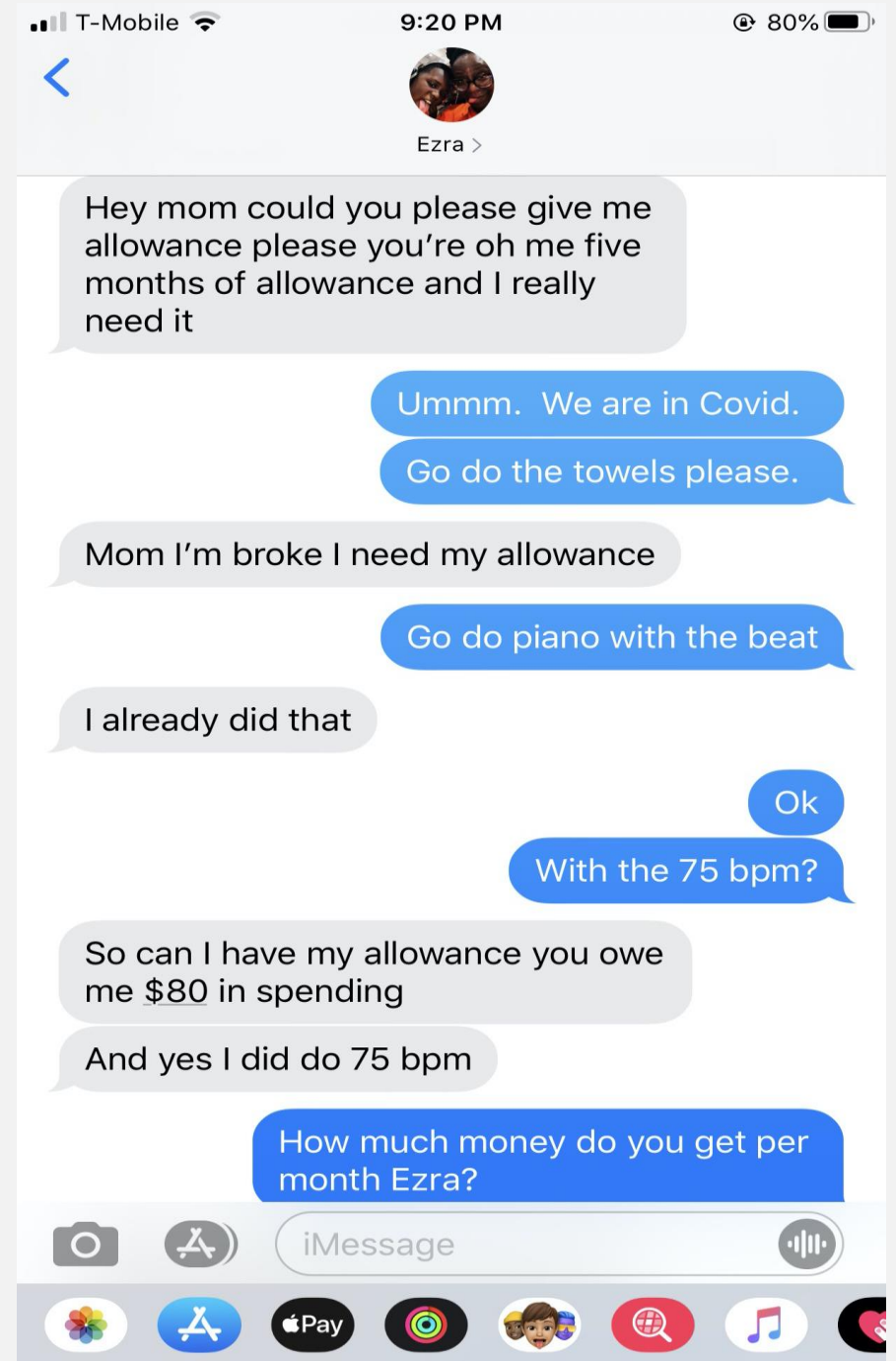


THE RELEVANCY OF LITERATE PRACTICES IN STEM PEDAGOGY: A CASE FOR TEXTS



AP CHEM INVENTORY, SEPTEMBER 30, 1989

1 WHITE CEILING W/ WHITE LIGHTS

1 WHITE TEACHER TEACHING

25 WHITE DESKTOPS

1 WHITE FLOOR

2 WHITE LECTURE BOARDS

21 WHITE STUDENTS LEARNING

3 BROWN STUDENTS

2 WHITE CONVERSATIONS IN THE
BACK OF THE CLASS

1 WHITE TEACHER'S WHITE PUN

10 WHITE STUDENTS LAUGHING
AND

BLACK ME



- Wilson (2020) writes:
- CollegeBoard's AP Exam data for 2018 showed a [44% increase in Black students taking at least one AP Computer Science exam](#). Most of us would take this at face value and congratulate ourselves for a job well done. However, this percentage amounts to only **7,301 Black students out of a total of 135,992**. [African-Americans received just 7.6% of all STEM bachelor's degrees and 4.5% of doctorates in STEM](#).

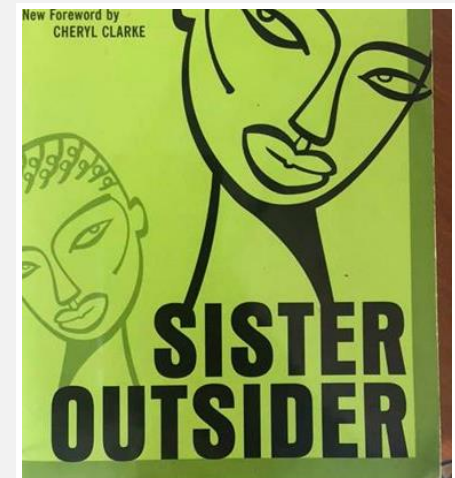
EDUCATION

SAN DIEGO UNIFIED SCHOOL DISTRICT BSTA
PROGRAM CLEAR TEACHER CREDENTIAL – CHEMISTRY

LOS ANGELES UNIFIED SCHOOL DISTRICT INTERN
PROGRAM PRELIMINARY CREDENTIAL-CHEMISTRY

UNIVERSITY OF MICHIGAN, ANN ARBOR, MI
MASTER OF ENGINEERING, ENVIRONMENTAL
ENGINEERING

TUSKEGEE UNIVERSITY, TUSKEGEE, AL
BACHELOR OF SCIENCE, CHEMICAL ENGINEERING



WHY ARE WE HERE?

1

The sociopolitical context in the United States has encouraged many of us that we need to understand more about the “education debt,” and specifically BIPOC students (Ladson-Billings, 2006)

2

STEM subjects, grades 4-higher education, remain challenged in increasing and sustaining its use of literacy practices in its content knowledge development (Fang, 2012; NIL 2007)

3

Teachers need support in how to develop literacy practices into their instruction that increases STEM knowledge and honors the perspectives and experiences of their students.

GOALS

1

Demonstrate how STEM teachers can use literacies as a process in developing content knowledge

2

Encourage teachers to build upon the relationship between process knowledge and students' cultural identities

3

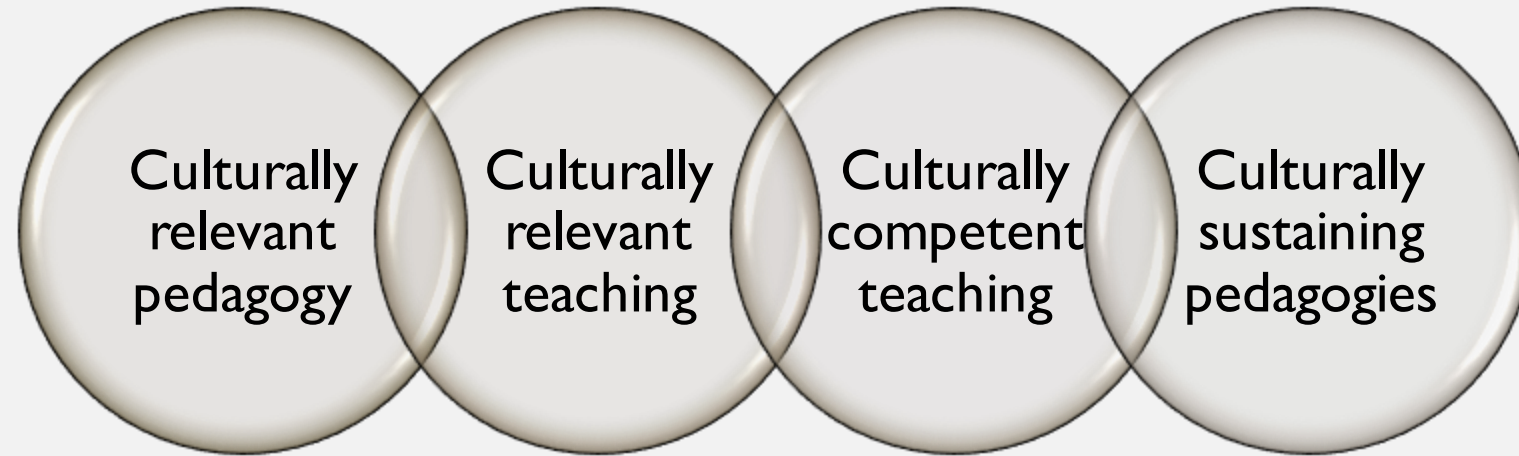
Guide teachers through how to choose texts to find linguistic and sociocultural relevance for their 21st century learners.

THE ROOTS OF RELEVANCY TO THE FRUIT OF SUSTAINABILITY

- Google “Culturally Relevant Pedagogy” 7,410,000 results
- Ladson-Billings cited 7524
- Ladson-Billings, G. (1994). *The dreamkeepers*. San Francisco, CA: Jossey-Bass.
- Ladson-Billings, G. (1995). But that’s just good teaching: The case for culturally relevant pedagogy. *Theory Into Practice*, 34(3), 159–165.



TERMINOLOGIES



TIME-LINE FOR CRP (THE NOTORIOUS GLB)

2014

Culturally relevant pedagogy 2.0 aka. the remix

1994

The Dreamkeepers:
Successful teachers
of African American
students

1990

“Like lightning in a
bottle: Attempting to
capture the
pedagogical
excellence of
successful teachers
of Black students”

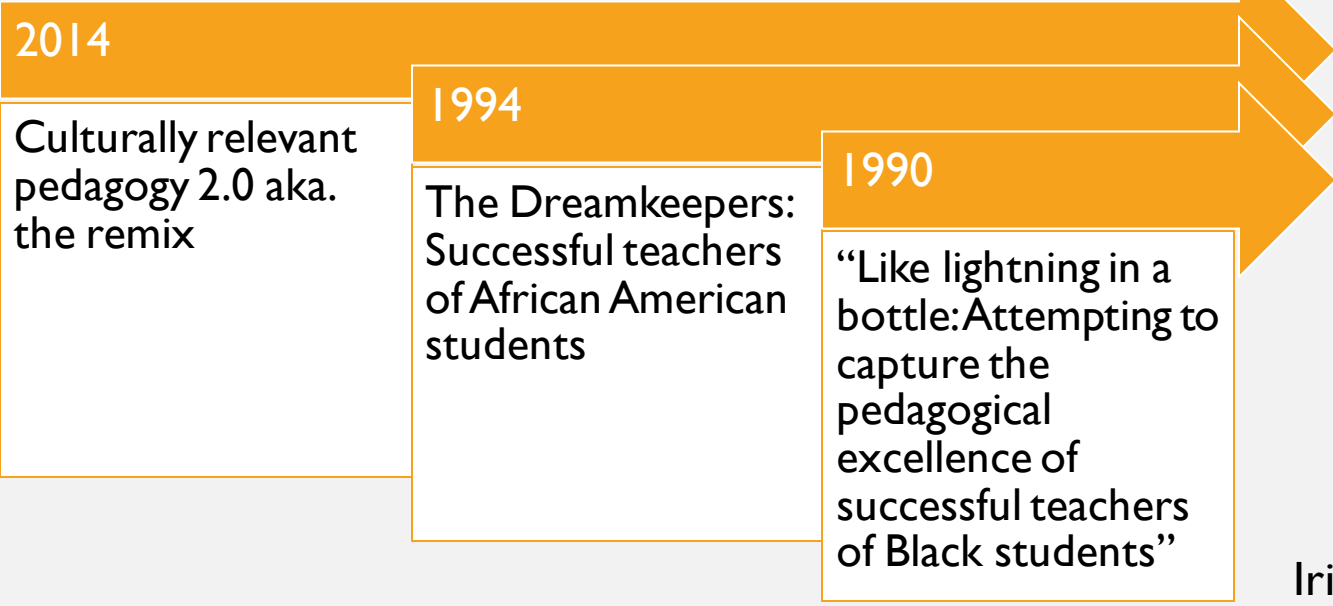
TIME-LINE FOR CRP (THE NOTORIOUS GLB)

Geneva Gay

Paris & Alim

Ayanna F. Brown

Courtney Cazden



Renee Smith-Maddox

H. Richard Milner

Irizarry

Mariana Souto-Manning

A FRAME OF MIND

Much more significant than methods are teachers' attitudes and beliefs about their students, their relationships with them, and their knowledge about their families and backgrounds
(Nieto, 2013, p. 20)

MY CULTURALLY RELEVANT EXPERIENCE IN SCHOOL

Mrs. Ladson



LEARNING
AND
GROWING AS
SISTERS WAS
ALSO HELD
AS A SACRED
TRUST THAT
WE WERE
RESPONSIBLE
FOR OUR
COMMUNITY



GOALS

1

Demonstrate how STEM teachers can use literacies as a process in developing content knowledge

2

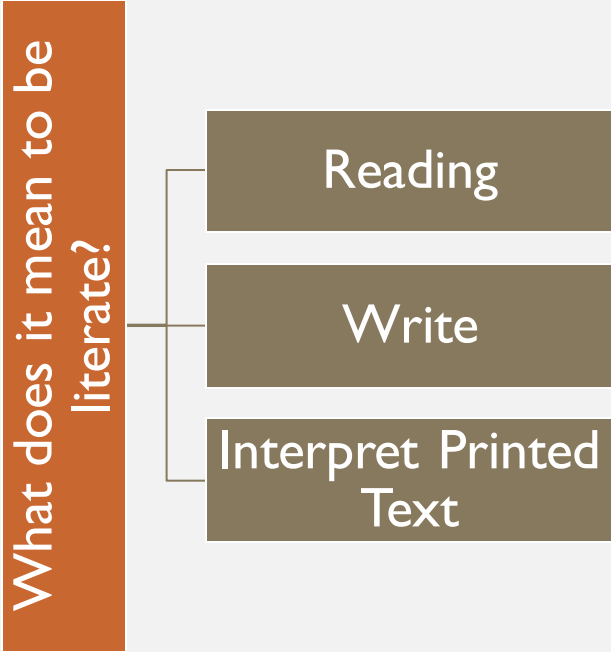
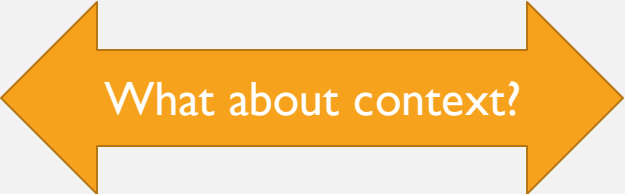
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Guide teachers through how to choose texts to find linguistic and sociocultural relevance for their 21st century learners.

AN IDEOLOGICAL VIEW OF LANGUAGE AND LITERACY: AUTONOMY

- Hymes (1975)
- Smitherman (1977)
- Street (1985)
- Bloome (1985)
- Gee (1996)
- Kinloch (2011)
- Baker-Bell (2019)



“JAYDEN BROKE”



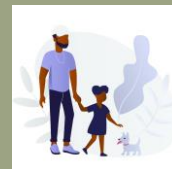
WHAT IS LITERACY?



“Literacy is a malleable repertoire of practices, no an unchanging or universal set of skills...change in literacy education is about change in the material worlds of social life and practice.And it is the new lived experiences and histories of childhood,work and leisure...(Luke,2004)



“...there is a clear gap between the way we are teaching reading and writing in school and the sophisticated set of practices students use outside of school...literacy is always and everywhere situated and, inseparable from practices (Pahl & Rowsell, 2005)



"...acts of, practices in, and activities around reading, writing, and speaking...includ[ing] a variety of media...from oral language, multimodalities, to computer and visual literacies

THE
CULTIVATION
OF LITERACIES



1



2



3



4

Step 1: Where are you going?

- Start **with** the end in mind
- Think Aloud and Share
- Demystify the Journey

Step 2: Invite Students...gain access...Funds of Knowledge (Moll)

- Activating Prior Knowledge must be inclusive of ALL Knowledge
- Be Consistent

Step 3: Recursive Practices

- Questioning & Discovery have value
- Build in Reading

Step 4 "Talk Science"

- Highly discursive communities build confidence and willingness to problem **solve**

WHAT DOES LITERACIES AS A PROCESS LOOK LIKE?

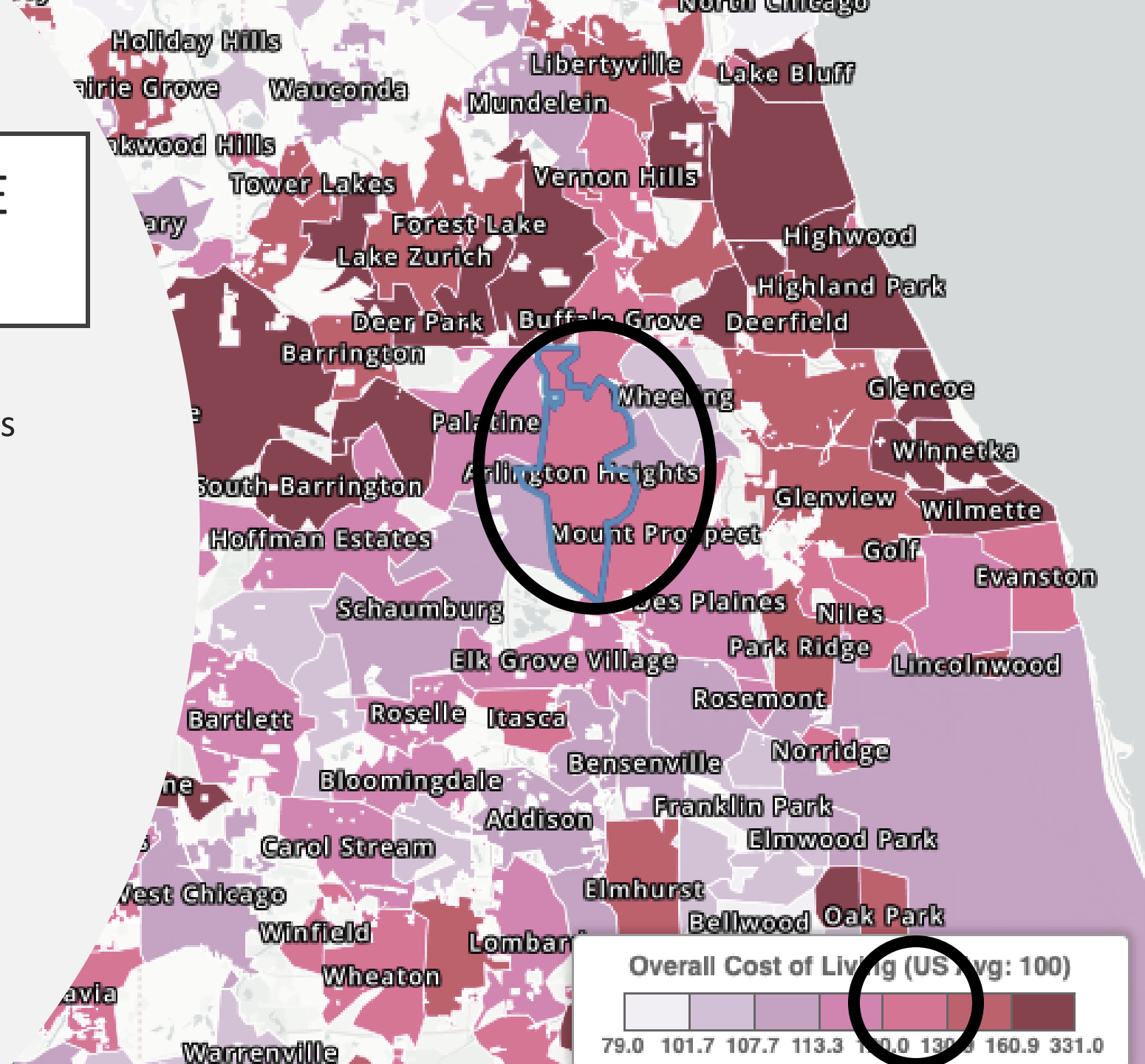
The logo for the National Institute for Literacy is a teal-colored circle with a white border. Inside the circle, the text "NATIONAL INSTITUTE FOR LITERACY, 2007; FANG, 2012" is written in white, uppercase letters, centered and stacked vertically. The background of the slide features a dark grey vertical bar on the left side.

NATIONAL
INSTITUTE
FOR
LITERACY,
2007; FANG,
2012

- “A major concern in the United States is that more than 70% of students in grades 4-12 lack the skills to read and write proficiently in academic content areas”
- ”...literacy instruction should continue beyond the elementary years and should be tailored to the more complex forms of literacy that are required of adolescent students in the middle and high school years”
- ...many middle and high school teachers have little or no preparation for teaching these skills within their content-area disciplines and have few resources upon which to draw...”

TAX BASES AND HOME COSTS

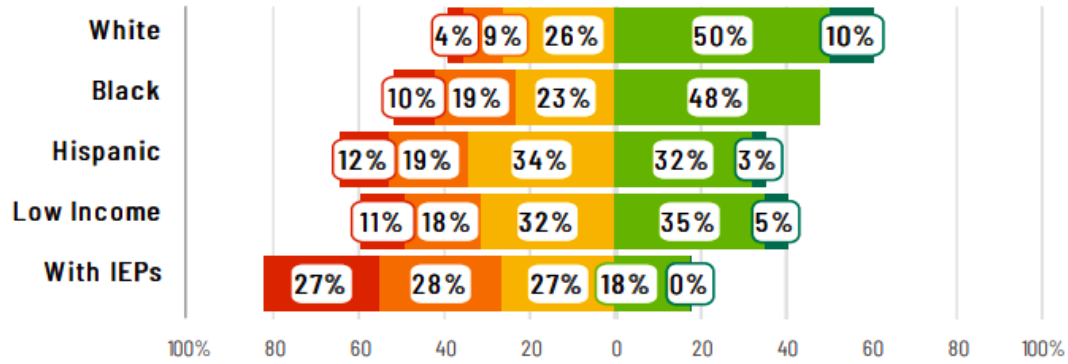
- **2020 Sales Tax Rate:** 6.75% (this includes state, county, and city rates)
- **Median Home Cost:** \$324,300



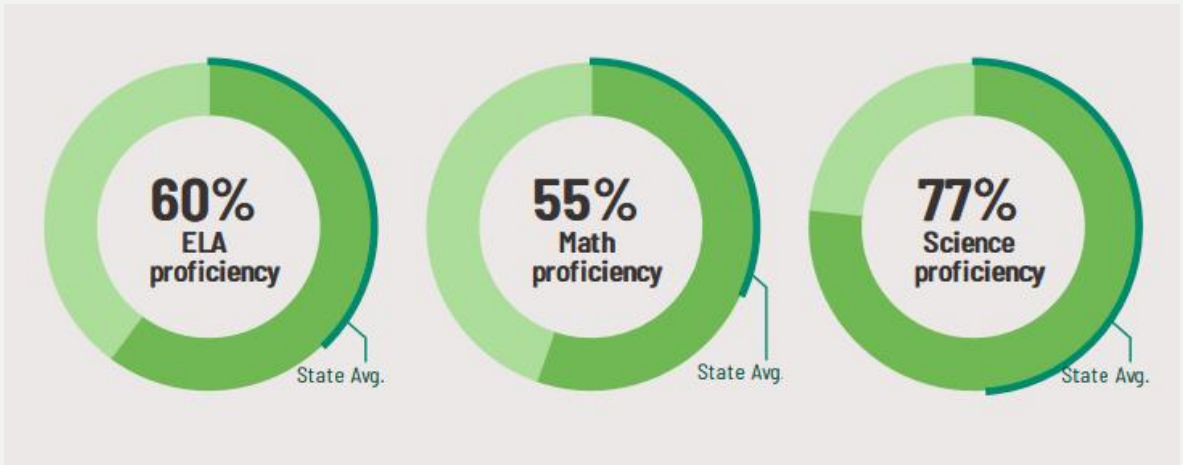
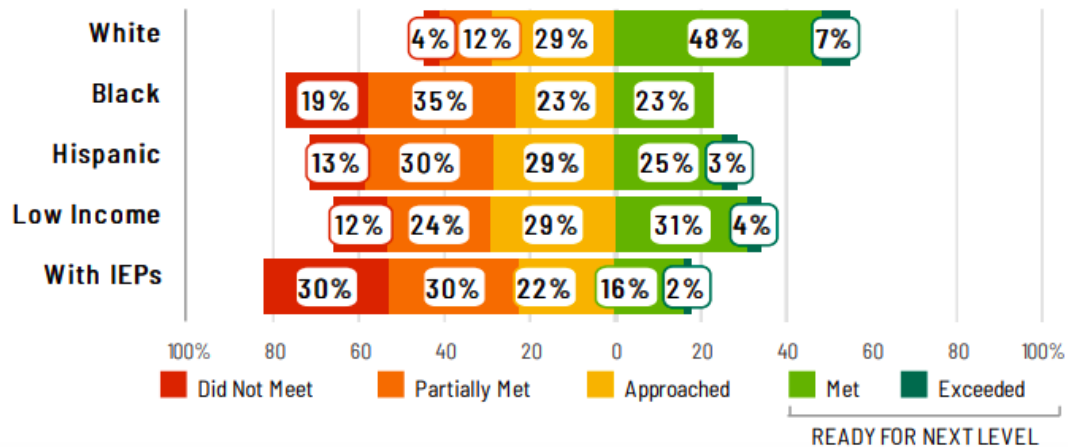
DISTRICT STUDENT ACHIEVEMENT



English Language Arts



Mathematics

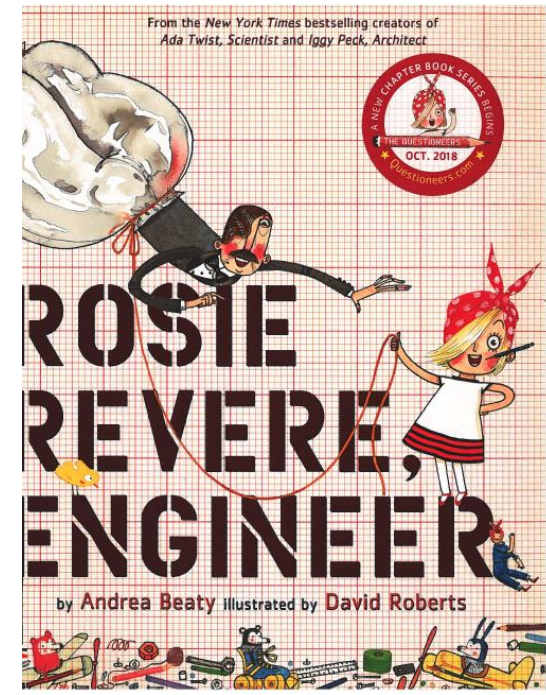
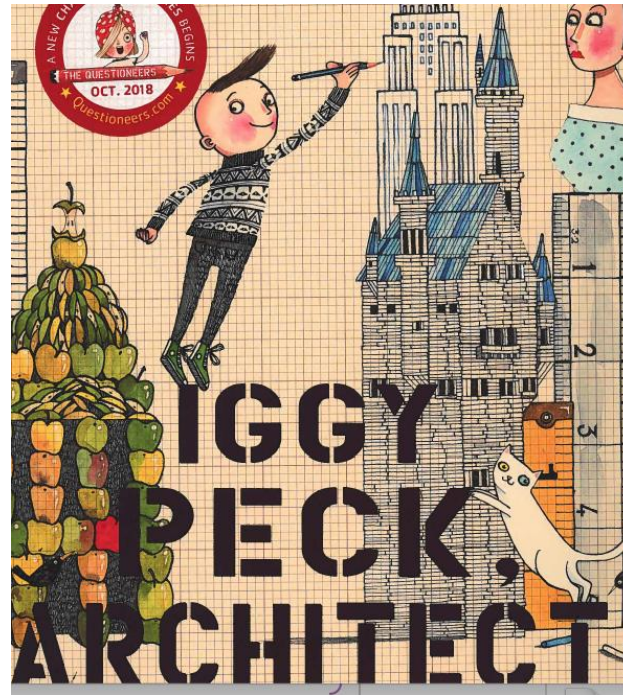
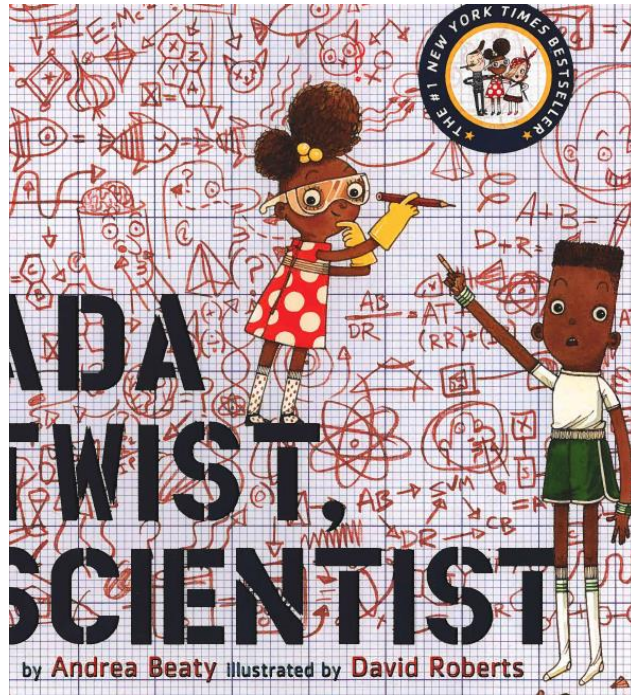


MUCH LIKE LADSON-BILLINGS' REFRAME OF
ACHIEVEMENT GAP TO EDUCATION DEBT IN
2006, I'D LIKE TO RESITUATE LITERACY.

- Much of our energy has invested in Common Core and increasing complex texts in secondary education and also reaching to K-5 introducing informational text
- Tremendous investment places “reading skills” at the center of standardized testing the remediation
- Families are introduced or sometimes sequestered into family-school reading programs to increase bonding or community engagement with reading
- ALL OF THESE EFFORTS CONTRIBUTE TO IMPROVING TEXT TO ACADEMY ENGAGEMENT...BUT...HAVE WE CONSIDERED

OUR ABILITIES TO
RELATE SCIENTIFIC
THINKING INTO
EVERYDAY PROBLEM
SOLVING PROHIBITS
OUR STUDENTS,
ESPECIALLY BIPOC
STUDENTS AND
WOMEN FROM
REALIZING THEY ARE
STEM.





CHILDREN DEVELOPING THEIR LITERACIES,
OFTEN INSPITE OF SCHOOL AND FAMILY

WHAT IS TEXT?

- Anything we use that helps us engage in meaning making. How we order our understanding is based on how we think and how information shapes our thinking.
- The modalities for meaning making can come in many forms. These forms are “text.”
 - Print
 - Music
 - Memories



This Photo by Unknown Author is licensed under [CC BY-NC-ND](https://creativecommons.org/licenses/by-nc-nd/4.0/)

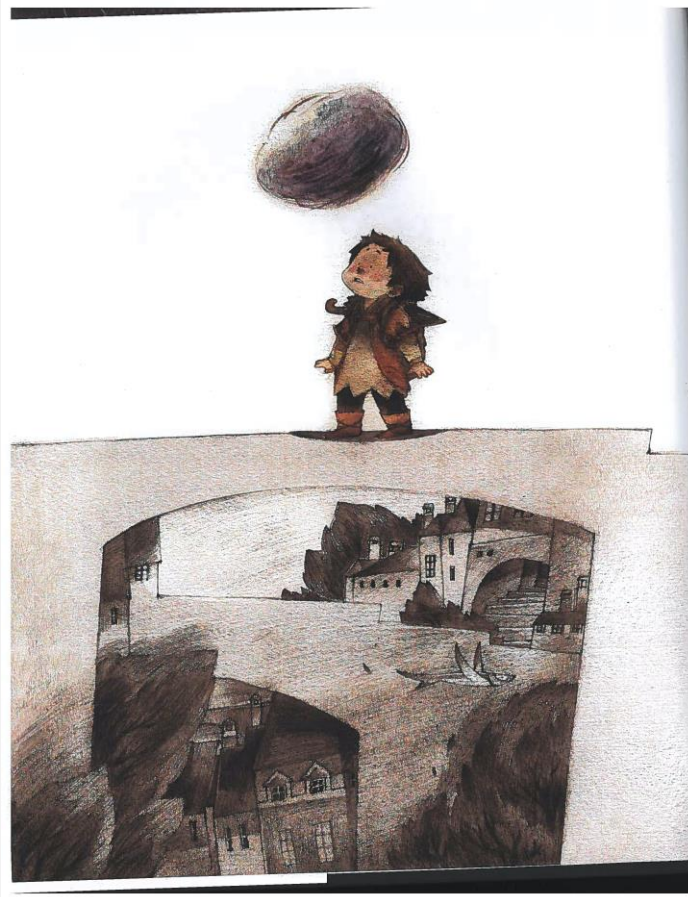
BUILDING IN
PROCESS
KNOWLEDGE
AS UNSURE
AND SCARY

But also developing
within the culture of
learning the normalcy of
FAILure or “trial and
error”

WHAT DO
YOU DO
WITH A
PROBLEM?



WHAT DO YOU DO WITH A PROBLEM

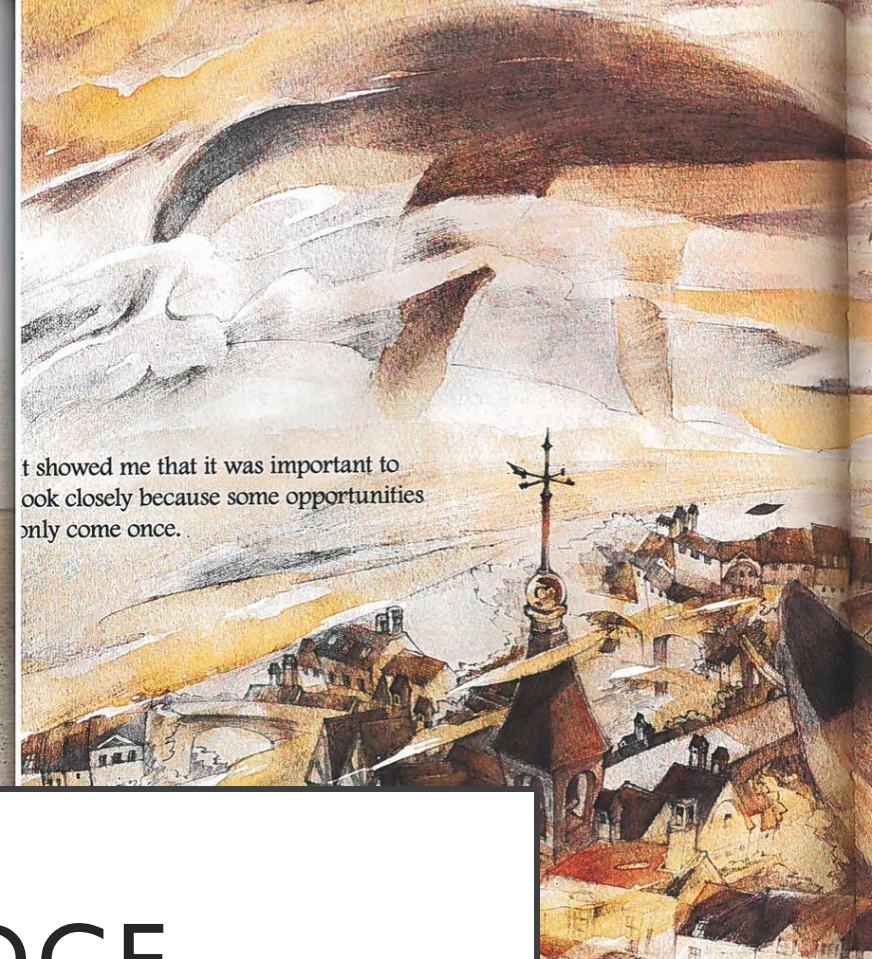
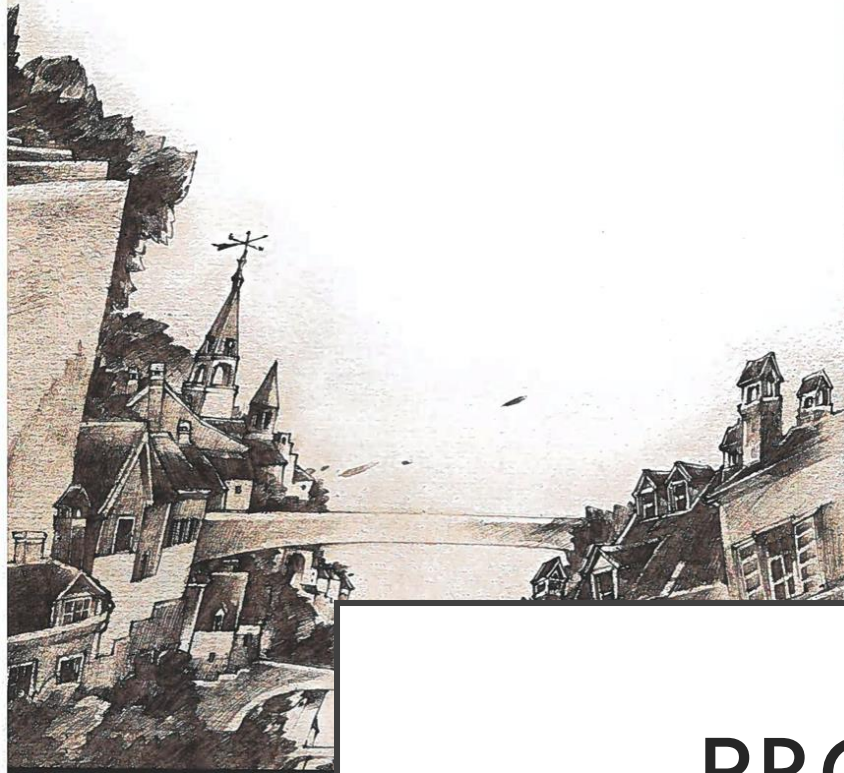


I don't know how it happened,
but one day I had a problem.
I didn't want it. I didn't ask for it.
I really didn't like having a problem,
but it was there.



My problem held an opportunity!

It was an opportunity for me to learn and to grow.
To be brave. To do something.



It showed me that it was important to
look closely because some opportunities
only come once.

PROCESS KNOWLEDGE

PROCESS STRATEGIES



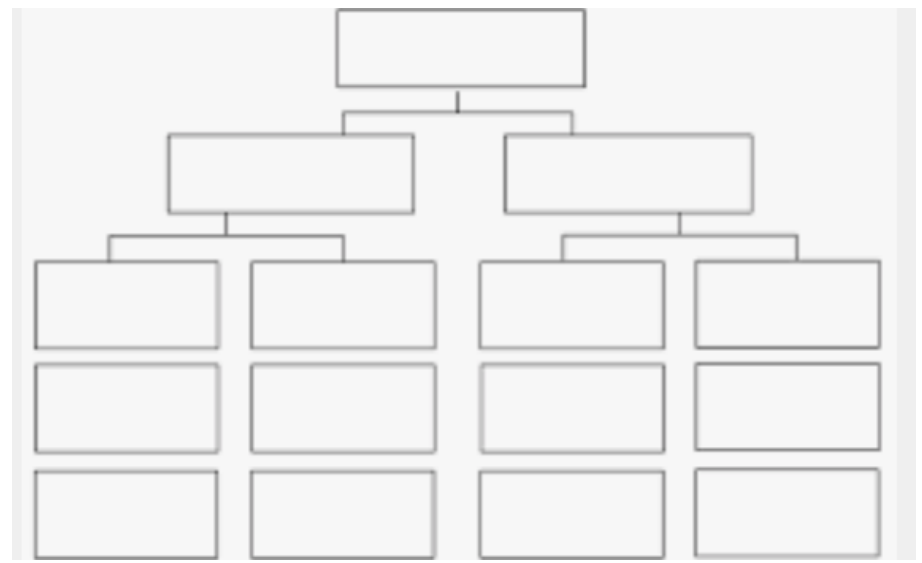
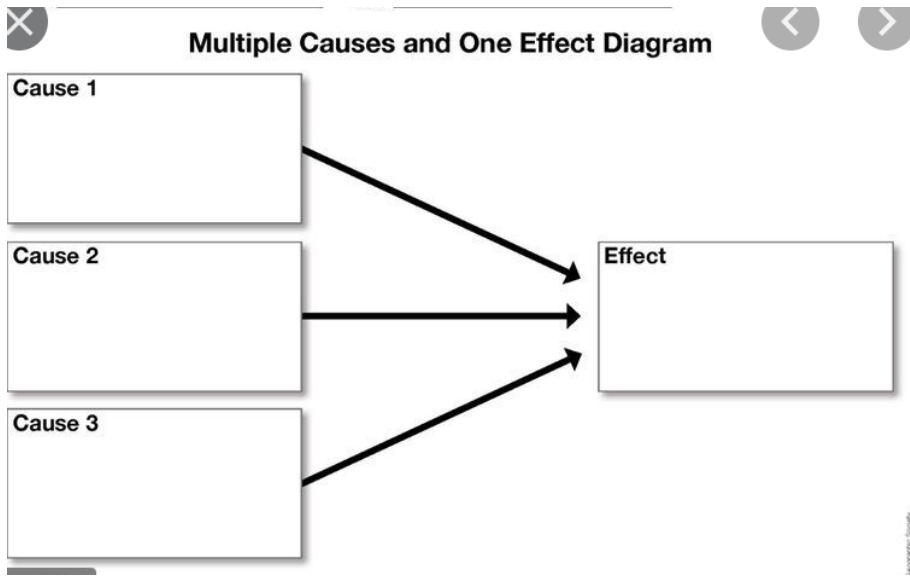
Good readers ask questions before, during, and after reading- but teachers must guide process knowledge with good questions.



What can teachers do? Find children's books connected to large scientific complex ideas. These ideas may be represented in picture books. **USE THEM.** As pre-reading question and have student read the picture **CLOSEly** to consider meaning and the scientific concept.

USE VARYING TYPES OF QUESTIONS

- Explicit information in the text, that is, that answer is evident in the text can often be copied...it is a right there question. LOW LEVEL but useful to build confidence. Anticipate that students are simply copying from the book. Where do you go from there?
- Implicit information- the answer is in the text, but the reader has to pull it together from different parts of the text- Pulling it together response.
 - Enable your students to use graphic organizers to process the different ideas in order to “pull it together.”



USING INFERENCES TO GATHER INFORMATION WHILE READING

VARYING QUESTIONS (CONTINUED)

- Implicit information found in text and the students' prior knowledge. Here students must synthesis ideas and information.
- Student' prior knowledge and experiences alone; that is, the student does not have to read the text to answer the question, but reading the text will inform the answer.

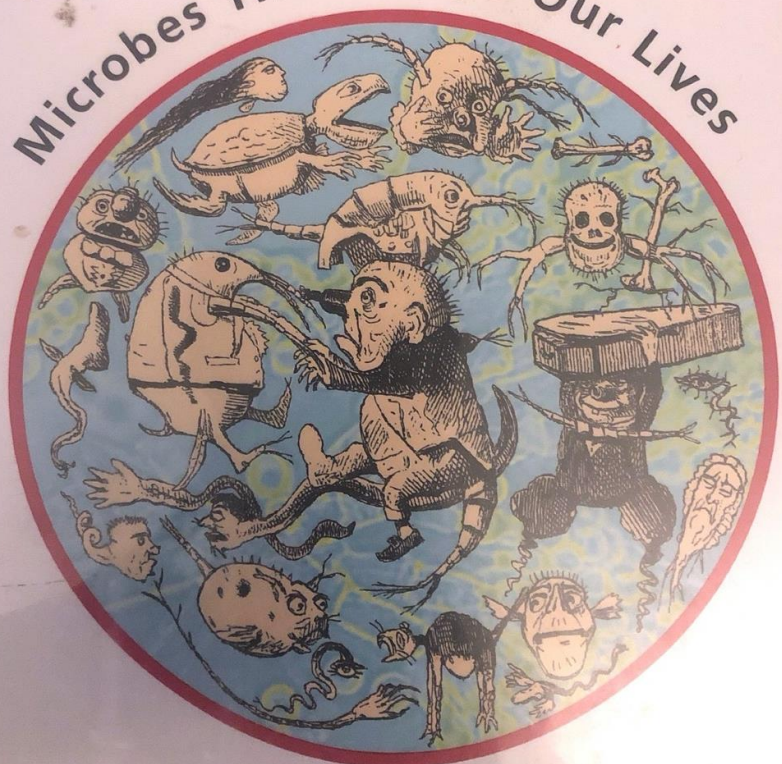
LET'S PRACTICE

Read the Book Covers

INVISIBLE ALLIES

TUOLUMNE COUNTY LIBRARY
3 9949 01010 3201

Microbes That Shape Our Lives



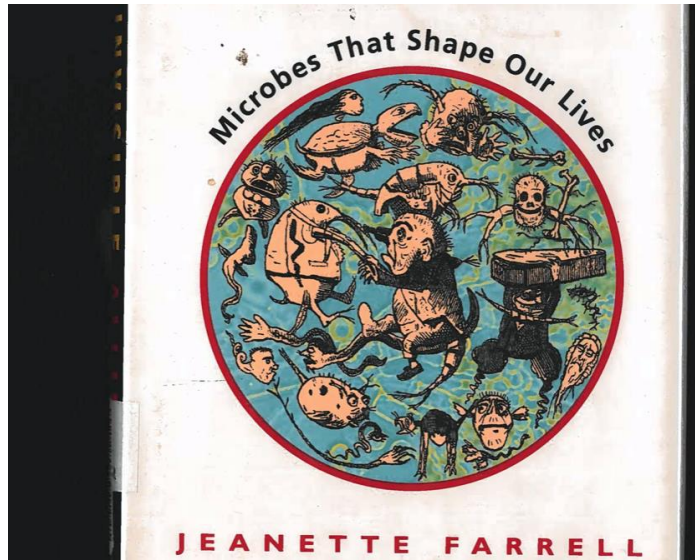
JEANETTE FARRELL

Author of *Invisible Enemies: Stories of Infectious Disease*

LET PRACTICE WITH VOCABULARY

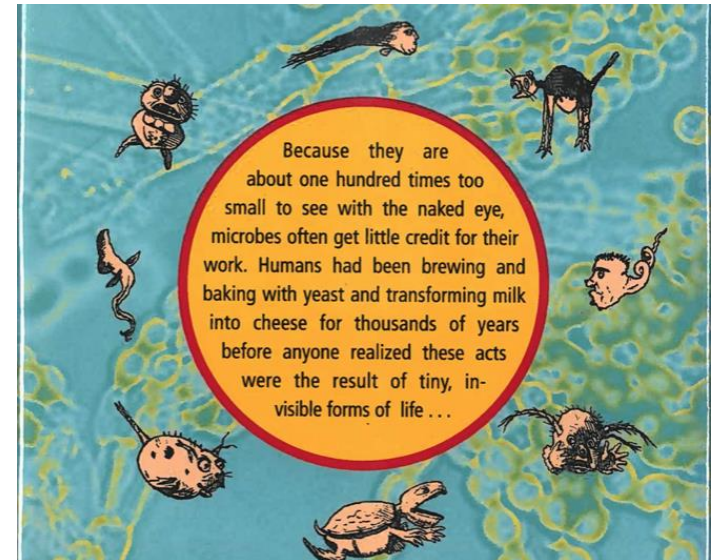
Ally

Enemy



... of creatures your size I offer
a free choice of habitat,
so settle yourselves in the zone
that suits you best, in the pools
of my pores or the tropical
forests of arm-pit and crotch,
in the deserts of my fore-arms,
or the cool woods of my scalp.
—W. H. AUDEN
from "A New Year Greeting," 1969

More than one hundred trillion tiny creatures
far too small for you to see live in and on you.
Your body houses about ten times more mi-
crobes than you have cells. Some spots host
more guests than others: the "desert" of your
back may contain as few as four hundred mi-
crobes per postage-stamp-sized piece of skin



WHAT KIND OF EXPLICIT AND IMPLICIT QUESTIONS
CAN WE CREATE THAT ARE TEXT DEPENDENT?

READ PARAGRAPH 2- 3

What vocabulary jumps out at you? You have heard the word before, but you have not used it in your own speaking? When you talk, this word is not used, much. Can you find a word or a few words?

4 INVISIBLE ALLIES

life: microbes, or microorganisms, live in the absolute dark two thousand yards deep in the ocean, in hot springs that heat nearly to boiling, and in the icy interior of Antarctica. Microbes strive to live everywhere, and they make no exception for our bodies.

Before the thought of these creepy visitors sends you running, somewhat futilely, for a bar of soap, consider this: the successful persistence of microbes is responsible for life on Earth. Microbes release oxygen into the air we breathe, they rid the world of noxious mounds of dead plants and animals, and they free up the parts of those dead things so that we can use them to make our bodies. Those microbes living in our gut digest our foods, make vitamins we need, and hold other unwelcome microbial invaders at bay. It is very likely that if all other forms of life were to die, the microbes would go right on enjoying planet Earth in our absence. If the microbes were to die off, however, plants, animals, and humans would not stand a chance.

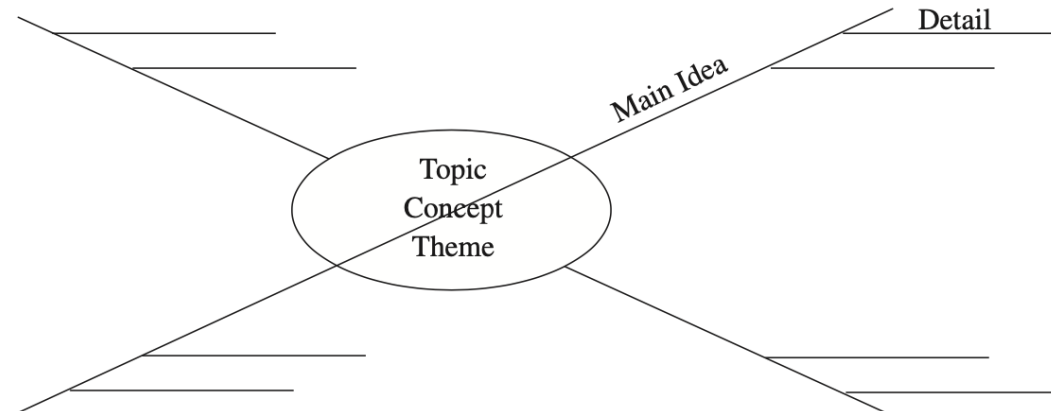
This book shines a spotlight on the essential work of our invisible companions to show how we humans depend on microbes every day, most intimately. While it is certainly true that some microbes have earned human enmity—some ferment our sweat until it stinks, raise pimples on our faces, rot holes in our teeth, sicken us and kill us—far more of their uncountable numbers live among us peacefully, nearly all of the time. One microbiologist in what he called the 1941 Census of Bacteria in the United States tried to calculate the total numbers of helpful and harmful bacteria. He concluded:

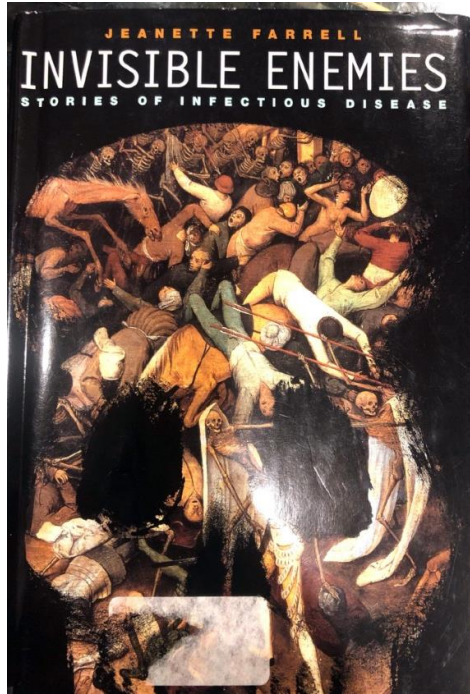
READ AND ASK YOURSELF QUESTIONS: HOW ARE THESE WORDS BEING USED IN

Graphic and Semantic Organizers

Spider Maps

Spider Maps are used to describe a central idea: a thing (a geographic region), process (meiosis), concept (altruism), or proposition with support (experimental drugs should be available to AIDS victims). Key frame questions are: What is the central idea? What are its attributes? What are its functions?





When George Washington first felt the soreness in his throat on that cold December afternoon in 1799, he must have known that even he, master of Mount Vernon, first President of the United States, conqueror of the British Army in the war for American independence, could be up against a foe he might not defeat. Despite nasty weather the day before, Washington had ridden his horse through the windblown rain, hail, and snow to oversee his farm. The next morning he felt the beginnings of a cold, and it was during the next night that he woke his wife to tell her he had grown chill and feverish. At first light his friend Dr. James Craik was called.

A concerned Dr. Craik called two other physicians, Dr. Elisha Dick of Alexandria, Virginia, and Dr. Gustavus Richard Brown of Port Tobacco, Maryland, assembling the finest in medical care to be had. Their course of treatment was to have George Washington inhale vinegar and water, gargle a mixture of vinegar and sage tea, undergo an enema, and take three doses of calomel and sev-

The bacterium that causes cholera seen through a scanning electron microscope at 29,000 times its actual size

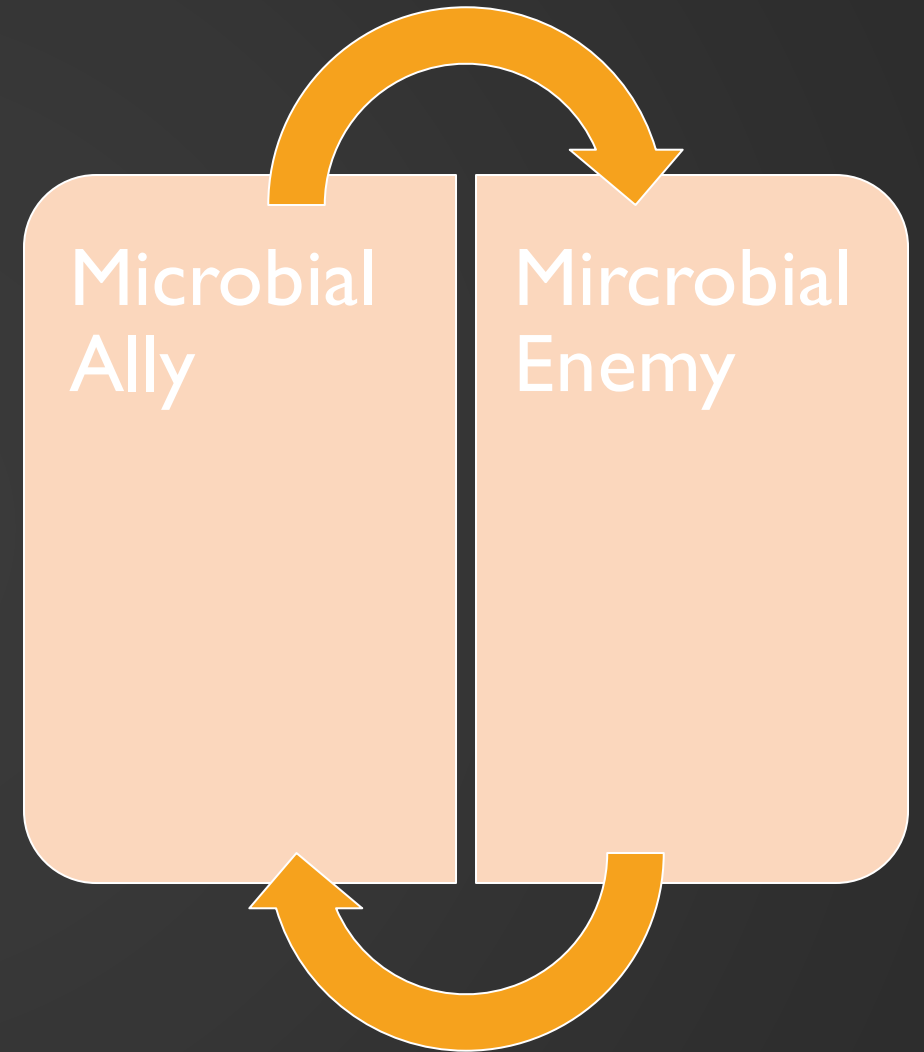
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The bacterium that causes cholera seen through a scanning electron microscope at 29,000 times its actual size

INVISIBLE ENEMIES

ALLIES .VS. ENEMIES



GOALS

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3

Guide teachers through how to choose texts to find linguistic and sociocultural relevance for their 21st century learners.



Kris Gutierrez, UC at Berkeley

PROCESS KNOWLEDGE AND CULTURAL IDENTITY

- Culture is a verb
- Culture is dynamic
- Culture is both tangible and intangible
- Culture is mitigated by time, space, region
- Culture is situated
- Culture is not race but racial constructions construct culture
- Culture must be studied because when you think you got it right, you've got it wrong



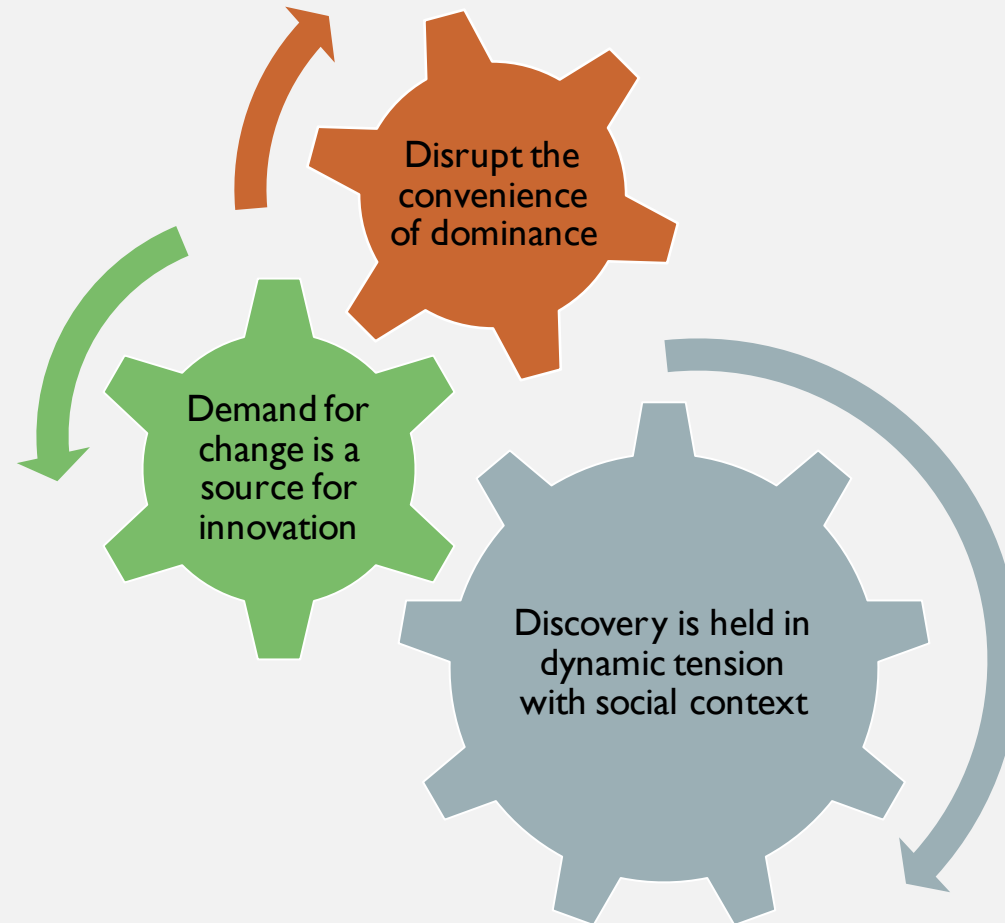
WHAT DOES POP-CULTURE TEACH US ABOUT PROCESS AND CULTURAL IDENTITY?

- Sustaining pedagogies are work that seek to enact “pedagogies that are not filtered through a lens of contempt and pity (Paris & Alim 2014).
- ”What would our lives look like if this gaze weren’t the dominant one?
- What would liberating ourselves from this gaze and educational expectations it forwards mean for our abilities to envision new forms of teaching and learning?

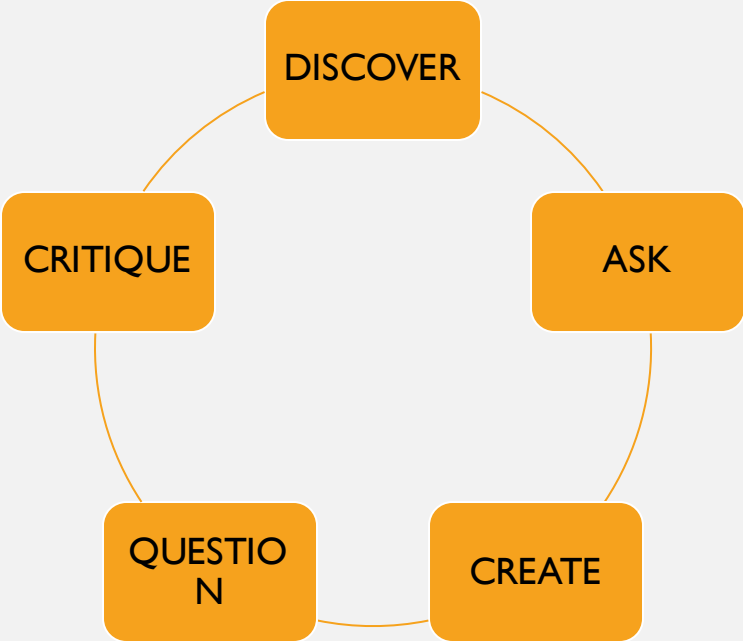
THE POWER AND CURSE OF THE GAZE



WHAT DO WE LEARN FROM RUFF'S 2016?



PROCESS KNOWLEDGE AND CULTURAL IDENTITY



PROCESS KNOWLEDGE DEVELOPMENT REQUIRES USES OF LANGUAGE

- Process knowledge refers to the community of learners building and developing the strategies to make sense of information.
- Sense-making or thinking aloud is the unique space where being “correct” is less valuable than the cognitive demands involved in problem solving.
- Developing the academic language to talk science or any other discipline requires verbal, oral, argumentative, and deliberative opportunities to use language



TALKING SCIENCE

Language, Learning,
and Values

Joy L. Lemke



**“Those Loud Black Girls”: (Black) Women, Silence, and Gender
“Passing” in the Academy**

SIGNITHIA FORDHAM

First published: March 1993 | <https://doi.org/10.1525/aeq.1993.24.1.05x1736t> | Citations: 186

Abstract

This article explores the impact of gender diversity on school achievement. Using data obtained from an ethnographic study of academic success in an urban high school, this analysis examines how the normalized definition of femaleness—white middle-class womanhood—juxtaposed with a two-tiered dominating patriarchy, propels African-American females to resist consuming images that assert their “nothingness”. “Loudness”,¹ thus becomes a metaphor for African-American women’s contrariness, embodying their resistance to this proclaimed “nothingness”. How “loudness” reflects their efforts to subvert the repercussions of these prevailing images is examined along with an assessment of its impact on academic achievement.

WHAT DOES THIS LEARNING LOOK LIKE?

Its loud

It moves

It debates

It reflects

It laughs

It builds

It questions

It challenges



WHAT ARE THE TOOLS?

- Experiential Learning
- Cultural Models
- Linguistic Jousting
- Written Representations
- Building Models
- Writing Thoughts
- Artful Interpretations

GOALS

1

Demonstrate how STEM teachers can use literacies as a process in developing content knowledge

2

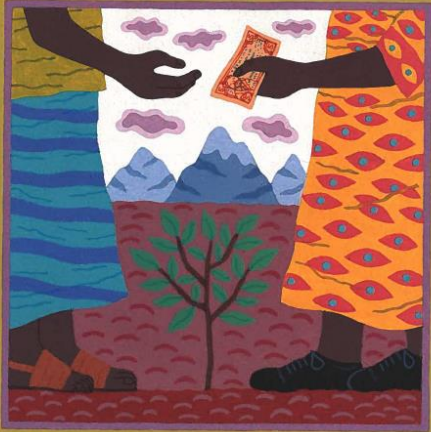
Encourage teachers to build upon the relationship between process knowledge and students' cultural identities

3

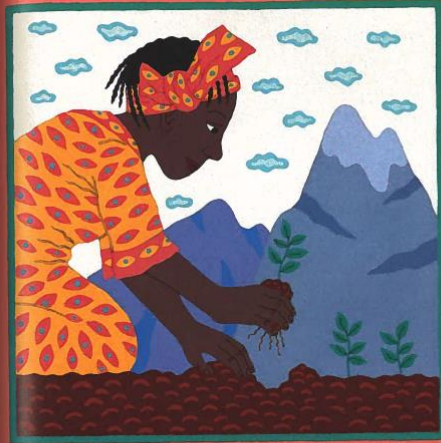
Guide teachers through how to choose texts to find linguistic and sociocultural relevance for their 21st century learners.

WHEN BEGIN INSTRUCTION, WHAT ARE YOUR TEXTUAL SOURCES?

- Our autonomous view of literacy quickly defaults to textbooks. Not simply as a source, but often the **ONLY** source.
- Secondarily to textbooks, there is a tendency to use a documentary or film to supplement the textbook.



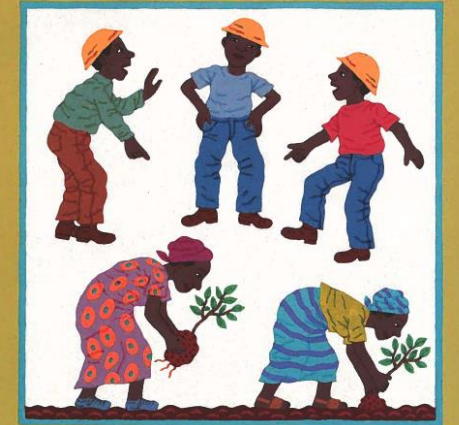
Wangari pays them a small amount for each seedling still living after three months—their first earnings ever.



Wangari thinks about the barren land. *I can begin to replace some of the lost trees here in my own backyard—one tree at a time.* She starts by planting nine seedlings.

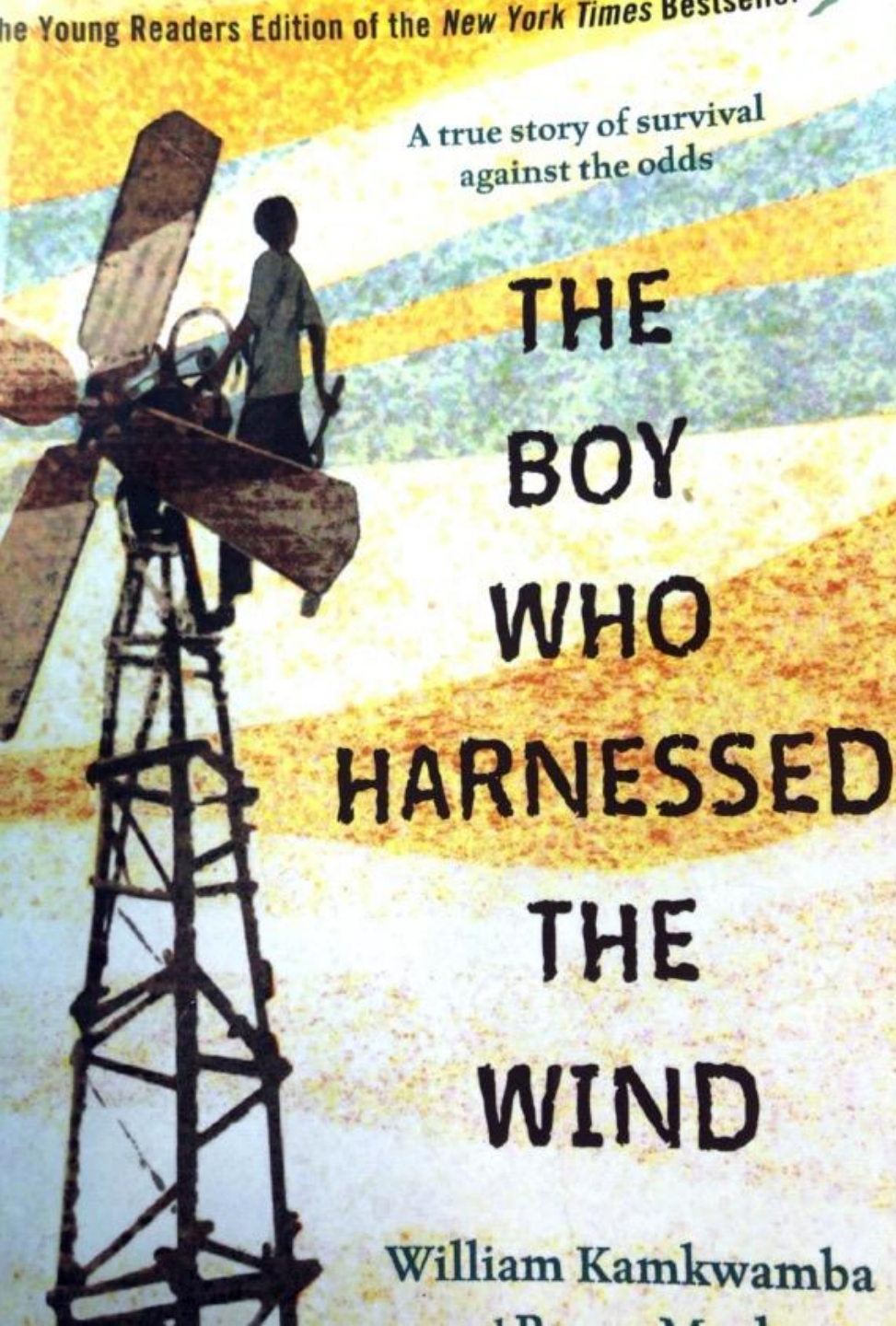


Next, Wangari convinces the village women that planting trees is a good thing. She gives each one a seedling. "Our lives will be better when we have trees again. You'll see. We are planting the seeds of hope."



The government men laugh. "Women can't do this," they say. "It takes trained foresters to plant trees." The women ignore the laughter and keep planting.

A true story of survival
against the odds

The book cover features a silhouette of a young boy standing on a tall, wooden lattice tower. At the top of the tower, a large, four-bladed windmill is mounted. The background is a textured, yellowish-brown landscape with a blue sky. The title is written in large, bold, black, sans-serif capital letters.

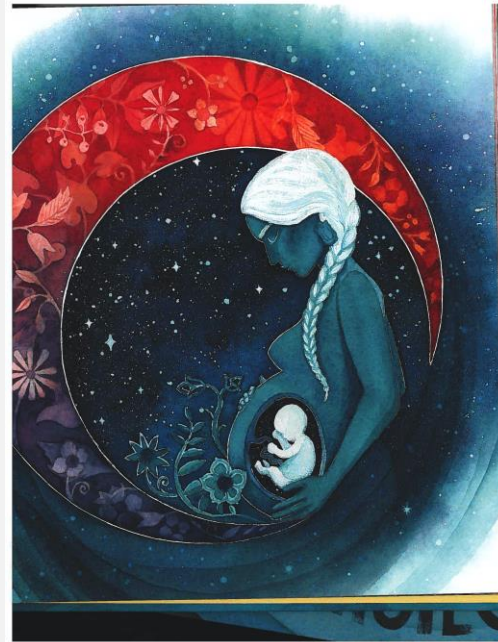
**THE
BOY
WHO
HARNESSED
THE
WIND**

William Kamkwamba

PROLOGUE

- The machine was ready. After so many months of preparation, the work was finally complete: The motor and blades were bolted and secured, the chain was taut and heavy with grease, and the tower stood steady on its legs. The muscles in my back and arms had grown as hard as green fruit from all the pulling and lifting. And although I'd barely slept the night before, I'd never felt so awake. My invention was complete.

WE ARE WATER PROTECTORS



The background of the slide is a close-up photograph of a fabric, possibly silk or satin, with a complex, flowing pattern. The colors are primarily shades of blue and green, with some lighter, almost white, highlights where the fabric folds or catches the light. The texture appears smooth and slightly reflective. A white-bordered rectangular box is centered horizontally and vertically, containing the email address in white text.

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Thank you for your time, your attention, and your instructional leadership