested kooyang at Budj Bim. Are these facts or interpretations?

○ Interpretations. They explain what several facts mean together.

○ Facts. Each claim can be checked against evidence.

2. "All of these changes together were one revolution" is…

○ An interpretation that must be checked against the facts.

○ A fact that archaeologists can check.

3. Which TWO facts most directly support the word revolution, meaning a big, lasting change?

○ Many communities continued hunting and gathering wild foods.
○ New ways of producing food changed where people lived and allowed some communities to grow larger.
○ People in different regions produced different kinds of food.
○ Farming and herding lasted for thousands of years and spread to new places.

4. Which fact most directly shows why the word Agricultural may not describe every food system in this unit?

○ Wheat and rice were grown in different parts of the world.
○ Domesticated plants changed over many generations.
○ At Budj Bim, the Gunditjmara used stone and water systems to trap, hold, and harvest kooyang rather than planting crops or herding animals.
○ Farming did not begin everywhere at the same time.

5. What do you think? Check one.

○ The name fits.

○ The name partly fits.

○ The name does not fit.

6. Write it or say it.

How well does the name Agricultural Revolution fit the evidence? Use at least two facts from the lessons to explain your answer.

I think the name _____ the evidence because _____.

One fact that supports my answer is _____.

Another fact is _____.

Words to Know

kooyang

The Gunditjmara word for eels, the long, smooth fish.

Kooyang travel between the sea and the wetlands, so they are always on the move. Say how the Gunditjmara used that fact instead of working against it.

aquaculture

Getting food from water by managing and harvesting aquatic animals or plants.

Fishing takes what the water already holds. Explain what aquaculture does that fishing does not.

channel

A narrow path cut or built for water to travel along.

The boy says the walls hold the water, the channels guide the water, and the traps catch the kooyang. Say what would go wrong if his people had built the walls and the traps but no channels.

Country (with a capital C)

For the Gunditjmara, Country is much more than the ground. It is a whole place and all that belongs to it: the water, the sky, the animals, the stones, the stories, and the ancestors. The people belong to Country and care for it, as it cares for them.

The grandmother says Country is the water, the sky, the eels, the stones, the stories, and the ancestors, all together. Name one part of Country that an ordinary physical map would not fully show.

revolution (review)

A big, lasting change in the way people live.

A revolution is big and it lasts. The Gunditjmara built their stone channels at least 6,500 years ago and are still caring for that Country today. Say which part of the word revolution that fact supports.

Writing About History

In this lesson you saw how the Gunditjmara built stone channels at Budj Bim to guide water and hold kooyang.

Plan a paragraph about Budj Bim using the outline below. Fill in each part, then write a paragraph.

Topic Sentence (T.S.): At Budj Bim, the Gunditjmara people used stone and water to catch and keep kooyang.

Detail (D): _____

Detail (D): _____

Detail (D): _____

Concluding sentence (C.S.): The Gunditjmara knew the water and the eels, so

Now write your paragraph.

Unit 5: Making a Life

Lessons 27 to 34, 13,000 to 6,500 years ago (and today).

Unit 4 left people living across much of the world as the ice retreated. Unit 5 follows communities that began managing plants, animals, and water more intensively to make important food sources more dependable. Hunter-gatherers already had detailed knowledge of the places where they lived. This unit examines what some communities did with that knowledge: saving seed and planting it, planting tubers, keeping animals and managing herds, and building ditches, channels, ponds, and traps to control water around food plants and animals.

The lessons proceed in chronological order and move around the world, from the Fertile Crescent at 13,000 years ago to southern Australia at 6,500 years ago. Taken together, they show that food production did not begin in one place and spread from there. People in Southwest Asia worked with wheat and barley, people in the Lower Yangtze worked with rice, and people in the valleys of Mexico worked with squash. Dry hills supported wild wheat, while wet valleys supported wild rice. Communities worked with the plants suited to the places where they lived.

Lesson 30 provides the contrast. The farming system studied in this lesson did not develop from species domesticated in Greece. It arrived with families who crossed the Aegean carrying domesticated seeds and animals, tools, and knowledge of planting crops and managing flocks. The change is preserved in the archaeological layers, where domesticated sheep and goat bones and charred wheat appear together in the earliest farming deposits and are absent from the older deposits below them.

Unit 5 also introduces evidence of changes that occurred across generations rather than in a single moment. One seed does not establish cultivation, and one animal bone does not establish herding. Archaeologists compare plant remains, animal bones, tools, and built features from dated layers. Changes in plants and animals, together with fields, ditches, channels, ponds, and traps, show that communities were managing food sources in different ways.

These changes did not produce a single way of living. At Guilá Naquitz, families planted squash in good ground near water and then moved elsewhere to hunt and gather, returning months later to harvest. In the green Sahara, herders remained mobile and moved with their cattle. As the region dried, many moved toward remaining water sources, including

the Nile. In the Andes, one family used different elevations of a mountain, keeping animals on the high grass, growing hardy potatoes in cold ground and quinoa lower down, and carrying fruit up from the warm valleys. Elsewhere, communities continued hunting, gathering, and fishing and did well. In Lesson 27, a mother says of her cousins who follow the wild herds that their way is good and this way is good, and that they are simply different.

Lesson 33 closes the unit at Budj Bim, on Gunditjmara Country, where people built stone walls, channels, ponds, and traps to guide water and trap, store, and harvest kooyang, the short-finned eel. This is aquaculture. It provided a dependable food source and formed an economic and social base for Gunditjmara communities over thousands of years. The landscape also contains the remains of circular stone houses.

The unit ends here rather than in a grain field as an intentional example that farming was one of several ways communities made food more dependable. Aquaculture and farming both involve managing food sources, and they are not the same system. The grandmother in this lesson describes Country as the land, the water, the sky, the eels, the stones, the stories, and the ancestors together.

Across all seven lessons, knowledge came first. Each community used detailed knowledge of local plants, animals, water, and seasons to manage food sources in new ways. Your learner carries into Lesson 34 a world in which people are living in many different ways at the same time.

LESSON 33: Budj Bim

6,500 years ago, the wetlands of southern Australia

Objective

In this lesson, your learner researches kooyang and the stone aquaculture system the Gunditjmara built at Budj Bim, writes about how they used stone and water to catch and keep eels, and closes the unit by using Fact and Interpretation together with Evidence to weigh whether the name Agricultural Revolution fits everything people actually did.

Materials

For Kooyang: The Eels of Budj Bim:

- Pencil
- Books about eels, the Gunditjmara, or Budj Bim, or internet access

For Budj Bim Lava-Stone Channel Bread:

- 1 can refrigerated biscuit dough or pizza dough
- 2 tablespoons melted butter or olive oil
- 1/2 teaspoon garlic powder
- 1/2 teaspoon dried Italian herbs
- 2 tablespoons grated parmesan, optional
- A small sprinkle of paprika, poppy seeds, or everything-bagel seasoning, for a stone look
- Cooked spinach linguine, green beans, or thin zucchini strips, for the eels
- **For the no-cook version**: A shallow tray or baking dish, small stones or blocks, Water

Suggested Schedule

Advance Prep: Before Session 1, have books about eels, the Gunditjmara, or Budj Bim on hand, or internet access, for the research questions. Before Session 3, buy the dough and the green strips for the eels. If you would rather not cook, your learner can build the same channel model with blocks or clay. The bread needs an adult at the oven.

Session 1 Read the lesson. Time Travel Passport. Kooyang: The Eels of Budj Bim.

Session 2 Words to Know. Writing About History.

Session 3 Think Like a Historian. Budj Bim Lava-Stone Channel Bread.

Using the Time Travel Passport

Map: Find Budj Bim on Gunditjmara Country and mark it. **Write**: Budj Bim, 6,500 years ago. **Stamp**: The Aquaculture of Budj Bim.

Kooyang: The Eels of Budj Bim

Dates are approximate. Accept reasonable answers in the right range rather than one exact number.

1. Kooyang.
2. The short-finned eel.

3. An aquaculture system of stone channels, walls, ponds, and traps.
4. The eels hatch in the sea, swim into rivers and wetlands as young eels and grow there for years, then travel back to the sea to lay their eggs.
5. Yes. Gunditjmara people continue to care for and manage Budj Bim, including restoring traditional water flows and use of the aquaculture system.

Think Like a Historian

This page asks your learner to evaluate the name Agricultural Revolution using evidence from the unit. In this course, revolution means a big, lasting change. Agricultural usually refers to farming or herding, but the Gunditjmara made food more dependable by managing water and kooyang without planting crops or herding animals. Your learner may decide that the name fits, partly fits, or does not fit if the conclusion is supported by evidence.

1. Facts. Each claim can be checked against evidence.

2. An interpretation that must be checked against the facts.

3. New ways of producing food changed where people lived and allowed some communities to grow larger. Farming and herding lasted for thousands of years and spread to new places.

4. At Budj Bim, the Gunditjmara used stone and water systems to trap, hold, and harvest kooyang rather than planting crops or herding animals.

5. Answers vary. No answer is preferred.

6. Answers vary. Look for a clear conclusion and at least two accurate facts from the unit that support it.

Words to Know

Answers vary. Look for:

kooyang: The Gunditjmara built channels and traps along the kooyang's route, guiding the moving eels into traps and holding ponds.

aquaculture: Aquaculture manages a water system or aquatic food source. At Budj Bim, the Gunditjmara guided kooyang into traps and holding ponds, kept them until they were needed, and then harvested them.

channel: The eels would have no way to reach the traps and the ponds. Walls alone hold water in one place, and traps alone sit where nothing swims. The channel is what connects them.

Country: stories, ancestors, or the relationships and responsibilities connecting people to Country.

revolution: Something that has held for 6,500 years and is still going is a lasting change. Look for lasting rather than big.

Writing About History

This exercise asks your learner to provide three details that support a given topic sentence. Relevant details describe how the Gunditjmara used stone and water to manage kooyang. The walls, channels, ponds, and traps support the topic sentence. The volcano and stone houses are important facts about Budj Bim, but they do not support this particular sentence.

Details: any three, in your learner's own words. Stone walls to hold the water; channels to guide it from pond to pond; woven basket traps set in the channels; eels kept alive in ponds until needed; eels smoked to keep for later and for trade.

Concluding sentence: an ending that says their knowledge made their food dependable. *Example*: so they had eels to eat and to trade even when the eels were not running.

Watch for: a learner who lists details that are true of the place but not about catching and keeping eels, such as the volcano or the stone houses.