



The New Science of Vocabulary: How AI Can Support Language Learning

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TextProject

Target Words: Narrative Texts

chimed

concluded

flickered

gallant

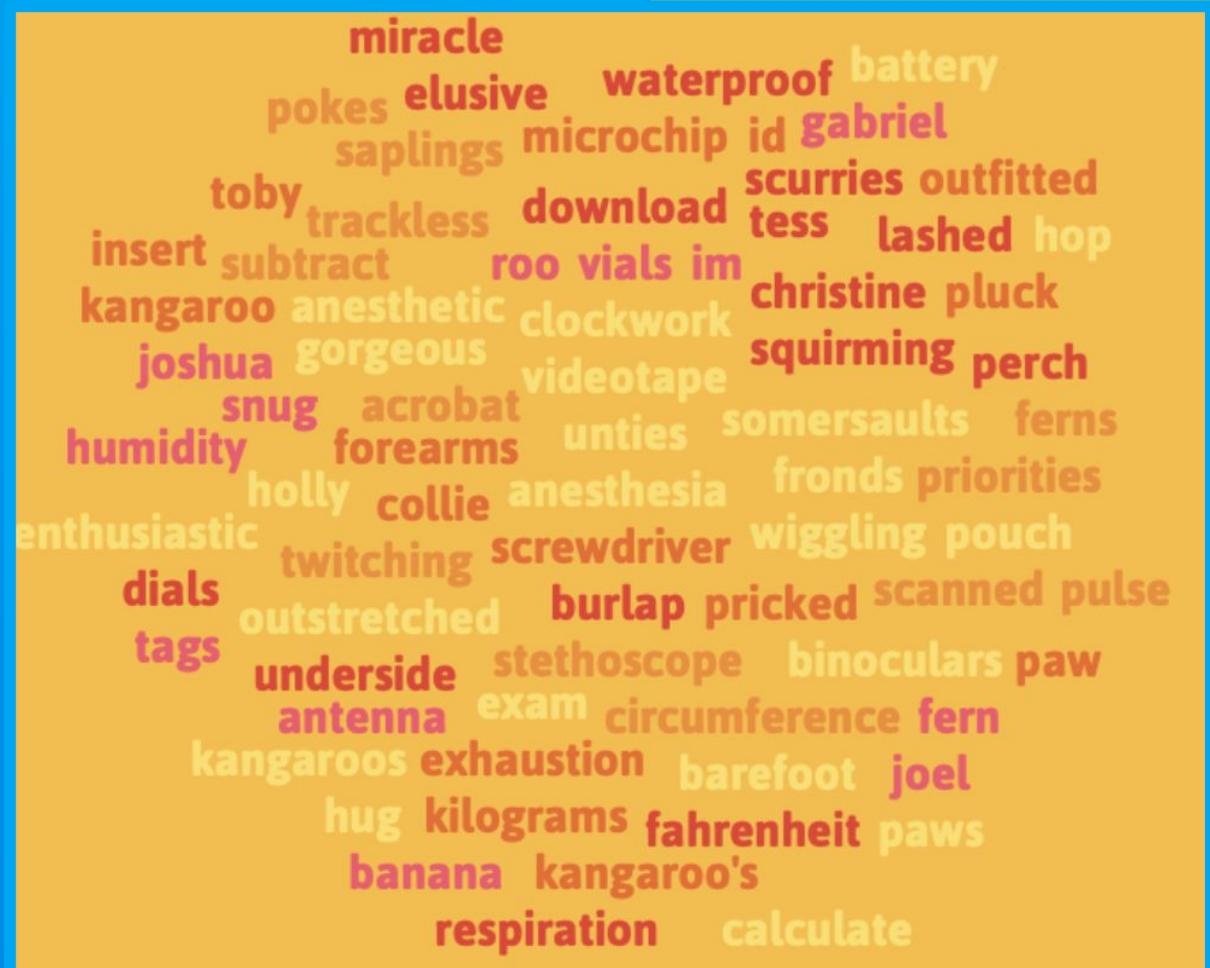
preparations

slender

announcement
sprinkling balcony shivered
humming cockroach santiago
rehearsed aguinaldos cucarachita café caribbean
impatiently hildamar's espanol cha buenos
paste countertop navidades marcas dos tio ay pedro
strumming ^{ap} que parranderos saludar pura martina el
applause los pasteles tres todos quebueno belpre's clapped
begged bodega dias santurce ves vengo reyes lebron ponce
de gallant y chiki ratoncito una guiro vecinos nenes barrio tiptoe
bubbled cuatro ninos titi veremos saludos kra ahh es pork
puppets bendito navidad santiago's lindo chik ya en
fiesta asalto habia luceros habichuelas chimed
crates mami bueno hildamar belpre hurray costumes
ramon padre bienvenidos sofia ^{ling} skipped
manuel la perez donated roasting
sparkled decorations carpenter
celebrated

Target Words: Informational Texts

dwarfed
presence
outfitted
procedure
transferred
snug
calculate
perch
enthusiastic
beaming



Effectiveness of Typical Vocabulary Selection

Wright & Cervetti (2017) review of 36 Studies:

Direct instruction of word meanings (even long-term, multifaceted interventions) did NOT improve generalized **comprehension**, beyond the immediate instructional texts.

Cervetti et al. (2023) meta-analysis of 39 Studies:

Direct instruction of word meanings did not expand students' overall **vocabulary** knowledge beyond immediate instructional texts.

PHONEMIC AWARENESS

PHONICS

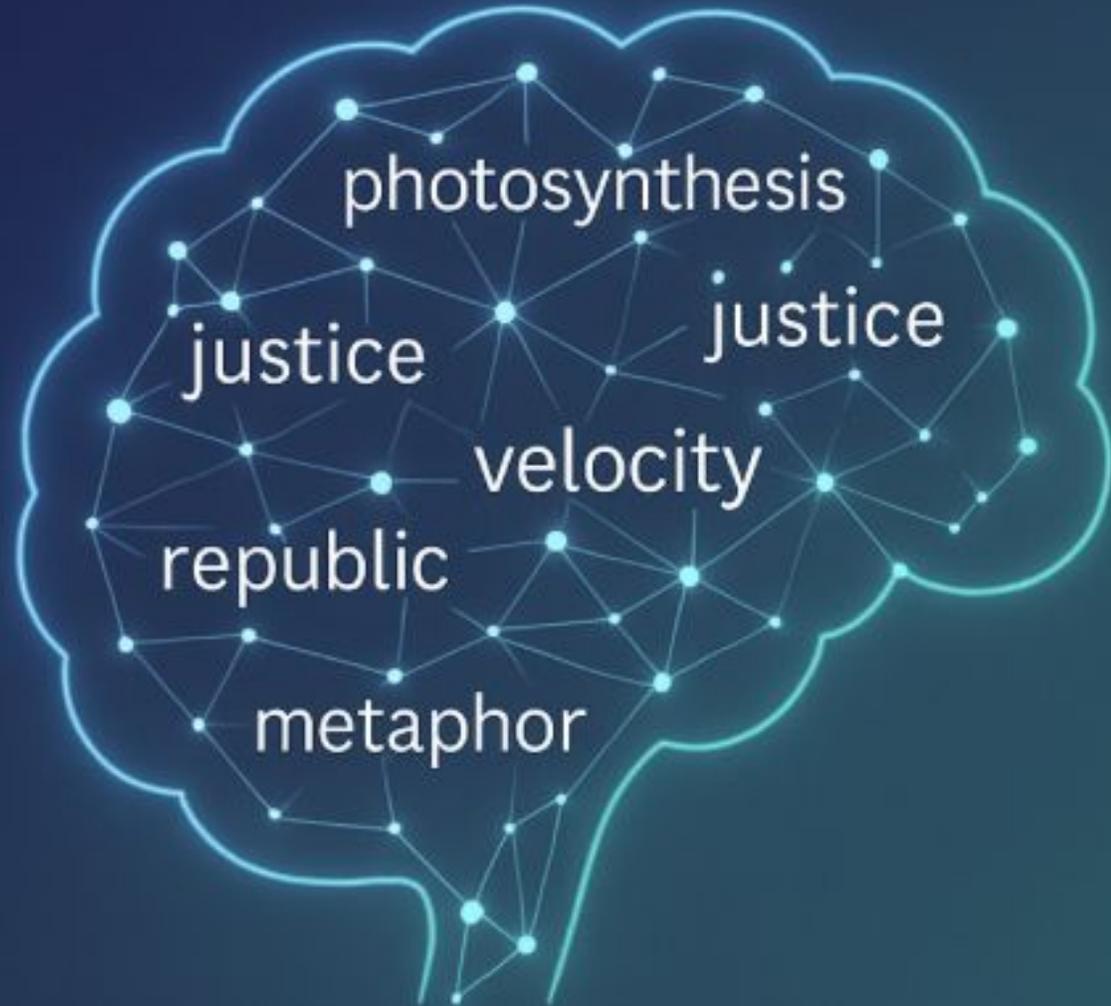
FLUENCY

VOCABULARY

COMPREHENSION



Why Large Language Models Matter for Vocabulary Instruction



- LLMs “read” billions of words. They show us which words are common, rare, and critical for academic success.
- They uncover how words work in context—not just their definitions, but how they connect to ideas and other words.
- LLMs help us focus instruction on words students are most likely to struggle with—and most need to succeed



Big Data Shifts

Available Corpora

(Large Collections of Words
from Texts)

1927: Thorndike's Teacher's word book based on words from Bible and some children's books

THE TEACHER'S WORD BOOK

By EDWARD L. THORNDIKE
Professor of Educational Psychology, Teachers College
Columbia University

Second Edition
January, 1927

PUBLISHED BY
Teachers College, Columbia University
NEW YORK CITY
1921

A to Acre					
a	208	1a1	abuse	21	3b
Aaron	6		abyss	9	
abandon	17	4a	academy	9	
abash(ed)	4		accent	14	4b
abate	10	5b	accept	47	2a
abbey	9		acceptance	9	
abbot	7		access	11	5b
abdomen	5		accessory	4	
Abe	3		accident	26	4a
abed	5		accidental	5	
Abel	5		accommodate	10	5b
abhor	14	4b	accommodation	8	
abide	18	4a	accompaniment	3	
ability	16	4a	accompany	34	2b
abject	7		accomplish	31	2b
able	70	1b	accomplishment	5	
aboard	15	4b	accord	16	4a
abode	17	4a	accordance	8	
abolish	10	5b	according	48	2a
abominable	9		accordingly	20	3b
abomination	5		accost	5	
abound	10	5b	account	63	1b
about	172	1a1	accumulate	3	
above	101	1a3	accurate	3	
Abraham	14	4b	accursed	13	5a
abridge	4		accusation	8	
abroad	23	3a	accuse	22	3b
abrupt	7		accuser	5	
absence	22	3b	accustom	26	3a

School Text Available in 2020s

- Educator's Word Frequency (EWFG) database (Zeno et al., 1995): \approx 17 million words from Grade 1-college texts
- TextProject's TextBase: \approx 10 million words from trade books and content area, leveled, and decodable texts across 6 grade bands:

K-1: 750,000

2-3: 1,750,000

4-5: 1,650,000

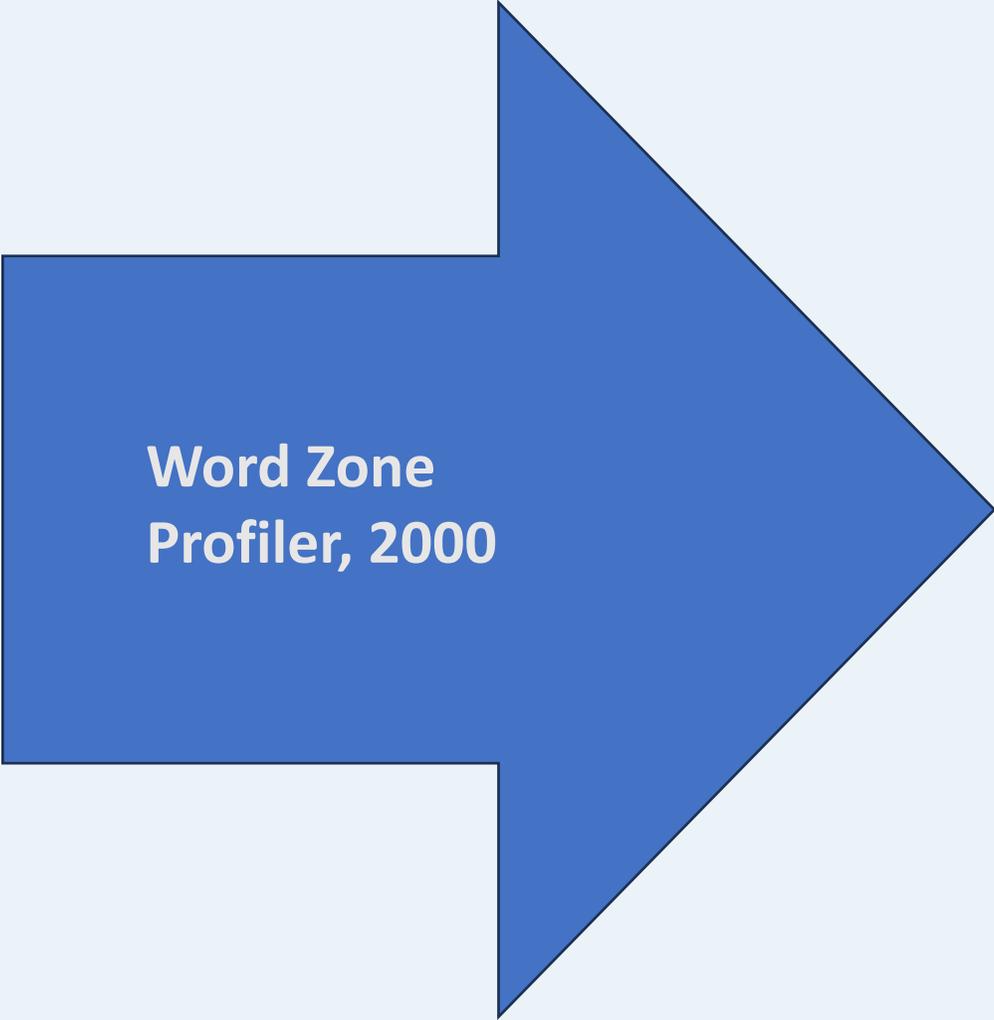
6-8: 1,765,000

9-10: 1,260,000

11-College-and-Career Reading: 1,750,000

Big Data Shifts

Available Databases of
Word Features



**Word Zone
Profiler, 2000**

Word	High Frequency	Count	Decodability
a	HF	54	1
all	HF	3	6
and	HF	12	3
around		1	8
backpack		3	8
bark		1	6
bat		1	2
be	HF	2	1
bear		2	5
bears		1	5
bell		1	6
bet		1	2
big		1	2
bird		3	6
blue		1	5
book		1	7
boy		1	7
brown		1	7
bug		1	2
butterflies		1	8
butterfly		7	8

Word	Frequency	Word Length	UFunction	WordZone	Supercluster	Megacluster	Age of Acquis	Dispersion	Complex Mor	Number Mor	Academic Vo	Academic Vo	Family	Rime Family	POS	Mean Concrete
a	54	1	24070	1	3i.1	10	2.893384	0.9982	24070	1					Article	1.46
all	3	3	3370	1	3g.3	10	4.239515	0.993	3370	1			all o	5	Determiner	2.27
and	12	3	27594	1	27b.1	8	4.569882	0.9972	27594	1			and a	11	Conjunction	1.52
around	1	6	812	2	2x.6	6	5.944635	0.9488	970.8567	9			N/A		Adverb	1.96
backpack	3	8	1	7	22a.10	12	5.38	0.5716					N/A		Noun	4.96
bark	1	4	33	4	19d.1	2	5.17	0.7438	48.0554	6			N/A		Noun	4.52
bat	1	3	16	5	34c.2	13	4.85	0.7618	36.6359	9			at a	8	Noun	5
be	2	2	5272	1	50a.1	14	5.11	0.9733	36725	9	633	4416	e		Verb	1.85
bear	2	4	122	3	4e.7	11	3.58	0.7342	175.3104	18			ear e	22	Noun	4.88
bears	1	5	122	3	4e.7	11	3.58	0.7885	175.3104	18			ear e	22	Noun	4.88
bell	1	4	58	4	19b.2	2	3.89	0.8452	69	3			ell e	37	Noun	4.96
bet	1	3	17	5	42c.4	4	7	0.4367	19	3			et e	36	Verb	3.1
big	1	3	517	2	3a.3	10	2.89	0.8135	598.5284	6			igi	73	Adjective	3.66
bird	3	4	121	3	4j.1	11	3.52	0.7461	222.457	7			ird er	N/A	Noun	5
blue	1	4	162	3	58a.1	10	3.53	0.856					ue u	85	Adjective	3.76
book	1		290	3	15c.1	13	3.68	0.9521	480.2457	11			ook u	32	Noun	4.9
boy	1		292	3	9c.1	5	3.67	0.7393	513.7697	7			oy oi	86	Noun	4.76
brown	1		128	3	58a.1	10	4.196887	0.8545					ow ow	7	Name	4.48
bug	1		13	5	4k.1	11	3.79	0.5543		5			ug U	N/A	Noun	5
butterflies	1			6	4k.1	11	3.67	0.6488					N/A	N/A	Noun	4.93
				6	4k.1	11	3.67	0.7162					N/A	N/A	Noun	4.93

Word Zone
Profiler, 2020

Word	Freq_HAL	AoA_Kuper	AoA_LWV	AoA_Glasgow	Freqtraj_TASA	Cumfreq_TASA	DPoS_Brys	NLett	OLD20	OLD20F	Orth_N	Orth_N_Freq	Orth_N_Freq_G	Orth_N_Freq_G_Mean	Orth_N
	16.177	2.893384	2.01871		0.185579101	10.10967809	Article	1	1.45	9.831	5	13	0		
ll	14.346	4.239515	3.48872969	1.807	-0.19898142	7.912225988	Determiner	3	1.2	8.693	9	6.8	0		
nd	16.187	4.569882			0.318048484	10.19212895	Conjunction	3	1.25	9.101	11	9.4	0		
ackpack	7.567	5.38			-1.88449054	-1.355794054	Noun	8	3	5.872	0				
at	8.775	4.85	4.68593011	2.922991657	-1.79491442	1.342308296	Noun	3	1	9.45	26	9.1	15	10.6	
ears	9.031				-0.97922601	2.735553143	Noun	5	1.1	7.727	20	7.5	2	10.9	
et	10.306	7	6.78685054		-2.24244546	1.662282169	Verb	3	1	10.158	21	10	9	12.2	
rg	12.093	2.89	2.83996563		-1.50526193	5.736890943	Adjective	3	1.1	8.74	19	8.5	0		
ird	9.856	3.52	3.614409	2.097	-1.35181422	3.957040527	Noun	4	1.75	8.476	5	6.6	0		
lue	11.396	3.53	3.443	1.882	-0.89060314	4.368437232	Adjective	4	1.75	7.722	6	6.3	0		
oy	10.665	3.67	2.8	1.424	-1.35398419	5.011019009	Noun	3	1	8.508	20	8.4	3	11.6	
rown	10.648	4.196887	3.1	1.939	-0.84037152	4.090860612	Name	5	1.6	7.882	8	6.9	0		
up	10.281	2.79			-2.08833269	1.365572612	Noun	3	1.05	8.434	20	8.5	4	12.2	
					-1.05169584	0.509089712	Noun	11	4.4	5.45	0				
					-1.59184595	0.707422968	Noun	9	3.25	5.577	0				

SCOPE, 2024:
250+ word
features

	0	4.93	6.452	6.765	6.37	5										
	0.211765	kæ'n	4.55		3.63	8										
	157.7375	174.163	655	256	1617	616	10	1	0.6	0.529	12	8.523	0.9			
	119.5593333	148.221	543	275	2325	925	20	2.2	0.35	0.011	6	6.23	0.9			
	98.0575	105.545	701	143	1442	288	16	1.94	0.75	0.212	18	8.237	0.9			
	32.702	35.488	11	8	45	33					0	0.9	0.9			
	108.66	124.58	134.18	200	40	483	115	20	2.15	0.2	0.076	0	0.9			
	81.3715	95.041	103.976	357	97	950	279	20	1.95	0.58	0.12	19	9.786	0.8		
	0.465329232	0.435940449	0.985815603	0.006918239	1	0.035532995	0.952380952	0.596129558	0.999346405	0.258823529	0.010463862					
	1	0.251485917	0.512246239	0.030660377	1	0.238095238	0.820512821	0.617853687	0.999346405	0.294117647	0.011262728					
	0.518858628	0.911330432	0.733133433	0.985815603	0.780530973	0.991967871	0.714285714	1	0.894520032	0.999346405	0.336091453	0.935606061				
	0.294171745	0.37104175	0.50583686	0.91517478	0.573636597	0.863303438	0.848158131	0.552828359	0.750620261	0.701366249	0.285486903	0.874588709				
	0.45623436	0.441891875	0.571463014	0.91517478	0.536628932	0.998832786	0.848158131	0.541707435	0.768100413	0.701366249	0.311862529	0.958091111				
	0.978628637	0.992259186	0.967588598	0.853358634	0.481889205	0.931099476	0.559027778	0.74267101	0.72160922	0.91953125	0.99511122	0.962962963				

What Big Data Makes Possible



The Size of the English Lexicon (Oxford English Dictionary)

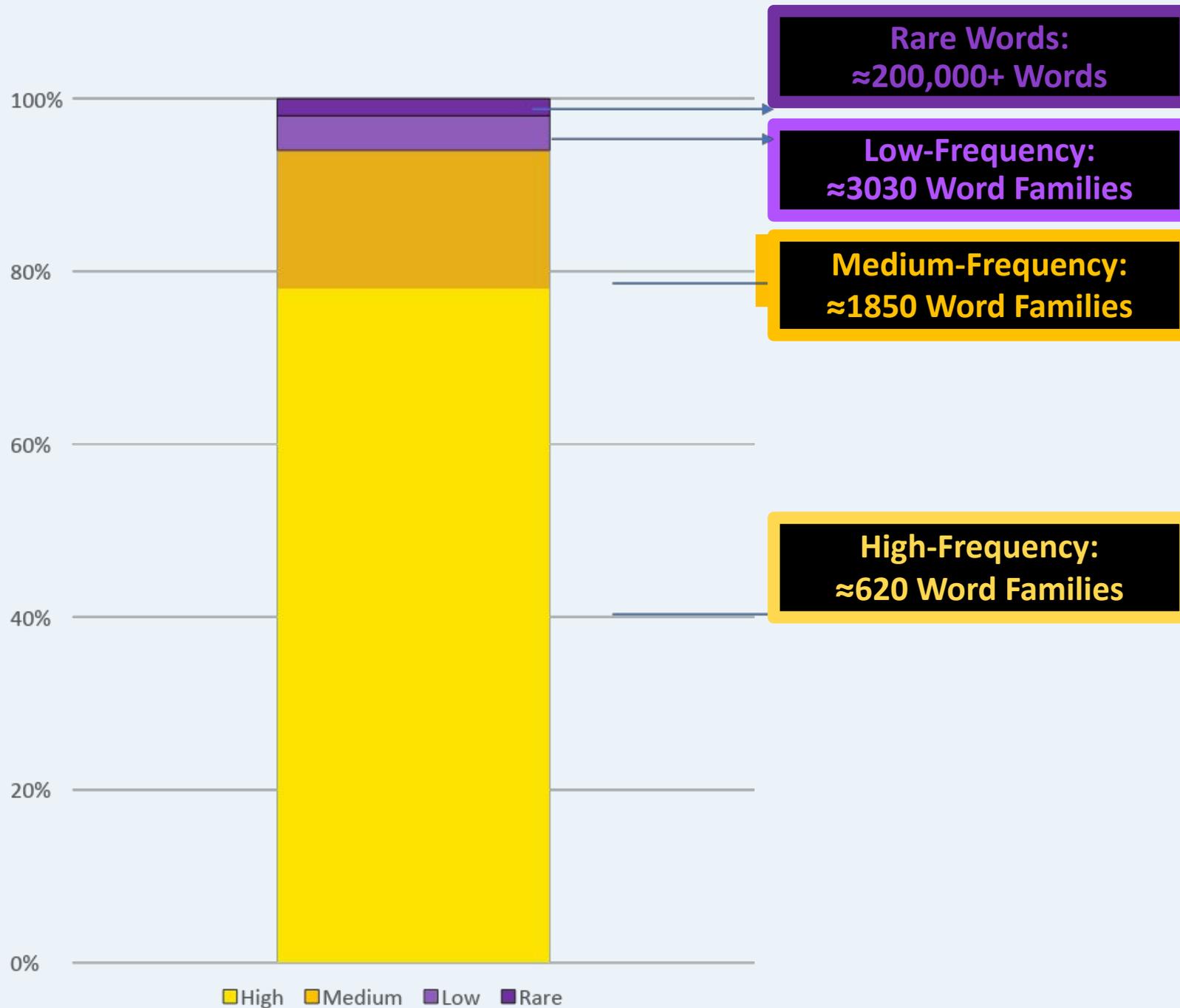
285,500
root or
head
words

326,00
derivates
& phrases

47,150
obsolete
words

And this doesn't include the multiple meanings of words.

Word Distribution in School Texts



Using AI to:

Select

Target Words and
Texts

Teach

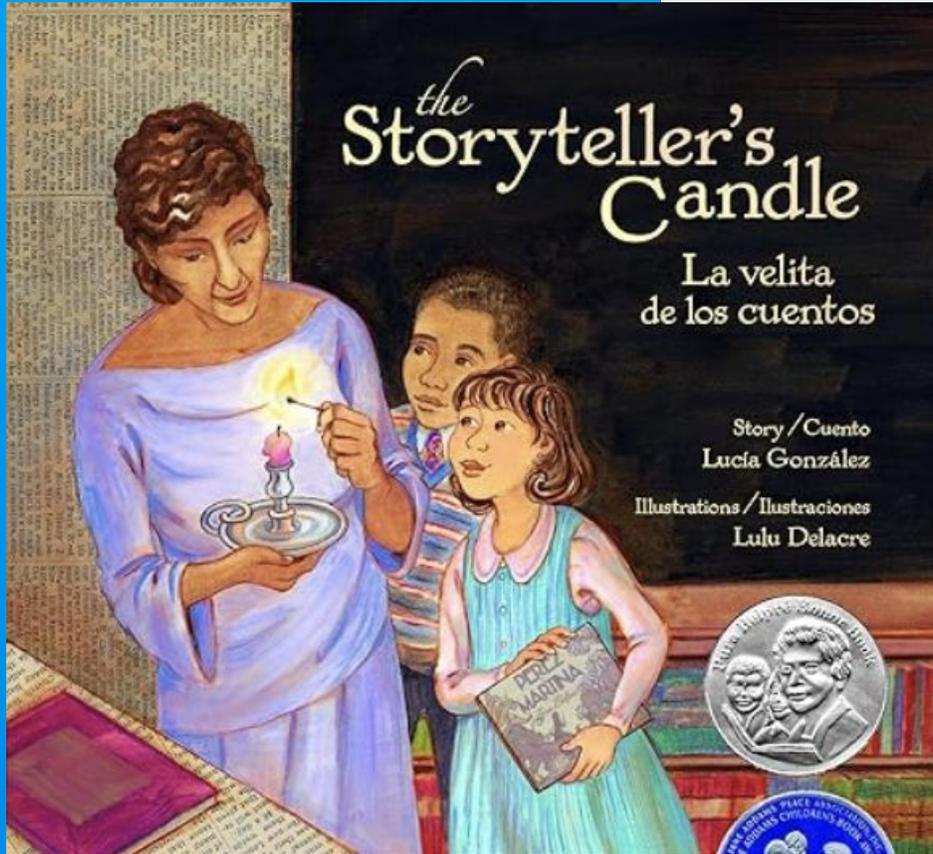
Words Explicitly

Assess

Vocabulary &
Automaticity

Select:
Target Words and
Texts

An Alternative to Cherry Picking Vocabulary



chimed	2
concluded	1
flickered	1
gallant	1
preparations	1
slender	1

Can you help me in identifying which of these words are ones that may be challenging for students but are also words that will extend beyond third grade and support their reading in the middle grades and beyond:
announcement, parade, chimed, characters, costumes, applause, gallant, fiesta, preparations, event, rehearsed, donations, celebrated, decorations. I also want to help my students' background knowledge on the topic of what is part of a performance like a play.

- "slender" - Limited academic utility, mainly descriptive
- "gallant" - Literary word but limited modern use
- "chimed" - Specific to sound, limited academic use
- "preparations" - ✓ HIGH VALUE - used across subjects and contexts
- "flickered" - Specific to light/movement, limited academic use
- "concluded" - ✓ HIGH VALUE - important for academic writing and reading

Target Words

1. "announcement" - ✓ HIGH VALUE - formal communication across contexts
2. "event" - ✓ HIGH VALUE - used across all subjects
3. "preparations" - ✓ HIGH VALUE (overlaps with publisher list)
4. "celebrated" - ✓ HIGH VALUE - cultural and historical contexts
5. "donations" - ✓ HIGH VALUE - civic and social studies contexts

Valuable Words for Long-Term Academic Success

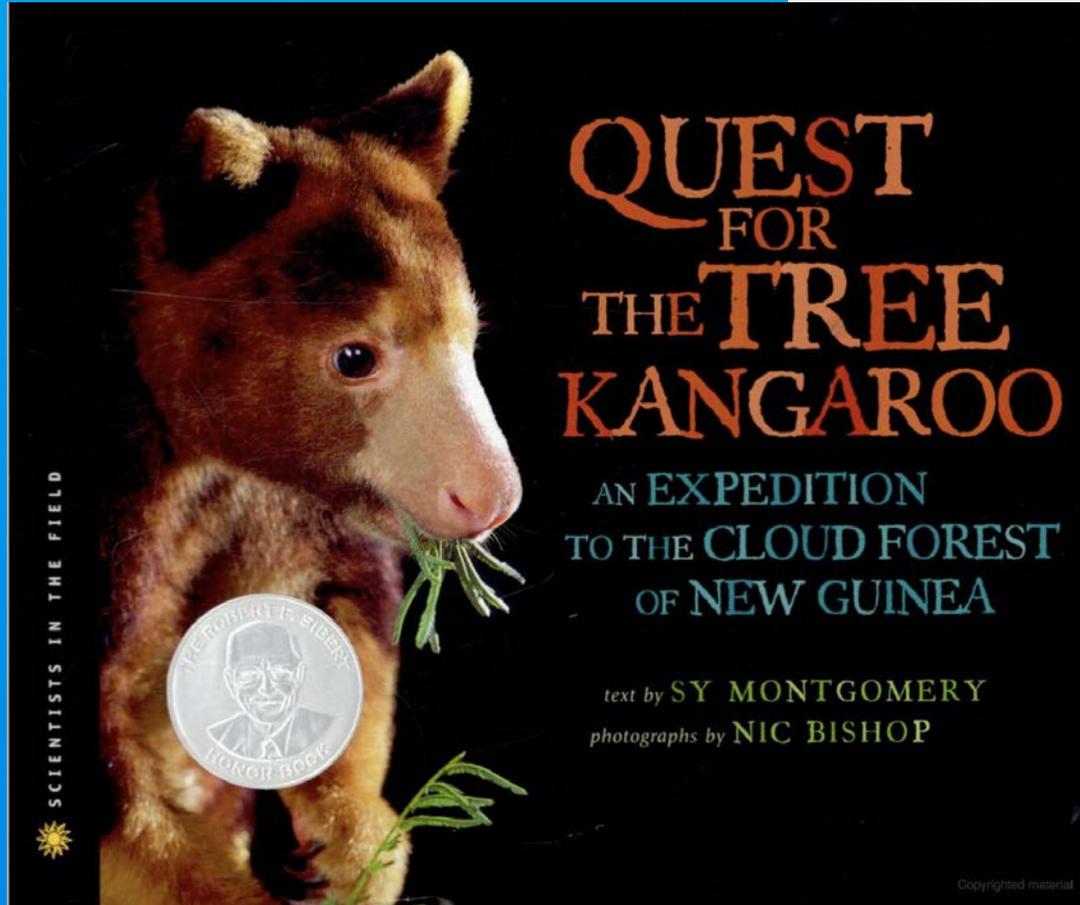
1. "rehearsed" - Understanding performance preparation
2. "characters" - Understanding story elements and roles
3. "costumes" - Understanding visual representation
4. "applause" - Understanding audience participation
5. "decorations" - Understanding setting creation

Words Related to Performance

1. "fiesta" - Understanding cultural celebrations
2. "celebrated" - Understanding commemoration
3. "event" - Understanding organized gatherings

Building Background

An Alternative to Cherry Picking Vocabulary



dwarfed	0
presence	1
outfitted	1
procedure	2
transferred	1
snug	1
calculate	1
perch	2
enthusiastic	1
beaming	1

FH

Can you revisit the words procedure, calculate, transferred, outfitted, enthusiastic, presence, snug, perch, beaming, dwarfed in relation to the specific text--Quest for the Tree Kangaroo--how many of these words are essential for the meaning of this text?

ESSENTIAL (3 words):

- **Procedure** - Central to understanding the organized scientific process of examining the animals safely
- **Calculate** - Critical for the specific mathematical task ("Heart rate is sixteen times twelve. You do the math")
- **Transferred** - Key to understanding how the tracking technology works ("data can be transferred to a computer")

HELPFUL BUT NOT ESSENTIAL (4 words):

- **Snug** - Important for collar fitting, but "comfortable but snug" provides enough context
- **Perch** - Useful for visualizing the animals' position, but "climbs to the highest perch" is clear from context
- **Outfitted** - Describes the collar equipment, but the collar's function is explained without needing this word
- **Presence** - Used in "our presence to drive them closer," but the meaning comes through contextually

NOT ESSENTIAL (3 words):

- **Enthusiastic** - Describes emotion but doesn't affect plot comprehension ("he wants to go out and hunt for more" conveys the meaning)
- **Beaming** - Emotional description alongside "huge and smile" which already conveys happiness
- **Dwarfed** - I don't find this word in the text

Quest for the Tree Kangaroo--this is an informational text in my school's third-grade reading program. Can you give me the top 10 words that are important for students to know, in order to comprehend this text?

1. **Tracker** - A person who follows and finds animals; essential since trackers are the main characters who locate the tree kangaroos
2. **Elusive** - Hard to find or catch; key to understanding why finding tree kangaroos is so exciting and difficult
3. **Anesthesia/Anesthetic** - Medicine that makes animals sleep during medical procedures; central to the safe examination process
4. **Radio collar** - A special collar with a transmitter to track animals; the main scientific tool and goal of the research
5. **Transmitter** - A device that sends out signals; necessary to understand how the radio collar works
6. **Respiration** - Breathing rate; critical for understanding the medical monitoring during the procedure
7. **Procedure** - A series of steps to accomplish something; helps students understand the organized scientific process
8. **Examination/Exam** - A detailed check of the animal's health; central to understanding what the scientists are doing
9. **Temperature** - How hot or cold something is; important for the medical monitoring context
10. **Frequency** - A specific radio channel or number; necessary to understand how each animal's collar works differently

1. Selecting words

Take-aways?



Teach: Words
Explicitly

Activity 1a: Generating Semantic Maps

Can you organize these words into connected categories that will aid students in understanding the connections across the words and to the core concepts in the book, *Quest for the Tree Kangaroo*: examination, microchip, elusive, agile, radio collar, procedure, cautious, respiration, sedated, satellite, frequency, transmitter, strong, anesthesia.

Tree Kangaroo Semantic Map

TREE KANGAROO CHARACTERISTICS

elusive

agile

cautious

strong

TRACKING TECHNOLOGY

radio collar

transmitter

frequency

satellite

microchip

MEDICAL MONITORING AND EXAMINATION

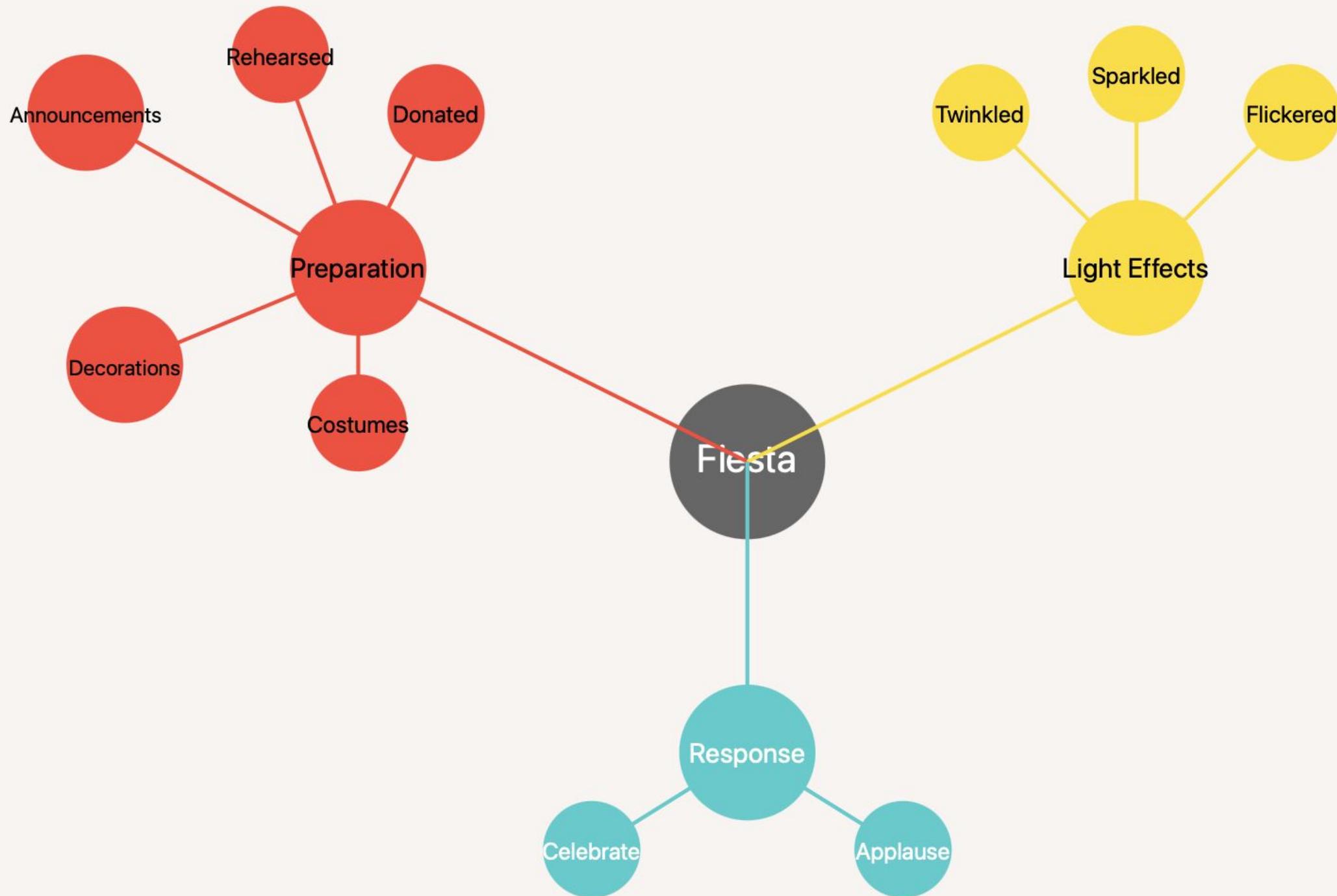
examination

procedure

anesthesia

sedated

respiration



Activity 1b: Generating Semantic Grids

FH Can you make a semantic grid with the words flickering, sparkled, twinkle and 5 other words that have varied degrees of intensity in the same semantic category. Can you ensure that 2 of the new words are ones that students who are not great third-grade readers can read?

Semantic Grids: *Storyteller's Candle*

blaze

flash

sparkled

gleam

flickering

shine

twinkle

glow

shout*

proclaim

broadcast

announce

notify

tell*

say*

Semantic Grids: *Tree Kangaroo*

Intensity of "Hard to Catch/Find"

Secretive

Mysterious

Elusive

Slippery

Evasive

Fugitive

Intensity of "Moving Skillfully"

Steady

Flexible

Quick

Agile

Athletic

Nimble

Acrobatic

Activity 1c: Morphological Families: *Storyteller's Candle*

FH Can you make a mind map of all of the morphological relatives for the word announcements.

announce

Verb Forms

announces
announced
announcing

Noun Forms

announcer
announcers
announcement
announcements

Re- Forms

reannounce
reannounced
reannouncing
reannouncement

Pre- Forms

preannounce
preannounced
preannouncing
preannouncement

Un- Form

unannounced

Morphological Families: *Quest for Tree Kangaroos*

transmit

transmitter

transmitted

transmission

sedate

sedated

sedation

sedative

anesthetic

anesthesia

anesthetize

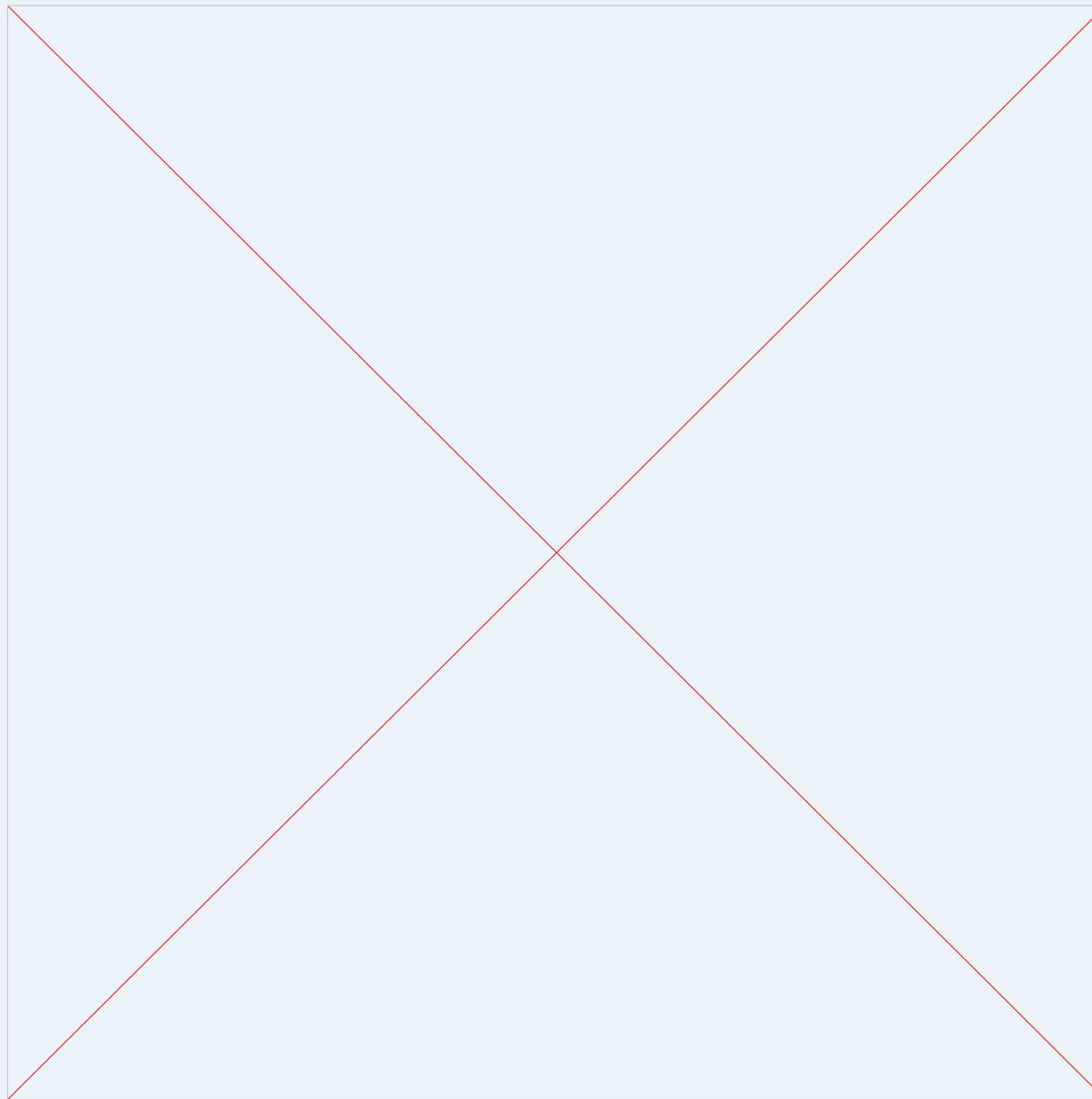
anesthetized

respire

respiration

respiratory

My Neural Neighborhoods



My Neural Neighborhood: *The Storyteller's Candle*

broadcast

Verb Forms broadcasts broadcasted broadcasting	Noun Forms broadcaster broadcasters broadcast broadcasts	Re- Forms rebroadcast rebroadcasts rebroadcasted rebroadcasting
--	---	--

shout*

proclaim

broadcast

announce

notify

tell*

say*

proclaim

Verb Forms proclaims proclaimed proclaiming	Noun Forms proclaimer proclaimers proclamation proclamations	Ex- Forms exclaim exclaimed exclaiming exclamation exclamations
---	---	---

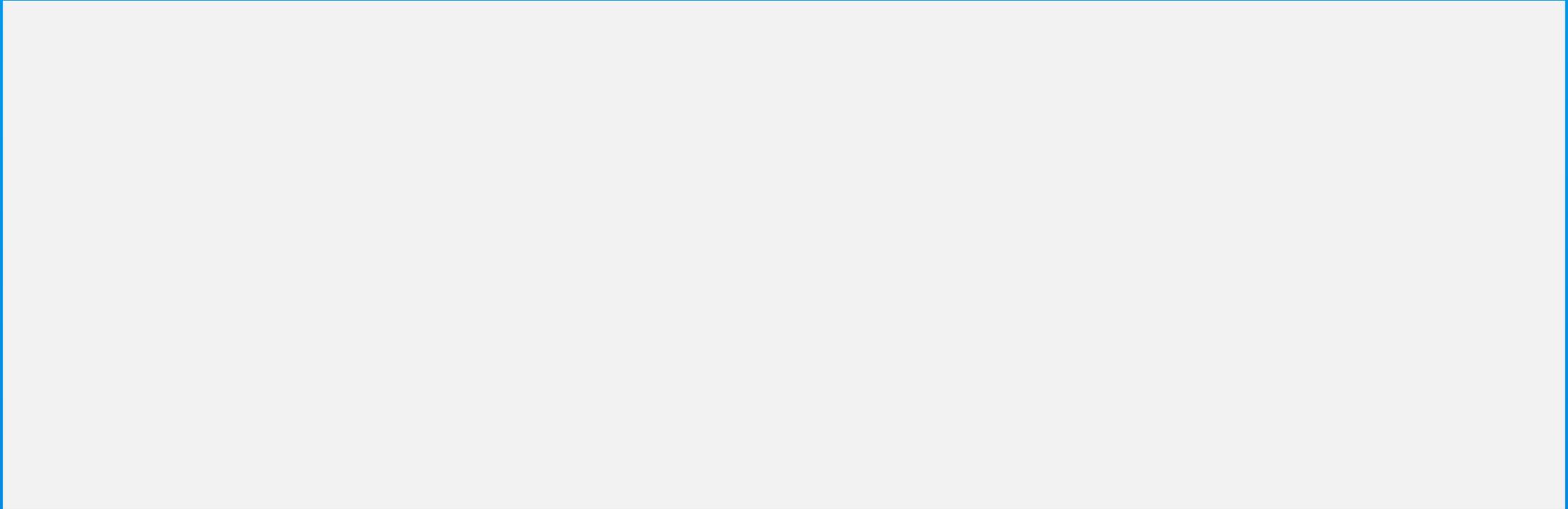
announce

Verb Forms announces announced announcing	Noun Forms announcer announcers announcement announcements	Re- Forms reannounce reannounced reannouncing reannouncement	Pre- Forms preannounce preannounced preannouncing preannouncement	Un- Form unannounced
---	---	---	--	--------------------------------

notify

Verb Forms notifies notified notifying	Noun Forms notifier notifiers notification notifications	Pre- Forms prenotify prenotified prenotifying prenotification
--	---	--

Activity 2: Generating Text Sets with Critical Vocabulary





Preparing for the School Play

Putting on a play takes hard work and careful preparation. First, actors rehearse their lines over and over until they know them perfectly. Some kids feel nervous during their first rehearsal, but they get better each time they practice.

While actors rehearse, others work on costumes. Costumes help tell the story. The costume team measures everyone and picks out special clothes. Kids try on their costumes during dress rehearsal to make sure everything fits.

Behind the scenes, more preparations happen. Students paint colorful backdrops and build props like trees and castles. The lighting crew learns when to make the stage bright or dim.

Finally, opening night arrives. The actors put on their costumes and rehearse their lines backstage. When the curtain opens, families and friends fill the auditorium. At the end of the play, loud applause fills the room. The audience claps and cheers for all the hard work everyone has done.



The third graders wore animal costumes for their big show.

The Dancing Zoo Animals

Today our third-grade class put on the play "The Dancing Zoo Animals." For weeks, we had daily rehearsals to learn our parts for the play. Mrs. Cooper, our teacher, made an announcement before the play began: "Remember, we've rehearsed this many times. You are well prepared for the performance!"

But we are too busy looking at one another's costumes to be worried. Jake wore an elephant costume with big floppy ears. My penguin costume was black with a big white bowtie. Sofie's costume was the tallest of all. That's because she was a giraffe.

Finally, the gym was full of our families and friends. We danced out onto the stage just like we had practiced in rehearsals. Jake's elephant trunk made everyone laugh as he pretended to spray water at the audience. When Sofia the giraffe pretended to eat leaves from the paper trees, the audience laughed again. My favorite part was when I and the other penguins waddled in a line and then did the slide move that we had rehearsed.

At the end of the show, everyone in the audience applauded. Some people in the audience even stood up to give us more applause! Mrs. Cooper made one last announcement: "You were great in rehearsals but your performance this afternoon was even greater."

Can you write two stories that include the words announce, celebrate, prepare, rehearse, donate? Please repeat each of the words at least twice in each of the stories. Morphological family members of the key words can also be used such as announcement for announce. Please make the stories about 200 words long. The stories are aimed for third graders who are neither highly automatic or motivated as readers.



What's a Fiesta?

The word "fiesta" means "party" in Spanish. It can be big or small, loud or quiet, but it is always a time to celebrate. A fiesta can happen for many reasons. People might have a fiesta for a birthday, a holiday, or to honor someone special. Fiestas are a way to celebrate friendship, family, or a special event in the community.

At a fiesta, there is often music. People might play drums, guitars, or sing songs. Sometimes there is dancing. People clap, move to the beat, and enjoy the celebration.

There is almost always food! Some fiestas have tacos, rice, fruit, or sweet breads.

Many people like to decorate for a fiesta. Colorful paper flags, balloons, streamers, and lights help make a place feel bright. These decorations show that something special is happening.

Some fiestas have piñatas filled with candy. Others might have parades, costumes, or face painting.

A fiesta is more than a party. It is a time to celebrate, to share with others, and to make joyful memories that last.



The Best Fiesta Ever

Luz could not wait for her school's big fiesta. For weeks, her class had rehearsed their special dance. Now they knew every step by heart.

On Thursday, Mrs. Soto made her final announcement to the class: "Remember, tomorrow is our spring fiesta!" Everyone cheered at the end of the announcement.

Early on Friday morning, preparations began. Luz and her friends helped with the preparations by hanging ribbons and balloons. Then it was time to put on their costumes.

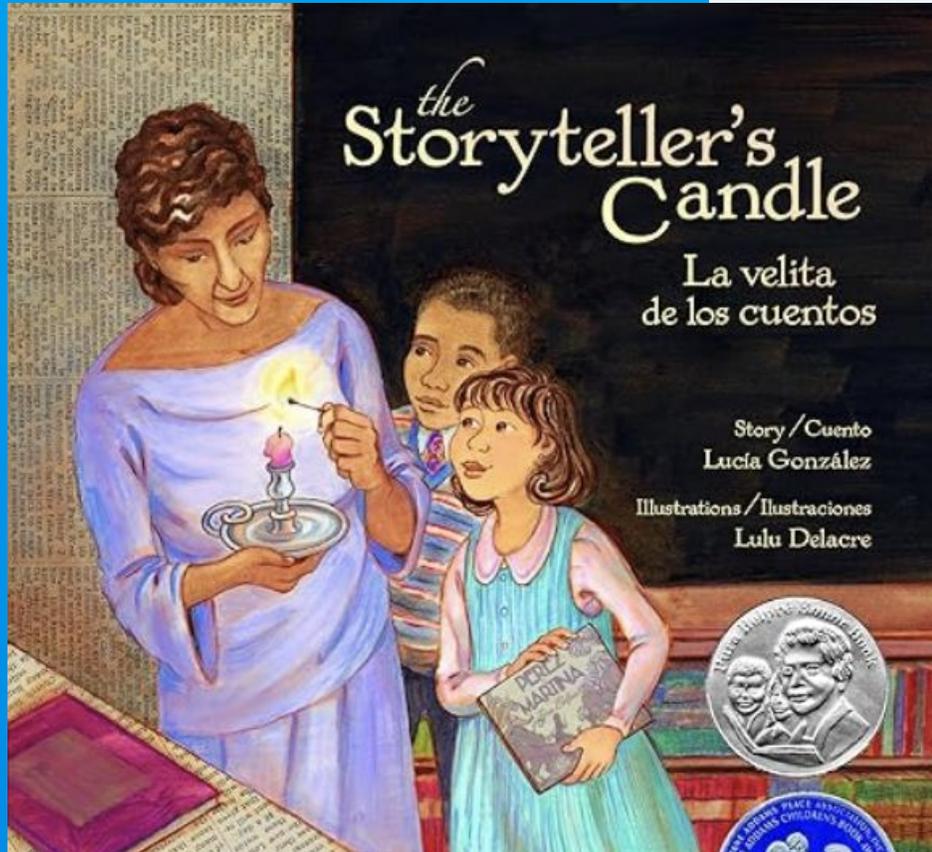
The gym soon filled with family and friends who had come to celebrate. Luz's heart was racing, but she remembered how much they had rehearsed. She knew they were prepared.

The music started. Luz's class danced just like they had rehearsed. When the dance ended, the applause was so loud it made Luz's heart swell with pride.

After the performance, the fiesta continued. Families had donated food to make the party even more of a celebration. Tables were filled with donations: tacos, rice, beans, cookies, and cakes.

"This is the best fiesta ever!" Luz thought as she looked at all the happy faces, the beautiful decorations, and her friends in their costumes. Luz knew she would always remember how it felt to dance in her costume, see all the pretty decorations, and hear that wonderful applause. This had been the best celebration ever!

Additional Opportunities with Critical Vocabulary



	#Times in Original Text	+Times in Set of 4 Texts
announcement	2	4
applause	1	5
celebrated	1	7
costumes	2	14
decorations	1	4
fiesta	2	17
preparations	3	7
rehearsed	1	14

Can you generate 4 texts appropriate for third graders who are not highly automatic or motivated readers? Each text should be around 225 words in length. Here are the 4 topics for the texts: (a) an overview of tree kangaroos and their behaviors; (b) the technology that scientists use to track tree kangaroos; (c) what scientists do to keep tree kangaroos safe during examinations; and (d) how tree kangaroos are different than typical kangaroos. Please ensure that these words are included in the texts at least several times: agile, elusive, transmit, frequency (as in a frequency band for a radio collar), anesthesia, and sedated. Morphological family members of the key words can be used (e.g., transmission for transmit, sedation for sedated).



Tree Kangaroos: Amazing Animals of the Forest

Tree kangaroos are animals that live high up in the trees. They spend most of their time climbing and jumping from branch to branch. Unlike other kangaroos that live on the ground, tree kangaroos are built for life in the trees.

Tree kangaroos are very elusive. That means they are hard to find. They hide so well in the forest that scientists have trouble spotting them.

These animals also show great agility. They are excellent jumpers and climbers. Tree kangaroos can leap from one branch to another. Their agility helps them move quickly and safely through the trees.

Tree kangaroos are also very cautious. When they hear or see something coming, they quietly climb higher to stay safe. This careful behavior protects them from danger.

Don't be fooled by their soft fur and sweet faces—tree kangaroos are strong! They have powerful arms and legs. Their strength helps them hold onto branches and climb tall trees. They can even grab things with their strong paws.

These five traits—being elusive, agile, cautious, strong, and great at tree living—make tree kangaroos just right for life in the forest.



This is a koala (NOT a tree kangaroo) but it shows a radio collar that transmits information to scientists.

How Scientists Track Tree Kangaroos

Scientists use technology to study tree kangaroos. They want to learn where these animals go and what they do. First, scientists put a radio collar around a tree kangaroo's neck. This collar looks like a dog collar, but it has special parts inside. The radio collar is comfortable and doesn't hurt the animal.

Inside the collar is a transmitter. A transmitter is like a tiny radio that sends out signals. Scientists can study these signals to track where the animal goes.

Each transmitter sends signals on its own frequency. A frequency is like a radio station number. Just like your car radio has different stations, each tree kangaroo has its own frequency number. This way, scientists know which animal they are tracking.

The collar also has a microchip inside. A microchip is a tiny computer smaller than your fingernail. The microchip stores information about the animal, just like a name tag.

High above Earth, satellites fly around in space. These satellites pick up the signals from the transmitters. The satellites help scientists know exactly where each tree kangaroo is, even when the animals are hiding in thick forests.

This tracking technology helps scientists learn about tree kangaroos without bothering them too much.

Keeping Tree Kangaroos Safe During Examinations

Scientists give tree kangaroos health examinations, just like when you visit the doctor. But scientists follow special procedures to keep the animals safe during examinations because tree kangaroos get scared around people.

The most important part of this procedure is using anesthesia. Anesthesia is special medicine that makes animals fall asleep. When an anesthesia works, the animal becomes sedated. Sedated means the animal is in a deep, peaceful sleep and cannot feel anything.

During the examination, scientists watch the sedated animal carefully. They check three things to make sure the anesthesia is working safely and the animal stays properly sedated. First, scientists check the tree kangaroo's pulse to make sure its heart is beating at a good speed during the procedure. A pulse tells how fast a heart is beating.

Second, they watch the animal's respiration. Respiration means breathing. Scientists count how many times the tree kangaroo breathes in and out each minute. Good respiration shows that the anesthesia is working properly.

Third, they take the animal's temperature. A normal temperature means the animal is healthy during the examination.

Scientists must work quickly during this procedure. They don't want to keep the animal under anesthesia too long. By watching the pulse, respiration, and temperature, they can finish the examination safely and quickly.





Kangaroos and Tree Kangaroos

Kangaroos and tree kangaroos belong to the same animal family. They have some things in common, but they also live in very different places and move in different ways.

Both animals have long tails and strong back legs. They are mammals, so they have fur and feed their babies milk. A baby kangaroo is called a joey. It stays in its mother's pouch until it is big enough to live on its own.

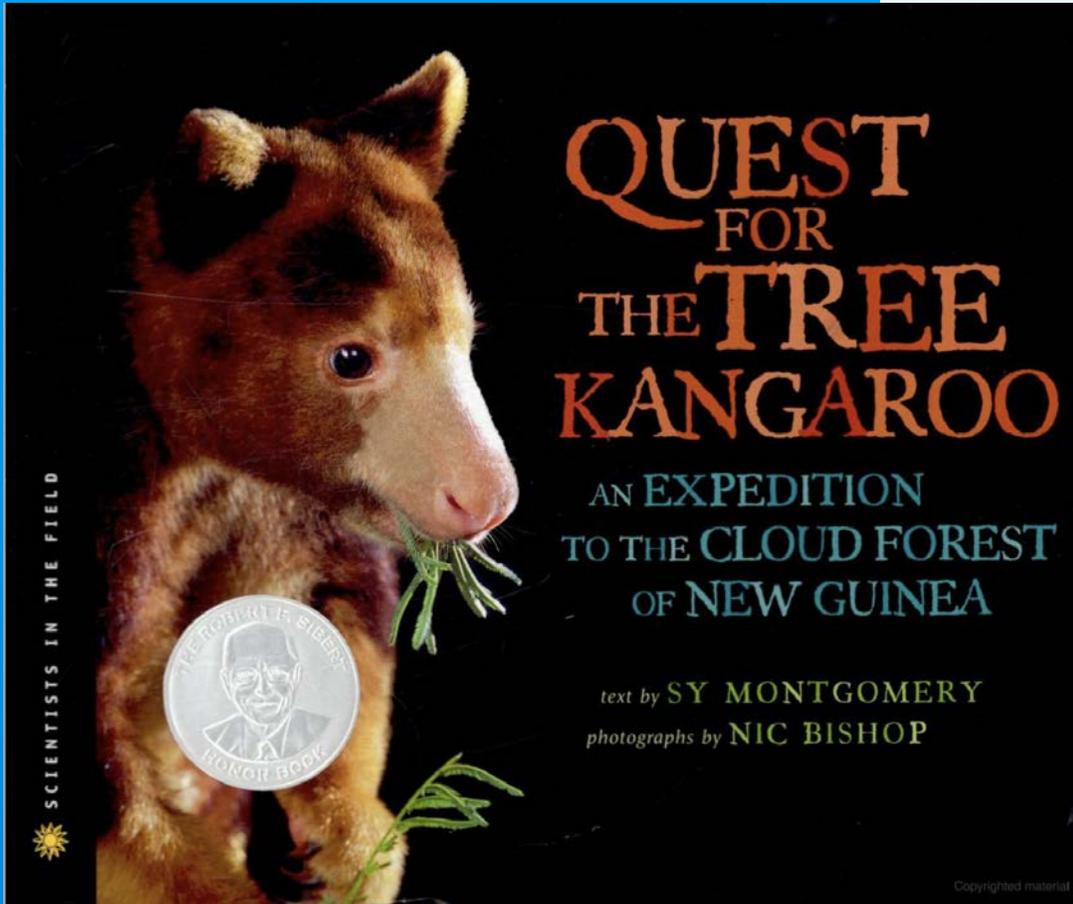
Kangaroos live on the open land of Australia. They can hop fast and can jump very far in one hop. Their tails help them balance as they move. Kangaroos live in groups called mobs.

Tree kangaroos live in the rainforests. They are good at climbing. Their legs are short but their front paws are strong for grabbing tree branches. Their tails help keep them balanced as they climb high in the trees.

Unlike land kangaroos, tree kangaroos are quiet and hard to spot. They live alone or in small groups and move slowly through the trees.

Both kinds of kangaroo carry their joeys in pouches. Both use their tails for balance. But one is built for speed and hopping. The other is built for climbing in the trees of the rainforests.

Additional Opportunities with Critical Vocabulary



Word	#Times in Original Text	+Times in Set of 4 Texts
agile	0	3
elusive	1	3
transmit	1	6
frequency	1	3
anesthesia	5	8
sedated	0	5

2. Teaching words

Take-Aways



Assess: Vocabulary and Automaticity

FH I would like you to make a maze assessment of the attached text. In a maze assessment, the first sentence is kept intact. After that, every 7 word is represented by a blank, followed by parenthesis with three choices: the correct word and two words with the same number of letters and same parts of speech but not silly words).

Maze Assessment

Target Vocabulary

fiesta

applause

donated

rehearsed

celebrated

costumes

decorations

announcement

1. Tom _____ his old books to kids who needed them at school.
2. The class _____ their songs every day until they knew all the words.
3. At the _____, there were fun games and lots of good food to eat.
4. The crowd gave loud _____ when the little dog did its trick.
5. We put up birthday _____ like balloons and streamers all over the house.
6. The teacher made an _____ about the field trip next week.
7. The kids put on their Halloween _____ and went to get candy.
8. We _____ with cake and ice cream when my team won the game.

Semantic Family Members

Fill in the blank with the best word.

Words to choose from:

broadcast	notify	announce	shout
proclaim	say	tell	

1. The TV station will _____ the football game live across the country.
2. The school will _____ parents by email if there is a snow day.
3. The principal will _____ important news over the speakers about the fire drill.
4. The coach had to _____ instructions to the players during the noisy game.
5. The king will _____ his daughter as the new ruler of the kingdom.
6. Can you _____ your name clearly when it's your turn?
7. I need to _____ you something important about the class party.

Morphological Family Members

Fill in the blank with the correct word.

Words to choose from:

announced	announcement	announced
announces	announcer	unannounced

1. The baseball _____ spoke clearly into the microphone.
2. The principal made an _____ about **the** pizza party.
3. My cousin made an _____ visit with her new puppy.
4. The teacher _____ the winner of the art contest every Friday.
5. Mom _____ that we could get ice cream after dinner.
6. The student is _____ the weekly lunch menu over the speakers.

3. Assessing Words

Take-aways?



Using AI to:

Select

Target Words and
Texts

Teach

Words Explicitly

Assess

Vocabulary &
Automaticity

Potential Problems: AI for Vocabulary Instruction

Generating text with consideration of vocabulary requires clarity of curriculum and developmental progression.

“The lowest hanging fruit”: An even larger world of worksheets; fewer opportunities to deal with complex texts.

Knowledge is the commodity of the digital age. Fatuous texts and worksheets can be a barrier to knowledge acquisition as well as a deterrent to motivation and learning.

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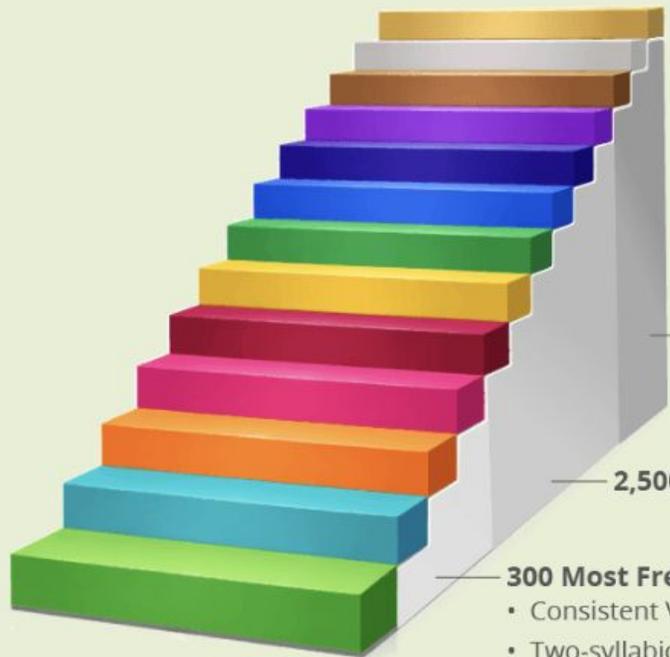
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Staircase of TEXT COMPLEXITY



5,500 Most-Frequent Word Families

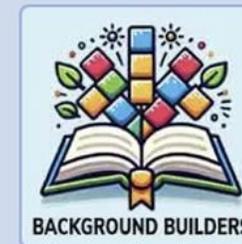
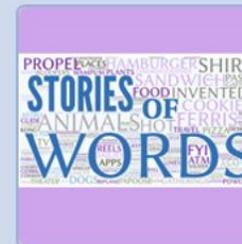
2,500 Most-Frequent Word Families

300 Most Frequent Words

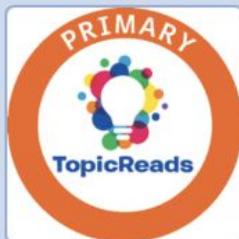
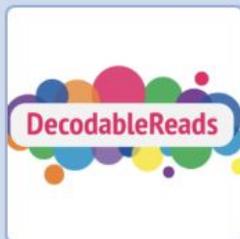
- Consistent Vowel Patterns in mono-syllabic words
- Two-syllabic words with CVC in 1st syllable (e.g., funny, muffin) & some compound words (e.g.,

1,000+ Open-Access Texts
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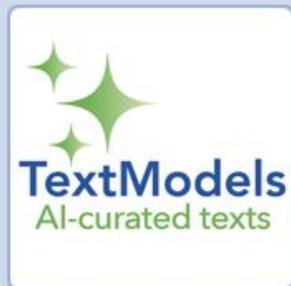
Middle School



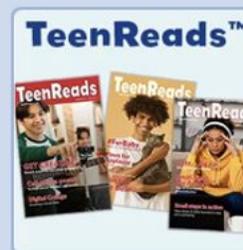
Grades K-1



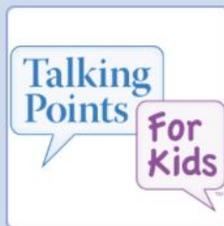
All Grades



High School



Grades 2-5



Using AI to Curate Texts

Building Background That Matters: How I Create Text Sets for Adolescent Readers

by Elfrieda (Freddy) H. Hiebert

During several recent presentations, participants have asked how I generate text sets to build background knowledge for a particular literary selection. It's an important question—because for many adolescents, especially those who are disengaged from reading, background knowledge is often the difference between confusion and connection.

At TextProject, I've been developing text sets in the form of Background Builders and StoryLabs. These are sets of short, focused texts designed to give students access to the ideas, contexts, and concepts that underpin a narrative. Their purpose is not to summarize a story, but to make the story readable—to give students enough footing so they can follow what's happening and why it matters.

This kind of support is especially important with narrative texts. Informational texts are typically organized to explain a concept directly—like how the digestive system works. But stories are different. Authors assume readers bring a certain amount of cultural, historical, or social knowledge to the text. When students don't have that knowledge, the story can feel distant, confusing, or simply uninteresting.

Consider a short story set during the Dust Bowl. Without some understanding of drought, migration, and economic hardship, students may miss the stakes of the characters' decisions. Or take a novel like *Things Fall Apart*. The narrative depends on an understanding of Igbo society and the profound changes brought on by the arrival of European missionaries. For many students in contemporary U.S. classrooms, these contexts are unfamiliar. Without support, the text can feel opaque. That's where text sets come in.

When I build a set, I start by asking a simple but essential question: What does a reader need to know to make sense of this story? From there, I identify a small number of high-value topics—ideas that will unlock key aspects of the narrative. These might include historical events, cultural practices, or domain-specific concepts.

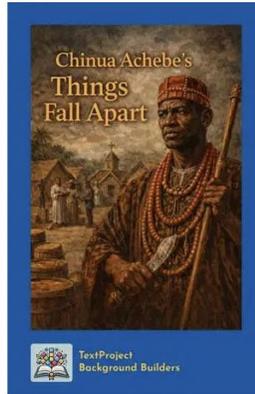
Using AI tools, I generate initial drafts of short texts on these topics. But the real work—and the most important work—comes next. I review and revise carefully to ensure that:

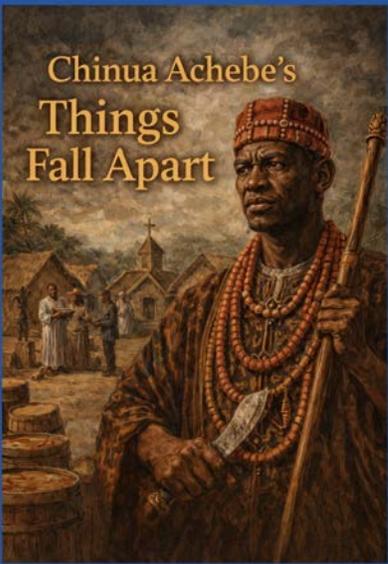
- The content is accurate and appropriate for the students I have in mind
- The language is accessible, without being watered down
- Key ideas and vocabulary are repeated enough to support understanding
- The text is engaging and worth reading in its own right

I'm sharing a set of slides that illustrates how I go about gathering the "grist" for these AI-curated texts. While I don't walk through every editing decision, the handout outlines the general process—especially how I identify and refine topics, so they truly serve students.

The goal is not to simplify complex texts. It's to prepare students to meet them.

View slide handout: [Building Background That Matters: How I Create Text Sets for Adolescent Readers](#)





TextProject
Background Builders

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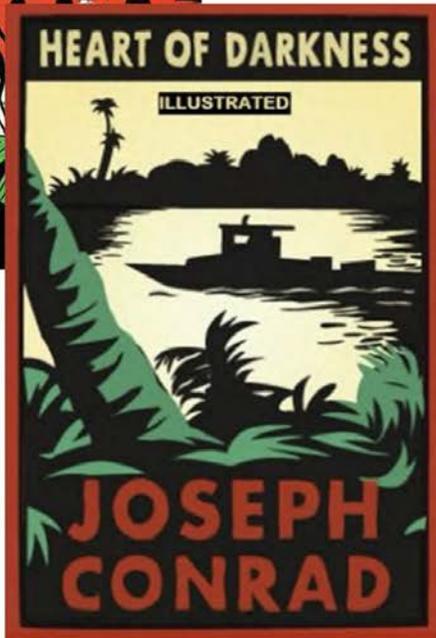
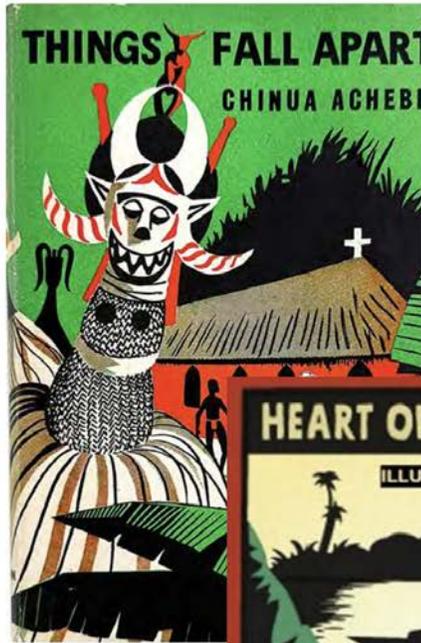
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How Africa Was Shown in Earlier Novels Written by Europeans

When *Things Fall Apart* was published in 1958, it was not the first novel set in Africa. For decades, European writers had written books about the continent. But almost all were told from a European point of view. The land was described in detail, but African people were rarely the main characters. They did not often speak for themselves but appeared as background figures in stories about European explorers, traders, or soldiers.

One well-known example is *Heart of Darkness* by Joseph Conrad. In that novel, Africa is the setting for a journey made by a European sailor. The focus is on what happens to the Europeans, not on the inner lives of African people.

These kinds of books shaped how many readers in Europe and the North America imagined Africa. They often suggested that African societies were simple. Readers rarely saw detailed portrayals of family life, law, or religion within African communities.

In the 1950s, most African countries were still under European rule. African voices were not widely heard in world literature. Achebe wanted to change that. *Things Fall Apart* shows Igbo life as a full society, with strengths, flaws, humor, and conflict. Achebe was not just writing a story. He was entering a conversation — and reshaping it.

WordRoots

Anglo-Saxon

[The Big Red Sign](#)



The Big Red Sign

Sam and Meg were on their way to school. Sam saw the big red sign at the corner. "STOP!" said Sam. "We need to stop here and look both ways."

Meg stopped next to Sam. They watched as cars stopped at the sign. "The cars are stopping because of the sign," said Meg.

"Now it's safe," said Sam. "Let's go!"

[Tomas the Helper](#)



Tomas, the Helper

Tomas saw his little brother reaching happily for a toy. His brother was still sleepy and the toy was on a busy shelf. It was too high for him to reach.

Tomas quickly ran over. "I can be your helper!" he said. His brother was thankful when he got his toy.

Then the two children played happily. Tomas liked being a helpful, older brother.

French/Latin

[A Voice Against Bullying](#)



A Voice Against Bullying

Mary couldn't stop quiet any longer. She had seen kids make fun of the new student's lunch every day for a week. On Friday, she stood up in the cafeteria and denounced their behavior.

"I want to announce something," she said, her voice shaking but strong. "The way you're treating Alex is wrong. Making fun of someone's lunch from their culture is not funny. It's mean and it has to stop."

At first, the cafeteria went silent. Then her loud, bold voice rang up. "Way's right," the announcer said. "Denounce this bullying. We did just what we came here to do. It's not funny if people make fun of them."

One by one, other students shared stories about special lunch from their families. By the end of lunch, some of the kids who had been doing the teasing renounced their mean behavior and apologized to Alex. Sometimes it just takes one person to denounce something wrong to make a real change.

[The World's Greatest Mispronouncer](#)



The World's Greatest Mispronouncer

Jack grabbed on the game show announcer. He'd hosted his own company game for the third time. "Welcome back to 'Win Big or Go Home!' featuring our amazing sponsor, PURSE, some Air Purifiers!"

"It's Purse time!" Jack shouted at the TV. "Use PURSE V and GO! Together they have the best!"

The announcer's mispronunciation got louder as the show went on. "And now a special deal from PURSE: some i repeat, PURSE some Air Purifiers!"

Jack couldn't take it anymore. He stopped announcing the products on his phone. The announcer was getting more flustered by the minute. "You! MISTAKE! your! answer! very! PURSE! some!"

By the end of the show, Jack had created a video, which he called "World's Greatest Mispronouncer." The video went viral overnight.

The next day, the announcer made an announcement. "I hereby announce that I'm leaving pronouncing PURSE some incorrectly. Though in my defense, I didn't call a PURSE some!"

Jack's aunt wasn't mad in fact, she found the announcement to make some funny pronunciation videos. Their partnership led to the most successful ad of the year.

[The Never-Ending Video Game](#)



The Never-Ending Video Game

Usually, when Marius's biggest brother Marcus in his video game the game would sometimes be fun and that was to start with. But today was different.

"This is unbelievable!" he groaned to his older brother. "The game just keeps going and going!"

"What does 'never-ending' mean?" Marcus asked, looking at the screen.

"It means something that lasts like it will never end!" Marius explained. "Like when there's on the phone with Grandma!"

Marius laughed. Let me determine what's wrong. She called at the conclusion. "You accidentally hit some super-power mode! Your character can't be obliterated by anything!"

"Unbelievable!" asked Marius?

"Yeah, it means to completely remove something," Marcus said. "Like when Dad demolished the weeds in the garden!"

"Could that mean to turn off super-power mode. The game is too fun if it can't end!"

Together they found the button to terminate the special powers. When they did, Marcus's character died for good and the game ended.

"Now the game isn't 'never-ending' anymore!" Marius said happily. "It may mean for some time, but it's a challenge!"

Greek

[Are You Scared of Santa & His Beard?](#)



Are You Scared of Santa and His Beard?

If seeing a big bushy beard makes you want to run and hide, you might have **popogonophobia**. This funny-sounding word comes from two Greek roots: **popogon** means beard and **phobos** means fear.

Some people get super nervous around beards. It might be Santa Claus's or the beard of an uncle. Whenever it is, **popogonophobia** is in certain ways when they see someone with a big beard. Their hearts beat faster and they just want to get away! It's weird but true. Some children's books tell them beards are scary. At least now you know what to call it!

[Love to Travel? That's Hodophilia](#)



Love to Travel? That's Hodophilia

Ever feel super excited when you're going on a trip? There's a special word for people who love to travel - **hodophilia**! This word comes from two old Greek words: **hodos** which means road and **philia** which means love. When you put them together, **hodophilia** means loving to travel and being on the road.

People who have **hodophilia** are called **hodophiles**. Just like how we just "let" to make words for people who do something like artist or scientist, we just add to **hodophilia** to describe someone who loves traveling.

Hodophiles are happy when they're taking trips. They love planning trips and get excited just thinking about their next adventure. Do you get excited when your family says "Let's go on a trip?" That's a **hodophilist** in action!

[The Time-Eaters](#)



The Time-Eaters

Ever feel like something's stealing all your time? There's actually a special word for that time-stealing thing: **chronophage**. This funny word comes from two Greek parts: **chronos** means "time" and **phago** means "eater."

Look around your day: can you spot any **chronophages**? Maybe it's that video game that takes you an hour playing the three hours when you thought you only play for those minutes. Or maybe it's TikTok, endlessly munching away your whole afternoon while you keep scrolling. Even your little brother's endless "why" questions can be a **chronophage**!

Pretty weird to think about, time being eaten, right? But now when something steals all your day, you know what to call it - a **chronophage**!



Image credit: shironosov | iStock



Image credit: master1305 | iStock

The World's Greatest Mispronouncer

Jake groaned as the game show announcer butchered his aunt's company name for the third time. "Welcome back to 'Win Big or Go Home!' featuring our amazing sponsor, PURE-zone Air Purifiers!"

"It's PURI-zone!" Jake shouted at the TV. "Like PURIFY and ZONE together! How hard is that?"

The announcer's mispronunciations got wilder as the show went on. "And now, a special deal from PRIME-zone. I mean, PRIZE-zone Air Purifiers!"

Jake couldn't take it anymore. He started recording the mistakes on his phone. The announcer was getting more flustered by the minute: "Visit PRISM-zone's website... sorry, PURPLE-zone..."

By the end of the show, Jake had created a video, which he called "World's Greatest Mispronouncer." The video went viral overnight.

The next day, the announcer made an announcement: "I hereby announce that I've been pronouncing PURI-zone incorrectly. Though in my defense, I didn't call it PURGE-zone!"

Jake's aunt wasn't mad. In fact, she hired the announcer to make some funny pronunciation videos. Their partnership led to the most successful ad of the year.

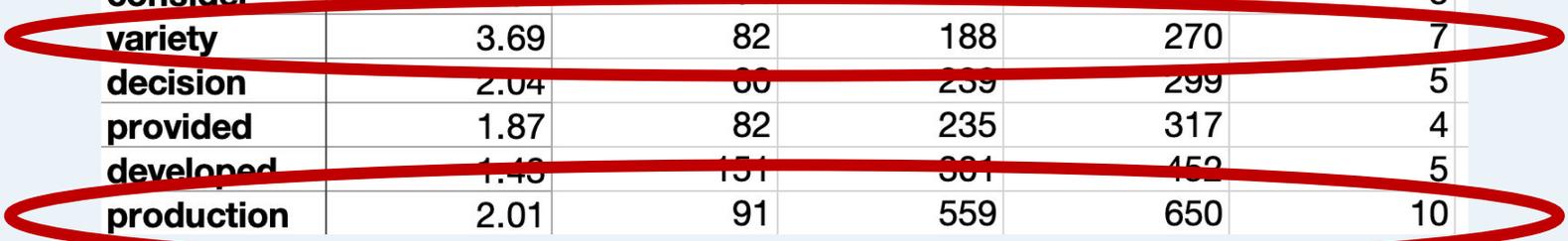
Underlying Research

- Exposure influences automaticity.
- Words are typically members of morphological families.
- Polysyllabic words (3+ syllables) challenge many students.

Method

- Identify the 3+ syllable words among the most frequent 1500 words in written English: EWFG database followed by SCOPE
"number of syllable" analysis:
 - 175 3+ syllable words
- Using dELP, pick 25 most difficult words
- Identify family members of target words: EWFG

	Difficulty	Predicted appearances /million	Additional Predicted appearances /million	Target + Family Members in 10+/million	# Family members >9 appearances /million
revolution	1.7	63	13	76	1
evidence	1.72	77	9	86	1
policy	1.64	64	29	93	1
frequently	2.19	67	36	103	2
rapidly	1.47	70	34	104	1
situation	1.47	78	34	112	1
specific	1.55	97	21	118	2
established	1.56	70	51	121	3
political	1.81	128	26	154	1
society	2.32	131	25	156	1
education	1.61	122	47	169	2
determine	2.2	69	103	172	4
economic	3.48	113	60	173	2
organization	1.41	67	114	181	4
expected	2.23	88	95	183	3
industrial	2.84	75	114	189	2
individual	1.76	132	66	198	1
particularly	4.05	69	131	200	1
companies	2.06	138	85	223	3
consider	1.67	104	158	262	5
variety	3.69	82	188	270	7
decision	2.04	80	239	299	5
provided	1.87	82	235	317	4
developed	1.43	151	301	452	5
production	2.01	91	559	650	10



I want to have a text for fourth graders who aren't great readers that describes a class putting on a variety show. I want to use words such as various, varieties, and other members of the morphological family. I want those words to be repeated. I also want to bring in the idea that it is a "production" and that they are producing the variety show....in other words, bring in words related to the morphological family of produce. And I want the text to be interesting and compelling--and something that kids who aren't very good readers will get engaged in. Please make the text no longer than 300 words.

When people make movies, there are always producers they are the people who do what? Our teacher has appointed all of us as producers of this variety show. We're going to give the production several times--once for the first grade class, another time for the other fourth-grade class, and the final time for the PTA.

Is it appropriate anywhere to use the word various--maybe twice?

Could they maybe have various tasks to do?



Producing a Variety Show

Our class is putting on a variety show—and we are the producers. In movies, producers are the people who plan, fix problems, and keep the show moving. Our teacher said, “You are all producers.” That means this production is up to us.

A variety show has different kinds of acts. That’s where the word *variety* comes from—lots of different things in one show.

The acts vary from group to group. Mia and Jay are producing a dance. Luis’s group is producing a skit about a robot teacher who gives out homework all day. Tara is singing a song which ends with a high note that makes everyone stop and listen. There is a lot of variety in our show.

As producers, we also have various tasks. Some of us are in charge of music. Others find props. Some help people get on stage at the right time.

We run into various problems as we get ready. The music cuts out. A prop goes missing. “Producers fix problems,” our teacher reminds us. We find ways to fix the problems that come up.

We will produce this variety show for various groups—first graders, other fourth graders, and the PTA. On the final show for the PTA, the room is full. The lights go down. For a moment, it is very quiet. We smile at each other. We made this production. Then the music starts. And our variety show begins.

Number of appearances of multisyllabic words from rich morphological families

Producing a Variety Show:

- production: 11
- variety: 9

Can you generate a set of sentences for a study sheet (with the 7 target words at the top of the sheet and blanks in sentences for specific target words? I want the sentences to have a contiguous story line and I want the target words to belong to the morphological family of production and of variety. Remember that the students for whom this is intended are in the fourth grade but are neither avid nor automatic readers.

Study Sheet

Word Bank: produce, producer, production, producing, produced, variety, various

1. Our class is getting ready to _____ a variety show for the school.
2. Each group is a _____, in charge of one act in the show.
3. The whole _____ includes songs, dances, and funny skits.
4. The acts show a lot of _____, because each one is different.
5. Right now, some students are _____ a dance, while others plan a skit.
6. We have _____ tasks, like running music, setting up props, and helping backstage.
7. By the end of the week, we have _____ a show full of fun and variety.



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Summary of efficacy of Scaffolded Texts on Automaticity and Comprehension

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More to Read and/or Hear (for free!):

- Hiebert, E. H. (2020). The core vocabulary: The foundation of proficient comprehension. *The Reading Teacher*, 73(6), 757-768.
- Hiebert, E. H. (2024). Unpacking automaticity: Scaffolded texts and comprehension. *Journal of Adolescent & Adult Literacy*.
- Revolutionizing Vocabulary Learning: AI's Contributions to Word Selection in Education <https://textproject.org/vocabulary-learning-and-ai/>
- The Science of Word Zones: How Big Data is Building Better Readers <https://textproject.org/word-zones-science/>
- Using Story Structure for Comprehension and Enhancing Vocabulary <https://textproject.org/story-structure-and-vocabulary/>
- Terminology, Texts and Teachers in an AI World: Possibilities and Problems <https://textproject.org/terminology-texts-teachers-ai/>

Sincerest thank you for your
time & commitment to our
students and their future!

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