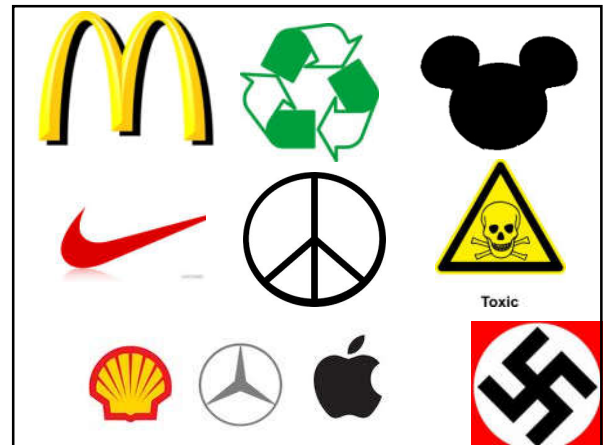## DEPTH & COMPLEXITY

We are surrounded by symbols.

SYMBOLS:

- share information
- create expectation
- convey emotion
- tell us what to do/not do
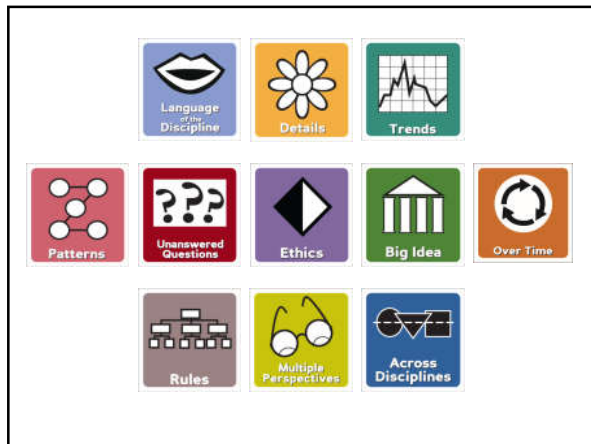- can change meaning

Toxic
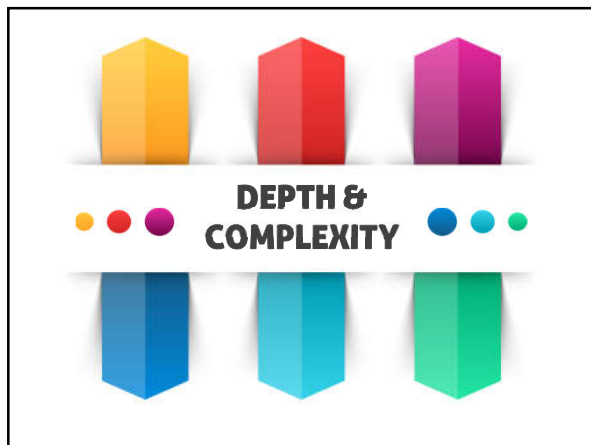
Think of a Symbol.

Criteria:
- easily recognizable
- emotion level $\geq$ 6
- be able to describe its effect (create expectation; convey info, etc.)

We're going to use a particular set of 11 symbols to help us engage with our learning.
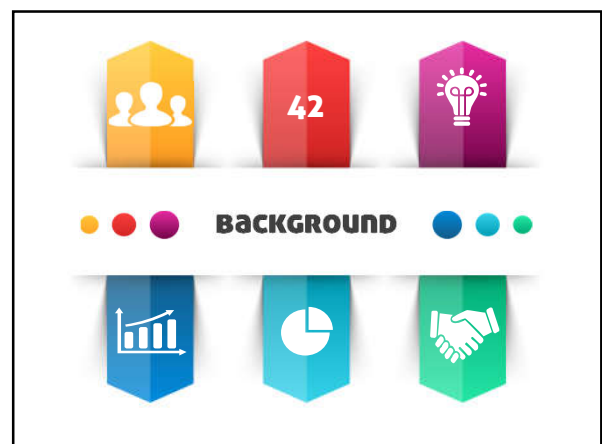
And they will…

- share information
- create expectation
- give common vocabulary
- tell us what to do/not do
- change meaning

DEPTH & COMPLEXITY

DEPTH & COMPLEXITY

a FRAMEWORK for academic exploration to help raise thinking skills

- universal way to explore
- robust thinking toolbox
- disciplinarianism
- all ages & content areas
- standards alignment

42

BACKGROUND

We are looking through a lens that pivots .

DEPTH & COMPLEXITY

the icons are a path to understanding the thinking lens we're using for that experience

DEPTH & COMPLEXITY

The eleven elements are not in any particular order.

What We'll Do Today:

- Understand the eleven elements of the framework
- Apply them to our content
- Know how to introduce them to students

1

FILL ME IN

The questions that p_____ face as they raise ch_____ from in_____ to adult life are not easy to answer. Both fa_____ and m_____ can become concerned when health problems such as co_____ arise any time after the e_____ stage to later life. Experts recommend that young ch_____ should have plenty of s_____ and nutritious food for healthy growth. B_____ and g_____ should not share the same b_____ or even sleep in the same r_____.

The questions that poultrymen face as they raise chickens from incubation to adult life are not easy to answer. Both farmers and merchants can become concerned when health problems such as cough arise any time after the egg stage to later life. Experts recommend that young chicks should have plenty of sunshine and nutritious food for healthy growth. Banties and geese should not share the same barnyard or even sleep in the same roost.

Δ30,000

12th 40,000

3rd 10,000

In school: 3,000 per year

Pre-school: 840 per year

LANGUAGE OF THE DISCIPLINE

JAMES A. MICHENER

CHESAPEAKE
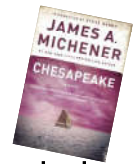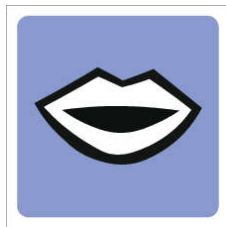
"But always he lacked the essential tool without which the workman can never attain true mastery:

he did not know the names of any of the parts he was building, and without the name he was artistically incomplete.

It was not by accident that doctors and lawyers and butchers invented specific but secret names for the things they did;

to possess the name was to know the secret.
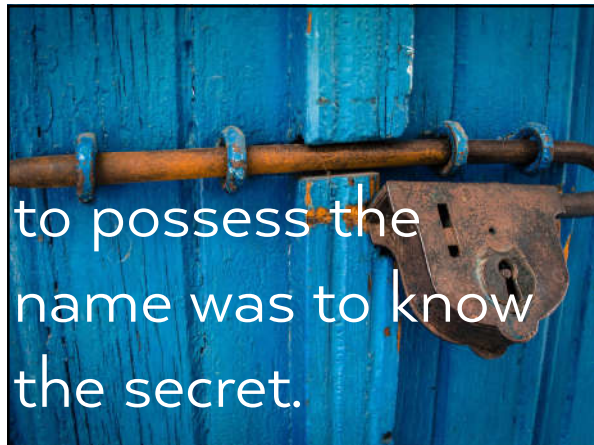
With correct names one entered into a new world of proficiency, became the member of an arcane brotherhood,

a sharer of mysteries, and in the end a performer of merit.

Without the names one remained a bumbler or, in the case of boatbuilding, a mere carpenter."
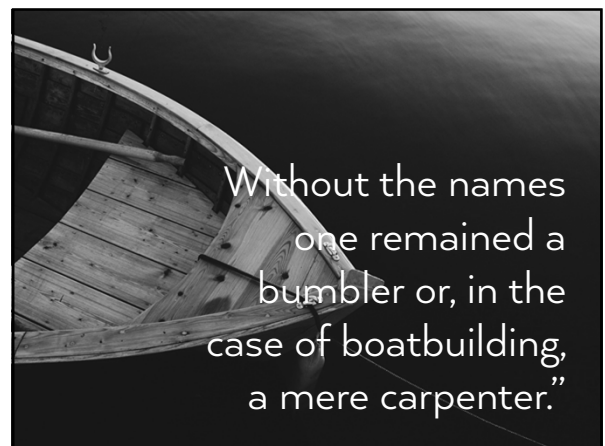
Who am I?

Think of a field, domain, or content area.

Next, think of 5 words that are the LotD of that field & write them on your Experience Sheet.
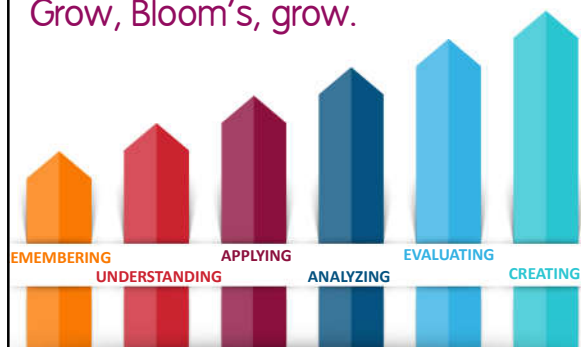
Do not share.

Find someone from another table in your same card suit.

Share your words with each other and guess your respective fields.

If you finish before time is up, think of more words for the other person's list.

iMPLEMENT

See Bloom's grow.
Grow, Bloom's, grow.

REMEMBERING
UNDERSTANDING
APPLYING
ANALYZING
EVALUATING
CREATING

iMPLEMENT: Elementary Science

What do these words have in common?
•cirrus
•stratus
•cumulonimbus
•stratocumulus

1. What are two words that are missing that should be on the list?

2. Draw a picture of one you think would not be good if you were at a picnic.

iMPLEMENT: SecondaryMath

1. Why is this funny?

2. Draw the shape that best reflects this comic.

3. Think of another number that would work in this comic.

iMPLEMENT: Middle School ELA

Word Interview: Word ___conflict___

What words mean the same as you?
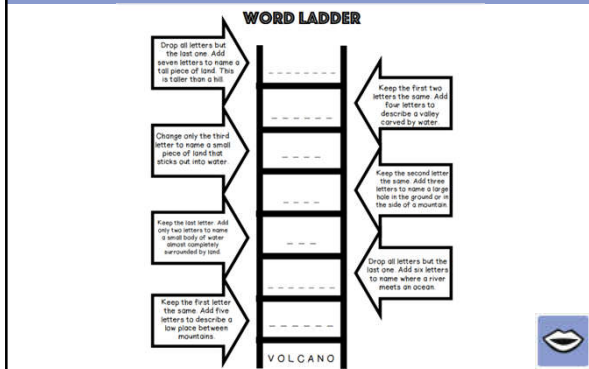What makes you happy?
Who or what is your best friend?
What do you dislike most?
If you could give anyone advice, who would you give it to and what would you say?
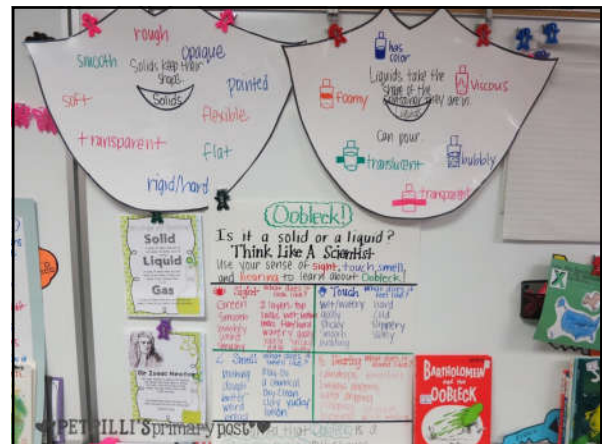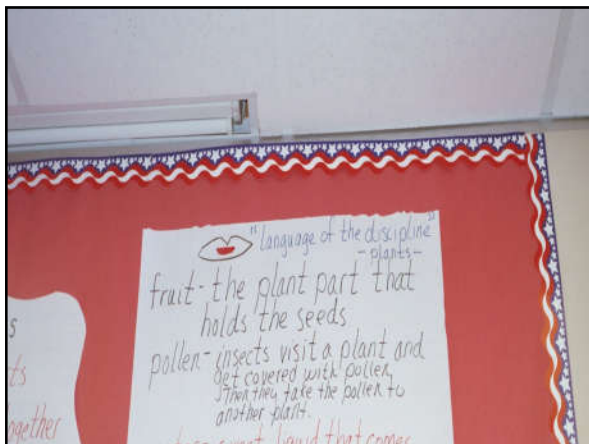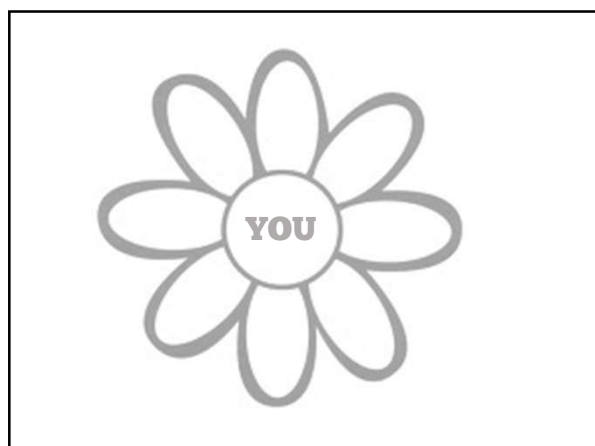
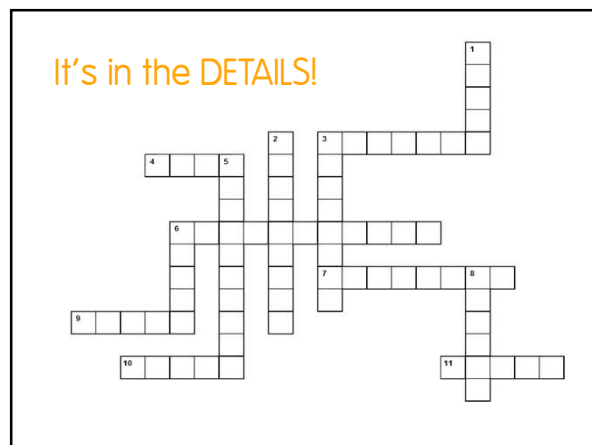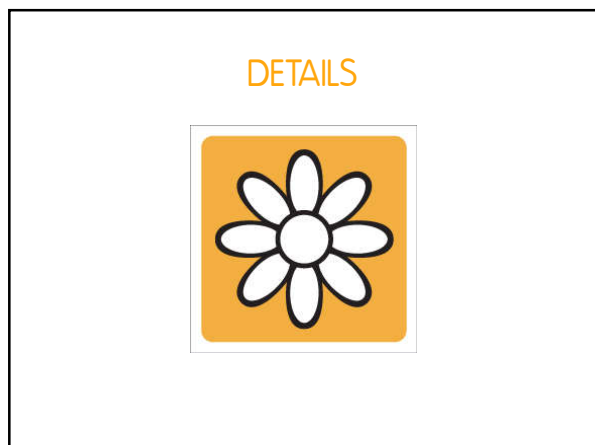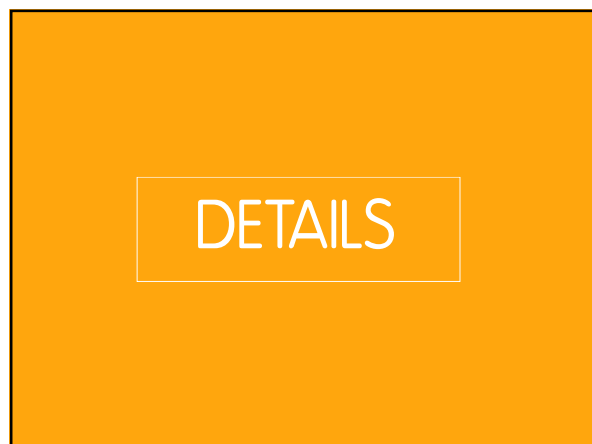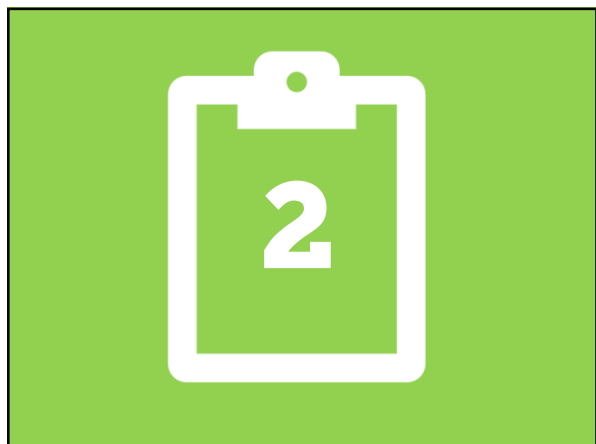## iMPLEMENT: Elementary Science

iMPLEMENT: World Languages

Change "tengo" to first person plural.

Write three nouns that begin with the fifth letter of the new conjugation.

Write an acrostic poem with one of the nouns using at least one verb, one noun, and one adjective.

2

DETAILS

DETAILS

It's in the DETAILS!

YOU

iMPLEMENT: Social Studies

List at least 8 🌼 details about Abraham Lincoln.

Which 🌼 details are most important? How can you support that opinion?
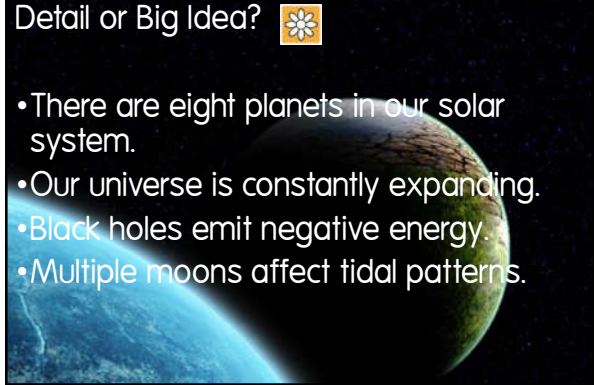
What ideas do we most associate with him? 🌼

iMPLEMENT: Middle School Science
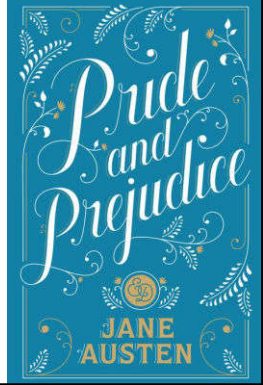
Detail or Big Idea?

- There are eight planets in our solar system.
- Our universe is constantly expanding.
- Black holes emit negative energy.
- Multiple moons affect tidal patterns.
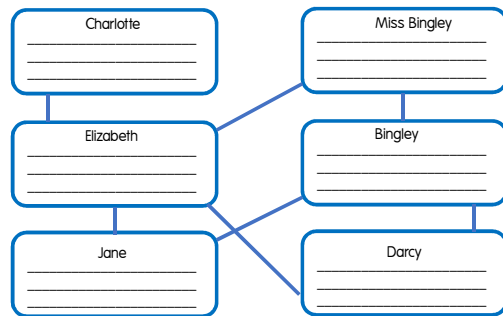
iMPLEMENT: ELA
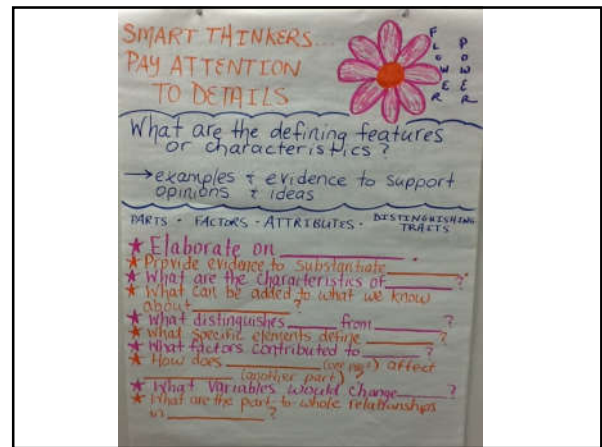
Using a sociogram with Details

iMPLEMENT: ELA

List three traits of each character and then show how that character is connected to the character(s) with whom they share connectors.

Charlotte

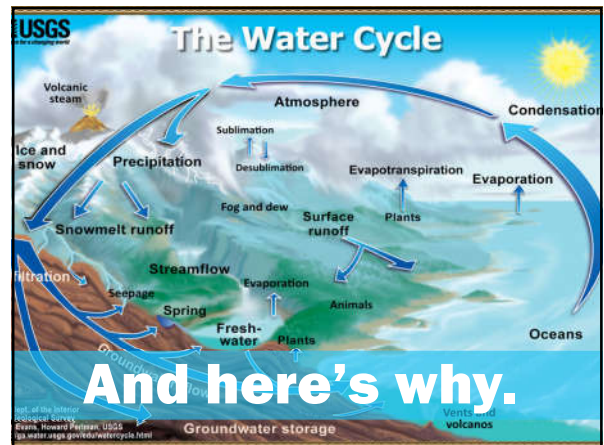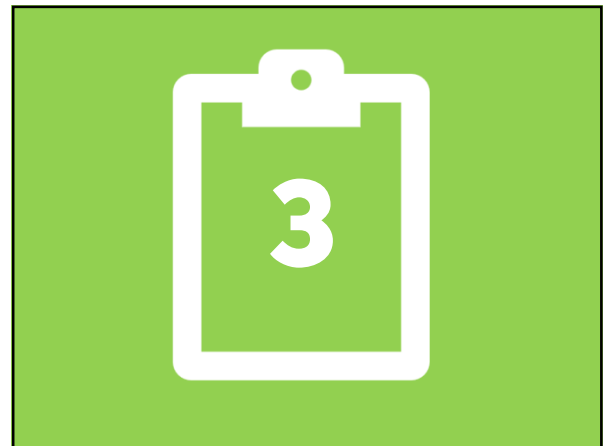Miss Bingley

Elizabeth

Bingley

Jane

Darcy

iMPLEMENT: MS Art

Compare the attributes of the self-portraits of Rembrandt & Van Gogh. Include line, shape, form, texture, color, value, and space.

Slide 1

Combine with ⟳ (Over Time) for analysis

Character Change Over Time

Slide 2

3

Slide 3

You are drinking dinosaur pee.

Slide 4

The Water Cycle

And here's why.

Slide 5

The THREE LITTLE PIGS

Little pig, little pig, Let __ __!

Slide 6

The THREE LITTLE PIGS

Not by the __

__ __ __ __!

Then I'll [insert threat].

The THREE LITTLE PIGS

PATTERNS

PATTERNS

AGREE/DISAGREE ACTIVITY

Agree or Disagree

AGREE/DISAGREE:

When there is a pattern, you can predict what comes next.

AGREE/DISAGREE:

Patterns can be replicated.
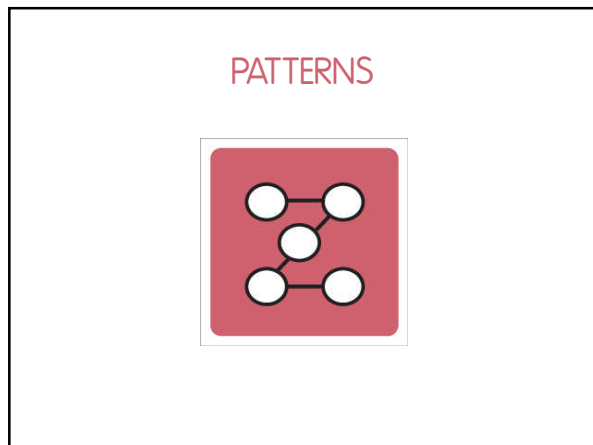
AGREE/DISAGREE:

A cycle is not a pattern.

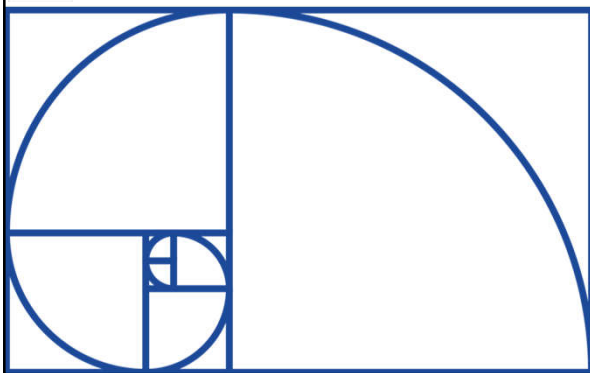**AGREE/DISAGREE:**

If you see repetition, look for a pattern.

AGREE/DISAGREE:

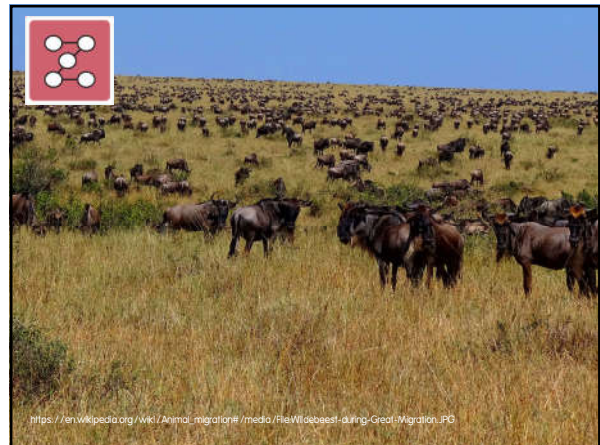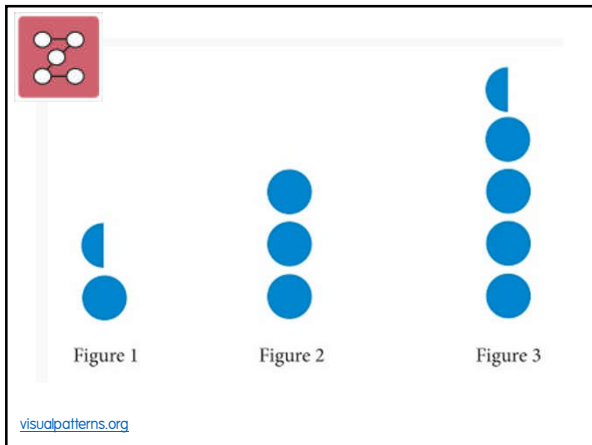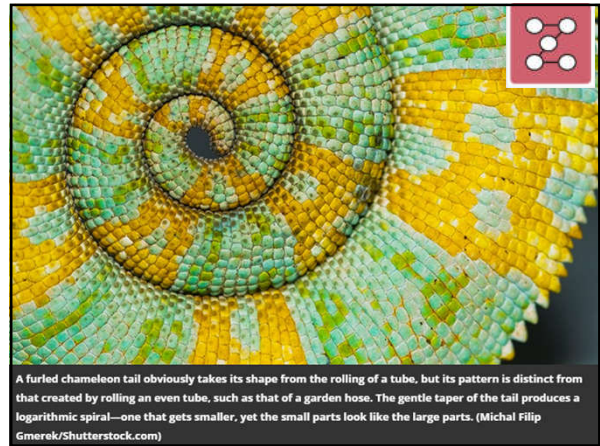Patterns cannot be man-made. They can only be natural.

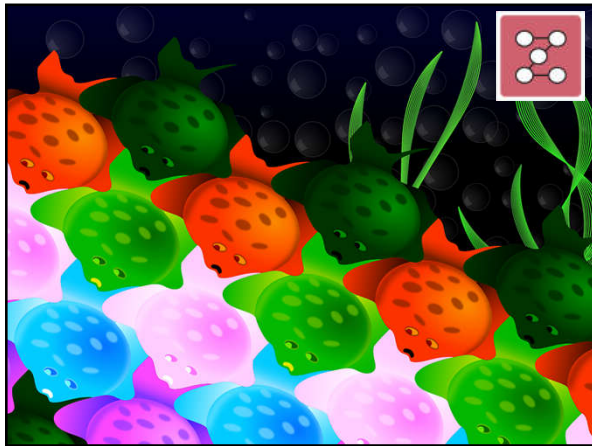**AGREE/DISAGREE:**

A recurring element could be considered a pattern.

Patterns occur in all domains.

conflict – war – peace
[optional step: seeds of next war]

A furled chameleon tail obviously takes its shape from the rolling of a tube, but its pattern is distinct from that created by rolling an even tube, such as that of a garden hose. The gentle taper of the tail produces a logarithmic spiral—one that gets smaller, yet the small parts look like the large parts. (Michal Filip Gmerek/Shutterstock.com)

Figure 1   Figure 2   Figure 3

visualpatterns.org

https://en.wikipedia.org/wiki/Animal_migration#/media/File:Wildebeest-during-Great-Migration.JPG

LH PATTERNS FOR THE 12-BAR BLUES

WHOLE NOTES

C   F   G

BLOCKED 5THS & 6THS

C   F   G

http://colorinmypiano.com

CONJUGAISON DES VERBES RÉGULIERS AU PRÉSENT

ER PARLER	IR FINIR	RE ATTENDRE
JE PARLE	JE FINIS	J'ATTENDS
TU PARLES	TU FINIS	TU ATTENDS
IL/ELLE PARLE	IL/ELLE FINIT	IL/ELLE ATTEND
NOUS PARLONS	NOUS FINISSONS	NOUS ATTENDONS
VOUS PARLEZ	VOUS FINISSEZ	VOUS ATTENDEZ
ILS PARLENT	ILS FINISSENT	ILS ATTENDENT

frenchinnormandy.com

What is a pattern in your discipline?

[stand when you can think of one]

Could you ask them to

DESCRIBE THE PATTERN?

Could you ask them to

EVALUATE THE PATTERN'S IMPORTANCE?

Could you ask them to

COMPARE THE PATTERN TO ANOTHER PATTERN?

Could you ask them to

IDENTIFY PRIMARY AND SECONDARY PATTERNS?

Could you ask them to

RECOGNIZE WHEN/WHERE A PATTERN BREAKS?

Could you ask them to

SEE THE PATTERN OUT OF SEQUENCE AND FIX IT?

---

iMPLEMENT: Secondary Music

Identify patterns of opposites in Beethoven's 5th Symphony.
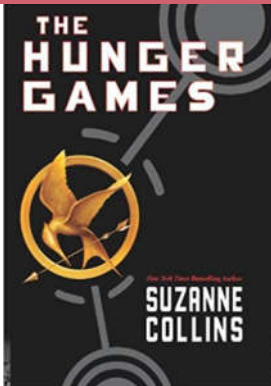
---

iMPLEMENT: Secondary Music

Differentiate it:
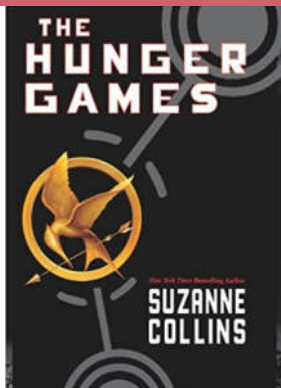Create a chart comparing the patterns of opposites in Beethoven's 5th Symphony to those in *Fur Elise*.

---

iMPLEMENT: ELA

How does/does not Katniss follow the pattern of the heroic archetype?

THE HUNGER GAMES

SUZANNE COLLINS

---

iMPLEMENT: ELA

Differentiate It:
Compare and contrast the heroic journey of Katniss with that of Theseus.

THE HUNGER GAMES

SUZANNE COLLINS

---

iMPLEMENT: Elementary Science

ped using the following elements from the NRC document *A Framework for K-12 Science Education*.

Disciplinary Core Ideas

LS1.B: Growth and Development of Organisms
- Reproduction is essential to the continued existence of every kind of organism. Plants and animals have unique and diverse life cycles. (3-LS1-1)

Crosscutting Concepts

Patterns
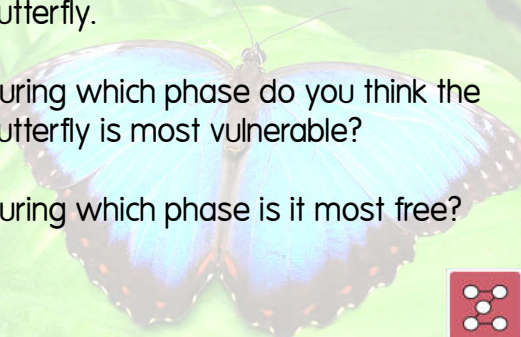- Patterns of change can be used to make predictions. (3-LS1-1)

15

3-LS1-1. DEVELOP MODELS TO DESCRIBE THAT ORGANISMS HAVE UNIQUE AND DIVERSE LIFE CYCLES BUT ALL HAVE IN COMMON BIRTH, GROWTH, REPRODUCTION, AND DEATH

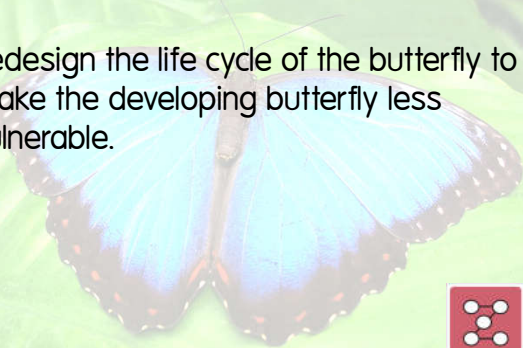Create a diagram of the life cycle of the butterfly.

During which phase do you think the butterfly is most vulnerable?
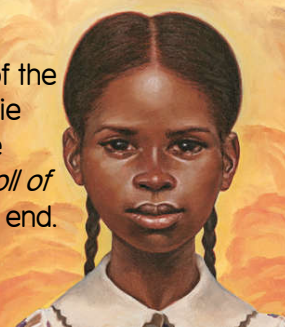
During which phase is it most free?

Differentiate it...

Redesign the life cycle of the butterfly to make the developing butterfly less vulnerable.
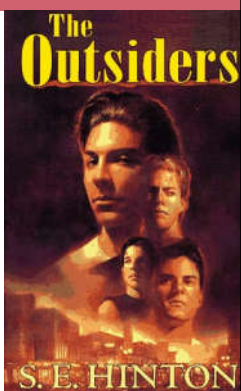
iMPLEMENT: Middle School ELA

Create a 3-circle Venn Diagram comparing the development of the character Cassie Logan from the beginning of *Roll of Thunder* to the end.
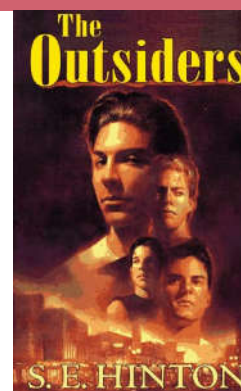
iMPLEMENT: Middle School ELA

Create an image essay illustrating the archetypes found in *The Outsiders*.

iMPLEMENT: Middle School ELA

Differentiate it: Create an image essay contrasting the archetypes found in *The Outsiders* to those found in *A Wrinkle in Time*.

4

WHAT AM I?

Always wear your seatbelt.

Obey the speed limit.

You must have a license.

Signal 100 feet before a turn.

Yield to pedestrians.

WHAT AM I?

"I" before "e" except after "c"

{& a bunch of other exceptions}.

Use the possessive in front of a gerund.

Sentences begin with a capital letter.

Sentences begin with a capital letter.

WHAT AM I?

Waft, don't inhale.

Do not return unused chemicals to their original container.

Tie long hair back.

Never look into a container that is being heated.

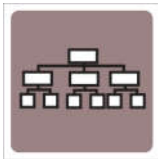I have to have three sides.

I have to have three angles.

If one of my angles is 90°, I'm right.

The sum of my interior angles is 180°.

YOUR TURN

RULES

RULES

Hate this game?
You're playing it wrong.

MONOPOLY

RULES INCLUDE:
standards
directions
methods
organization
usual behavior

WHAT ARE THE
RULES OF THIS?

WHAT ABOUT THIS?
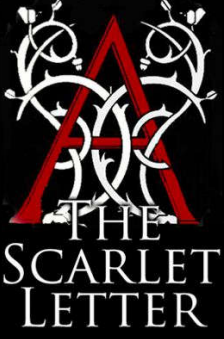
What is a rule in your discipline?

[write it down]

iMPLEMENT: Secondary ELA

In *The Scarlet Letter,* are the rules society imposes on women fair?

How does it punish the breaking of those rules?

Who else is punished besides the rulebreaker and how?

THE SCARLET LETTER

iMPLEMENT: Secondary ELA

Differentiate it:

Compare the rules society imposes on women in *The Scarlet Letter* to contemporary mores. Argue either that a) the rules have changed or b) the punishments are more subtle.

THE SCARLET LETTER

iMPLEMENT: Middle School PE

What constitutes a legal underhand serve for net & wall games such as badminton, volleyball or pickleball? Demonstrate three legal serves & one illegal serve.

https://commons.wikimedia.org/wiki/File%3APickleballs_on_Court.jpg

iMPLEMENT: Elementary Math

845

Say: What does the 8 stand for in this number? It's 8 what?

iMPLEMENT: Elementary Math

6__

Say: How could we make this say 600? What would have to add?

iMPLEMENT: Elementary Math

Differentiate (dep. upon ability):

Create 6-digit numbers, following these rules:
1) At least one number must be odd.
2) At least one number must be able to be skip-counted by 3.
3) The number must end in with a digit that was not used in the number before.

iMPLEMENT: Elementary Math

Differentiate (dep. upon ability):

What rule of Roman numerals are these numbers breaking? Fix them.

19 = XIIII
100 = VV

iMPLEMENT: Elementary Math

Differentiate (dep. upon ability):

What rule about Roman numerals do you see in both of these statements?

XL = 40
IX = 9

iMPLEMENT: Elementary Math

Differentiate (dep. upon ability):

Research how to write "36" in both Mayan and Babylonian numerals.

iMPLEMENT: ELA

Identify the phrases in the following sentences. Label the underlined words: par = participial ger = gerund inf = infinitive appos = appositive prep = prepositional

____1. There was no talk in all England but of the new baby, Edward Tudor, <u>Prince of Wales</u>, who lay lapped in silks and satins, unconscious of all this fuss, and not knowing that great lord and ladies were tending him . . .
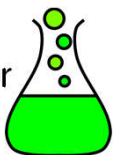____2. The windows were small, <u>glazed with little diamond-shaped panes</u>, and they opened outward, on hinges, like doors.

iMPLEMENT: Secondary Science

Correct the names of these common chemical compounds.

NaClO is sodium hyperchloride

$C_{12}H_{22}O_{11}$ is fructose

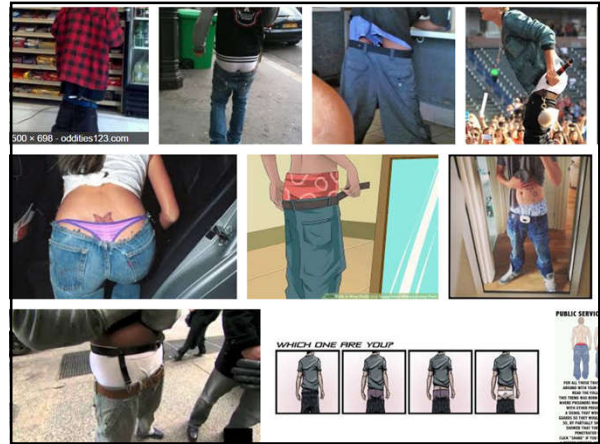$MgSO_4 \cdot 7\ H_2O$ is magnesium sulfur quadrahydrate

Differentiate it:

Create a chemical compound (using symbols only ☺) that has at least 6 elements, two of which must be carbon & hydrogen (bonus: Why would I ask that?).
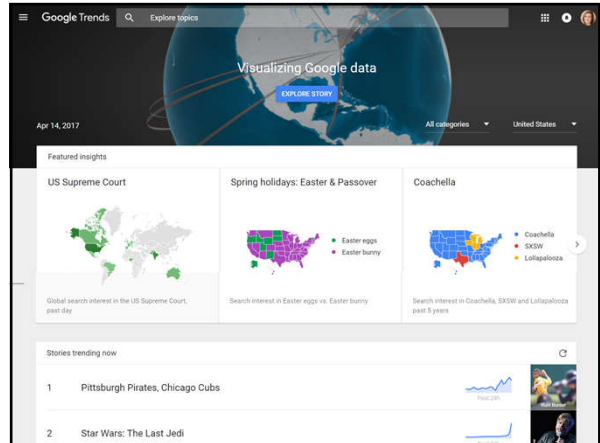
Write it using Hill System Order & name the compound, following all naming rules.

Invent a reasonable use for it.

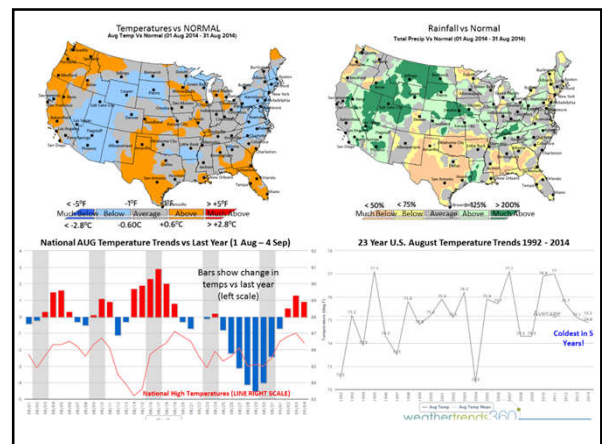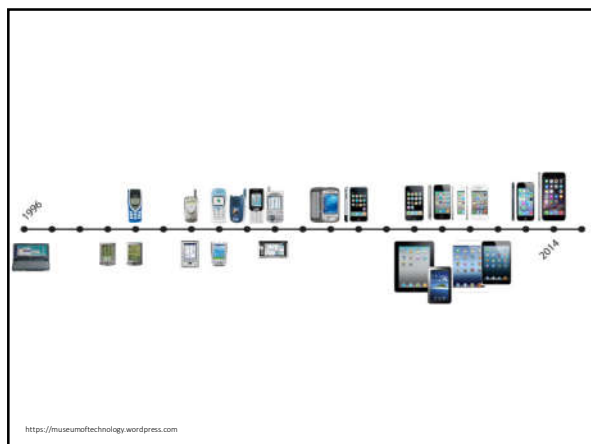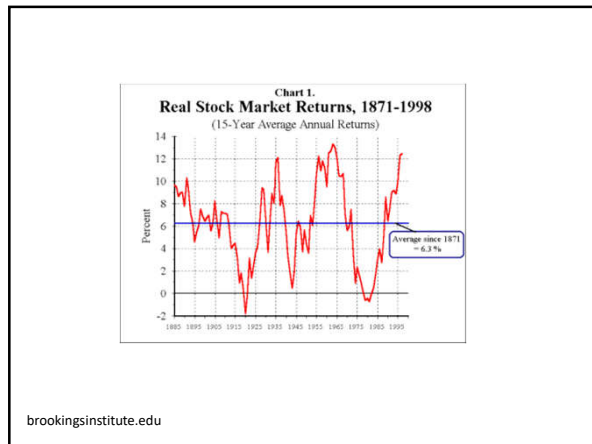What's the difference between a fad & a trend?

TRENDS

a general direction in which something is developing or changing

influences that affect change

Cause & Effect

TRENDS

Trends

https://museumoftechnology.wordpress.com

Chart 1.
Real Stock Market Returns, 1871-1998
(15-Year Average Annual Returns)

brookingsinstitute.edu

Trends exist in every industry and content domain.

6 book trends for 2016: Look into the future

571 million more print books were sold in 2015 than the year before, Nielsen bookscan reported in December. (Kirk McKoy / Los Angeles Times)
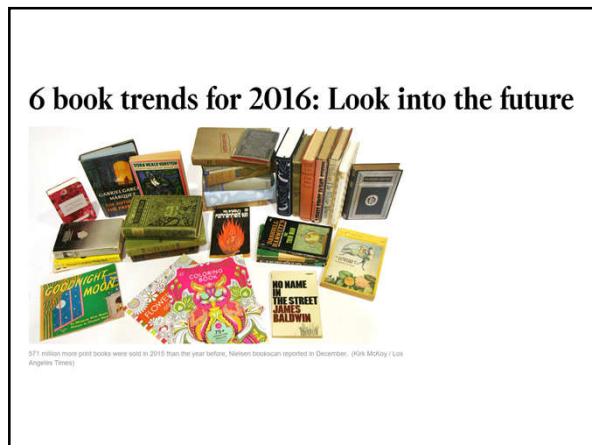
Some disciplines are a natural fit.

eras / -isms / movements

The Age of Exploration

Look for causes of the trend & factors influencing the trend.

Look for blend of change and stasis.

Look for gaps & relationships. Do elements or groups move closer or away from each other?

Trends are always complex.

Look for relationships among trends.

overlap the trends

Saving interest rates and inflation

Monthly interest rate %

— instant access
— Base rates
— Deposit savings
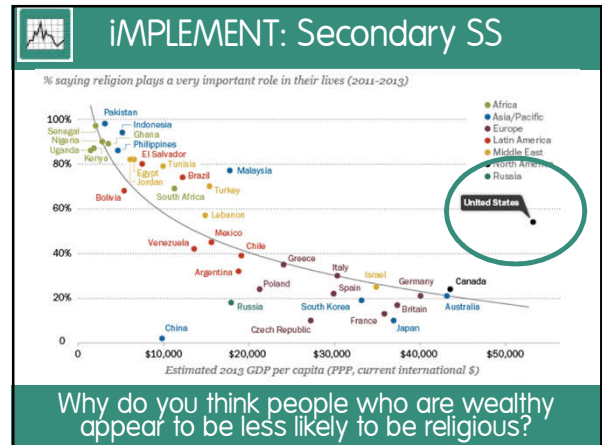— Inflation

www.economicshelp.org | Source: Bank of England

Ian says it's zoomed in Change over Time.

27

iMPLEMENT: World Languages

At-risk languages

● Critically endangered ● Seriously endangered ● Endangered

More or fewer languages?

What influenced the growth of the Germanic language family?

Some events have multiple consequences. On the bow, identify a cause. On the arrows, list consequences of that cause/action.

iMPLEMENT: ELA

---

iMPLEMENT: Secondary SS

% saying religion plays a very important role in their lives (2011-2013)

Why do you think people who are wealthy appear to be less likely to be religious?

Questions you could ask? Related Activities?

---

iMPLEMENT: Secondary SS

Urbanization

1900	2 out of every 10 people lived in an urban area
1990	4 out of every 10 people lived in an urban area
2010	5 out of every 10 people lived in an urban area
2030	6 out of every 10 people will live in an urban area
2050	7 out of every 10 people will live in an urban area

Questions? Activities? Products?
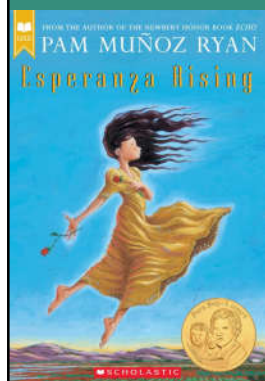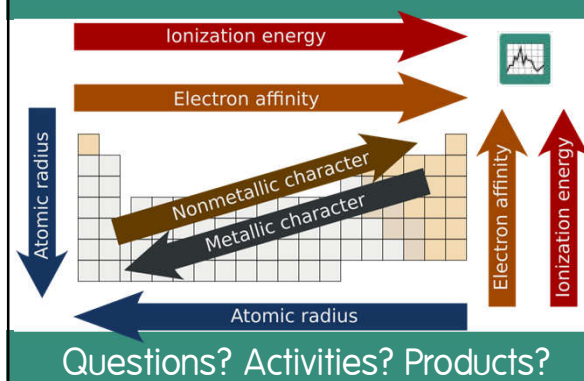
iMPLEMENT: ELA

Evaluate the political, social, and economic factors that influenced Esperanza's journey. Which had the greatest impact on her and her family? Which had the least? Which affect you?

iMPLEMENT: Middle School Science

Questions? Activities? Products?

Can you find a correlation between those trends and uses?

6

Titanic WAS NOT sunk by Iceberg – new evidence suggests shock theory to disaster

THE Titanic was NOT sunk after striking an Iceberg, it has sensationally been claimed more than a century since the ship disaster.

By SEAN MARTIN
PUBLISHED: 04:12, Wed, Jan 4, 2017 | UPDATED: 07:40, Wed, Jan 4, 2017

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Titanic NOT sunk by iceberg documentary claims   < Share

Millennium Problems

Yang–Mills and Mass Gap
Experiment and computer simulations suggest the existence of a "mass gap" in the solution to the quantum versions of the Yang-Mills equations. But no proof of this property is known.

Riemann Hypothesis
The prime number theorem determines the average distribution of the primes. The Riemann hypothesis tells us about the deviation from the average. Formulated in Riemann's 1859 paper, it asserts that all the 'non-obvious' zeros of the zeta function are complex numbers with real part 1/2.

P vs NP Problem
If it is easy to check that a solution to a problem is correct, is it also easy to solve the problem? This is the essence of the P vs NP question. Typical of the NP problems is that of the Hamiltonian Path Problem: given N cities to visit, how can one do this without visiting a city twice? If you give me a solution, I can easily check that it is correct. But I cannot so easily find a solution.

Navier–Stokes Equation
This is the equation which governs the flow of fluids such as water and air. However, there is no proof for the most basic questions one can ask: do solutions exist, and are they unique? Why ask for a proof? Because a proof gives not only certitude, but also understanding.
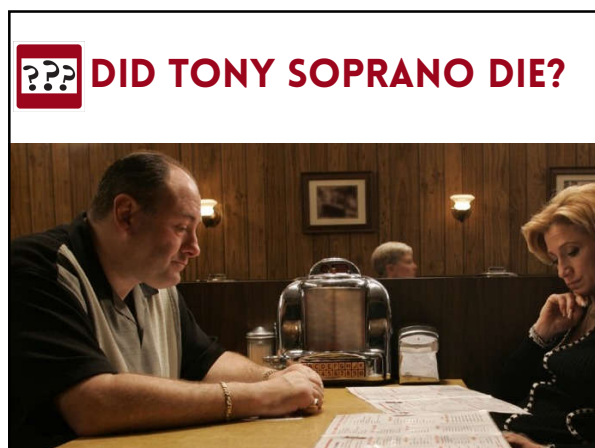
Hodge Conjecture
The answer to this conjecture determines how much of the topology of the solution set of a system of algebraic equations can be defined in terms of further algebraic equations. The Hodge conjecture is known in certain special cases, e.g., when the solution set has dimension less than four. But in dimension four it is unknown.
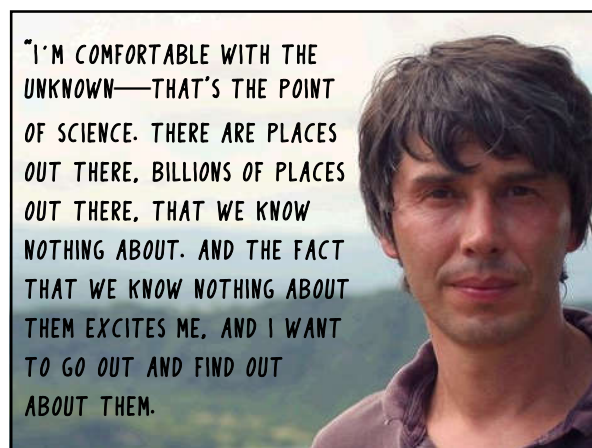
Poincaré Conjecture
In 1904 the French mathematician Henri Poincaré asked if the three dimensional sphere is characterized as the unique simply connected three manifold. This question, the Poincaré conjecture, was a special case of Thurston's geometrization conjecture. Perelman's proof tells us that every three manifold is built from a set of standard pieces, each with one of eight well-understood geometries.

Birch and Swinnerton-Dyer Conjecture
Supported by much experimental evidence, this conjecture relates the number of points on an elliptic curve mod p to the rank of the group of

---

WHY IS THERE MORE MATTER THAN ANTIMATTER? ???

??? People weekly WHO SHOT J.R.? Five Dallas insiders know, some famous Texans guess—and you can too (your ballot is on page 89) Hey, joggers: let's run the 100 (miles, that is) Custody-fight kidnapping C&W throb Eddie Rabbitt Who shot J.R. Ewing? TIME TV's Dallas WHODUNIT?

??? DID TONY SOPRANO DIE?

"I'M COMFORTABLE WITH THE UNKNOWN—THAT'S THE POINT OF SCIENCE. THERE ARE PLACES OUT THERE, BILLIONS OF PLACES OUT THERE, THAT WE KNOW NOTHING ABOUT. AND THE FACT THAT WE KNOW NOTHING ABOUT THEM EXCITES ME, AND I WANT TO GO OUT AND FIND OUT ABOUT THEM.

AND THAT'S WHAT SCIENCE IS. SO I THINK IF YOU'RE NOT COMFORTABLE WITH THE UNKNOWN, THEN IT'S DIFFICULT TO BE A SCIENTIST... I DON'T NEED AN ANSWER. I DON'T NEED ANSWERS TO EVERYTHING. I WANT TO HAVE ANSWERS TO FIND." - PHYSICIST BRIAN COX

What do you not know the answer to because that answer is not available?

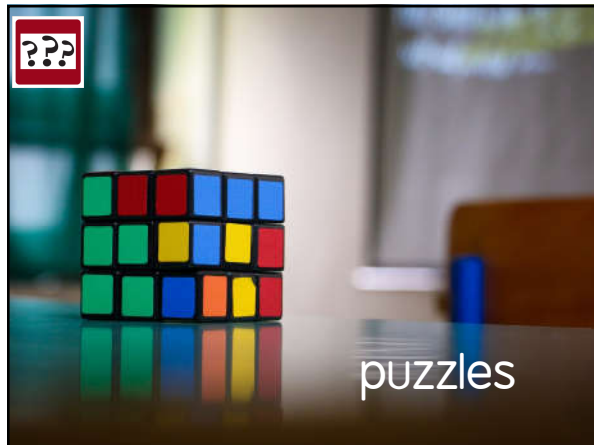What is something you do not know the answer to but you could find with currently available knowledge?

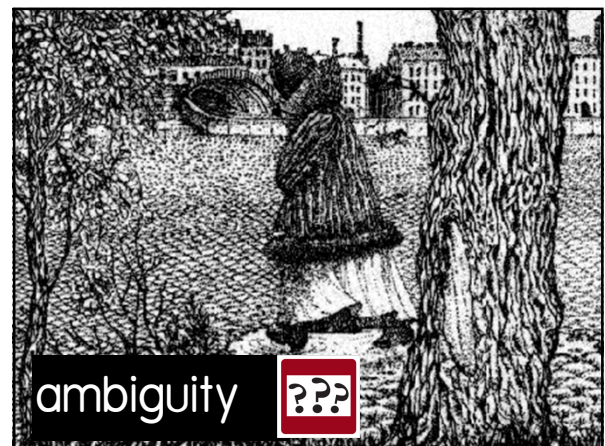What is something you know, but other people disagree with you about?
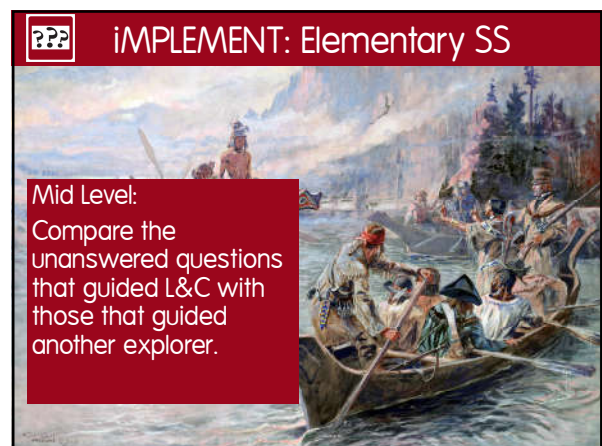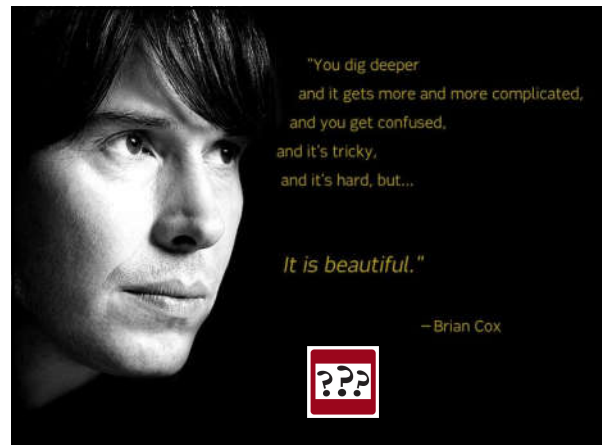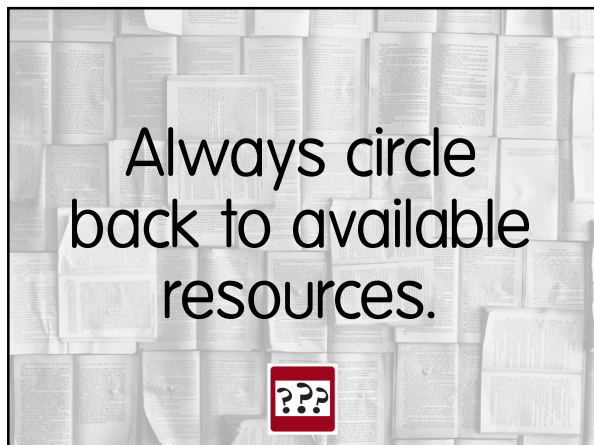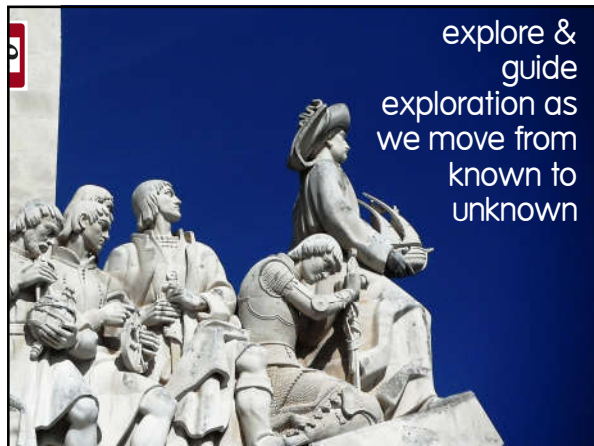
Dice Game

- Share your unanswerable question.
- What is your go-to answer source?
- What kinds of ?s cause disagreement?
- What do you think happened to Amelia?
- What is something your SS often think that is wrong?
- What something parents often think that is wrong?

UNANSWERED QUESTIONS

Unanswered Questions

puzzles

conundrums

dilemmas

lacking certainty

DOUBT KILLS MORE DREAMS THAN FAILURE EVER WILL

SUZY KASSEM

doubtful

ambiguity

discrepancies

Sometimes know answer for one situation, but not another.

comfort with ambiguity and a sense of wonder

key factor in being a disciplinarian

explore & guide exploration as we move from known to unknown

Research / Research Questions / What resources are most likely to answer this question?

Always circle back to available resources.

"You dig deeper
and it gets more and more complicated,
and you get confused,
and it's tricky,
and it's hard, but...

It is beautiful."

—Brian Cox

iMPLEMENT: Elementary SS

Low Level :
What unanswered questions guided the Corps of Discovery?

iMPLEMENT: Elementary SS

Mid Level:
Compare the unanswered questions that guided L&C with those that guided another explorer.

iMPLEMENT: Elementary SS

High Level:
Should Lewis be considered a failure for not finding something that did not exist?

iMPLEMENT: Elementary SS

High Level:
What evidence exists that there was another presidential agenda?
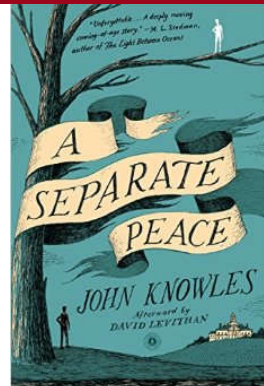
Remember: direct to quality resources

---

iMPLEMENT: HS ELA

Mock Trial: Did Gene shake the branch on purpose?

A SEPARATE PEACE
JOHN KNOWLES

Create an illustration of what was in Julia's room 101.

Make a reasonable, supported argument that Kitty marries in a 3-minute video.

Clare Higgins, 1980   Polly Maberly, 1995   Carey Mulligan, 2005   Florence Hoath, 2008

iMPLEMENT: HS AP Chem

Create a sophisticated, persuasive scientific poster evaluating the validity of the following unanswered questions in chemistry. Which of them is the most important to be answered?

Why can't we design chemical systems more efficient than photosynthesis? We know how it works but we do not know how to build one! Despite the efforts of several decades, artificial photosynthesis has failed to replicate the chemistry of reaction center of photosynthesis. Prashant Kamat, Editor-in-Chief of ACS Energy Letters

Biochemistry on earth is based on abundant water being available, hydrocarbon-based biochemistry, and temperatures in the vicinity of 300 K, plus or minus 50 degrees. Could there be life forms in the universe that are based on radically different chemistry than the biochemistry of earth and that might thrive under conditions far more "extreme" than even the most extreme conditions supporting life on earth?" – Charles Sanders, Interim Editor of Biochemistry

7

Shall we play a game?

Okay/Not Okay

Ordering something you don't really want to get your order to qualify for free shipping, knowing you're going to send it back.

ATHLETA **FREE SHIPPING** ON ORDERS OF $50 OR MORE UNDERLINED DETAILS
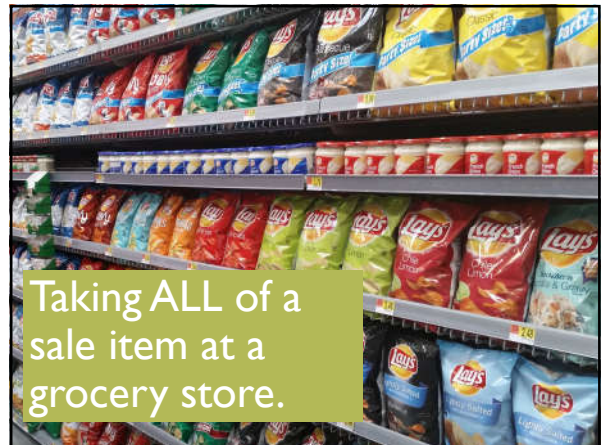
OLD NAVY

WOMEN   WOMEN'S PLUS   MATERNITY   MEN   GIRLS   B

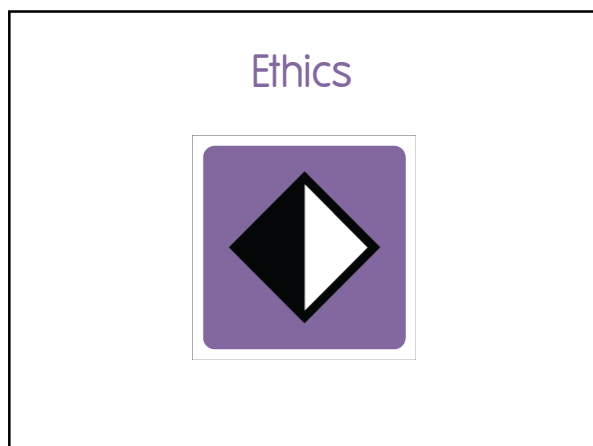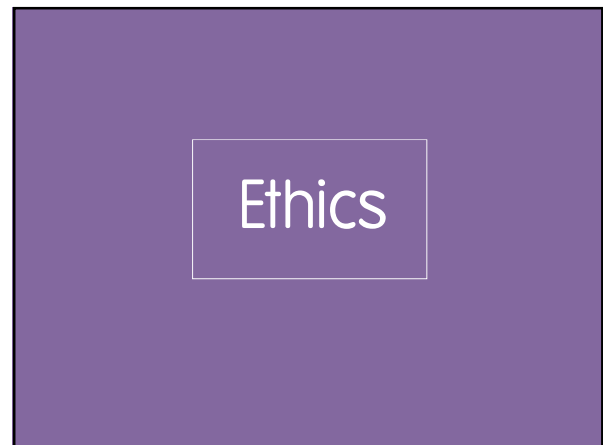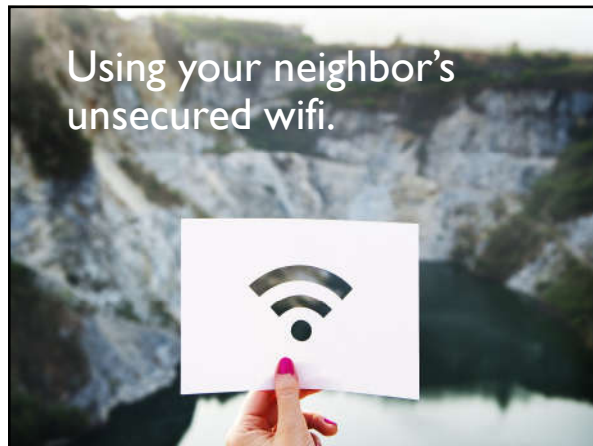Taking shampoo/ conditioner/ soap from hotel rooms, even if you didn't use it while you were there.

Not really stopping at a stop sign out in the middle of nowhere.

STOP

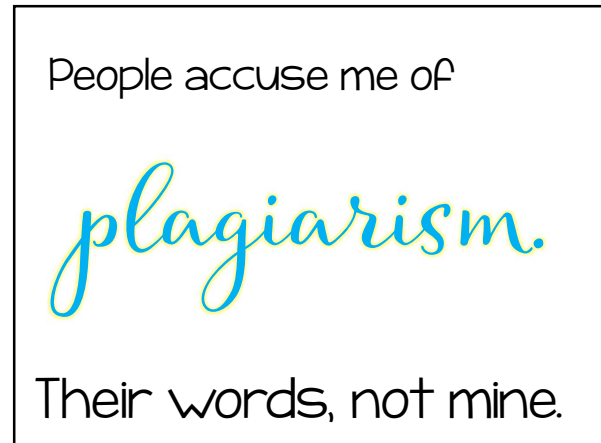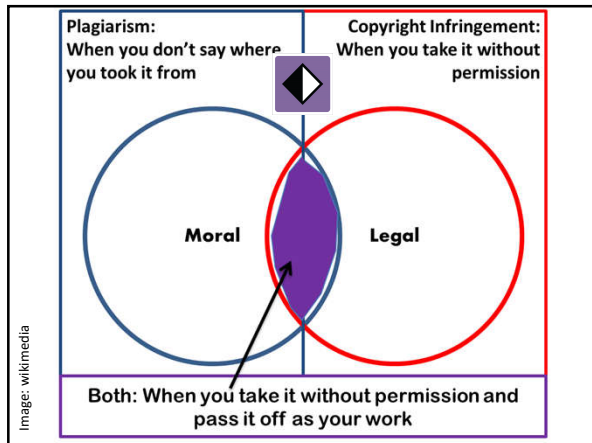Taking ALL of a sale item at a grocery store.

22-year-old son says, "That's just capitalism."

Calling in sick, and not leaving any directions for a sub.

Using your neighbor's unsecured wifi.

Telling your friend you know his/her spouse is having an affair (it's true).

Buy an item of clothing to wear for a special occasion, and leaving the tag on so you can return it after the event.

Ethics

Ethics

Values ◀▶ What is Right?
fairness philosophies
controversy
STANDARDS
JUSTICE morals

Goldilocks and the Three Bears
Caralyn Buehner & Mark Buehner

Apparently, I'm not the only one who's worried about this.

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Fairy Tale Law: Goldilocks and the Three Bears
April 13, 2012 by Avery Appelman — Leave a Comment

On Monday, we explored the story of the Three Little Pigs and the criminal charges which could be brought against the violent, villanous Big Bad Wolf. This week we are recounting the tale of Goldilocks, a mischievous little girl who gets herself into trouble with a family of

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When you don't say where you took it from

Copyright Infringement:
When you take it without permission

Moral   Legal

Both: When you take it without permission and pass it off as your work

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Multilingual Plagiarism Checker

Accurate, professional, online

Find the length of each line segment. For each graph give an ordered pair to extend each of the line segments.

Find the length of each line segment without graphing.

(2, 5) (2, 11) _____

(-6, 2) (-6, 9) _____

(7, -5) (3, -5) _____

AB _____ Ordered pair _____   RS _____ Ordered pair _____   UT _____ Ordered Pair _____   MN _____ Ordered Pair _____   FG _____ Ordered Pair _____

Joe took a taxi across town for a meeting. The coordinates are shown below. (Each unit on the grid = 1 city block.)

The taxi company Joe used charges $2 per city block of travel. The driver charged Joe $15 for the fare.

Was this a fair price for the fare? How do you know? Prove your answer with evidence.

Meeting (6,6)

Joe's (6,1)

Find the length of each line segment. For each graph give an ordered pair to extend each of the line segments.

Find the length of each line segment **without** graphing.

(2, 5) (2, 11) _____
(-6, 2) (-6, 9) _____
(7, -5) (3, -5) _____

Joe took a taxi across town for a meeting. The coordinates are shown below. (Each unit on the grid = 1 city block.)

The taxi company Joe used charges $2 per city block of travel. The driver charged Joe $15 for the fare.

Was this a *fair* price for the fare? How do you know? Prove your answer with evidence.

iMPLEMENT: Elementary Science

Should great art belong to private owners or public institutions? Cite a character for each position and, using examples from the text, defend their point of view.

iMPLEMENT: Elementary Science

3-LS2 Ecosystems: Interactions, Energy, and Dynamics

First, intro content in your fave way.

{Here's an example}

99 strange collective animal names

Whether it's a shrewdness of apes or a zeal of zebras, lots of animals have bizarre names when they cluster into crowds.

1st, we'll have a little fun with crazy names for groups of animals.

I'll flip the classroom & have them watch this video at home.

Next, they'll come back to class & we'll read this book, looking for connections between it and the video.

Animals that Live in Social Groups

Bobbie Kalman
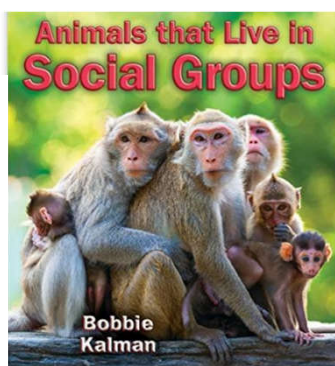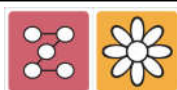
Why Live in Groups

There are several major disadvantages to living in gr

1. Greater competition for food, mates, sleeping sites

2. Increase parasite and disease load.

There is an incidental reason why some animals live
individuals. E.g., birds don't nest on cliffs because th
because they are attracted by a scarce resource: cliff

How do individuals benefit by living in groups?

1. **Cooperative food collection.** Wolves hunt together. By doing so each can more easily track a
large game. Although the individual has to share meat, each still benefits from group hunting.
hunting is less important in primates. Chimps hunt some but meat is not a major part of their
hunting is important in many human societies, however.

2. **Sleeping together to conserve warmth.** This explains why individuals form groups at night b
explain why groups are maintained during the day.

3. **Shared information.** By forming groups, individuals can (recipro
example, frugivores let each other know where fruit tree

4. **Protection from predators.** There are three reasons wh up to av
predation.

My advanced learners will read a scholarly article instead.
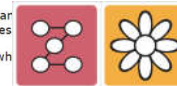
Next, the students will create a tree map classifying animals by the reasons they group.

safety　　　food　　　social
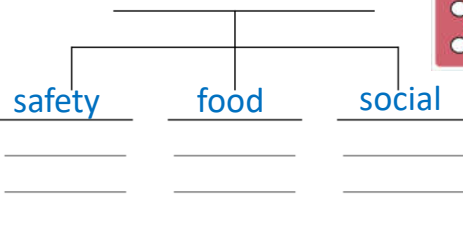
My advanced students will create a persuasive piece (brochure or commercial) encouraging the polar bear to begin living in groups.

And then….enter ETHICS.

Students will debate:

Resolved: It is fair for packs of animals to hunt in order to kill a solitary animal.

iMPLEMENT: Secondary Science

Ethics of… cloning … nomenclature … climate change … animal dissection …

◆ iMPLEMENT: ELA

What is the ethical dilemma faced by Barton in *Cold Equations*?

So shallow; go deeper.

BILL CAMPBELL   POPPY MONTGOMERY
THE COLD EQUATIONS

OUT OF TIME. OUT IN SPACE.
THE ONLY CHOICE IS LIFE OR DEATH.

◆ iMPLEMENT: ELA

Find a solution to Barton's ethical dilemma in *Cold Equations.*

BILL CAMPBELL   POPPY MONTGOMERY
THE COLD EQUATIONS

OUT OF TIME. OUT IN SPACE.
THE ONLY CHOICE IS LIFE OR DEATH.

◆ iMPLEMENT: ELA

Hold a mock trial for Barton.

BILL CAMPBELL   POPPY MONTGOMERY
THE COLD EQUATIONS

OUT OF TIME. OUT IN SPACE.
THE ONLY CHOICE IS LIFE OR DEATH.

8

The Three Stooges
Meet Depth
& Complexity

BIG IDEA

BIG IDEA

Capture everything you know about something in one sentence.

- ❑ Lab safety
- ❑ Multiplication
- ❑ democracy
- ❑ Poetry
- ❑ The treble clef
- ❑ Irregular verbs

THE OVERARCHING IDEA OF ANY CONCEPT OR LESSON OR UNIT

Can be complicated, even for things that seem simple...and the reverse is also true.
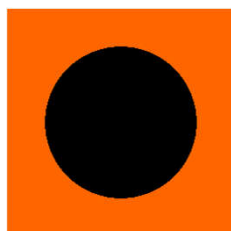
By Michael James Dean - Own work, CC BY-SA 3.0, https://commons.wikimedia.org/w/index.php?curid=17070006

Mandelbrot set

From Wikipedia, the free encyclopedia

The **Mandelbrot set** is the set of complex numbers c for which the function $f_c(z) = z^2 + c$ does not diverge when iterated from $z = 0$, i.e., for which the sequence $f_c(0)$, $f_c(f_c(0))$, etc., remains bounded in absolute value.

THIS IS JUST A DEFINITION

The Mandelbrot set is an example of a complex structure arising from the application of simple rules.

It is one of the best-known examples of mathematical visualization.

THE THUMBPRINT OF GOD

By Metrónomo (Own work) [CC BY-SA 4.0-3.0-2.5-2.0-1.0 (http://creativecommons.org/licenses/by-sa/4.0-3.0-1 via Wikimedia Commons

MANY SINGERS.
ONE VOICE.
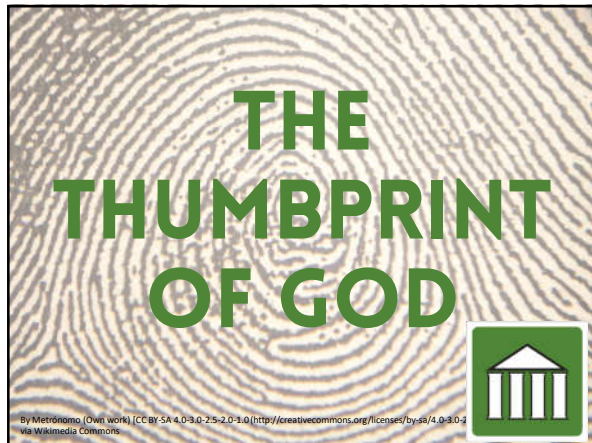
It can get you into trouble.

God is love.
Love is blind.
Stevie wonder is blind.
Stevie wonder is God.

iMPLEMENT

ALWAYS SUPPORT BIG IDEA WITH DETAILS.

Details

DETAIL DETAIL DETAIL DETAIL

BIG IDEA

Ian's idea...

A bird in hand is worth two in the bush.
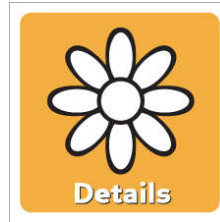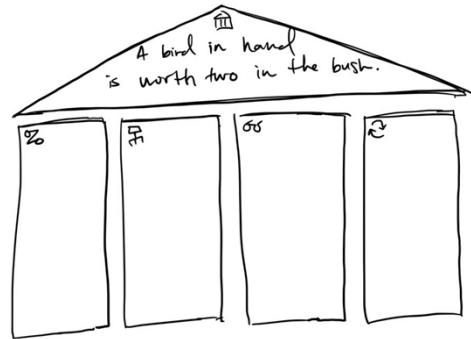
It can be used as a group or whole class activity.

People can use the power of the environment to survive.

Competition for natural resources can lead to conflict between groups of people.

Shifts in power can lead to change

The rules for gender in a society influences the power people have

http://wiseschool.weebly.com/grade-four1/relating-the-big-idea

Lead students to or through Big Idea by integrating with Across Disciplines.

Across Disciplines

http://wiseschool.weebly.com/grade-four1/relating-the-big-idea

The value of one thing depends on the value of another.

Algebra
The input depends on the output.

Place Value In rounding the first number depends on the number in front of them.
1,235

Science
The human body (doing work) depends on the human body's nerves and bones.

Measurement
The amount of inches on a ruler depend from is a ruler or isn't

RULES of VALUE

Lead students to or through Big Idea by integrating with Across Disciplines.

http://wiseschool.weebly.com/grade-four1/relating-the-big-idea

iMPLEMENT: Elementary Math

Ian's example…

Ask students to group up (or work solo). Give them these examples:

- $5^2 = 25$
- $4^2 = 16$
- $3^2 = 9$

Ask them to determine the job of that *incredible flying two*.

iMPLEMENT: Elementary Math

Lisa's example…

iMPLEMENT: Middle Math (8th)

Why can't these systems of linear equations be solved?
(eyes & brains only)

$3x + 2y = 5$ and $3x + 2y = 6$

$2x + 6y = 12$ and $2x + 6y = 10$

---

iMPLEMENT: Middle Math (8th)

Can these be solved?

$3x + 2y = 5$ and $3x + 2y = 6$

$2x + 6y = 12$ and $2x + 6y = 10$

Differentiate it (need support):

Big Idea: Some _____ can be _____ through _____ and don't need to be calculated.

Word Bank:
solved   inspection   problems

Differentiate it (advanced):

Which of the two Big Ideas below have the most application to other math problems as well?

Some problems can be solved by inspection and don't need calculation.

Variables must have unique values in a system of equations.

---

iMPLEMENT: Elementary ELA

What can you say about the importance of outdoor spaces based on this book alone?

---

iMPLEMENT: Elementary ELA

What other texts have we read this year that have the same or similar Big Idea?

iMPLEMENT: World Languages

How is a Big Idea in *Les Trois Petits Cochons* similar to a Big Idea in *Le Petit Chaperon Rouge*?

Il était une fois une maman cochon qui avait trois petits cochons. Elle les aimait beaucoup, mais comme il n'y avait pas assez de nourriture pour qu'ils puissent tous manger à leur faim, elle les a envoyé tenter leur chance dans le vaste monde.

iMPLEMENT: ELA

An item that was really important to _____ was _____ because _____.

Another way to the solve the problem of _____ might have been to _____ _____.

By the end of the story, _____ learned that _____ _____ _____.

It seemed unfair that_____ _____ _____ _____.

9

WATCH ME! WATCH ME!

IS THIS GOOD, BAD, OR NEUTRAL?
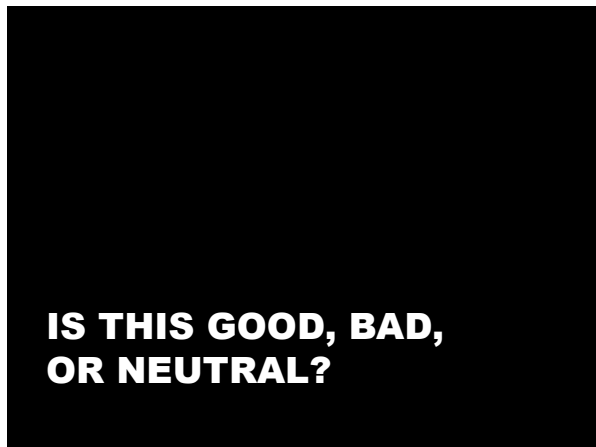
IS THIS GOOD, BAD, OR NEUTRAL?

OVER TIME

THINK OF AN OBSOLETE PROBLEM.

THINK OF A NEW PROBLEM.

OVER TIME

GALILEO
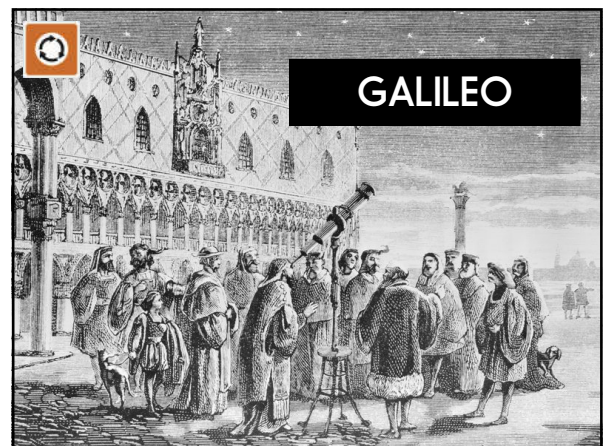
SHAKESPEARE
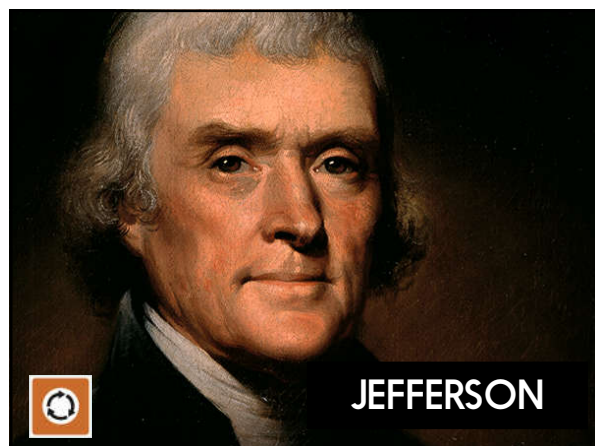
JEFFERSON

SMOKING

FAMILIES

CURSIVE

BUTTER

36
x 24
144
+ 720
864
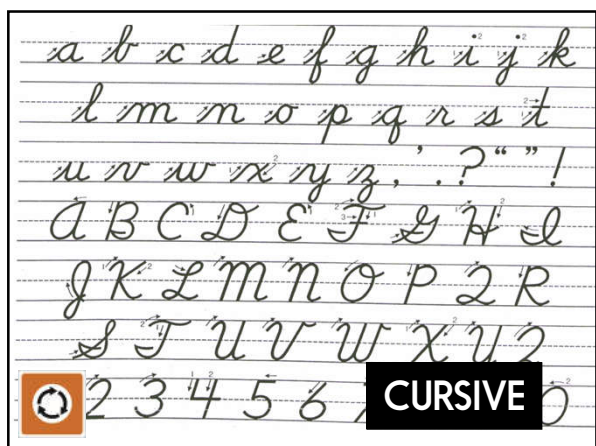
MULTIPLICATION

36
x 24
600
120
120
+ 24
864

How has something changed over time in your discipline?

[write it down]

Character Change Over Time
Anna's Tenth Summer

---
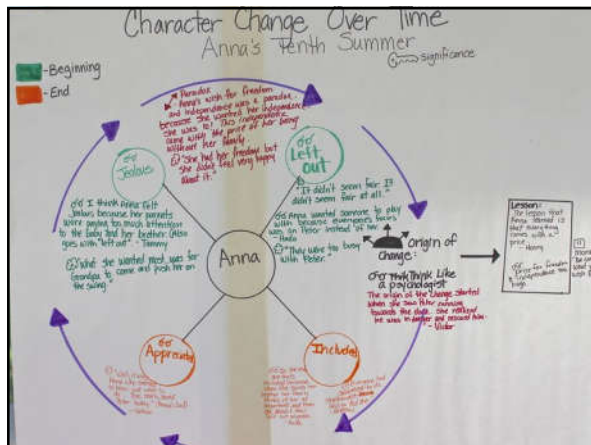
iMPLEMENT: Secondary Math

Set up a uniform rate table for the challenge below:

A 555-mile, 5-hour plane trip was flown at two speeds. For the first part of the trip, the average speed was 105 mph. Then the tailwind picked up, and the remainder of the trip was flown at an average speed of 115 mph. For how long did the plane fly at each speed?

$D = RT$

	DISTANCE	RATE	TIME
1st PART	d	105 mph	t
2nd PART	555 - d	115 mph	5 - t
TOTAL	555 miles	--------------	5 hours

Ya with me, humanities peeps?

WHAT'S HAPPENING?

What happens over time to the plane?

Would it be fair to charge passengers more for planes that fly faster?

Differentiate it:

What would your hourly pay rate have to be to justify paying an extra $150 for the faster rate of speed?

(trickstier than it looks)

This works well for velocity questions, too.

iMPLEMENT: ELA

PAM MUÑOZ RYAN

Esperanza Rising
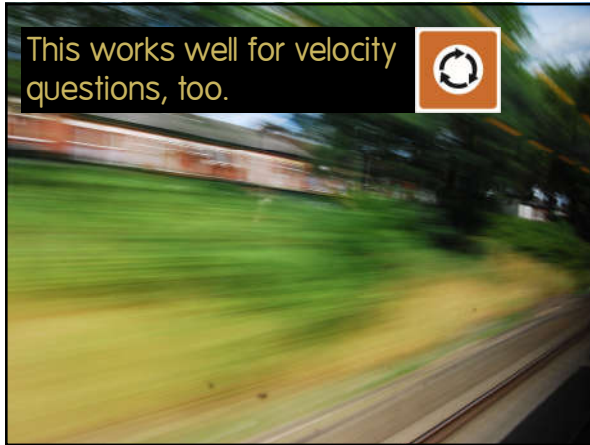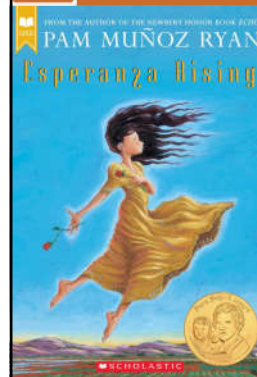
How would Esperanza's story have been different had it happened during World War II or the current day versus during the Great Depression?

iMPLEMENT: ELA

Trace the changes in Esperanza's character over the course of the novel. Identify ways in which she changes and ways in which she stays the same.
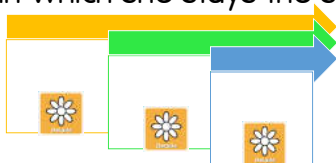
Support your claim that she is either a static or dynamic character.

iMPLEMENT: Kinder Math

Which of these could be a bedtime?
A dinner time?
Sleeping time?
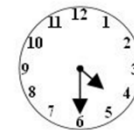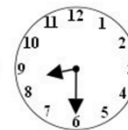
Differentiate it:

Think of something you would not be likely to do at these times.

When it's these times for you, what time is for people in Sydney, AU?

iMPLEMENT: Secondary ELA

Use the Thinking Map of your choice to compare and contrast a character as he/she changes from the beginning of the novel to the end.
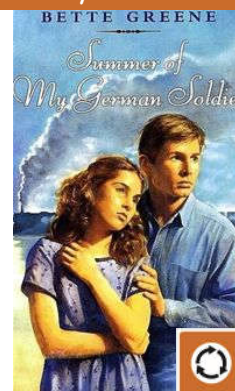
iMPLEMENT: Secondary ELA

Imagine that there were a sequel written. What conflict might exist at the beginning of the sequel? Design a movie poster that uses a one-line slogan highlighting that conflict.

10
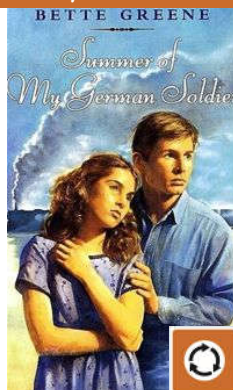
Let's Look

What questions come to mind?

Similarities? Differences?

How is this different from the others?

Who would want to see from this angle?

How would someone be sitting who had this perspective?

Would this be a better apartment building or office building?

What would a window washer think about this?
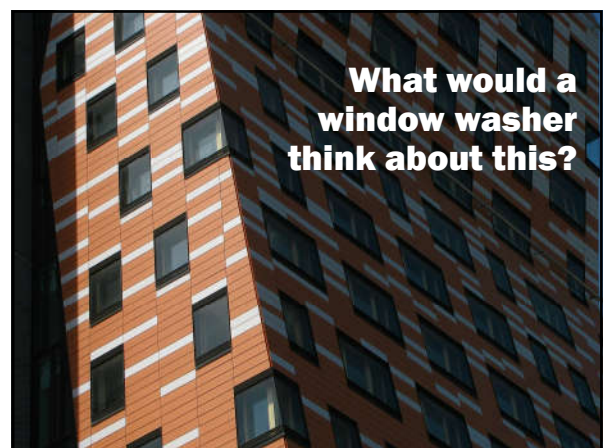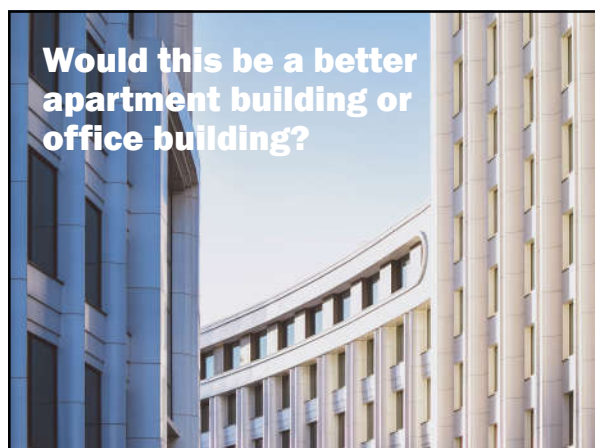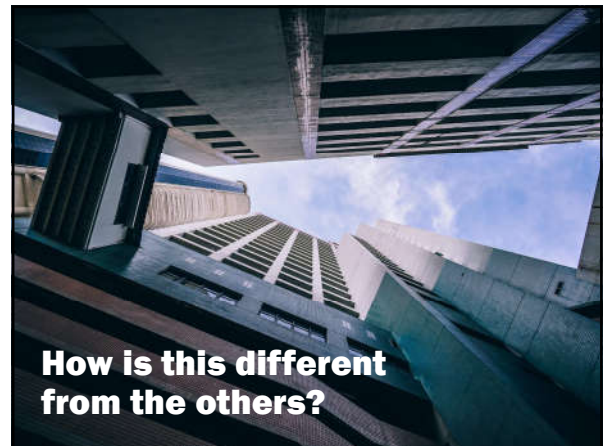
Let's Look Some More

Would you want to swim here?

Are you sure?

http://www.cbsnews.com/news/thousands-of-sharks-swarming-off-florida-shore/

What are some contrasts you see?

What animals have this perspective?

Describe the surfer's relationship to the sea.

Who would best be helped by this perspective?

How would a marine biologist feel about the boats? Same or different from the boaters?

Who might be scared if they saw this?

Who is most worried about this?

http://latimesblogs.latimes.com/lanow/2012/06/great-pacific-garbage-patch-tsunami-debris.html

Multiple Perspectives

Perspective is an art technique for creating an illusion of three dimensions (depth and space) on a two-dimensional (flat) surface.

Perspective is what makes a painting seem to have form, distance, and look "real".

Perspective is everything.

Multiple Perspectives

DIFFERENT POINTS OF VIEW
OFTEN DEPENDENT UPON TIME & PLACE & CULTURE
Ways of seeing & reporting
AFFECTED BY ROLES & RESPONSIBILITIES

Perspective affects interpretation of events, actions, **and even** facts.

If one morning I walked on top of the water across the Potomac River, the headline that afternoon would read: 'President Can't Swim.'
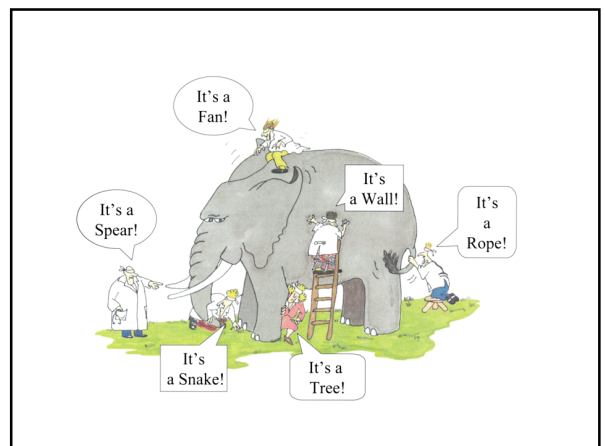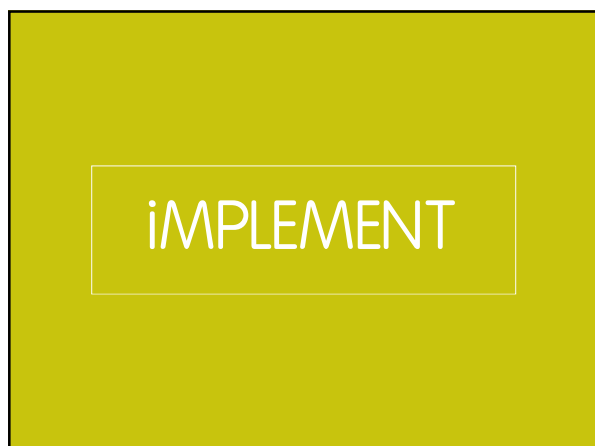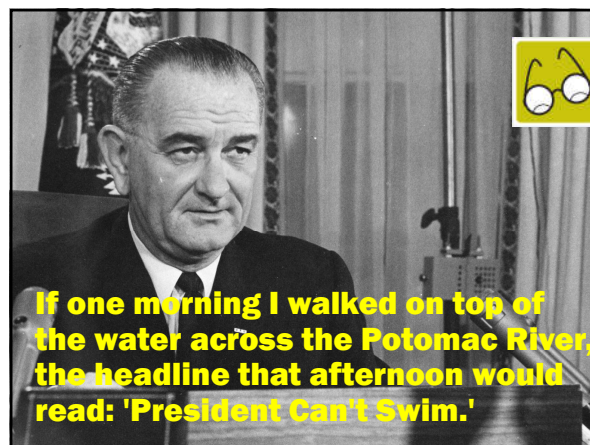
iMPLEMENT

iMPLEMENT: Elementary Science

5-PS2 Motion and Stability: Forces and Interactions

5-PS2 Motion and Stability: Forces and Interactions

Students who demonstrate understanding can:

5-PS2-1. Support an argument that the gravitational force exerted by Earth on objects is directed down. [Clarification Statement: "Down" is a local description of the direction that points toward the center of the spherical Earth.] [Assessment Boundary: Assessment does not include mathematical representation of gravitational force.]

The performance expectations above were developed using the following elements from the NRC document A Framework for K-12 Science Education:

Science and Engineering Practices	Disciplinary Core Ideas	Crosscutting Concepts
Engaging in Argument from Evidence Engaging in argument from evidence in 3–5 builds on K–2 experiences and progresses to critiquing the scientific explanations or solutions proposed by peers by citing relevant evidence about the natural and designed world(s). • Support an argument with evidence, data, or a model. (5-PS2-1)	**PS2.B: Types of Interactions** • The gravitational force of Earth acting on an object near Earth's surface pulls that object toward the planet's center. (5-PS2-1)	**Cause and Effect** • Cause and effect relationships are routinely identified and used to explain change. (5-PS2-1)

Connections to other DCIs in fifth grade: N/A

Articulation of DCIs across grade-levels: **3.PS2.A** (5-PS2-1); **3.PS2.B** (5-PS2-1); **MS.PS2.B** (5-PS2-1); **MS.ESS1.B** (5-PS2-1); **MS.ESS2.C** (5-PS2-1)

Common Core State Standards Connections:

ELA/Literacy –

RI.5.1 Quote accurately from a text when explaining what the text says explicitly and when drawing inferences from the text. (5-PS2-1)
RI.5.9 Integrate information from several texts on the same topic in order to write or speak about the subject knowledgeably. (5-PS2-1)
W.5.1 Write opinion pieces on topics or texts, supporting a point of view with reasons and information. (5-PS2-1)

iMPLEMENT: Elementary Science

5-PS2 Motion and Stability: Forces and Interactions

Disciplinary Core Ideas

PS2.B: Types of Interactions
- The gravitational force of Earth acting on an object near Earth's surface pulls that object toward the planet's center. (5-PS2-1)

Which is more affected by gravity, the moon or Earth?

Debate: Because of gravity, planets with large masses are bossier than planets with a smaller mass.

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iMPLEMENT: Secondary Math

The concepts of congruence, similarity, and symmetry can be understood from the perspective of geometric transformation. Fundamental are the rigid motions: translations, rotations, reflections, and combinations of these, all of which are here assumed to preserve distance and angles (and therefore shapes generally). Reflections and rotations each explain a particular type of symmetry, and the symmetries of an object offer insight into its attributes—as when the reflective symmetry of an isosceles triangle assures that its base angles are congruent.

Perspective is a central tenet of geometry.

---

7. $\triangle RST$ was dilated and then reflected over line m to create image $\triangle ABC$.
a) Which angle in the image is 63°?
Choose:
- $\angle C$
- $\angle S$
- $\angle B$
- $\angle R$
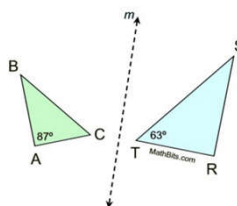
You can be very simplistic, but please don't stop there.

State if the triangles in each pair are similar. If so, state how you know they are similar and complete the similarity statement.

1)

$\triangle UTS \sim$ _____

2)

$\triangle CBA \sim$ _____

3)

4)
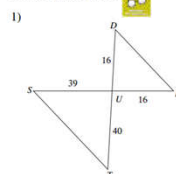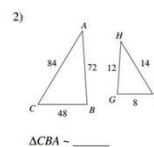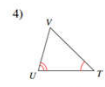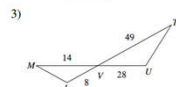
How would a landscape architect use this?

7. $\triangle RST$ was dilated and then reflected over line m to create image $\triangle ABC$.

a) Which angle in the image is 63°?

Choose:
- ○ $\angle C$
- ○ $\angle S$
- ○ $\angle B$
- ○ $\angle R$
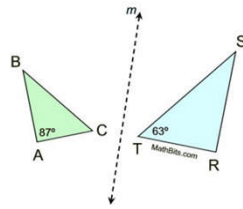
What words would a five-year-old use to describe this?

Things can be very different from each other, and yet be similar in very important ways.

Multiple Perspectives **+** Big Idea

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iMPLEMENT: Secondary ELA

Analyze two conflicts in the story from the perspectives of Finny and Gene.

JOHN KNOWLES
A SEPARATE PEACE
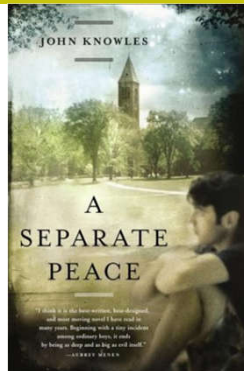
Don't forget the product piece:

Create a cause and effect chain that explores the origins of the conflicts.

JOHN KNOWLES
A SEPARATE PEACE
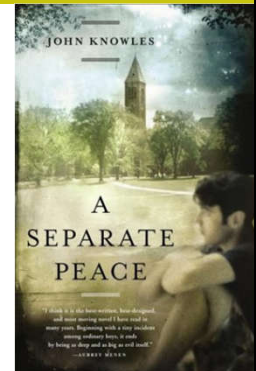
Differentiate it:

Choose one the following artists **+** and select three of their works that best represent the narrative style of Gene. [poster]
- M.C. Escher
- Van Gogh

JOHN KNOWLES
A SEPARATE PEACE

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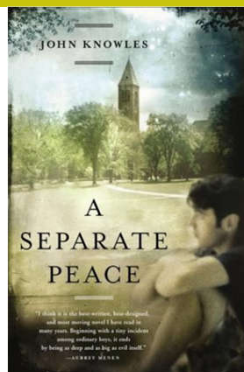
iMPLEMENT: Physical Education

Describe the rules of baseball from the perspective of the ball.

Who is most hoping the batter will swing on a 3-2 count?

Is an 0-2 count desirable?

SIX DEGREES OF KEVIN BACON

35° 75° 90° 110° 135° 170°

The Butterfly Effect.

flap flap

Yesss... Yesss...

by J.L.Westover

www.mrlovenstein.com

Across Disciplines
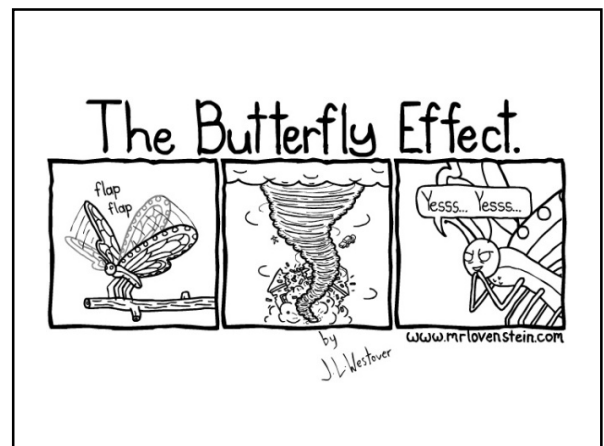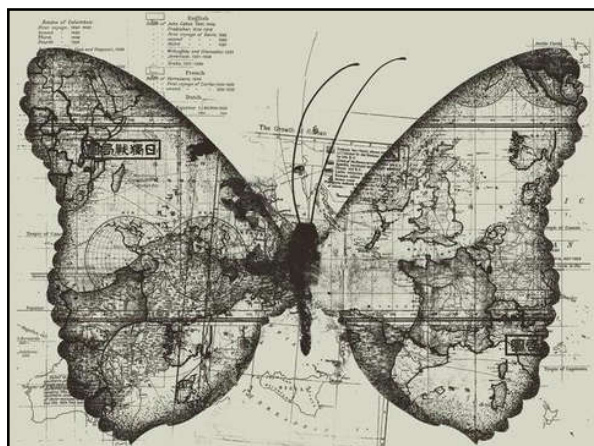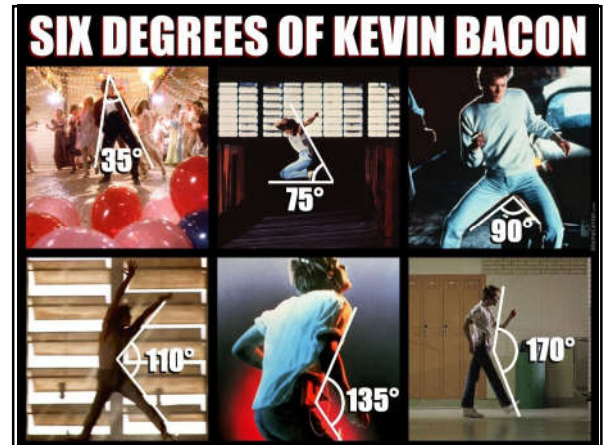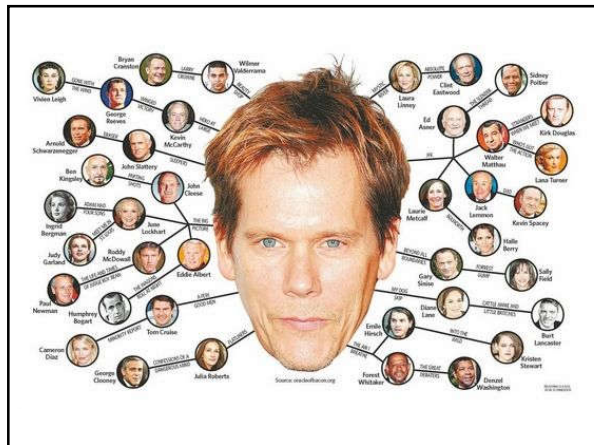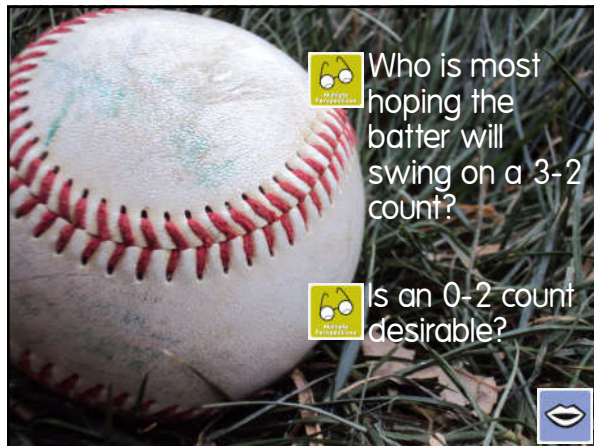
This is more than just language arts + history.

Across Disciplines

iMPLEMENT

Create a multi-flow map, showing the way that World War 1 connects with science, math, and poetry.

World War I
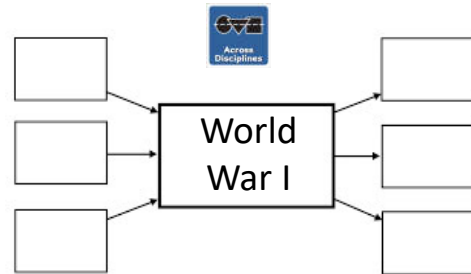
Which topic most relates to the concept of standard deviation?

- Intelligence?
- Baseball?
- Height?
- Elections?

Take the one you selected and gather two credible sources to prepare to defend it in a Socratic Seminar.

iMPLEMENT: Kinder Social Studies

Would a sailor rather have a map or a globe?

How about an astronaut?

iMPLEMENT: Kinder Social Studies

What can we tell about who lives in these houses?

Which house would a termite like least? Which house is most likely to burn?

Is the number of colored houses greater or less than the other houses?

Put the houses in order of how much you'd like to live in them, from 1st to 4th.

iMPLEMENT: Secondary PE
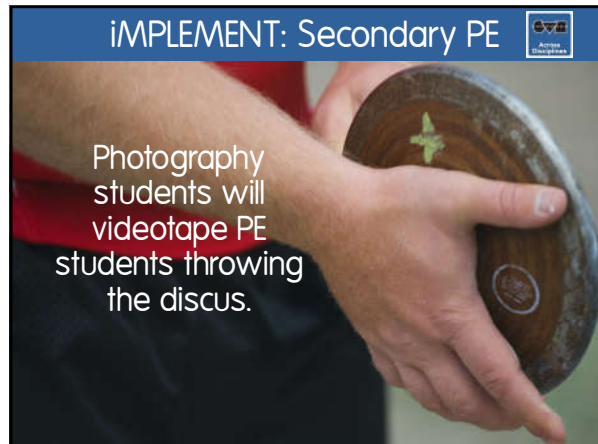
Across the Disciplines of Math, Photography, Art, Speech, Social Studies, and Physics

Across Disciplines
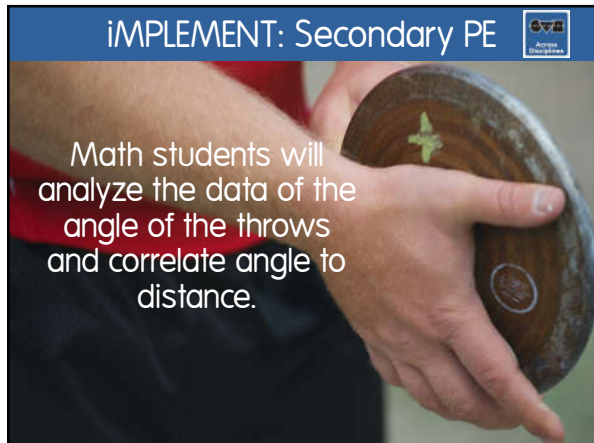
iMPLEMENT: Secondary PE

Photography students will videotape PE students throwing the discus.
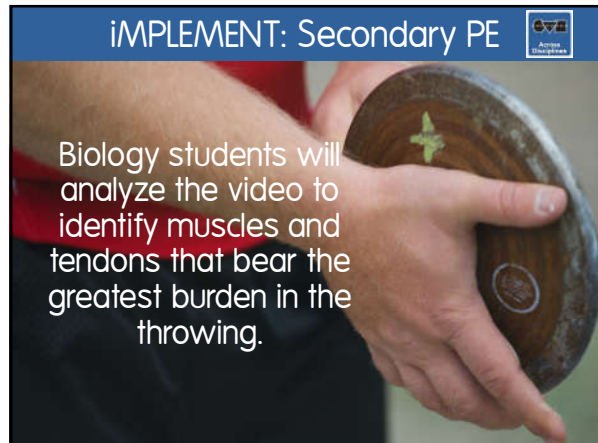
iMPLEMENT: Secondary PE

Math students will analyze the data of the angle of the throws and correlate angle to distance.
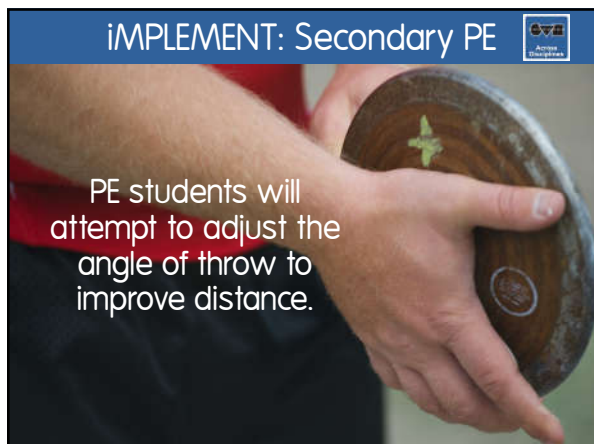
iMPLEMENT: Secondary PE

Biology students will analyze the video to identify muscles and tendons that bear the greatest burden in the throwing.
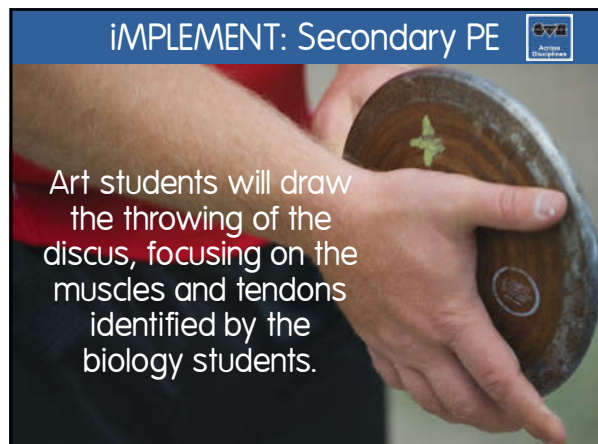
iMPLEMENT: Secondary PE

PE students will attempt to adjust the angle of throw to improve distance.
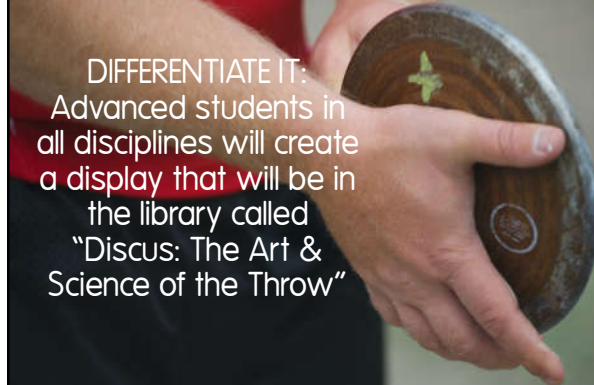
iMPLEMENT: Secondary PE

Art students will draw the throwing of the discus, focusing on the muscles and tendons identified by the biology students.

iMPLEMENT: Secondary PE
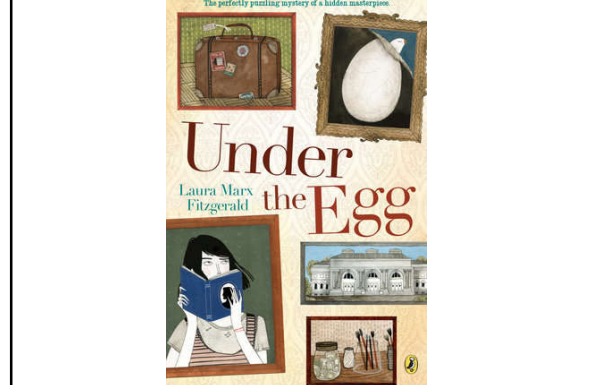
DIFFERENTIATE IT: Advanced students in all disciplines will create a display that will be in the library called "Discus: The Art & Science of the Throw"

iMPLEMENT: ELA

The perfectly puzzling mystery of a hidden masterpiece.

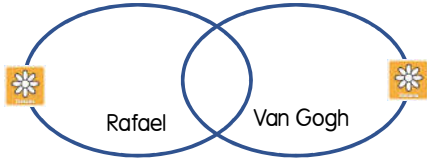Under the Egg

Laura Marx Fitzgerald

iMPLEMENT: ELA

Turn the "School of Athens" into flap art citing
• FOUR references from the novel
• THREE artistic techniques

iMPLEMENT: ELA

Compare the self-portrait of Rafael to the one of Van Gogh using what you've learned about art from the novel.

Rafael   Van Gogh
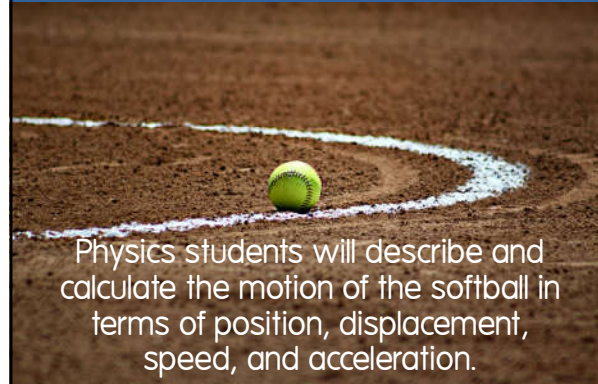
How would a Renaissance painter view Van Gogh's work?

iMPLEMENT: Secondary PE

PE students will throw and hit a series of softballs, video recorded by photography students.

iMPLEMENT: Secondary PE

Physics students will describe and calculate the motion of the softball in terms of position, displacement, speed, and acceleration.

iMPLEMENT: Secondary PE

Math students will analyze the data looking for patterns.
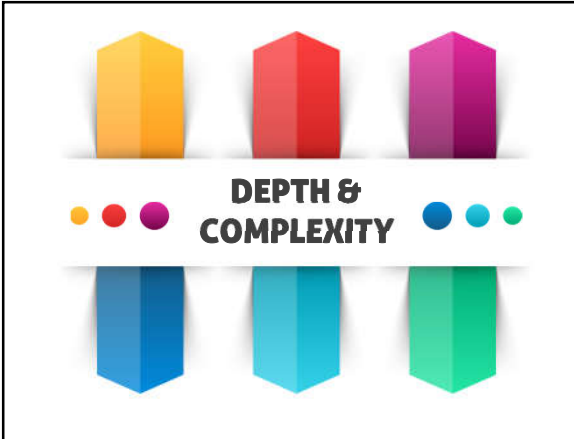
iMPLEMENT: Secondary PE

Speech students will create a presentation for the softball teams and coaches sharing the patterns.

Think of three things you teach that you could implement an

Across Disciplines

approach, and select at least two disciplines for each of those.

DEPTH & COMPLEXITY