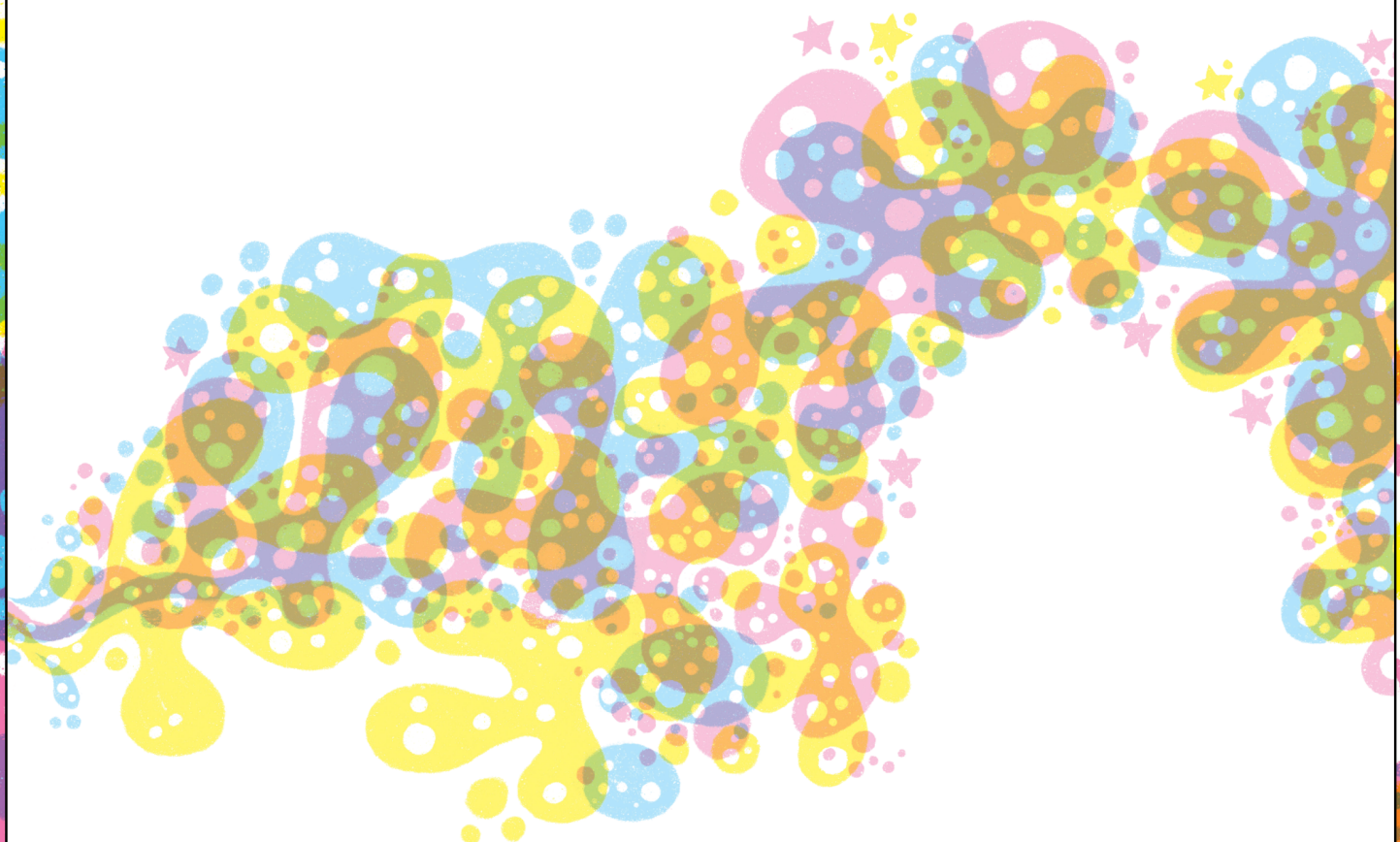


How to BAKE a UNIVERSE

An Educator's Guide

by Alec Carvlin
illustrated by Brian Biggs

For Grades K-5



Hey Teacher!

With Big Bangs and quarks, bright stars and swirly, spirally galaxies, baking a universe can be quite an undertaking (not to mention a 14-billion-year-long one). But teaching it in your classroom doesn't have to be! What might seem like a single-subject book is actually the perfect tool to engage students in persuasive writing, creative thinking, and drawing important text-to-self and text-to-world connections. And, of course, there's plenty of science for later grades to sink their teeth into without you needing an advanced degree in astronomy or particle physics to teach it to them.

Each of the three lessons is aligned with Common Core standards, but can be customized to suit any classroom's needs. Additionally, there are printable worksheets and activity cut-outs included to make your life just that little bit easier.

Thank you so much for considering using How to Bake a Universe in your classroom! I (Alec) am extremely grateful that you're giving my work a chance to do exactly what I wrote it to do - excite young minds. And I know my illustrator, Brian, my editor, Simon, and all of our collaborators at Norton Young Readers share that same sentiment.

So have fun reading How to Bake a Universe! If you have any questions, comments, or want to share a cute picture or nice sentiment, be sure to use the contact form on our website, howtobakeauniverse.com.

Your friend in all things cosmic and culinary,
Alec Carvlin

TABLE OF CONTENTS:

Pg. 3-4: Common Core Standards

Pg. 5-6: Interactive Read-Aloud - Adaptable for Grades K-5

Pg. 7-8: What's in Your Universe? - Sentence Completion for Grades K-2

Pg. 9-10: What's it Made of? - The Building Blocks of Things Adaptable for Grades K-5

This guide was written with the help of Madeline Thompson, a graduate of the Harvard University Masters of Education program and current 1st grade teacher in New York, NY.

COMMON CORE STANDARDS

Quick note! These common core standards are chosen from an assortment of standards ranging from grades K-5. They are not representative of the entirety of standards that could apply to teaching *How to Bake a Universe*. Rather, they are an idea of the subject areas that could be addressed in the classroom and how certain themes and topics might better apply to students in higher grades.

Science -

1-ESS1-1: Patterns of the motion of the sun, moon, and stars in the sky can be observed, described, and predicted

2-PS1-3: Make observations to construct an evidence-based account of how an object made of a small set of pieces can be disassembled and made into a new object.

5-PS1-1: Develop a model to describe that matter is made of particles too small to be seen.

5-PS2-1: Support an argument that the gravitational force exerted by Earth on objects is directed down.

5-ESS1-1: Support an argument that differences in the apparent brightness of the sun compared to other stars is due to their relative distances from the Earth.

Mathematics -

K.MD.A.2: Directly compare two objects with a measurable attribute in common, to see which object has “more of”/“less of” the attribute, and describe the difference. (K-PS3-1), (K-PS3-2)

MP.2: Reason abstractly and quantitatively (2-PS1-2)

4.MD.A.1: Know relative sizes of measurement units within one system of units including km, m, cm; kg, g; lb, oz; l, ml; hr, min, sec. Within a single system of measurement, express measurements in a larger unit in terms of a smaller unit. Record measurement equivalents in a two-column table.

5.NBT.A.1: Explain patterns in the number of zeros of the product when multiplying a number of powers of 10, and explain patterns in the placement of the decimal point when a decimal is multiplied or divided by a power of 10. Use whole number exponents to denote powers of 10. (5-PS1-1)

ELA/Literacy -

W.1.7: Participate in shared research and writing projects (e.g., explore a number of “how-to” books on a given topic and use them to write a sequence of instructions). (1-ESS1-1), (1-ESS1-2)

W.1.8: With guidance and support from adults, recall information from experiences or gather information from provided sources to answer a question. (1-ESS1-1), (1-ESS1-2)

RI.2.3: Describe the connection between a series of historical events, scientific ideas or concepts, or steps in technical procedures in a text. (2-PS1-4)

W.2.1: Write opinion pieces in which they introduce the topic or book they are writing about, state an opinion, supply reasons that support the opinion, use linking words (e.g. *because*, *and*, *also*) to connect opinion and reasons, and provide a concluding statement or section (2-PS1-4)

W.2.8: Recall information from experiences or gather information from provided sources to answer a question. (2-PS1-3)

INTERACTIVE READ-ALOUD
Adaptable for Grades K-5

OBJECTIVE: The objective of this interactive read-aloud is to engage students in a rich text discussion, allowing them the opportunity to learn new vocabulary, bring in their prior knowledge, make predictions, and draw text-to-self and text-to-world connections.

PREPARATION:

Materials:

How to Bake a Universe

Optional Materials:

Printable Sunglasses Cut-outs

Scissors

Art supplies for each student

Vocabulary:

Quick note! Some of the exact definitions for these words can get a bit heady. The goal with this vocabulary, at all ages, is to have students understand the *relations* between things. For example, that quarks make up atoms - not that quarks are one of the fundamental particles of the Standard Model and have six types and blah blah blah. Save that for the PhD classes!

Universe - All existing matter and space.

Cosmic - Relating to the universe or cosmos.

Particle - A tiny portion of matter. Optionally, for later grades, you can distinguish between a particle and a fundamental particle (e.g. a quark), as fundamental particles can't be broken down into anything smaller.

Quark - A (fundamental) particle smaller than an atom. For later grades: they combine to form protons and neutrons, which combine with electrons to form atoms.

Atom - Units of matter that form elements. For later grades: they are made up of protons, neutrons, and electrons.

Gas clouds - Clouds of gas and dust are masses of elements, which are made up of atoms. They come together via gravity to form stars.

Star - A star is a bright astronomical body that is held together by gravity - like our own Sun, or the many stars we can see in the night sky.

Planet - A planet is a large astronomical body that moves in an elliptical orbit around a star.

Galaxy - A galaxy is a system of millions or billions of stars, together with gas and dust, held together by gravity.

Gravity - Gravity is the force that pulls objects toward one another (depending on how massive they are - more massive objects pull less massive objects, like how the Earth pulls each of us towards the ground).

PROCEDURE:

Optionally, have students decorate their own sunglasses using the provided cutout before reading. When you reach the page that says "Here's where your sunglasses come in," have them put their sunglasses on.

To begin, introduce the book *How to Bake a Universe* and solicit students' ideas, predictions, and connections about the title and cover illustration.

Sample questions include: What do you think this book is going to be about? What on earth does the title mean? What do you know about the universe? What do you know about baking?

Read *How to Bake a Universe*, optionally utilizing the call-and-response style written into parts of the text (e.g. "Does your universe look like a) a boily bubbly soup, b) a topsy turvy sea..." et cetera - these sections were written to make reading it aloud more, well, interactive!). As you read, pause to comment and ask questions about the vocabulary words and what they mean in the context of the story. Additionally, pause at any measurements encountered - amounts of time, heat, or size - to discuss relative comparatives.

Sample questions: We know what a star is - what does this page say about how they form? 377,000 years - is that a long time or a short time? Have you ever had to wait that long for something? A trillionth of a trillionth of a trillion - how small do you think that is?

P.S. - Don't worry! Much of the measurement stuff is beyond our imagination, even as adults, and as such there aren't necessarily *right* answers to those questions. In asking them, the goal is to facilitate students' curiosity and inquiry and encourage them to stretch their imaginations. This section can easily be adapted, or subtracted, to fit the grade level of your students.

Finally, consider having your students look at the illustrations throughout your read, pausing to have them make inferences about how the character is feeling and, for later grades, how those emotions are driving the story forward.

Sample Questions: How do you think she's feeling right now? How do you know she's feeling that way? Have you ever felt that way? What would you do in that situation?

After reading, go back over the vocabulary and ask students what they think the ending meant. What was the message in the text? How did it make them feel?

A possible extension is to assign each student a "role" as if the story were a play. For example, one student can be the chef, a group of students can be quarks, atoms, gas clouds, planets, stars, and galaxies - one can even be the alien at the end! Have students listen for when their part is called in the story, and jump up to act out what it might mean to be a quark, a planet, or an alien. This can help to keep students engaged with the text while you read, and provides a fun, embodied classroom exercise.

WHAT'S IN YOUR UNIVERSE?
Sentence Completion for Grades K-2

OBJECTIVE: The objective of this lesson is to introduce students to the structure of persuasive writing, and provide a rich environment for them to draw text-to-self connections.

PREPARATION:

Materials:
How to Bake a Universe
Scissors
Writing Materials
Printable Worksheet

Terms to define before reading:

Recipe
Ingredient
Universe

PROCEDURE:

Introduce the book *How to Bake a Universe* to your students. Tell them you are going to read a book about how the universe came to be.

In this story, we're going to follow a recipe. The recipe tells us how to make our own universe! Let's find out what we're going to need.

Read the story, stopping to ask questions, make comments, and identify the "key ingredients" of the recipe. The key ingredients are as follows: heat, time, quarks, atoms, light, stars, planets, galaxies, and explosions. Whether or not to include "nothing" as a key ingredient is up to you. Optionally, have your students write each of the key ingredients down.

After reading the story, use the provided sheet (or your own) to turn it over to the students. Have them fill in the sentences stating their opinion, their reason, an example, and a conclusion. For instance: "I think friendship is a key ingredient in the universe. Because friendship makes people nicer to each other. Example: I need friendship in my universe to feel close to the people who make me happy. Conclusion: With more friendship, the universe would be complete!"

When students have finished completing their sentences, distribute art supplies and let them draw or color their universe in the space provided. Encourage them to include their "key ingredient" in their drawing. Gather each student's sheet and consider making a small poster or bulletin board with some space-themed decorations as a means of displaying them.

My name is _____ and this is my universe!

OPINION:

I think _____ is a key ingredient in the universe

REASON:

because _____.

EXAMPLE:

Everyone can use _____

to _____.

CONCLUSION:

With _____

the universe would be complete!



WHAT'S IT MADE OF?
The Building Blocks of Things Adaptable for Grades K-5

OBJECTIVE: Students will learn about how atoms form molecules, and be able to articulate how larger things are composed of smaller things.

PREPARATION:

Materials:

How to Bake a Universe

A bowl of water

A pipette and a smaller bowl or dish

Writing implements for each student

PROCEDURE:

Prior to reading, set out a bowl of water and use your pipette to put a single drop of water in either another bowl or a small dish (this can be done without a pipette). Have students guess what these might be for. Then introduce the book *How to Bake a Universe* to students.

In this story, we're going to read about the Big Bang and the creation of the universe. Because the universe is everything in existence, we're going to read about things that are really big and things that are really small. Keep an eye out for those.

As you read the book, stop to ask questions and make comments. Point out the particles that are very small, and the astronomical bodies that are very big, taking special care to describe how the very small things came together to form the very big things.

After reading, present the ocean as an example of a very big thing and ask students what smaller things they think came together to form it. You can hint at the bowl of water. Then ask students what smaller things came together to form the bowl of water. If they aren't making the connection, you can hint at the droplet from the pipette.

For later grades: ask students if they think there are smaller things that came together to form the droplet of water, reminding them that there was a certain "building block" they read about in the book - the atom. Then group students into threes and designate two H's and one O per group. Alone, every student is an atom, but when two H's and one O hold hands, they're now a molecule of water! And there would have to be a lot of them to make that droplet.

With the ocean broken down into a single drop of water, have students write down a very big thing of their own. Then have them break down the very big thing into its constituent elements (for later grades, down to the atom again to reinforce how atoms make up all matter). This can be done individually or in groups to allow for cooperative brainstorming.

Some examples include buildings (bricks, stones, windows, the roof, walls, doors, etc.), trees (roots, branches, leaves), and planes (wings, tail fin, cockpit, engines).

Finally, have students write a recipe to build their bigger thing back up out of its constituent elements. For instance, for a tree, first you need roots growing into the ground, then it has to grow big and tall, then it needs branches, and those branches need leaves, and those leaves need sun. If your students are working in groups, have each group share their recipe with the class. If they are working individually, consider creating a poster to display each student's completed recipe.

How to BAKE a **UNIVERSE**

SUNGLASSES: For style, protection, and close inspection!

