SANTA MONICA-MALIBU UNIFIED SCHOOL DISTRICT

Next Generation Science Standards (NGSS) Implementation Update

Board of Education Study Session

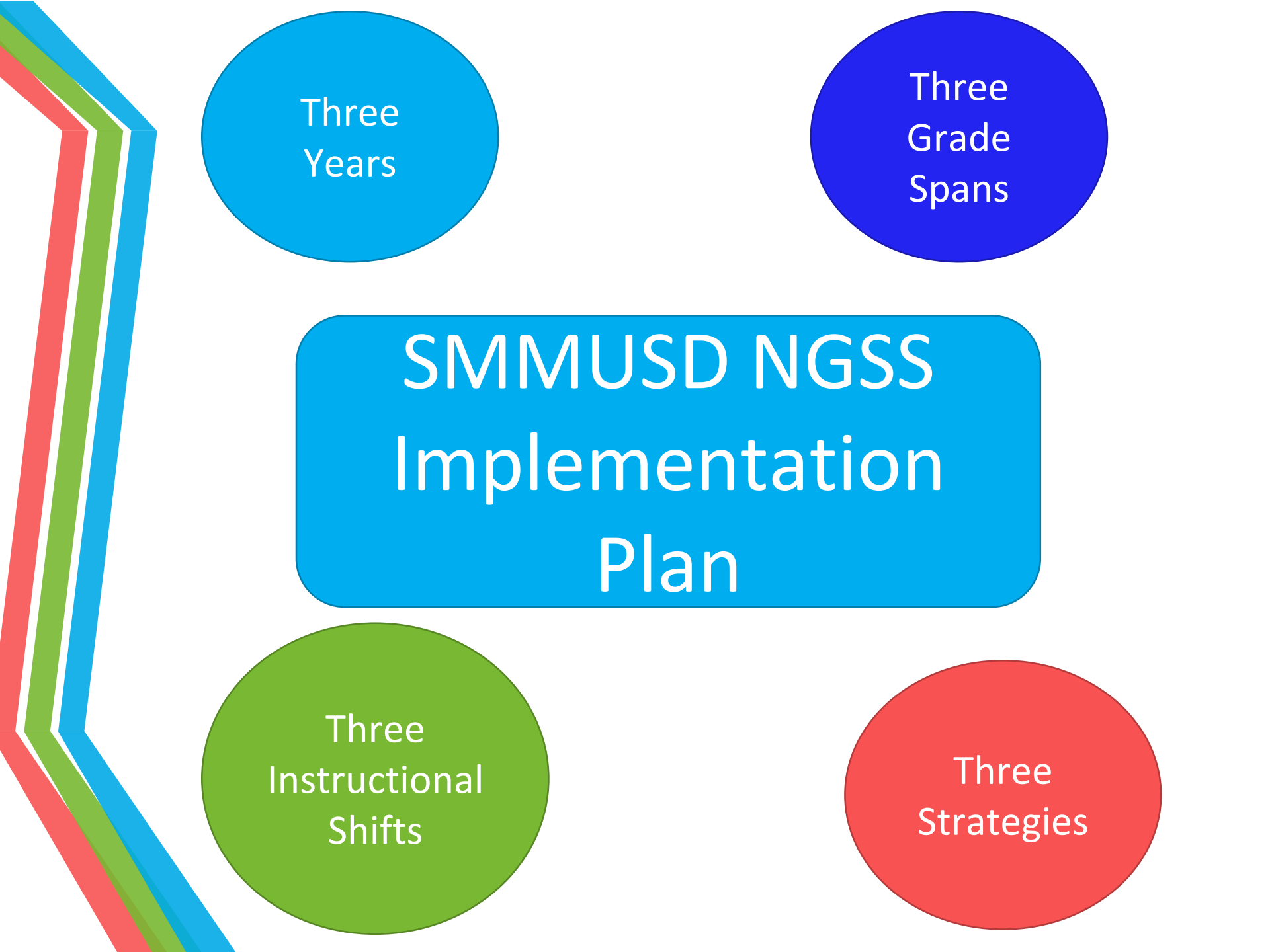
May 16, 2019

Purpose

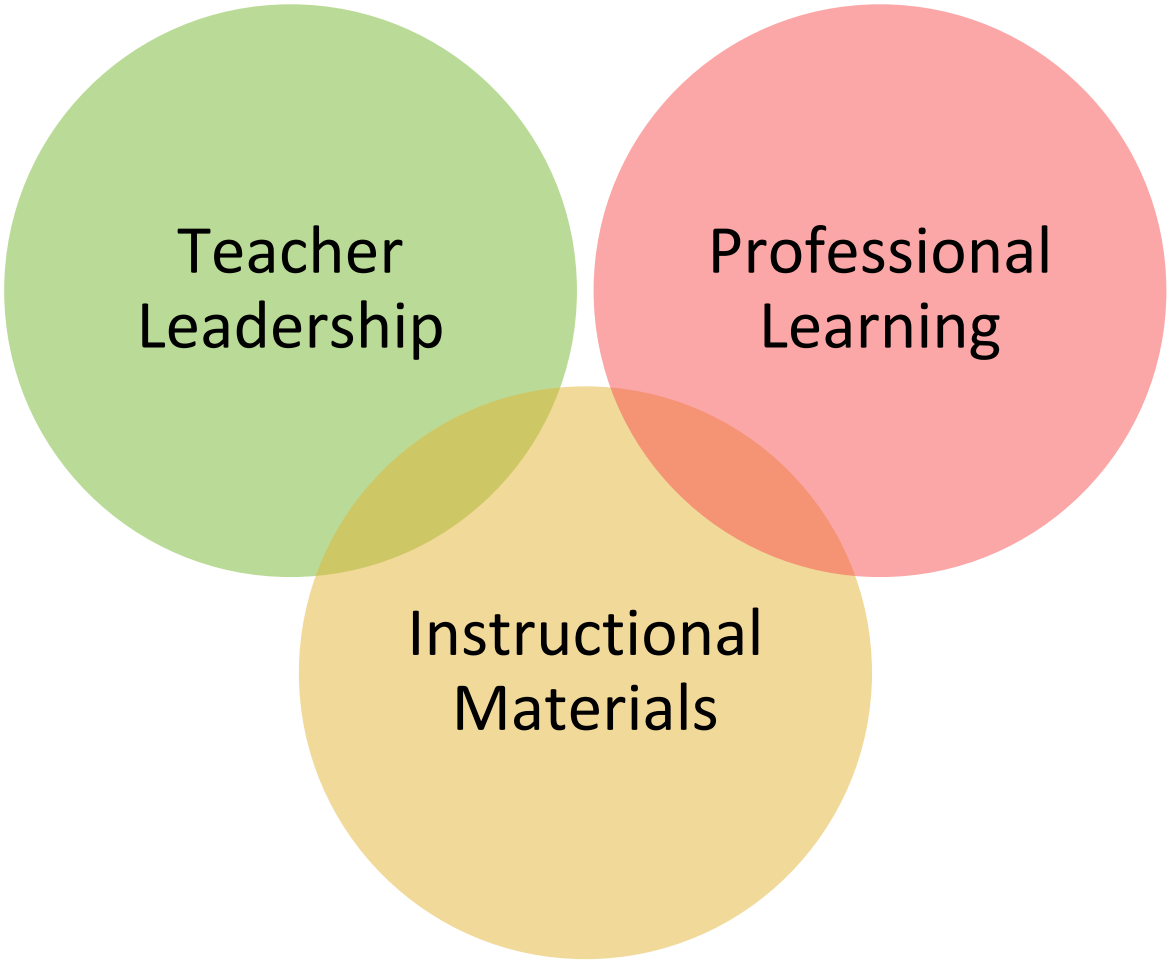
- To provide an update on the following items:
  - SMMUSD NGSS Implementation Plan
  - Transition to the High School Three Course NGSS Model

"All Standards, All Students"

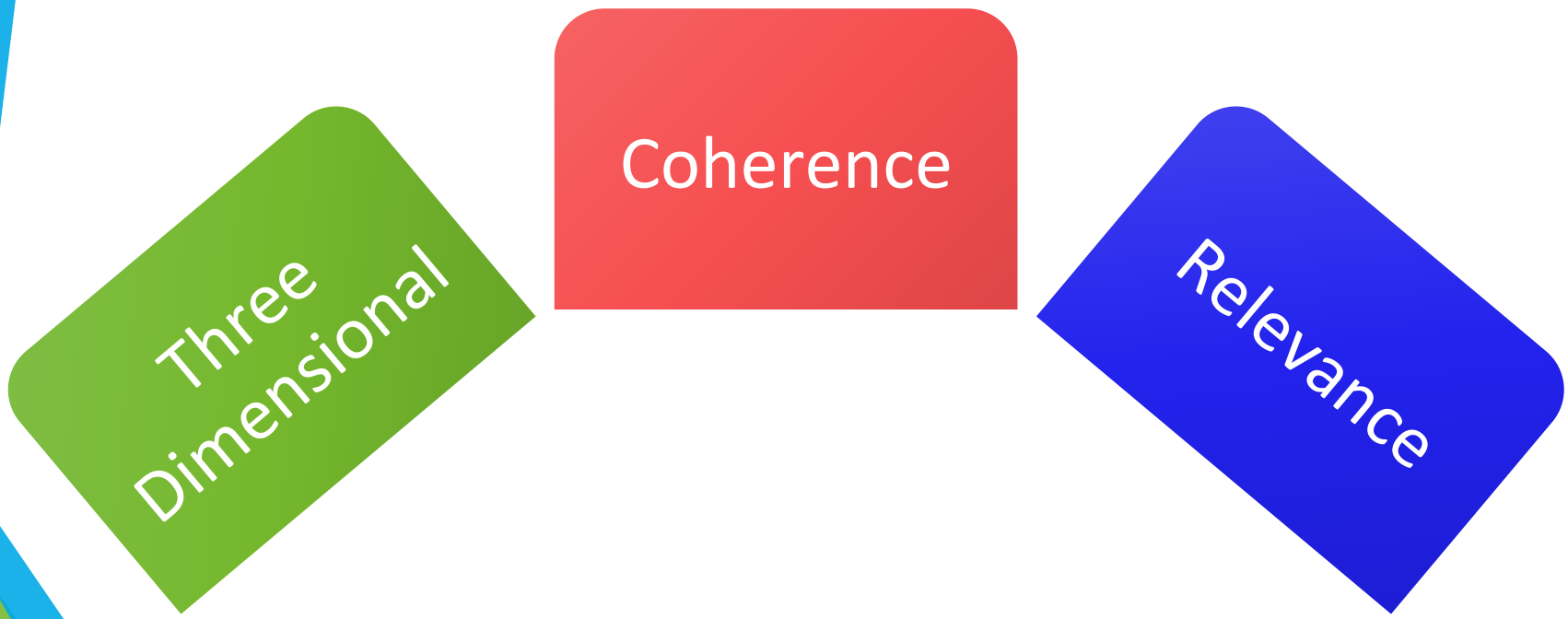
- NGSS Standards (2013)
- NGSS Framework (2016)
- Adopted Materials (2018)
- CAST Operational (2019)

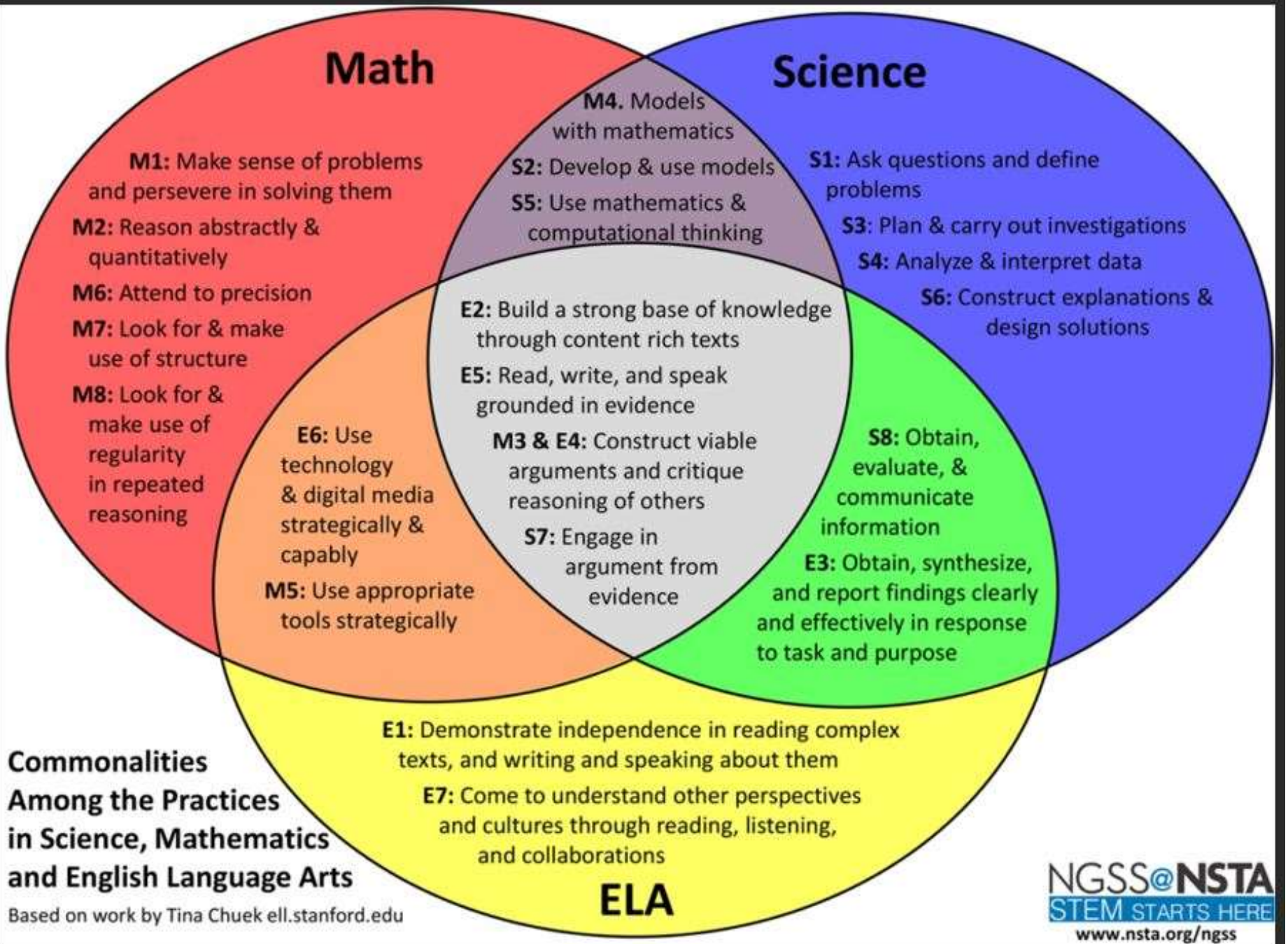

Three Years
Three Grade Spans
SMMUSD NGSS Implementation Plan
Three Instructional Shifts
Three Strategies

Three Strategies



Three Instructional "Shifts"





Commonalities Among the Practices in Science, Mathematics and English Language Arts

Based on work by Tina Chuek ell.stanford.edu

NGSS@NSTA
STEM STARTS HERE
www.nsta.org/ngss

SANTA MONICA-MALIBU UNIFIED SCHOOL DISTRICT

High School

NEXT GENERATION SCIENCE STANDARDS

Looks like…

Students …

- make sense of phenomena and design solutions
- learn through inquiry
- engage in purposeful reading, writing, speaking, and listening

Instructional shift from this . . .	**to this . . .**
Science education for most students	Science for ***all*** students
Learning about	To figuring it out
Teacher providing information to all students	Student centered learning

Strategy 1: Teacher Leadership

Highlights from our High School Leadership Team

- ★ CA Statewide NGSS High School Summit
- ★ Partnership with CSUN Professors
- ★ Articulation around course descriptions, CAST, and debrief PD sessions

Strategy 2: Professional Learning

★ Anchoring Phenomenon
★ Lesson Sequence & Unit Planning
★ *"Favorite Summative Assessment Task"*
★ Student Models
★ Collaboration

Anchoring Phenomenon: Biology: Where does the mass of a tree come from?

UNIT 5A OVERVIEW:

Phenomenon

4 grams **14,000,000 grams**

What do I notice? **What do I wonder?**

CONCEPTS COVERED:
1. Overview of human body systems
2. Digestive/Respiratory/Circulatory systems
3. Cellular respiration and photosynthesis
4. Fates of glucose

Assesments:
1 end of 5A quiz, 1 lab

PRIOR KNOWLEDGE CHECK:
1. True or False? To have more mass you need more atoms?

2. Where do heterotrophs get the building blocks they need to make more mass?

3. Where do autotrophs get the building blocks they need to make more mass?

4. What happens to food as it is being "digested"?

5. Why do we need to eat? Why do we need to breathe?

Model 1:

Model 2 (revised). This will be submitted as a test score.

Student Model examples

Student Model Examples

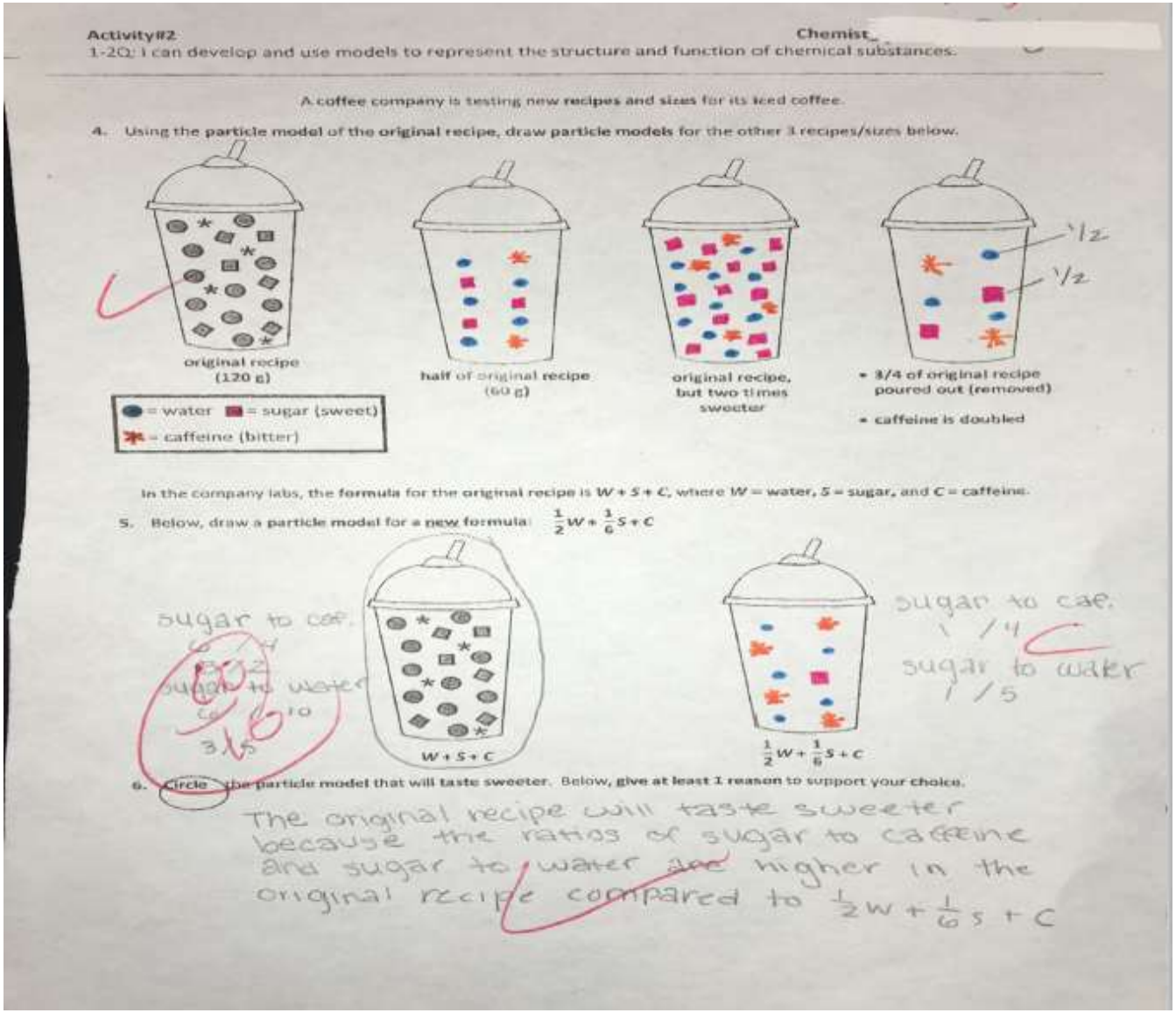
Anchoring Phenomenon: Chemistry

Tanker Implosion

Investigative Phenomenon: Chemistry

Reversible Chemical Reaction

Chemistry Student Model



Activity #2 Chemist_____

1-2Q: I can develop and use models to represent the structure and function of chemical substances.

A coffee company is testing new **recipes and sizes** for its iced coffee.

4. Using the **particle model** of the **original recipe**, draw **particle models** for the other 3 recipes/sizes below.

original recipe (120 g)

half of original recipe (60 g)

original recipe, but two times sweeter

- 3/4 of original recipe poured out (removed)
- caffeine is doubled

1/2

1/2

● = water ■ = sugar (sweet)
✱ = caffeine (bitter)

In the company labs, the **formula** for the original recipe is $W + S + C$, where W = water, S = sugar, and C = caffeine.

5. Below, draw a **particle model** for a **new formula**: $\frac{1}{2}W + \frac{1}{6}S + C$

sugar to caf.
6/4
sugar to water
6/5
3/5

$W + S + C$

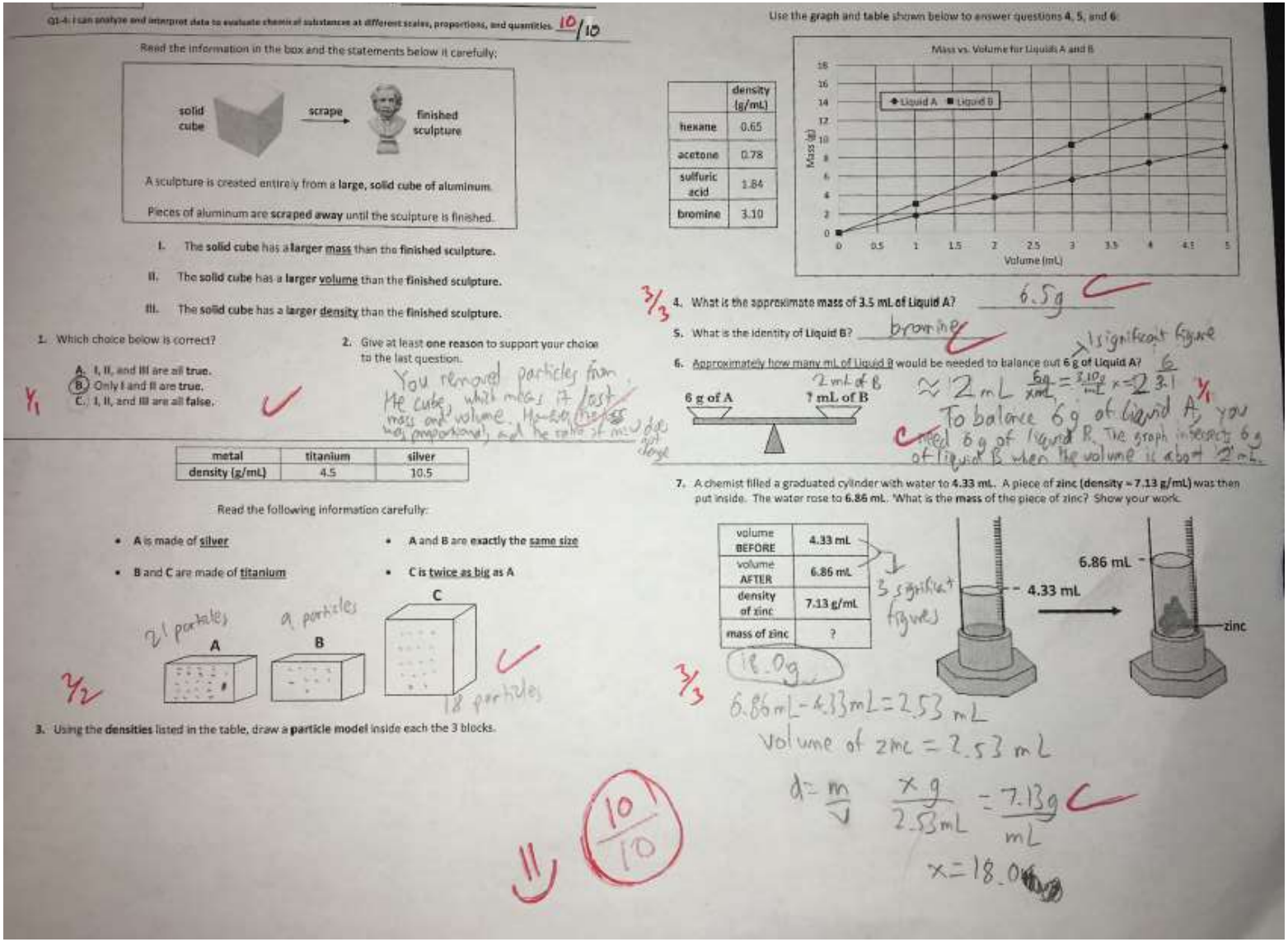
$\frac{1}{2}W + \frac{1}{6}S + C$

sugar to caf.
1/4
sugar to water
1/5

6. **Circle** the **particle model** that will taste sweeter. Below, **give at least 1 reason** to support your choice.

The original recipe will taste sweeter because the ratios of sugar to caffeine and sugar to water are higher in the original recipe compared to $\frac{1}{2}W + \frac{1}{6}S + C$

Chemistry Student Model



Q1-4: I can analyze and interpret data to evaluate chemical substances at different scales, proportions, and quantities. 10/10

Read the information in the box and the statements below it carefully:

A sculpture is created entirely from a **large, solid cube of aluminum**.

Pieces of aluminum are **scraped away** until the sculpture is finished.

I. The **solid cube** has a **larger mass** than the **finished sculpture.**

II. The **solid cube** has a **larger volume** than the **finished sculpture.**

III. The **solid cube** has a **larger density** than the **finished sculpture.**

1. Which choice below is correct?

A. I, II, and III are all **true.**
B. Only I and II are **true.**
C. I, II, and III are all **false.**

1/1

2. Give at least **one reason** to support your choice to the last question.

You removed particles from the cube, which makes it lost mass and volume. Mass and volume are proportional, and the ratio of mass to volume does not change.

metal	titanium	silver
density (g/mL)	4.5	10.5

Read the following information carefully:

- **A** is made of **silver**
- **B** and **C** are made of **titanium**
- **A** and **B** are **exactly the same size**
- **C** is **twice as big** as **A**

2/2

3. Using the **densities** listed in the table, draw a **particle model** inside each the 3 blocks.

Use the **graph** and **table** shown below to answer questions **4, 5,** and **6**.

	density (g/mL)
hexane	0.65
acetone	0.78
sulfuric acid	1.84
bromine	3.10

3/3

4. What is the approximate **mass** of **3.5 mL of Liquid A**? 6.5g

5. What is the identity of **Liquid B**? bromine

6. Approximately how many mL of Liquid B would be needed to balance out **6 g of Liquid A**?

2 mL of B ≈ 2 mL

1 significant figure

To balance 6g of Liquid A, you need 6g of Liquid B. The graph intersects 6g of Liquid B when the volume is about 2 mL.

1/1

7. A chemist filled a graduated cylinder with water to **4.33 mL**. A piece of **zinc (density = 7.13 g/mL)** was then put inside. The water rose to **6.86 mL**. What is the **mass** of the piece of zinc? Show your work.

volume BEFORE	4.33 mL
volume AFTER	6.86 mL
density of zinc	7.13 g/mL
mass of zinc	?

3 significant figures

3/3

18.0g

6.86mL − 4.33mL = 2.53 mL

Volume of zinc = 2.53 mL

$d = \frac{m}{V}$ $\frac{x\ g}{2.53\ mL} = \frac{7.13\ g}{mL}$

x = 18.0

10/10

Anchoring Phenomenon: Physics: Car Crashes

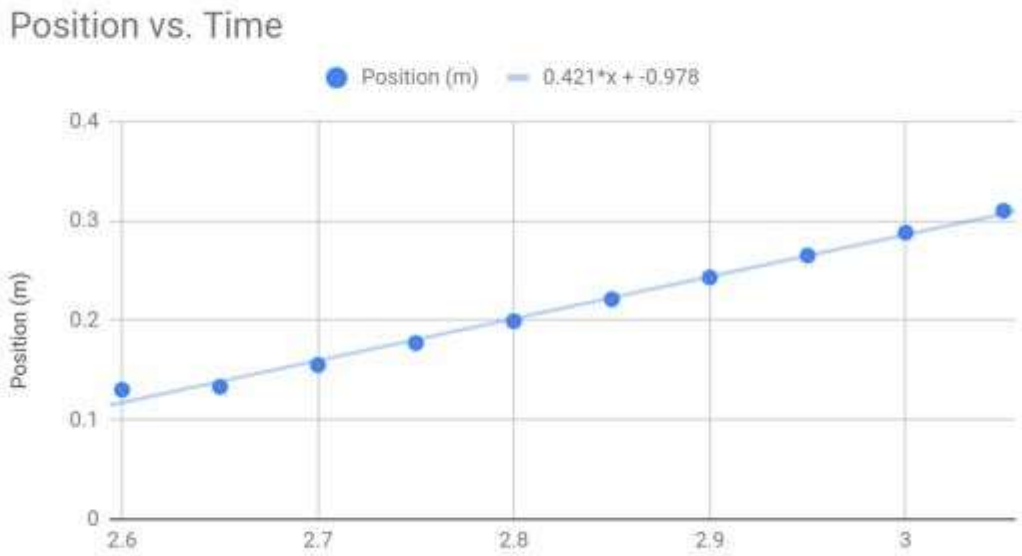
- How can we determine how fast a car is moving?
- Concepts covered:
  - Position
  - Velocity
  - Acceleration

Student Model

Data:

Time (s)	Position (m)
2.6	0.13
2.65	0.133
2.7	0.155
2.75	0.177
2.8	0.199
2.85	0.221
2.9	0.243
2.95	0.265
3	0.288
3.05	0.31

Analysis:



1. What was the relationship between the variables?

2. What was your math model?

3. What did your slope represent?

4. What did your y-intercept represent?

5. What were some possible ways in which your data could be inaccurate? What step(s) did you take in order to eliminate as much error in your data collection as possible?

Conclusion

The relationship between the variables is as follows: $\frac{final\ position - initial\ position}{final\ time - initial\ time} = average\ velocity$. My math model is the following: $position = (0.421\ \frac{meters}{second}) * time - 0.978\ m$. The slope of the graph represents the average velocity of the buggy throughout the time graphed. The y-intercept represents the position where the buggy started. The data could be inaccurate due to the buggy not traveling straight or something else being picked up by the motion sensor. These inaccuracies could be corrected by building a jig to keep the buggy on a straight trajectory and removing other objects from the lab table when gathering data.

Instructional Materials

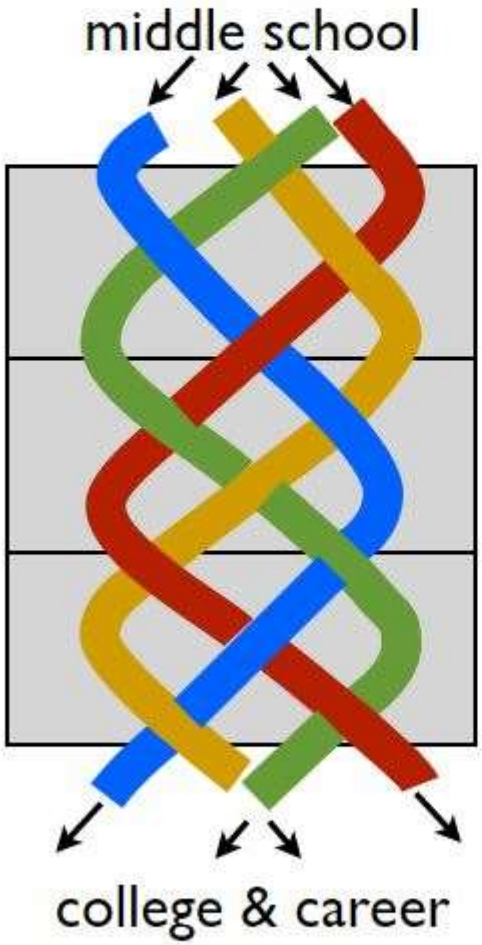
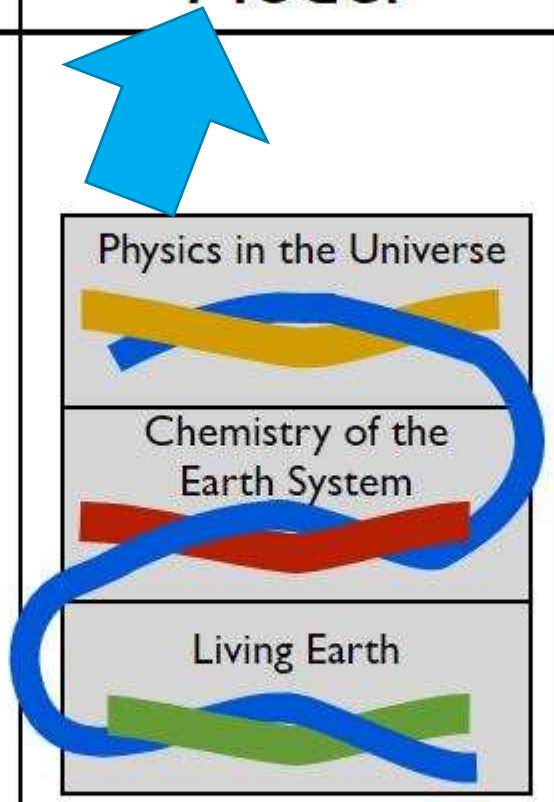
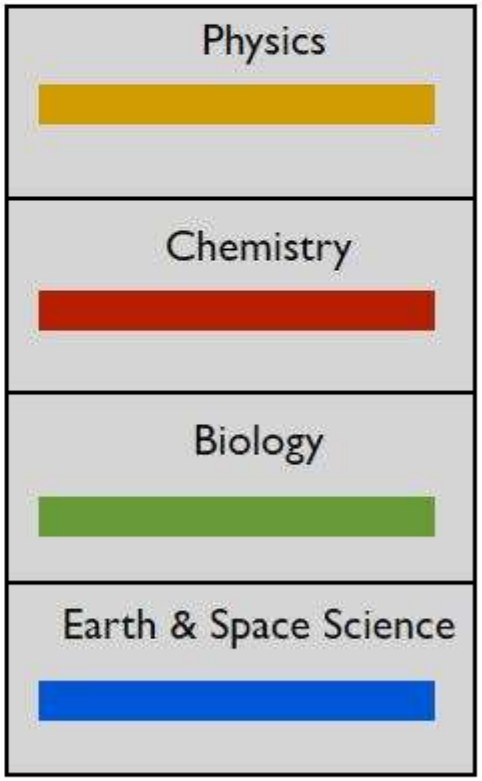
- ❑ Instructional Materials Fairs
- ❑ Formation of instructional materials adoption team
- ❑ District “Toolkit” and Lens
- ❑ 2019-20 Pilot (Biology)
- ❑ Revisit Chemistry, Physics

Strategy 3: Instructional Materials

SANTA MONICA-MALIBU UNIFIED SCHOOL DISTRICT

Three Course Model

NEXT GENERATION SCIENCE STANDARDS

Every Science, Every Year 3 Year Model	*ESS Integration* 3 Course Model	*Discipline Specific* 4 Course Model
		

Order of courses is NOT prescribed

Order of courses is NOT prescribed

r 1

r 2

r 3

r 4

More integration of science disciplines

Why Transition to the Three Course Model?

- Most commonly adopted model in the state
- Facilitates the transition from current district model
- Increases flexibility in course selection
- Embedded Earth Science standards vertically align environmentally-based curriculum
- Preparedness for CAST

Considerations: Three Course Model

★ All Students, All Standards requires:

- Students take all three courses
- Steps to ensure the Guaranteed and Viable Curriculum (GVC)
- Consideration of the current course sequence
- Options for AP classes
- Consideration of current SMMUSD Graduation Requirements (Science)

Neighboring Districts

District	Model	Graduation Requirement
BHUSD	Four Course*	2 yrs
CCUSD	Three Course	2 yrs
LVUSD	Three Course	2 yrs*

SMMUSD Graduation Requirement (Science)

Pass two years of science in Grades 9-12; one year must be a life science; one year must be a physical science.
This requirement is equal to 20 semester credits.

87% of current Seniors have received credit for completing at least 1 semester of a third science course.

Next Steps

- Time to collaborate:
  - Living Earth: Biology Course proposals to Board of Education (June 6)
  - Bring forward Chemistry & Physics Course Proposals during the 2019-20 school year
  - Refine course sequence/options
- Deepen application of the NGSS Instructional Shifts (including AP)
- Backwards plan (from performance task, to unit development to learning experiences)
- Collaborate with outside districts

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Our CSUN Partners:
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Questions and/or Comments