Eat Your Science HOMEWORK

Educators' Guide

Ann McCallum

Illustrated by Leeza Hernandez

Welcome Science Chefs!

Put on your lab coat and get ready to experiment with YUM! With this collection of oh-so-tasty science treats, you will learn to make Atomic Popcorn Balls, Sedimentary Pizza Lasagna, Black Hole Swallow-Ups, and more. Along the way, you will find out interesting stuff about science, too. For example, why exactly does popcorn pop? What makes the vinegar and oil in salad dressing separate even after you have shaken them together like crazy? Or, is a black hole really just a giant gap in space? In this all new sequel to *"Eat Your Math Homework,"* we think you'll agree: Learning about science was never so delicious!

—Ann McCallum & Leeza Hernandez

Contents

About the Author: Ann McCallum

Ann McCallum is the award-winning author of several children's books, including two math fairytales and the math cookbook: Eat Your Math Homework: Recipes for Hungry Minds. She is also a high school teacher in Maryland, though she started her teaching career in a one-room schoolhouse in northern Canada (Rumor has it that she once crossed paths there with the neighborhood bear!). She spent over 4 years teaching in the United Arab Emirates where she went sand-skiing in the dunes behind the university. Ann enjoys reading, traveling, writing, and walking through leaves. Her family keeps her happy . . . and busy!

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About the Illustrator: Leeza Hernandez

Leeza Hernandez is an illustrator, author and graphic designer whose art has been featured in books, magazines, and newspapers. She is the 2011 winner of the Society of Children's Book Writers and Illustrators (SCBWI) Art Showcase and the 2009 recipient of the SCBWI Tomie de Paola Portfolio Award. She lives in Central New Jersey, with her family, a fluffy cat, two chubby goldfish, and a cheeky wild rabbit or two.

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OTHER BOOKS IN THE SERIES:
"Eat Your Math Homework: Recipes For Hungry Minds"

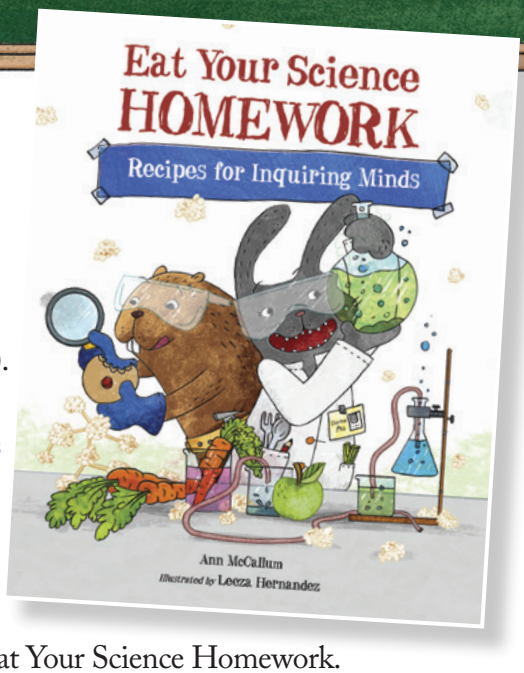
Team Visit!

Have Ann and Leeza come to your school.* The daring math duo offers a dynamic school presentation, including a behind-the-scenes-look at how the book was made and some lively audience activities!

Visit www.eatyourmathhomework.com

For more fab reviews, visit: www.eatyourmathhomework.com

Getting Started



Pre-Reading

How are food and science related? Have students brainstorm the connection between the two (Examples: Yeast, baking soda, and other leavening agents make bread and cakes rise. Heat from an oven causes a chemical reaction between dough and the finished product. Some solids, like butter, are liquid at higher temperatures).

Introduce the Book

1. Use the ice-breaker activity to introduce the concepts in the book. Give each student a copy of the 'Science Bingo' grid. Ask students to find classmates who can answer each of the questions in the boxes. A student who knows the answer should sign the box (and be prepared to share the answer later with the class). Alternatively, use the grid as the basis for a scavenger hunt—all answers can be found in Eat Your Science Homework.
2. Share the book, one section or more at a time. Use or adapt the activities in this guide to enhance students' learning and for an interrelated curriculum approach to learning. If practical, share some of the recipes with students—or have students make them at home.

Science Bingo

Find someone who:*

Can make a hypothesis about something.	Can describe what the periodic table is.	Knows the last step in the Scientific Method.	Can name the three states of matter.
Knows the chemical formula for water.	Can name the subatomic particles inside every atom.	Can name at least one element.	Can name a liquid that is more dense than water.
Is able to say whether sound or light travels faster.	Knows what the hardest mineral is.	Can name an inherited trait.	Can define a supernova.

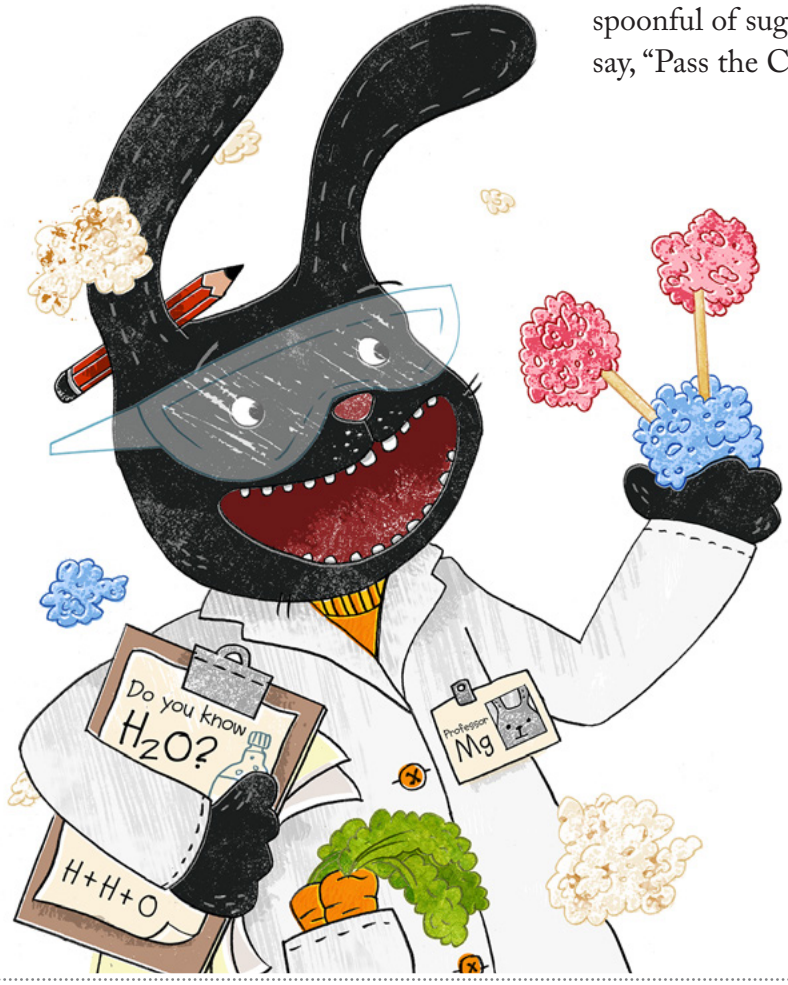
*All answers can be found in *Eat Your Science Homework*.

Atoms and Molecules

The atom—talk about tiny! What is an atom, anyway? Think of a single piece of Lego, only wa-a-a-a-ay smaller. If you put a bunch of Lego pieces together, you get a shape or project, right? It's kind of the same with atoms. Put a bunch of the same type of atoms together and you get elements, but mix them up and you get molecules.

Now for a little 'get-together' ... All elements invited!

When different elements bond together, they form molecules—a unit of at least two atoms. All substances have chemical formulas that provide a "recipe" for each molecule. Water is pretty simple: two hydrogen atoms plus one oxygen atom equals one water molecule. But sprinkle a little cinnamon on your toast, and you're looking at one complicated compound, or arrangement of two or more different elements. Cinnamon is written $C_{11}H_{13}NO$ (that is, eleven carbon atoms, thirteen hydrogen atoms, one nitrogen atom, and one oxygen atom). Instead of asking for a spoonful of sugar for your iced tea, you could say, "Pass the $C_{12}H_{22}O_{11}$, please!"



When 1 + 1 Doesn't Equal 2

1 + 1 = 2, right?
Not exactly… Try this experiment to find out when this isn't actually the case.

Question
Are molecules solid or do they have space between them?

Make a Hypothesis: (Write your hypothesis below)

EXPERIMENT
Materials Needed:

Water
Sugar
Spoon
1 cup measure
Glass that holds at least 2 cups of water
Marker or piece of tape

PROCEDURE
1. Pour exactly 1 measured cup of water into a clear glass. Mark where the water came up to with a marker or piece of tape.
2. Pour another measured cup of water into the glass. Mark where the 2 cup water line is. Then, dump all of the water out.
3. Add 1 measured cup of hot water to the empty cup. Add 1 cup of sugar and stir.

OBSERVE
What happened? Did the added cup of sugar force the water to move to the second water line?

CONCLUDE
Where did the sugar go? What does this tell you about molecules? Are they solid or do you think they have spaces between them?

The Three States of . . . Everything

When we talk about the three states of matter, we mean solids, liquids, and gases. Open your fridge and you'll see solids like butter or cheese, and liquids like grape or orange juice. Check out a gas when you take a deep whiff of a cut onion. But wait—what happens if you heat up the butter or cheese? What happens when you make popsicles from the grape or orange juice? And how about that steam when you boil a pot of soup? That's a gas, right?

Go on a scavenger hunt in your kitchen. What solids, liquids, and gases can you find? Which can you easily change into another state of matter?

Name: **Date:**

Name of Item	State you found it in	Can you help it change to a liquid?	Can you help it change to a solid?	Can you help it change to a gas?

Talk About Tiny!

How small is small?

Let's talk tiny when we're discussing molecules.

QUESTION
Are molecules small enough to pass through the membrane (outside skin) of a balloon?

MAKE A HYPOTHESIS: (Write your hypothesis below)

EXPERIMENT
Materials Needed:

1 balloon- not blown up
Vanilla or peppermint extract
Eye-dropper

PROCEDURE

1. Carefully use the eye-dropper to pour a little vanilla or peppermint extract into the unfilled balloon. Make sure you don't spill any outside.
2. Blow up the balloon and tie it shut. Wait a few minutes.

OBSERVE
Smell the balloon. Does it smell like the vanilla or peppermint extract on the outside?

CONCLUDE
How did the smell of the extract get to the outside of the balloon? What does this tell you about the skin of the balloon? What does this tell you about the size of molecules?

Vocabulary Log

Name:		Date:	
Word/Phrase	**My Definition**	**Actual Definition**	**Picture or Example**
Atom		The smallest particle of an element	
Element		Any pure substance that contains only one type of atom	
Matter		Any substance, living or nonliving, that takes up space and has mass.	
Molecule		A unit of two or more atoms, held together a strong chemical bond.	
States of Matter		Phases of matter such as solid, liquid, or gas.	

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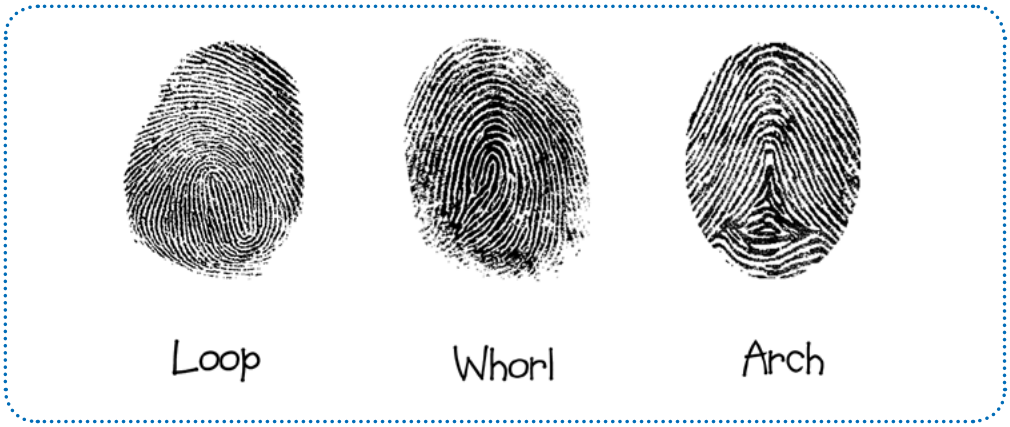
Inherited Traits

Have you ever heard someone tell you 'You look just like your mother/father/sister/brother'? The next time you browse through the family photo albums, take a careful look at the physical features of your family and relatives. Who has the same shaped nose? Who has similar eyes? What relative gave you your height? Your freckles? Your dark-colored hair?

Certain traits are inherited—passed down from your relatives to you—including physical appearance as well as things like how smart you are, or how good you are at fixing things. Is the type of fingerprints you have an inherited trait, too?

Every person in the world has a unique pattern of ridges on their fingertips. There are three main types of these patterns: loops, whorls, and arches (If the pattern of a specific print doesn't easily fit into one of these three categories, it can be placed in a separate group called 'mixed'). How would you describe each of these different print patterns?



A LOOP SHOWS

.....

AN ARCH SHOWS

.....

A WHORL SHOWS

.....

Fingerprint Know-How

You can practice taking your own fingerprints using one of two methods: a stamp pad OR using pencil rubbings.

The Stamp Pad Method

1. Start with your right-hand thumb. Press your finger onto the stamp pad and roll it firmly so that there is ink on the sides and pad of your thumb.
2. Carefully roll the inked thumb onto a clean sheet of white paper (Don't press too hard or you won't be able to see the separate ridges on the finger's surface). Wipe any extra ink off with a paper towel.
3. Repeat these steps for each finger on your right hand.

The Pencil Method

1. Use a number 2 pencil to scribble a dark patch of graphite onto a piece of paper.
2. Rub the front pad of your finger on the graphite to coat it with the dark dust. Make sure you rub the sides of your finger in the graphite as well.
3. Take a piece of ¾ inch transparent tape and 'lift' the print by placing the sticky side on your blackened finger and carefully pulling it off.
4. Stick the tape with fingerprint on a clean sheet of white paper. Examine the fingerprint. Use a magnifying glass to see more clearly.

Thumbs Up!

QUESTION

Is the type of fingerprint pattern you have an inherited trait? *You can test this question by answering the following: Do all or most of your family members have the same fingerprint pattern on their right-hand thumb?

MAKE A HYPOTHESIS

Most of my family members ..... (do/ do not) have the same basic fingerprint pattern on their right-hand thumb.

EXPERIMENT

Materials Needed:

Stamp pad (for stamp pad method) or pencil and tape (for pencil method)
White paper
Magnifying glass
Pencil and paper to record data

PROCEDURE

1. Use one of the methods for taking fingerprints (see earlier). Roll the thumb slowly and firmly so that you have the whole print.
2. Label whose thumbprint you have. Repeat this for other family members (*If possible, have family members who live farther away take a right-hand fingerprint for you. They may scan the results into the computer, or mail you the results).

OBSERVE

Using a magnifying glass, carefully analyze each print. Classify each as a loop, whorl, or arch pattern. Label this information below each person's name.

CONCLUDE

I think that the fingerprint pattern between family members ..... (is/is not) an inherited trait because. .....

**You may not have enough data for this. If not, what can you do to make the results of the experiment valid—a reflection of what are true facts?*

Trendy Prints

QUESTION

Is one pattern of fingerprints more common than the others?

You can test this question by answering the following: How many students in my class have a loop, whorl, or arch right hand thumb print?

MAKE A HYPOTHESIS

The most popular type of thumb print is a/an ..... because .....

.....

EXPERIMENT

Materials Needed:

Stamp pad (for stamp pad method) or pencil and tape (for pencil method)
White paper
Magnifying glass
Pencil and paper to record data

PROCEDURE

1. Each student should make a right-hand thumb print using one of the fingerprinting methods (see Fingerprint Know-How section).
2. Examine each print (with a magnifying glass if you have one). Label the type of fingerprint for each member of the class. Tally how many loops, whorls, arches, or mixed types you find.
3. Create a bar graph to record the data.

OBSERVE

Examine the bar graph to see which of the types of fingerprints is more popular.

CONCLUDE

The most common type of fingerprint in my class is the ..... .

Vocabulary Log

Name:		Date:	
Word/Phrase	**My Definition**	**Actual Definition**	**Picture or Example**
Forensic Science		Using science or technology to investigate a crime or problem.	
Minutiae		The main characteristics of a fingerprint.	
Inherited Traits		Characteristics that are passed down from relatives who were born before you.	
Friction Ridge Skin		the pattern of small, rasied lines on the skin.	

A Touchy Subject

Did you know ...

When fingerprints form?

An unborn baby forms tiny ridges on his or her fingertips as early as 11 weeks old. At birth, the baby has seven layers of skin and five of these have fingerprint ridges.

Why we leave fingerprints?

Our fingertips contain glands that produce oil. This oozes out through tiny pores in the skin and leaves a print every time we touch something.

Why we even have fingerprints?

Our fingerprints help us grasp onto things instead of having things slide right off.

Our fingerprints might also increase our sense of touch.

What dactyloscopy means?

This is the science of fingerprint identification. It comes from the Greek word 'daktylos' which means finger and 'skopein' which means to examine

Which animal has human-like fingerprints?

Koala bears have ridges on the tips of their fingers just like humans. But, don't worry—it's unlikely that a koala will be confused with a person at a crime scene. Koalas have two thumbs and claws instead of fingernails.

Who was the first American to be convicted using fingerprint evidence?

Thomas Jennings was convicted of murder in 1911 after touching wet paint at the scene of the crime. The court where Jennings was tried accepted the fingerprint evidence and he was later hanged.

Volcanoes and Heat

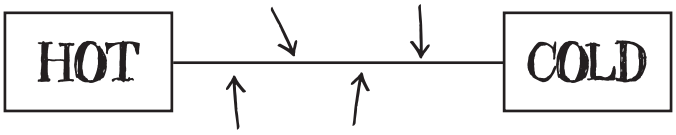
Hot Stuff!

Lava—love it or leave it? The word lava comes from an Italian word that means a stream formed as a result of rain. When lava, or liquid rock, erupts from a volcano, it flows down the sides of a volcano as if it were water. Just how hot does rock have to get before it turns into lava? Normal lava is between 1382° to 2282° Fahrenheit (750° to 1250° Celsius). To bake a pizza, you would use a hot oven, but even a hot oven is only about 425° Fahrenheit!

Scientists can tell the approximate temperature of lava by looking at what color it is. Orange to yellow is more than 1650° F (900° C). Bright, dark red is about 1165° F (630° C), and light red is around 895° F (480° C). That lava is hot stuff!

Make a Hot Line

Two volunteers hold each end of a long piece of string. On one end, the person holds a HOT sign and on the other side, the person holds a COLD sign.



Participants are given the names of substances or animals and must decide where they should be placed on the line between cold and hot. For example, they will need to decide which is colder, a frog or a turtle. Have participants make a guess first and then provide the correct temperatures so they may correctly categorize their guesses.

Item or animal	Actual average temperature (in Fahrenheit and Celsius)
Candle flame	2012°F / 1100°C
Boiling water	212°F / 100°C
Bird	105°F / 40.6°C
Horse	100.4°F / 38°C
Cow	101.5°F / 38.6°C
Rabbit	101°F / 38.3°C
Human	98.6°F / 37°C
Dog	102°F / 38.9°C
Elephant	97.7°F / 36.5°C
Goat	103.4°F / 39.7°C

A Whole Lotta Lava!

Volcanoes are formed from cooled lava. There are many active volcanoes in the world today. In the United States, two of them are found in Hawaii. The first, Mauna Loa, is the largest volcano in the world, rising four kilometers above sea level. It last erupted in 1984. Another volcano, Kilauea, is one of the world's most active volcanoes.

It started its eruptions in 1983 and has been continually erupting since then. Worldwide, about fifty to seventy volcanoes erupt every year—plus, there are more on the ocean floor that we can't see—that's a lotta lava!

The Earth—Thin Skinned

So you think you're on solid ground? Think again! Like a piece of fruit, the earth has an outer "skin," but the inside is a whole different matter. The surface of the earth is like the skin of an apple—only 4 to 44 miles (6 to 70 km) deep. The rest of the earth measures nearly 4000 miles (6400 km) to the center.

Travel down to the center of the earth and you'll find a solid metal core. This is surrounded by a thick layer of liquid metal—mostly iron and nickel. Even though the inner core has a temperature similar to the surface of the sun (9800°F / 5505°C), it is solid because of the enormous pressure pushing in on it.

The next layer is called the mantle, and the part of the earth we live on is called the crust. From the mantle, pockets of magma—molten rock—erupt and form lava.

Science Sampler

Fond of Fondue?

The idea of melting cheese and dipping bread in it probably came from peasants in Switzerland and France, who needed a tasty way to eat hardened cheese and stale bread. Nowadays, fondues can also be made with chocolate for dipping. Try this experiment for some delicious science!

QUESTION: Which has a lower melting point—cheese or chocolate?

MAKE A HYPOTHESIS

I think that ..... has a lower melting point because .....

.....

EXPERIMENT

Materials Needed:

Chocolate	*Cheese*
2 paper towels	*Microwave oven with glass viewing window*
Stop watch	*Small scale*

PROCEDURE

1. Measure an equal portion of cheese and chocolate. To be more precise, use a kitchen scale. Also, try to keep the cheese and chocolate approximately the same shape.
2. Place the chocolate on a paper towel in a microwave that has a glass viewing window. Turn the microwave on at the same time you start your stop watch (this is easier with 2 people conducting the experiment).
3. Watch carefully. At the first sign of melting, turn the stop watch and microwave off. Record how long it took to start melting.
4. Repeat the experiment with the cheese.

OBSERVE

What did you observe? Now, dip a pretzel or piece of croissant into the melted chocolate or cheese for your own mini-fondue. What a treat!

CONCLUDE

Note: Substances undergo change. A chemical change cannot be reversed because the structure of the molecules has been permanently changed (cake dough to baked cake). In a physical change, a substance can be changed back to its original state (solid chocolate to melted chocolate and back to solid chocolate). Is the melting cheese or chocolate in this process a chemical or physical change?

Vocabulary Log

Name:		Date:	
Word/Phrase	**My Definition**	**Actual Definition**	**Picture or Example**
Chemical Change		A change that cannot be reversed because the structure of the substance's molecules has been permanently changed.	
Inner Core		The innermost part of the earth that is made of mostly iron and nickel.	
Lava		Liquid rock that has erupted from a volcano.	
Magma		Liquid rock beneath the earth's surface.	
Physical Change		A change that can be reversed back to the substance's original state.	

Vocabulary Log Template

What are some vocabulary terms you discovered in each section of the book?

Name:		Date:	
Word/Phrase	**My Definition**	**Actual Definition**	**Picture or Example**