Canyon Professional Development

CANYON
PROFESSIONAL DEVELOPMENT

PD WITH PURPOSE


Problem Solving
With a Purpose

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Marni Landry

K12 STEM Outreach Manager

16 years teaching Science &

STEM integration in AZ

Top 10 Nobel Educator

Presidential Awardee

@marni_landry

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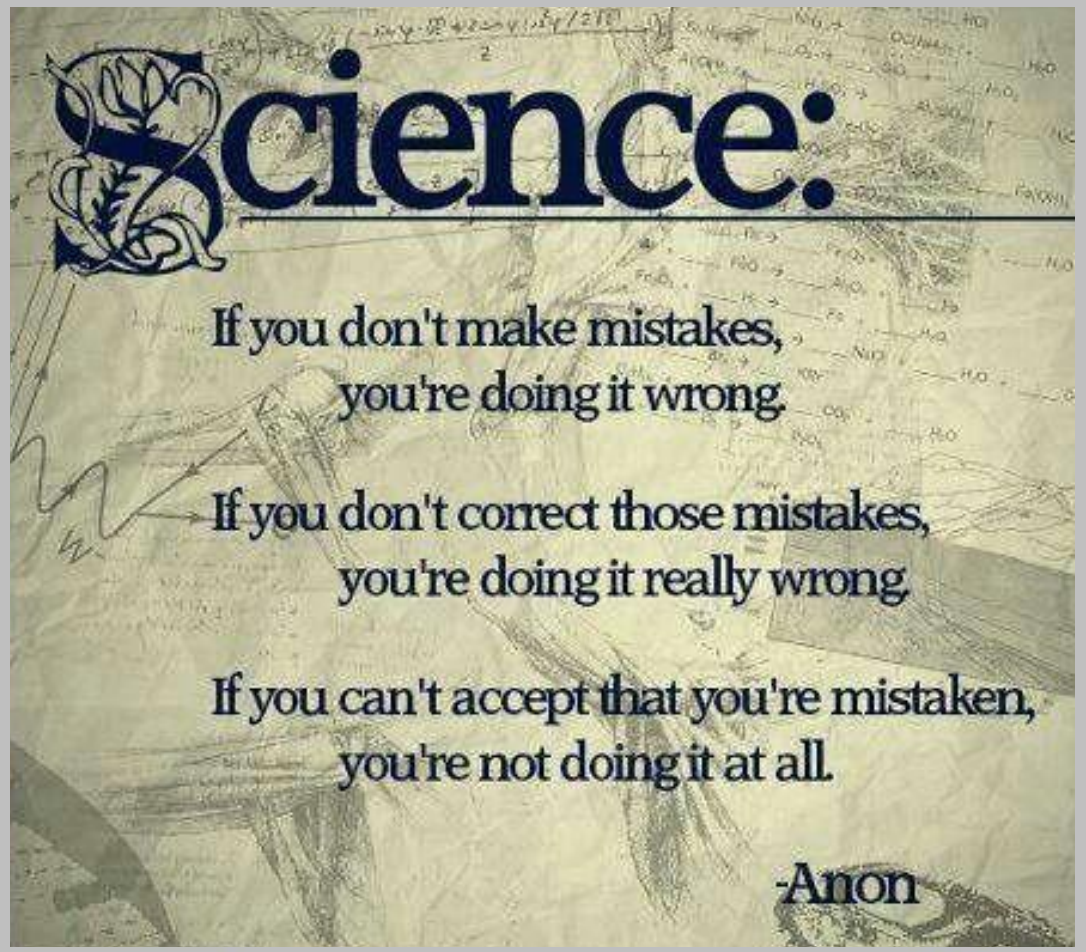

If you are doing it *right*

Things are going to go *wrong*

-Marni

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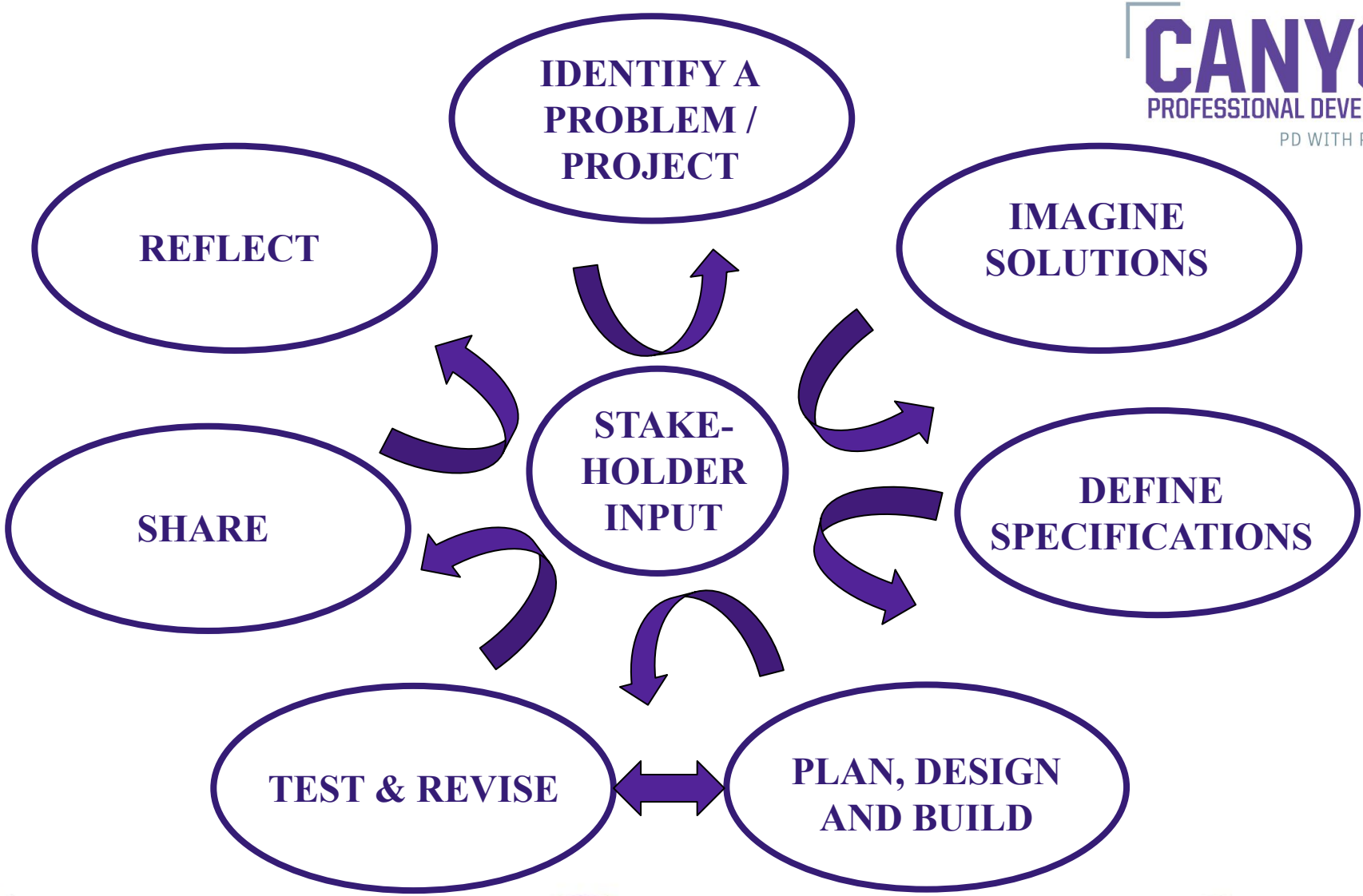
IDENTIFY A PROBLEM / PROJECT
IMAGINE SOLUTIONS
DEFINE SPECIFICATIONS
PLAN, DESIGN AND BUILD
TEST & REVISE
SHARE
REFLECT
STAKE-HOLDER INPUT

Authentic Problems

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UN Sustainable Development Goals

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What do YOU Know about Deforestation?

1. Forests cover 30% of the earth's land.
2. If the current rate of deforestation continues, it will take less than 100 years to destroy all the rainforests on the earth.
3. Agriculture is the leading cause of deforestation
4. One and a half acres of forest is cut down every second.
5. Loss of forests contributes between 12 percent and 17 percent of annual global greenhouse gas emissions.
6. The rate of deforestation equals to loss of 20 football fields every minute.
7. There are more than 121 natural remedies in the rainforest which can be used as medicines.

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Criteria

Design a wind dispersed seed carrier that will carry a single seed the farthest distance possible

Constraints

- 1 sheet of paper
- Seed can't fall out
- When testing with fan, ***you must complete 3 trials and record the data***
- Average 3 distances, enter on spreadsheet

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STEM teaching tools

Constructive Conversation Resource Card

Create: Prompts

Prompt Starters

- What is your idea?
- How can we combine these ideas?
- What do we need to do?
- What are other points of view?
- What do you think about...?
- Why...? How...? I wonder...?

From Zwiers, O'Hara, and Pritchard, 2014.

STEM teaching tools

Constructive Conversation Resource Card

Create: Responses

Response starters:

- One idea could be...
- My hypothesis is...
- That reminds me of...
- I noticed the pattern of...
- I think it depends on...

Design a wind dispersed seed structure that will carry a single seed the farthest distance possible

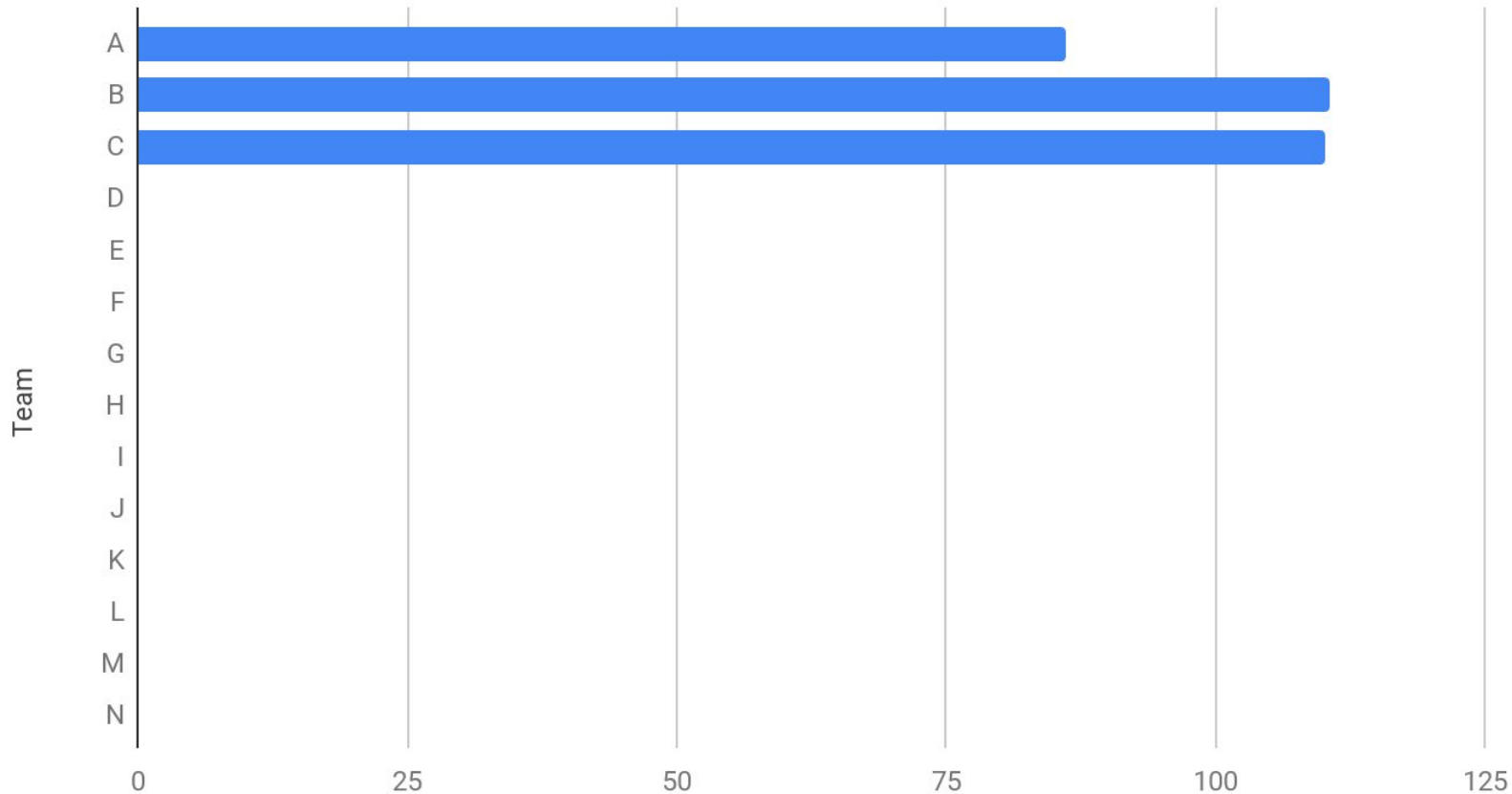
Constraints:

- 1 sheet of paper
- Seed can't fall out
- When testing with fan, ***you must complete 3 trials and record the data***
- Average 3 distances, enter on spreadsheet

Build Test Revise Test!

- Design uses only 1 sheet of paper
- Seed can't fall out
- When testing with fan, you must complete 3 trials and record the data
- Average 3 distances, enter on spreadsheet

Mean Distance (cm) and Mass g



STEM teaching tools

Sharing and Building on Each Others' Ideas

I'm explaining my ideas. I can use these phrases:

I think _____ because...

Evidence that supports my argument is...

I think this is supporting evidence because...

I think this relates to the scientific idea of...

Give an analogy or metaphor that relates to your idea.

I'm responding to the other person's ideas. I can use these phrases to *build* on their ideas:

Could you explain a bit more about _____?
What do you mean when you say _____?

I heard you say _____. That makes me think...

One difference between my idea and yours is...

I heard you say _____. I agree or disagree because...

I heard you say _____. What evidence is that based on?

You described _____. Do you have any ideas why that happens?

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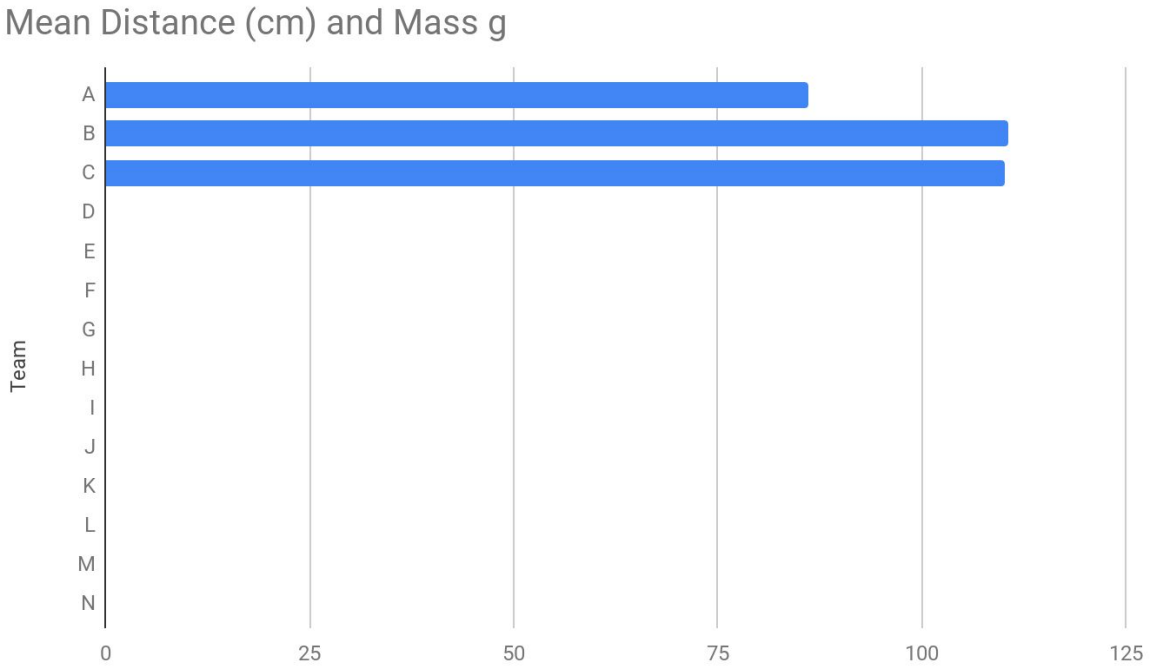
But what does it MEAN?



- Why mean of 3 drops?
- Identify & Interpret the Data
- What questions do you have about the data?
- How can this activity serve as an investigative phenomenon in YOUR content area?

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Science & Engineering Practices

1. Ask questions and define problems
2. Develop and use models
3. Plan and carry out investigations
4. Analyze and interpret data
5. Use mathematics and computational thinking
6. Construct explanations and design solutions
7. Engage in argument from evidence
8. Obtain, evaluate, and communicate information

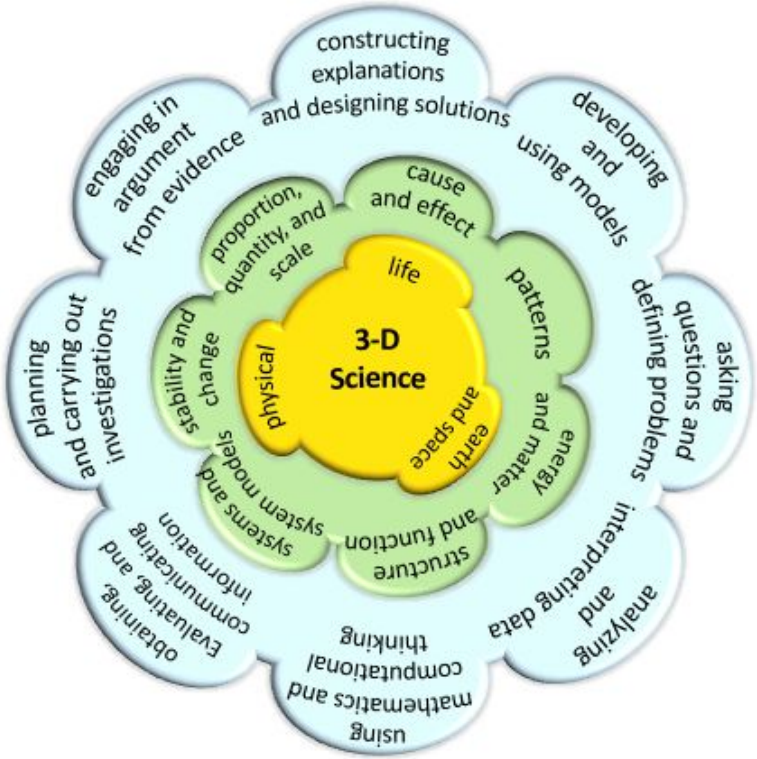

Figure 1: Three Dimensions of Science Instruction

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Cross Cutting Concepts

1. Patterns.
2. Cause and effect.
3. Scale, proportion, and quantity.
4. Systems and system models.
5. Energy and matter: Flows, cycles, and conservation.
6. Structure and function.
7. Stability and change.

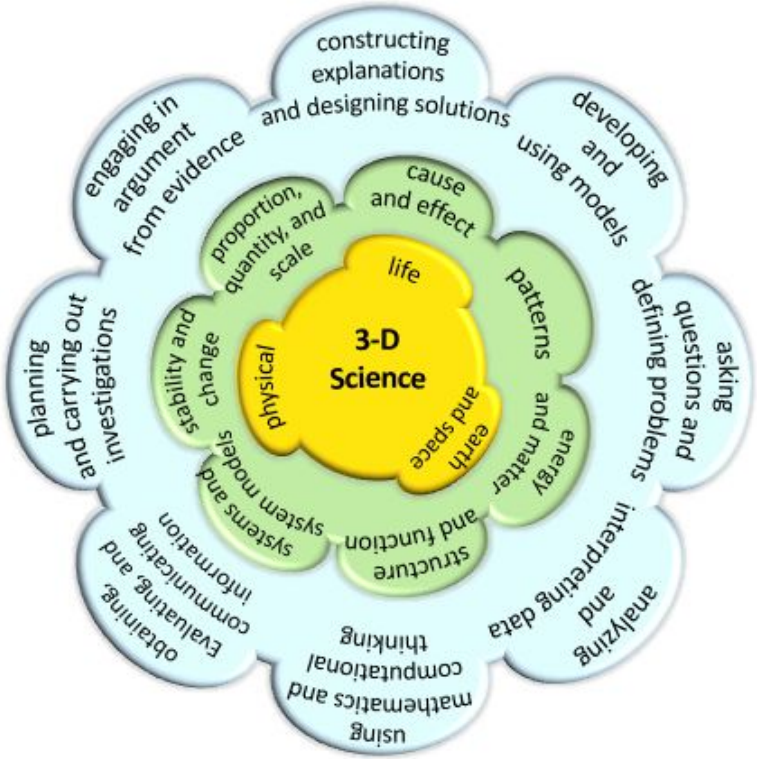

Figure 1: Three Dimensions of Science Instruction

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Core Ideas

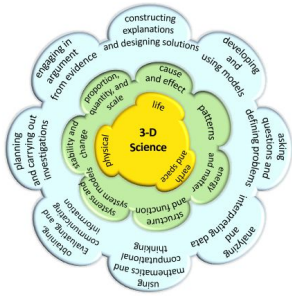

Figure 1: Three Dimensions of Science Instruction

Life Sciences

L1: Organisms are organized on a cellular basis and have a finite life span.

L2: Organisms require a supply of energy and materials

L3: Genetic information is passed down from one generation of organisms to another.

L4: The unity and diversity of organisms, living and extinct, is the result of evolution.

Earth and Space Sciences

E1: The composition of the Earth and its atmosphere and the natural and human processes occurring within them shape the Earth's surface and its climate.

E2: The Earth and our solar system are a very small part of one of many galaxies within the Universe.

Physical Sciences

P1: All matter is made of very small particles.

P2: Objects affect other objects at a distance.

P3: Changing the movement of an object requires a net force to be acting on it.

P4: The total energy in a closed system is always the same but can be transferred from one energy store to another.

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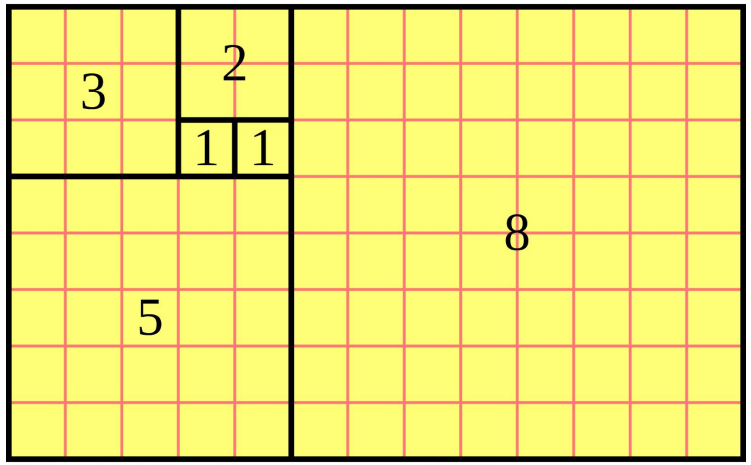
Math Practices

1. Make sense of problems and persevere in solving them.
2. Reason abstractly and quantitatively.
3. Construct viable arguments and critique the reasoning of others.
4. Model with mathematics.
5. Use appropriate tools strategically.
6. Attend to precision.
7. Look for and make use of structure.
8. Look for and express regularity in repeated reasoning



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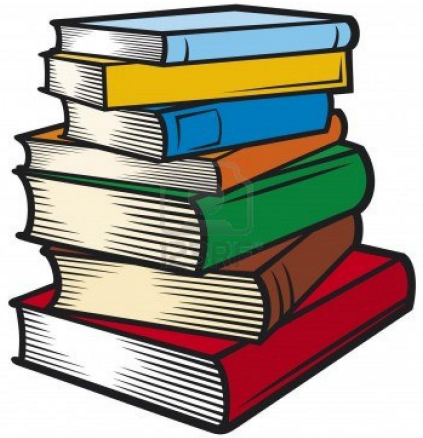
ELA Practices

1. Use technology, including the Internet, to produce and publish writing and to interact and collaborate with others.
2. Integrate and evaluate content presented in diverse media and formats, including visually and quantitatively, as well as in words.
3. Delineate and evaluate the argument and specific claims in a text, including the validity of the reasoning as well as the relevance and sufficiency of the evidence.
4. Prepare for and participate effectively in a range of conversations and collaborations with diverse partners, building on others' ideas and expressing their own clearly and persuasively.
5. Evaluate a speaker's point of view, reasoning, and use of evidence and rhetoric.



History & Social Science Practices

1. Posing and framing questions
2. Gathering a variety of evidence
3. Recognizing continuity and detecting change over time
4. Recognize global interconnections
5. Recognize the value of culture, civilization, and innovation

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Are You Ready?

- How can you incorporate this activity?
- What new ideas did this spark?

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Provocation Tools

- bit.ly/SDGTools


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Contact CanyonProfDev@gcu.edu

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