Presentation on K-12 Mathematics and Science/STEM Curriculum

June 27, 2023

Elizabeth Jacome
Director of Curriculum and Assessment
Polly Kimminau
Math Coordinator
Pam Vandivort
Science/STEM Coordinator

"Implementing a strategy of common, rigorous standards with differentiated resources and instruction can create excellence and equity for all students." (Childress, Doyle, & Thomas, 2009, p. 133, emphasis added)

AMPHITHEATER
Public Schools

2022-2023 Math, Science & STEM

- K-12 curricular resources that align the written, taught and assessed curriculum in math and science
- Tools that provide measurable criteria for determining mastery of grade-level standards
- Two-way communication channels that were used to support collaboration across Amphitheater schools and the Office of Learning and Instruction
- Professional learning to support teachers and schools

AMPHITHEATER
Public Schools

Science and Engineering Practices

ASKING QUESTIONS (FOR SCIENCE) AND DEFINING PROBLEMS (FOR ENGINEERING)

DEVELOPING AND USING MODELS

PLANNING AND CARRYING OUT INVESTIGATIONS

ANALYZING AND INTERPRETING DATA

USING MATHEMATICS AND COMPUTATIONAL THINKING

CONSTRUCTING EXPLANATIONS (FOR SCIENCE) AND DESIGNING SOLUTIONS (FOR ENGINEERING)

ENGAGING IN ARGUMENT FROM EVIDENCE

OBTAINING, EVALUATING, AND COMMUNICATING INFORMATION

AMPHITHEATER
Public Schools

Standards for Mathematical Practice

MAKING SENSE OF PROBLEMS AND PERSEVERING IN SOLVING THEM

REASONING ABSTRACTLY AND QUANTITATIVELY

CONSTRUCTING VIABLE ARGUMENTS AND CRITIQUING THE REASONING OF OTHERS

MODELING WITH MATHEMATICS

USING APPROPRIATE TOOLS STRATEGICALLY

ATTENDING TO PRECISION

LOOKING FOR AND MAKING USE OF STRUCTURE

LOOKING FOR AND EXPRESSING REGULARITY IN REPEATED REASONING.

AMPHITHEATER
Public Schools

AMPHITHEATER
Public Schools

Mathematics Curriculum and Instruction

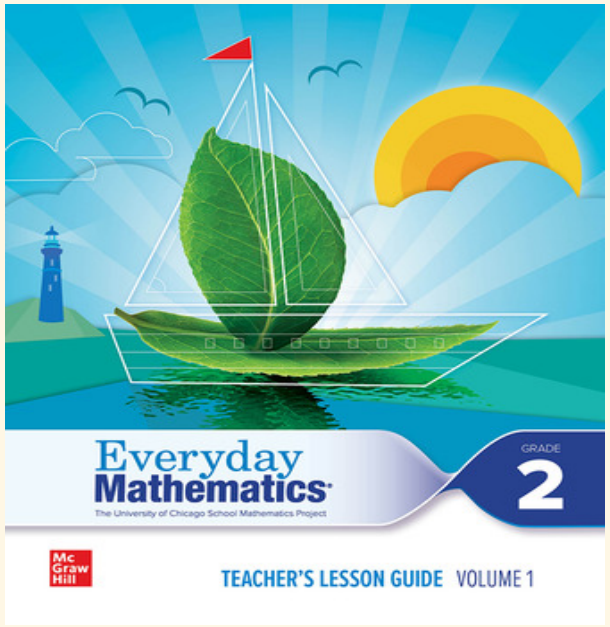
Polly Kimminau

Math Coordinator (K-12)

Amphitheater Public Schools
PORTRAIT OF A GRADUATE

Elementary Math: Scope and Sequence

AZ Math Standards



Benchmark Expectations

K-5 Scope and Sequence

AMPHITHEATER Public Schools

Mastery Expectations Organized by Quarter/Unit

2nd grade	
3rd Quarter	
Mastery Standards	
Unit 5	Unit 6
2.NBT.A.2 Count within 1000; skip-count by 5s, 10s, and 100s.	2.NBT.A.1 Understand that the three digits of a three-digit number represent amounts of hundreds, tens, and ones.
	2.NBT.A.1a Understand that 100 can be thought of as a bundle of ten tens - called a "hundred".
	2.NBT.A.1b Understand that the numbers 100, 200, 300, 400, 500, 600, 700, 800, 900 refer to one, two, three, four, five, six, seven, eight, or nine hundreds (and 0 tens and 0 ones).
	2.NBT.A.3 Read and write numbers to 1000 using base-ten numerals, number names , and expanded form.

Benchmark Expectations Organized by Quarter/Unit

AzCCRS Legend: Major Cluster Supporting Cluster

2nd grade

	2nd Quarter			Location in Everyday Math	
	Benchmark Expectations				
Cluster	Standard	Unit 3	Unit 4	Focus	Practice
Operations and Algebraic Thinking	2.OA.A.1	Add and subtract within 20 to solve one-step word problems involving situations of adding to, taking from, putting together, taking apart, and comparing with unknowns in all parts. Use drawings or equations to represent the problem.		3-2, 3-7, 3-8, 3-9	3-1. 3-3. 3-9, 3-11, 4-1, 4-3, 4-5, 4-7, 4-8, 4-11
	2.OA.B.2	Know doubles facts and combinations-of-10 and apply strategies to solve all addition facts. Know +/-0 and +/- 1 facts.		3-1, 3-2, 3-3, 3-4, 3-5, 3-6, 3-8, 3-9, 3-10, 3-11, 4-11	3-1, 3-2, 3-3, 3-4, 3-5, 3-6, 3-7, 3-8, 3-9, 3-10, 3-11, 4-1, 4-2, 4-3, 4-4, 4-5, 4-7, 4-9, 4-10
	2.OA.C.3		Mastery		3-2, 3-4, 3-11, 4-1, 4-2, 4-3, 4-4

Amphitheater Public Schools
PORTRAIT OF A GRADUATE

Spiraling Focus Organized by Quarter

3rd Quarter	
Spiraling Focus Standards	
Unit 5	Unit 6
By the end of the unit, expect students to...	By the end of the unit, expect students to...
2.OA.A.1 ...add and subtract within 100 to solve one-step word problems involving situations of adding to, taking from, putting together, and taking apart: by using drawings to represent the problem.	2.OA.A.1 ...add and subtract within 100 to solve one-step word problems involving situations of adding to, taking from, putting together, and taking apart: by using drawings to represent the problem.
2.OA.B.2 ...know doubles and combinations of 10 and apply strategies to solve all addition and subtraction facts.	2.NBT.B.5 ...add and subtract within 100 using strategies based on place value, properties of operations, and/or the relationship between addition and subtraction, with or without tools.
2.NBT.A.2 ...count by 1s within 1000 and skip count by 5s, 10s, and 100s.	2.NBT.B.7 ...add and subtract numbers at least within 100 using concrete models or drawings and strategies based on place value, properties of operations, and/or the relationship between addition and subtraction. Expect

Amphitheater Public Schools
PORTRAIT OF A GRADUATE

Everyday Math Assessment and AZ Mathematics Standards

AzCCRS Legend: Major Cluster Supporting Cluster

2nd Grade

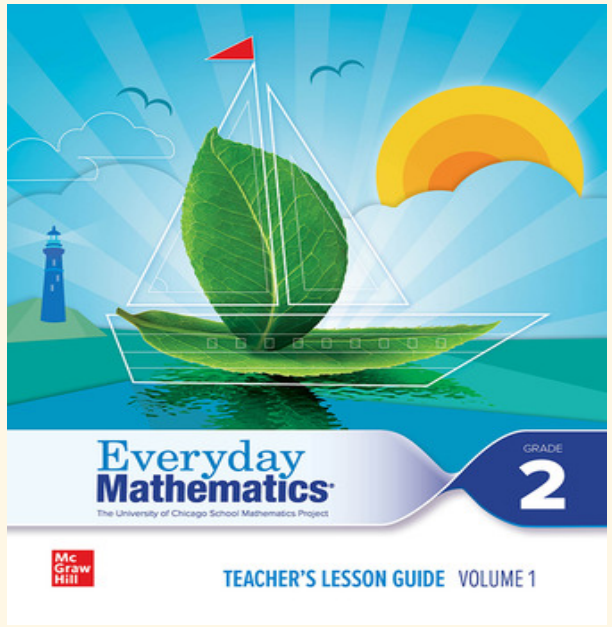
2nd Quarter

Ongoing Assessment (Assessment Check-In)

Unit 3		Unit 4	
Lesson	Standard(s)	Lesson	Standard(s)
1	2.OA.B.2 (Open Response and Re-Engagement)	1	2.MD.C.7
2	2.OA.B.2, 2.NBT.B.5	2	2.MD.C.7
3	2.OA.B.2	3	2.MD.C.7
4	2.OA.B.2	4	2.NBT.A.1, 2.NBT.A.1b, 2.NBT.A.3
5	2.OA.B.2	5	2.NBT.A.4
6	2.OA.B.2	6	2.NBT.A.1, 2.NBT.A.1a (Open Response and Re-Engagement)
7	2.NBT.B.7	7	2.NBT.A.1, 2.NBT.A.3, 2.NBT.B.7
8	2.OA.B.2	8	2.MD.A.1, 2.MD.A.3
9	2.OA.B.2	9	2.MD.A.1
10	2.OA.B.2, 2.MD.B.6	10	2.MD.A.1, 2.MD.A.2
11	Exploration (no Assessment Check-In)	11	Exploration (no Assessment Check-In)
12	Progress Check	12	Progress Check
		*	Mid-Year Assessment

Elementary Math: Report Cards

AZ Math Standards



Benchmark Expectations

K-5 Scope and Sequence

AMPHITHEATER Public Schools

2022-2023 Elementary Math Report Card Committee

Grade Level	Committee Members
K	Jen Martinez, Caryn Tate, and Coral Roberts
1	Mark Bailey and Jennifer Torres
2	Courtney Blake, Vanessa Miller, and Brent Daglio
3	Mabel Rivera, Vanessa Hicks, and Kelsey Glavin
4	Susan Latin and Helen Martinez
5	Liesl Scheffel, Amanda Larriva, Kris Holt, and Kim McDole

Special Advisors: Carol Tracy, Christine Sullivan, Elizabeth Jacome, and Tassi Call

Elementary Report Card Timeline

April - May 2022: Creation of the first Report Cards and Rubrics Drafts based on AZ Mathematics Standards and Everyday Math Benchmark Expectations

August 2022: Report Card Committee met to review the drafts and adjust.

August 2022: Polly Kimminau and Elizabeth Jacome created a “Report Card Rollout” video and Polly Kimminau offered 3 “Report Card Office Hours” to support teachers as they began using the new Report Cards.

December 2022: Teachers were given an opportunity to provide feedback on the Report Cards.

January 2023: Report Card Committee met multiple times to review teacher feedback adjust report cards for the 2023-24 school year.

March 2023: The “Final Draft” was sent out to all teachers to provide feedback and suggestions.

Elementary Standards-based Report Card and Rubrics

2nd Grade Report Card

Math	MP1	MP2	MP3	MP4
2.OA.A.1: Use addition and subtraction within 100 to solve one- and two-step word problems. Represent a word problem as an equation with a symbol for the unknown.				
2.OA.B.2: Fluently add and subtract within 20.				
2.NBT.A.2: Count within 1000; skip count by 5's, 10's, and 100's.				
2.NBT.A.3: Read and write numbers up to 1000 using base-ten numerals, number names, and expanded form.				
2.NBT.A.4: Compare two three-digit numbers using >, <, and =.				
2.NBT.B.5: Fluently add and subtract within 100 using strategies.				
2.NBT.B.8: Mentally add and subtract 10 or 100 to a given number in the range of 100 and 900.				
2.MD.A.4: Measure to determine how much longer one object is than another, expressing the length difference in terms of a standard length unit.				
2.MD.C.7: Tell and write time from analog and digital clocks to the nearest five minutes, using a.m. and p.m.				
2.MD.C.8: Solve word problems involving collections of money, including dollar bills, quarters, dimes, nickels, and pennies.				
2.MD.D.10: Draw a picture graph and a bar graph and solve simple put-together, take-apart, and compare problems using information presented in the graph.				
2.G.A.1: Identify and describe attributes of two-dimensional and three-dimensional shapes.				
2.G.A.3: Partition circles and rectangles into two, three, or four equal shares. Describe the shares using the words halves, thirds, fourths, half of, third of, etc.				

2.OA.A: Represent and solve problems involving addition and subtraction.

2.OA.A.1: Use addition and subtraction within 100 to solve one- and two-step word problems. Represent a word problem as an equation with a symbol for the unknown.

	Quarter 1	Quarter 2	Quarter 3	Quarter 4
4 Highly Proficient	**Adds and subtracts within 100** to solve **one- and two-step** word problems, as well as represents a word problem as an equation with a symbol for the unknown.	**Adds and subtracts within 100** to solve **one- and two-step** word problems, as well as represents a word problem as an equation with a symbol for the unknown.	**Adds and subtracts within 100** to solve **one- and two-step** word problems, as well as represents a word problem as an equation with a symbol for the unknown.	Uses **addition and subtraction within 1000** to solve **one- and two-step** word problems, as well as represents a word problem as an equation with a symbol for the unknown.
3 Proficient	**Adds within 20** to solve **one-step** word problems involving situations of adding to, taking from, putting together, taking apart, and comparing with unknowns in all parts.	**Adds and subtracts within 20** to solve **one-step** word problems involving situations of adding to, taking from, putting together, taking apart, and comparing with unknowns in all parts.	**Adds and subtracts within 100** to solve **one-step** word problems involving situations of adding to, taking from, putting together, taking apart, and comparing with unknowns in all parts.	**Adds and subtracts within 100** to solve **one- and two-step** word problems, as well as represents a word problem as an equation with a symbol for the unknown.
2 Partially Proficient	**Inconsistent in adding within 20** to solve **one-step** word problems involving situations of adding to, taking from, putting together, taking apart, and comparing with unknowns in all parts.	**Adds within 20** to solve **one-step** word problems involving situations of adding to, taking from, putting together, taking apart, and comparing with unknowns in all parts.	**Adds and subtracts within 20** to solve **one-step** word problems involving situations of adding to, taking from, putting together, taking apart, and comparing with unknowns in all parts.	**Adds and subtracts within 100** to solve **one-step** word problems involving situations of adding to, taking from, putting together, taking apart, and comparing with unknowns in all parts.
1 Minimally Proficient	**Unable to add within 20** to solve **one-step** word problems involving situations of adding to, taking from, putting together, taking apart, and comparing with unknowns in all parts.	**Unable to or inconsistent in adding within 20** to solve **one-step** word problems involving situations of adding to, taking from, putting together, taking apart, and comparing with unknowns in all parts.	**Unable to or inconsistent in adding** to solve **one-step** word problems involving situations of adding to, taking from, putting together, taking apart, and comparing with unknowns in all parts.	**Unable to or inconsistent in adding** to solve **one-step** word problems involving situations of adding to, taking from, putting together, taking apart, and comparing with unknowns in all parts.

Amphitheater Public Schools
PORTRAIT OF A GRADUATE

Using Scope and Sequence with Report Card Rubrics

2nd Grade Report Card

Math	MP1	MP2	MP3	MP4
2.OA.A.1: Use addition and subtraction within 100 to solve one- and two-step word problems. Represent a word problem as an equation with a symbol for the unknown.				
2.OA.B.2: Fluently add and subtract within 20.				
2.NBT.A.2: Count within 1000; skip count by 5's, 10's, and 100's.				
2.NBT.A.3: Read and write numbers up to 1000 using base-ten numerals, number names, and expanded form.				
2.NBT.A.4: Compare two three-digit numbers using >, <, and =.				
2.NBT.B.5: Fluently add and subtract within 100 using strategies.				
2.NBT.B.8: Mentally add and subtract 10 or 100 to a given number in the range of 100 and 900.				
2.MD.A.4: Measure to determine how much longer one object is than another, expressing the length difference in terms of a standard length unit.				
2.MD.C.7: Tell and write time from analog and digital clocks to the nearest five minutes, using a.m. and p.m.				
2.MD.C.8: Solve word problems involving collections of money, including dollar bills, quarters, dimes, nickels, and pennies.				
2.MD.D.10: Draw a picture graph and a bar graph and solve simple put-together, take-apart, and compare problems using information presented in the graph.				
2.G.A.1: Identify and describe attributes of two-dimensional and three-dimensional shapes.				
2.G.A.3: Partition circles and rectangles into two, three, or four equal shares. Describe the shares using the words halves, thirds, fourths, half of, third of, etc.				

Rubric

2.OA.A: Represent and solve problems involving addition and subtraction.

2.OA.A.1: Use addition and subtraction within 100 to solve one- and two-step word problems. Represent a word problem as an equation with a symbol for the unknown.

	Quarter 1	Quarter 2	Quarter 3	Quarter 4
4 Highly Proficient	**Adds and subtracts within 100** to solve **one- and two-step** word problems, as well as represents a word problem as an equation with a symbol for the unknown.	**Adds and subtracts within 100** to solve **one- and two-step** word problems, as well as represents a word problem as an equation with a symbol for the unknown.	**Adds and subtracts within 100** to solve **one- and two-step** word problems, as well as represents a word problem as an equation with a symbol for the unknown.	Uses **addition and subtraction within 1000** to solve **one- and two-step** word problems, as well as represents a word problem as an equation with a symbol for the unknown.
3 Proficient	**Adds within 20** to solve **one-step** word problems involving situations of adding to, taking from, putting together, taking apart, and comparing with unknowns in all parts.	**Adds and subtracts within 20** to solve **one-step** word problems involving situations of adding to, taking from, putting together, taking apart, and comparing with unknowns in all parts.	Add... with... one... pro... situ... to, ... put... taki... com... unk...	
2 Partially Proficient	**Inconsistent in adding within 20** to solve **one-step** word problems involving situations of adding to, taking from, putting together, taking apart, and comparing with unknowns in all parts.	**Adds within 20** to solve **one-step** word problems involving situations of adding to, taking from, putting together, taking apart, and comparing with unknowns in all parts.	Add... with... one... pro... situ... to, ... put... taki... com... unk...	
1 Minimally Proficient	**Unable to add within 20** to solve **one-step** word problems involving situations of adding to, taking from, putting together, taking apart, and comparing with unknowns in all parts.	**Unable to or inconsistent in adding within 20** to solve **one-step** word problems involving situations of adding to, taking from, putting together, taking apart, and comparing with unknowns in all parts.	Una... inc... add... one... pro... situ... to, ... put... taki... com... unk...	

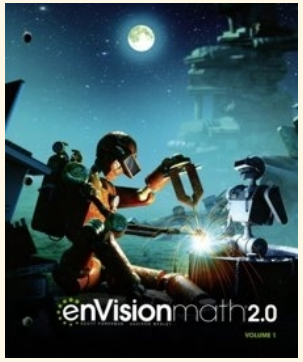
Scope and Sequence

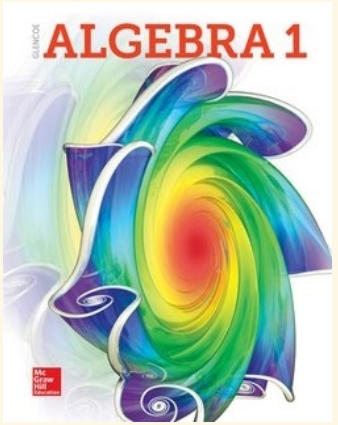
2nd grade

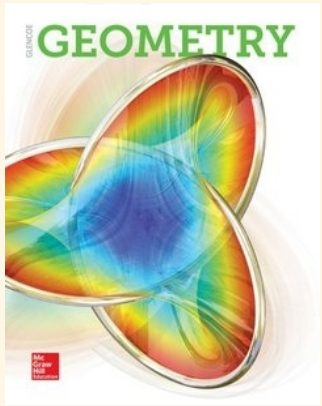
3rd Quarter			Location in Everyday Math	
Benchmark Expectations				
Standard	Unit 5	Unit 6	Focus	Practic...
2.OA.A.1	Add and subtract within 100 to solve one-step word problems involving situations of adding to, taking from, putting together, and taking apart, e.g. by using drawings or equations to represent the problem.	Add and subtract within 100 to solve one-step word problems involving situations of adding to, taking from, putting together, and taking apart, e.g. by using drawings or equations to represent the problem.	5-7, 5-8, 5-9, 5-10, 6-2, 6-3, 6-4, 6-5, 6-9	5-1, 5-6, 5-8, 5-9, 5-10, 6-1, 6-2, 6-3, 6-5, 6-7, 6-9, 6-10
2.OA.B.2	Know doubles and combinations-of-ten facts, and apply strategies to solve all addition and subtraction facts.		5-1, 5-9	5-1, 5-2, 5-4, 5-5, 5-7, 5-9, 6-

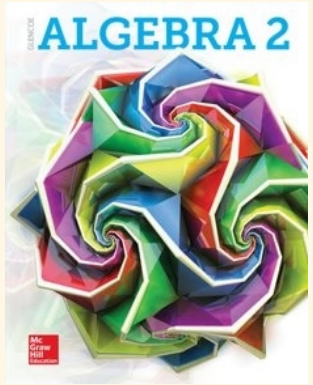
Secondary Math: Scope and Sequence

AZ Math Standards









2022-2023 Secondary Math Curriculum Committee

High School	Middle School	Office of Learning and Instruction
Ronnie Lise: AHS	Sarah Lortie: AMS	Karyn Frantziskonis: CISS
Nina Godlewski: CDO	Shelley Quevedo: Coronado	Katie Wray: CISS
Doug Kautz: IRHS	Leah Falcon: Cross	Polly Kimminau: Coordinator
	Teresa Fritton: Wilson	
	Christina Michaels: La Cima	

Secondary Curriculum Committee Timeline

November 2, 2022	Determined the Priority Standards
November, 22, 2022	Began working on the Scope and Sequence tables
February 1, 2023	Finished the Scope and Sequence tables and began working on the Proficiency Scales
March 29, 2023	Finished the Proficiency Scales

Scope and Sequence: A Pathway to Learning for Math - Algebra 1

Topic/Unit	Suggested Time Frame:	
Chapter 5: Linear Inequalities	Quarter # 2	

Priority Cluster and Standard(s):	Supporting Standards:
A1.A-CED.A Create equations that describe numbers or relationships. • **A1.A-CED.A.1** Create equations and inequalities in one variable and use them to solve problems. Include problem-solving opportunities utilizing real-world context. Focus on linear, quadratic, exponential and piecewise-defined functions (limited to absolute value and step). **A1.A-REI.B** Solve equations and inequalities in one variable. • **A1.A-REI.B.3** Solve linear equations and inequalities in one variable, including equations with coefficients represented by letters.	**A1.A-REI.D** Represent and solve equations and inequalities graphically. • **A1.A-REI.D.12** Graph the solutions to a linear inequality in two variables as a half-plane, excluding the boundary in the case of a strict inequality, and graph the solution set to a system of linear inequalities in two variables as the intersection of the corresponding half-planes.

Essential Question(s):

How are symbols useful in mathematics?
What mathematical symbols do you know?
Why is it important to understand what the symbols in a mathematical sentence represent?
How are symbols used to write expressions, equations, and inequalities?

How are graphs helpful when solving inequalities in two variables?

Key Concept(s):

I can...

Minimally Proficient

- Solve linear inequalities by using addition. ***MP***
- Solve linear inequalities by using subtraction. ***MP***
- Use algebra tiles to model and solve inequalities. ***MP***
- Solve linear inequalities by using multiplication. ***MP***
- Solve linear inequalities by using division. ***MP***
- Graph linear inequalities on the coordinate plane. ***MP***
- Solve inequalities by graphing. ***MP***

Partially Proficient

- Solve linear inequalities involving more than one operation. ***PP***
- Solve linear inequalities involving the Distributive Property. ***PP***
- Solve and graph absolute value inequalities (< and >) ***PP***

Proficient

- Solve compound inequalities containing the word and, and graph their solution set. ***P***
- Solve compound inequalities containing the word or, and graph their solution set. ***P***
- Use a graphing calculator to investigate the graphs of inequalities. ***P***

Highly Proficient

Key Vocabulary:

- boundary
- closed half-plane
- compound inequality
- half-plane
- inequality
- intersection
- open half-plane
- union

Amphitheater Public Schools
PORTRAIT OF A GRADUATE

Proficiency Scale

Chapter 5- Linear Inequalities

Priority Cluster/State Standard

A1.A-CED.A Create equations that describe numbers or relationships.

- **A1.A-CED.A.1** Create equations and inequalities in one variable and use them to solve problems. Include problem-solving opportunities utilizing real-world context. Focus on linear, quadratic, exponential and piecewise-defined functions (limited to absolute value and step).

A1.A-REI.B Solve equations and inequalities in one variable.

- **A1.A-REI.B.3** Solve linear equations and inequalities in one variable, including equations with coefficients represented by letters.

Standard	No Attempt Made 0	Minimally Proficient 1	Partially Proficient 2	Proficient 3	Highly Proficient 4
A1.A-CED.A.1		**Choose** a representation that models a **linear** relationship between quantities.	**Choose a representation** that models a linear or an **exponential** relationship between quantities.	**Create equations and inequalities** in one variable and **use them to solve problems.** Include equations arising from linear and quadratic functions, and simple rational and exponential functions.	**Create mathematical representations** that model relationships between quantities **relating multiple grade-level concepts** and when prompted **use the representation** to make further decisions about mathematical and real-world problems.

Amphitheater Public Schools
Middle School Acceleration Math Flowchart

Math Flowchart to determine student placement in an **ABOVE GRADE LEVEL** course.

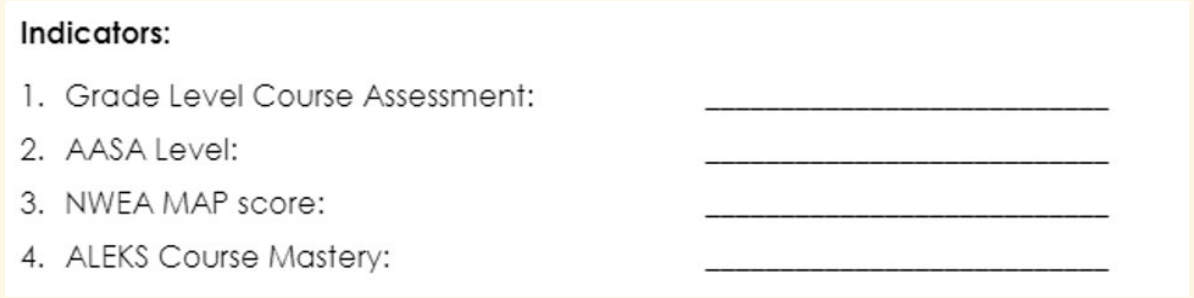
	"Foundational Skills for Algebra Success" (6th grade standards)	"Principles and Proportional Reasoning in Algebra" (7th grade standards)	"Introduction to Algebra 1" (8th grade standards)	"Algebra 1" (9th grade standards)	"Geometry" (10th grade standards)
Required	Demonstration of 5th grade math proficiency using the ***Everyday Math 4.0*** end of course assessment. (score of 80% or higher)	Demonstration of 6th grade math proficiency using the ***enVision math 2.0*** end of course assessment. (score of 80% or higher)	Demonstration of 7th grade math proficiency using the ***enVision math 2.0*** end of course assessment. (score of 80% or higher)	Demonstration of 8th grade math proficiency using the ***enVision math 2.0*** end of course assessment. (score of 80% or higher)	Demonstration of Algebra 1 proficiency using the ***Glencoe Algebra 1*** end of course assessment. (score of 80% or higher)
Choose One	AASA level: **Proficient** ***or*** NWEA MAP score of **≥233 (MAP 2-5)** or a score of **≥223 (MAP 6+)**.	AASA level: **Proficient** ***or*** NWEA MAP score of **≥232** or higher (MAP 6+).	AASA level: **Proficient** ***or*** NWEA MAP score of **≥244** or higher (MAP 6+).	AASA level: **Proficient** ***or*** NWEA MAP score of **≥250** or higher (MAP 6+).	AASA level: **Proficient** ***or*** NWEA MAP score of **≥250** or higher (MAP 6+).
Additional Support (If necessary)	Teacher Recommendation 6th grade ALEKS: 90% mastery	Teacher Recommendation 7th grade ALEKS: 90% mastery	Teacher Recommendation 8th grade ALEKS: 90% mastery	Teacher Recommendation Algebra 1 ALEKS: 90% mastery	Teacher Recommendation Geometry ALEKS: 90% mastery

Example: A 5th grader ***advancing*** to "Principles and Proportional Reasoning in Algebra" (7th grade standards) must follow the criteria outlined within the "Principles and Proportional Reasoning in Algebra" column.

Middle School Math Placement Resources

Middle School Math Acceleration Recommendation:

Provides parents with the data necessary to support acceleration

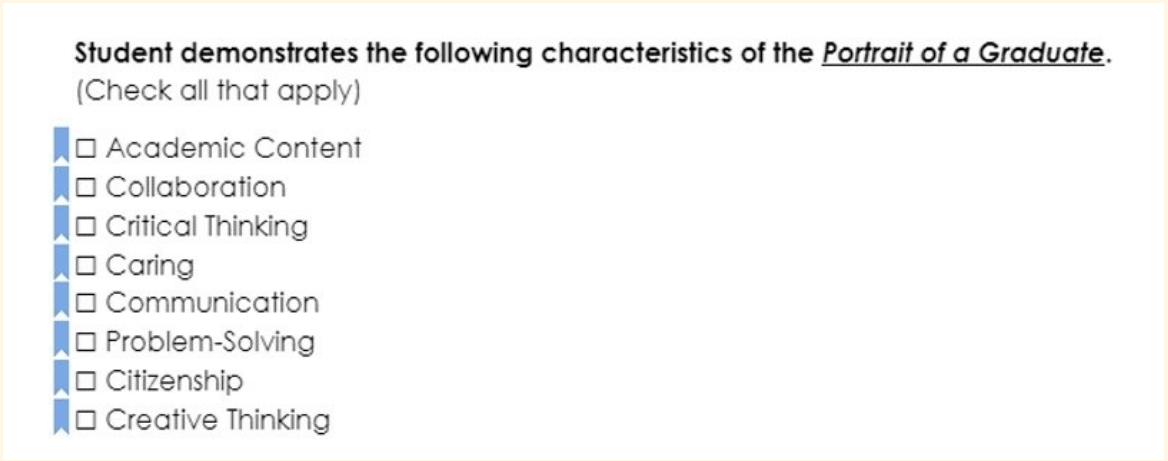


Indicators:

1. Grade Level Course Assessment: _____
2. AASA Level: _____
3. NWEA MAP score: _____
4. ALEKS Course Mastery: _____

Middle School Math Teacher Recommendation:

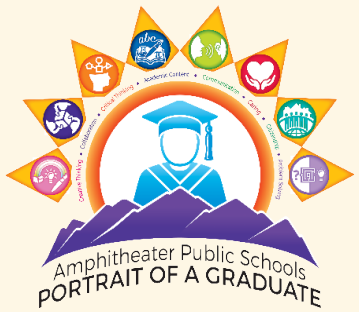
Focuses on Characteristics of the Portrait of a Graduate



Student demonstrates the following characteristics of the *Portrait of a Graduate*.
(Check all that apply)

- ☐ Academic Content
- ☐ Collaboration
- ☐ Critical Thinking
- ☐ Caring
- ☐ Communication
- ☐ Problem-Solving
- ☐ Citizenship
- ☐ Creative Thinking

Questions?



Science and STEM Curriculum and Instruction

Pam Vandivort

Science/STEM Coordinator

Elementary Science Tier 1 Curriculum Support

For ALL elementary schools:

- Whole-staff training (1 hr for PP; 3+ hrs for EiE) -updating as needed
- Expectations of at least 5 PP +1 EiE per year to cover all standards
- Clean, organize, practice using Maker Spaces
- Workshops to synch ELA, SS + Science Units

Ex. 5th Grade ELA starts with ‘Inventors’ so students study motions and forces via the history of air flight and automobiles during the Industrialization period of the USA

AMPHITHEATER
Public Schools

Elementary Science Standards

Arizona Science Standards - 3rd Grade

Three Dimensions of Science

Sensemaking in science occurs with the integration of three essential dimensions.

Science and Engineering Practices

- ask questions and define problems
- develop and use models
- plan and carry out investigations
- analyze and interpret data
- use mathematics and computational thinking
- construct explanations and design solutions
- engage in argument from evidence
- obtain, evaluate, and communicate information

Crosscutting Concepts

- patterns
- cause and effect
- structure and function
- systems and system models
- stability and change
- scale, proportion, and quantity
- energy and matter

Core Ideas

Core Ideas for Knowing Science

Physical Science

P1: All matter in the Universe is made of very small particles.
P2: Objects can 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 amount of energy in a closed system is always the same but can be transferred from one energy store to another during an event.

Earth and Space Science

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.

Life Science

L1: Organisms are organized on a cellular basis and have a finite life span.
L2: Organisms require a supply of energy and materials for which they often depend on, or compete with, other organisms.
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.

Core Ideas for Using Science

Physical Science Standards

Students develop an understanding of the sources, properties, and characteristics of energy along with the relationship between energy transfer and the human body.

3.P2U1.1	Ask questions and investigate the relationship between light, objects, and the human eye.
3.P2U1.2	Plan and carry out an investigation to explore how sound waves affect objects at varying distances.
3.P4U1.3	Develop and use models to describe how light and sound waves transfer energy.

Earth and Space Science Standards

Students develop an understanding of how the Sun provides light and energy for Earth systems.

3.E1U1.4	Construct an explanation describing how the Sun is the primary source of energy impacting Earth systems.

Phenomena are observable events that can be explained or explored. Science aims to explain the

Life Science Standards

Students develop an understanding of the flow of energy in a system beginning with the Sun to and among organisms They also understand that plants and animals (including humans) have specialized internal and external structures and can respond to stimuli to increase survival.

3.L1U1.5	Develop and use models to explain that plants and animals (including humans) have internal and external structures that serve various functions that aid in growth, survival, behavior, and reproduction.
3.L1U1.6	Plan and carry out investigations to demonstrate ways plants and animals react to stimuli.
3.L2U1.7	Develop and use system models to describe the flow of energy from the Sun to and among living organisms.
3.L2U1.8	Construct an argument from evidence that organisms are interdependent.

Key Crosscutting Concepts in 3rd Grade

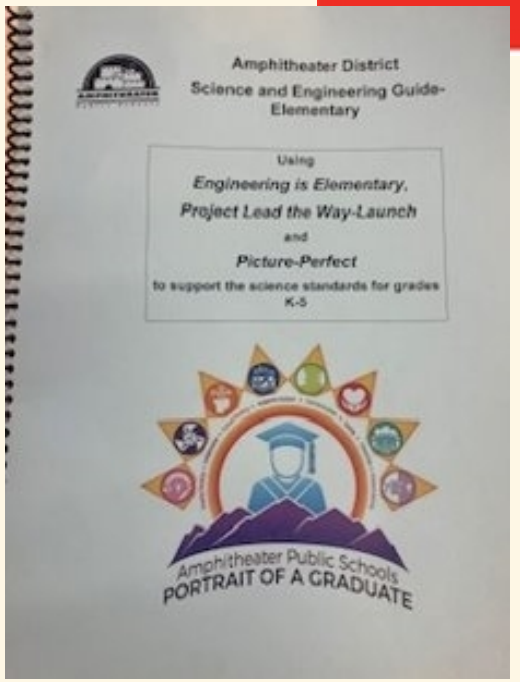
*Patterns; **Cause and Effect**; Scale, Proportion and Quantity; Systems and System Models; Energy and*

Amphitheater Public Schools
PORTRAIT OF A GRADUATE

Elementary Science Curriculum

Shorter (1-2 weeks)

EiE Engineering is Elementary®



Longer Units (3-4 wks)

Amphitheater Public Schools
PORTRAIT OF A GRADUATE

2 School Close-Ups: Keeling and Painted Sky

School	Keeling	Painted Sky
Plan of Action 22-23	Tier 1 Curriculum with fidelity Use the Maker Space and/or outdoor areas *All teachers and students attend at least 1 min-STEM challenge tutorial *All teachers conduct one class science project to be entered into SARSEF *All teachers increase their use of graphs, tables and other graphic organizers into daily practices *All teachers post CERs, and other EOLs for whole-school interaction	*All teachers trained and confident with Tier 1 curriculum *All teachers use the Maker Space and/or outdoor areas *Encourage the increased use of graphs, tables, etc. into daily practices
Results	AZSci increased from 4% to 16%; SARSEF Top Elementary School	Amphi's Top Elemenary AZSci Score

2023-2024

- Include Pre-K
- Pilot plan to increase attendance
- Whole-School STEAM pilot projects
- Maker Spaces functional/in use in all schools
- Whole-staff training/refresher sessions of Tier 1 curriculum where needed
- Ongoing SARSEF and SLL support
- Ongoing encouragement to incorporate graphs, tables, data imagery in every way possible

Middle School Science Standards

Arizona Science Standards - 8th Grade

Three Dimensions of Science

Sensemaking in science occurs with the integration of three essential dimensions.

Science and Engineering Practices

- ask questions and define problems
- develop and use models
- plan and carry out investigations
- analyze and interpret data
- use mathematics and computational thinking
- construct explanations and design solutions
- engage in argument from evidence
- obtain, evaluate, and communicate information

Crosscutting Concepts

- patterns
- cause and effect
- structure and function
- systems and system models
- stability and change
- scale, proportion, and quantity
- energy and matter

Core Ideas

Core Ideas for Knowing Science

Physical Science

P1: All matter in the Universe is made of very small particles.

P2: Objects can 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 amount of energy in a closed system is always the same but can be transferred from one energy store to another during an event.

Earth and Space Science

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.

Life Science

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

L2: Organisms require a supply of energy and materials for which they often depend on, or compete with, other organisms.

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.

Core Ideas for Using Science

Physical Science Standards

Students apply stability and change to explore chemical properties of matter and chemical reactions to further understand energy and matter.

8.P1U1.1	Develop and use a model to demonstrate that atoms and molecules can be combined or rearranged in chemical reactions to form new compounds with the total number of each type of atom conserved.
8.P1U1.2	Obtain and evaluate information regarding how scientists identify substances based on unique physical and chemical properties.
8.P4U1.3	Construct an explanation on how energy can be transferred from one energy store to another.
8.P4U1.4	Develop and use mathematical models to explain wave characteristics and interactions.
8.P4U2.5	Develop a solution to increase efficiency when transferring energy from one source to another.

Earth and Space Science Standards

Students explore natural and human-induced cause-and-effect changes in Earth systems over time.

8.E1U1.6	Analyze and interpret data about the Earth's geological column to communicate relative ages of rock layers and fossils.
8.E1U3.7	Obtain, evaluate, and communicate information about data and historical patterns to predict natural hazards and other geological events.

Life Science Standards

Students develop an understanding of patterns and how genetic information is passed from generation to generation. They also develop the understanding of how traits within populations change over time.

8.L3U1.9	Construct an explanation of how genetic variations occur in offspring through the inheritance of traits or through mutations.
8.L3U3.10	Communicate how advancements in technology have furthered the field of genetic research and use evidence to support an argument about the positive and negative effects of genetic research on human lives.
8.L4U1.11	Develop and use a model to explain how natural selection may lead to increases and decreases of specific traits in populations over time.
8.L4U1.12	Gather and communicate evidence on how the process of natural selection provides an explanation of how new species can evolve.

Key Crosscutting Concepts in 8th Grade

*Patterns; **Cause and Effect**; Scale, Proportion and Quantity; Systems and System Models; **Energy and Matter**; Structure and Function; **Stability and Change***

Phenomena are observable events that can be explained or explored. Science aims to explain the

Amphitheater Public Schools
PORTRAIT OF A GRADUATE

Middle School Deeper Dive Units…

Summer 2018: ASTA all-call for Deeper Dive Curriculum Guide Writing Committees

The Goal: Construct a total of 9 3D, Phenomena-driven, hands-on Curriculum guides; Life, Physical and Earth sciences for 6th, 7th & 8th for all MS teachers in AZ to have access

Team Amphi among the total of 9 teams selected

Lauren Marlatt, Coronado

Kyle Sutton, Wilson (currently at CDO)

Leslie Ferre, La Cima (currently in TUSD)

Pam Vandivort, Team Lead

Team Amphi was assigned the 7th grade Earth and Space Unit

Middle School Deeper Dive…

2018-2019 School Year: 3 day (Fri-Sun) in-person trainings at ADE in PHX every 6 weeks
Summer & Fall 2019: Team Amphi's Unit Guide is completed and published, but…

Fall 2020: Team Amphi completes last of the 9 Units and begins administering district-wide "Check Points" to identify strengths and opportunities for improvement within the new guide

2021-2022: All teachers provide ongoing feedback

2022-2023: Dept Heads collaborate to refine scope & sequences resources

Summer 2023: Teachers met for 3 day workshop to study the Curriculum Guides , compare AZSci data to each Unit and made adjustments for increased comprehension/scoring

Summer 2023: Team Amphi invited by ASTA

Our Goal: We do not want students to be answering questions that they have not asked/do not care about!

7th Grade Earth and Space

7.E1U1.5 Construct a model that shows the cycling of matter and flow of energy in the atmosphere, hydrosphere, (and geosphere).

Amphitheater Public Schools
PORTRAIT OF A GRADUATE

2022-2023 Middle School Science Curriculum Committee

Middle School Dept. Heads	Office of Learning and Instruction
Kellie Higgins: AMS	Robbin Arthurs: CISS
Lauren Marlatt: Coronado K-8	Pam Vandivort: Coordinator
Ethnee Taylor: Cross	
Jennifer Dresher: La Cima	
Patty Howland: Wilson K-8	

Middle School Scope and Sequence

Unit Name: Whales Used to Walk
Guiding Question: How do genetic variations occur?
Instructional Sequence 1:

What science and/or engineering content will be developed during this learning sequence? **Note:** This information comes from Tool 1	**Science and Engineering Practices**	**Core Ideas of Knowing Science**	**Crosscutting Concepts and Connections to Using Science**
	Constructing Explanations, Communicating and Gathering Evidence to Support an Argument • *Apply scientific knowledge and evidence to explain real-word phenomena, examples or events* • *Communicate scientific information and/or technical information in different formats (e.g. verbally, graphically, textually and mathematically)*	Genetic variations occur in offspring through the inheritance of traits or through mutations; Advancements in technology have furthered the field of genetic research which have had positive and negative effects on human lives • *Genes are located in the chromosomes of cells. Variations of inherited traits between parent and offspring arise from genetic differences that result from the subset of chromosomes inherited or from mutations; Some changes are beneficial, others harmful, and some neutral*	Cause and Effect • *Cause and effect relationships may be used to predict phenomena designed sy* Stability and Chan • *Small chan part of a sys cause large another par*
What connections will be made? **Note:** This information comes from Tool 1	**Connect to Prior Knowledge 7th Grade L1/Cells are the basic structural and functional unit of all living thin** • *Cells divide to replace aging cells and to make more cells in growth and reproduction.* **Connect to Prior Knowledge 7th Grade L1/Cells, tissues and organ systems maintain life.** • *Some cells in multicellular organisms are specialized.*		
Standards **Note:** This information comes from Tool 1	**8.L3U1.9** *Construct an explanation of how genetic variations occur in offspring through the inheritance of traits or thro mutations.* **8.L3U3.10** *Communicate how advancements in technology have furthered the field of genetic research and use evidenc an argument about the positive and negative effects of genetic research on human lives.*		

HO 3-7

Unit 2/Physical Science:

Learning Sequence : 1

Arizona State Science Standard(s) (AzSS):

8.P1U1.2: Obtain and evaluate information regarding how scientists identify substances based on unique physical and chemical properties.

8.P1U1.1: Develop and use a model to demonstrate that atoms and molecules can be combined or rearranged in chemical reactions to form new compounds with the total number of each type of atom conserved.

Big Idea: Substances can be identified using properties and all matter is conserved.

Guiding Question: How are physical and chemical characteristics contributing to the phenomenon of Lake Natron in Tanzania?

Competency:

Phenomenon: Lake Natron's characteristics

AMPHITHEATER Public Schools

Middle School Science Proficiency Scales

Proficiency Scale	
Priority Standard: **6.P1U1.1** Analyze and interpret data to show that changes in states of matter are caused by different rates of movement of atoms in solids, liquids, and gasses (Kinetic Theory).	
No Attempt Made **0**	No evidence
Minimally Proficient **1**	I understand that some matter changes states (solid, liquid, gas), but do not know why this happens.
Partially Proficient **2**	I understand that matter changes states (solid, liquid, gas), but cannot fully explain why this happens.
Proficient **3**	I can use data to explain that the movement of atoms causes matter to change states (solid, liquid, gas).
Highly Proficient **4**	I can use data to explain that the movement of atoms causes matter to change states (solid, liquid, gas) and support my explanation using multiple real-world examples, models, and/or scientific vocabulary.

AMPHITHEATER
Public Schools

2023-2024 Middle School Science Goals

Ongoing collaboration and support

Training and supporting new teachers

Renaming Unit files and posting to Share Point

Our guide is a living document that will require periodic updating as science and technology evolves

Keep a close watch on Standards, as the explanatory language has changed in some areas

2023-2024: Development of proficiency benchmark performance assessments that are modeled after the AzSCI format

AMPHITHEATER
Public Schools

High School Science

Biology, **Chemistry**, **Physics**

AzSci (Grade 11):

¼ Biology; ¼ Chemistry; ¼ Physics; ¼ Earth & Space Science

Amphi's plan: Incorporate Earth & Space standards into Biology, Chemistry and Physics (Leadership team makes suggestions, receives feedback from entire team, adjust according to collaborative results)

2022-2023 High School Science Curriculum Committee

High School Dept. Heads	Office of Learning and Instruction
Matt Haverty: AHS	Valerie Wirth: CISS
Jill Christman: CDO	Pam Vandivort: Coordinator
Paul DesJarlais: IRHS	

High School Science

Earth and Space Standards into Biology

Topic/Unit: Ecology and Energy	Suggested Time Frame:
Overarching topic: Organisms require a supply of energy and materials for which they often depend on, or compete with, other organisms.	Quarter #days to complete
Priority Clusters and Standards	**Supporting Standards:**
HS.L2U1.19 Develop and use models that show how changes in the transfer of matter and energy within an ecosystem and interactions between species may affect organisms and their environment. **HS.L2U1.21** Obtain, evaluate, and communicate data showing the relationship of photosynthesis and cellular respiration; flow of energy and cycling of matter. **HS.L2U1.21** Obtain, evaluate, and communicate data showing the relationship of photosynthesis and cellular respiration; flow of energy and cycling of matter. **HS. E1.U1.11** Analyze and interpret data to determine how energy from the Sun affects weather patterns and climate **HS. E1.U3.14** Engage in argument from evidence about the availability of natural resources, occurrence of natural hazards, changes in climate, and human activity and how they influence each other.	**HS+B.L2U1.3** Use mathematics and computational thinking to support claims for the cycling of matter and flow of energy through trophic levels in an ecosystem. **HS+B.L2U1.8** Develop and use models to develop a scientific explanation that illustrates how photosynthesis transforms light energy into stored chemical energy and how cellular respiration breaks down macromolecules for use in metabolic processes. **HS+B.L2U1.1** Develop a model showing the relationship between limiting factors and carrying capacity, and use the model to make predictions on how environmental changes impact biodiversity **HS+B.L4U1.2** Engage in argument from evidence that changes in environmental conditions or human interventions may change species diversity in an ecosystem **HS+E.E1U1.1** Construct an explanation based on evidence for how the Sun's energy transfers between Earth's systems

AMPHITHEATER Public Schools

High School Science

Earth and Space Standards into Chemistry

Overarching topic: The Universe is made up of matter.	Semester 1	
Priority Clusters and Standards:	**Supporting Standards:**	
HS.P1U1.1 Develop and use models to explain the relationship of the structure of atoms to patterns and properties observed within the Periodic Table and describe how these models are revised with new evidence. **HS. E1.U3.14** Engage in argument from evidence about the availability of natural resources, occurrence of natural hazards, changes in climate, and human activity and how they influence each other. **HS.P1U3.4** Obtain, evaluate, and communicate information about how the use of chemistry related technologies have had positive and negative ethical, social, economic, and/or political implications. **HS.P4U1.8** Engage in argument from evidence that the net change of energy in a system is always equal to the total energy exchanged between the system and the surroundings. **HS. E1.U3.14** Engage in argument from evidence about the availability of natural resources, occurrence of natural hazards, changes in climate, and human activity and how	**HS+C.P1U1.1** Develop and use models to demonstrate how changes in the number of subatomic particles (protons, neutrons,electrons) affect the identity, stability, and properties of the element. **HS+C.P1U1.2** Obtain, evaluate, and communicate the qualitative evidence supporting claims about how atoms absorb and emit energy in the form of electromagnetic radiation. **HS+C.P1U3.8** Engage in argument from evidence regarding the ethical, social, economic, and/or political benefits and liabilities of fission, fusion, and radioactive decay.	

AMPHITHEATER Public Schools

High School Science

Earth and Space Standards into Physics

Topic/Unit:- Energy Use	Suggested Time Frame:
Overarching topic: Use of Energy	**Semester 2**
Priority Clusters and Standards:	**Supporting Standards:**
HS.P4U1.8 Engage in argument from evidence that the net change of energy in a system is always equal to the total energy exchanged between the system and the surroundings. **HS.P4U3.9** Engage in argument from evidence regarding the ethical, social, economic, and/or political benefits and liabilities of energy usage and transfer. **HS.E1U1.12** Develop and use models of the Earth that explains the role of energy and matter in Earth's constantly changing internal and external systems (geosphere, hydrosphere, atmosphere, biosphere).	**HS+Phy.P4U1.6** Analyze and interpret data to quantitatively describe changes in energy within a system and/or energy flows in and out of a system. **HS+Phy.P4U2.7** Design, evaluate, and refine a device that works within given constraints to transfer energy within a system. **HS+Phy.P4U1.8** Use mathematics and computational thinking to explain the relationships between power, current, voltage, and resistance.

AMPHITHEATER Public Schools

High School Science Proficiency Scales

Proficiency Scale	
HS+Phy.P3U1.4 Engage in argument from evidence regarding the claim that the total momentum of a system is conserved when there is no net force on the system.	
No Attempt Made **0**	No evidence
Minimally Proficient **1**	Students can follow an argument from evidence regarding the claim that the total momentum of a system is conserved when there is no net force on the system.
Partially Proficient **2**	Students will identify evidence regarding the claim that the total momentum of a system is conserved when there is no net force on the system.
Proficient **3**	Students will engage in argument from evidence regarding the claim that the total momentum of a system is conserved when there is no net force on the system.
Highly Proficient **4**	In addition to Proficient 3, the student demonstrates in depth inferences and applications that go beyond what was taught.

AMPHITHEATER
Public Schools

2023-2024 High School Science Goals

- Collaborative work to establish resource materials to support each standard
- Collaborative work to create District performance assessments
- Monitor and adjust ES inclusion standards as AzSCI scores indicate

AMPHITHEATER Public Schools

Questions?