AMPHITHEATER ELEMENTARY SCIENCE CURRICULUM

6/30/2015

Kindergarten

The following pages provide guidance to teachers when implementing science instruction in Amphitheater Elementary Schools. This guide will be revised regularly to ensure alignment with current Arizona State Standards and the requirements of the district.

FORWARD

Dear Teachers and Administrators,

One of the best ways to engage children in their learning and in the world around them is to provide hands-on opportunities to learn and actually "do" science. Science and engineering education is more important than ever. Becoming college and career ready not only involves gaining factual knowledge, it also involves teaching children to question, explore, build, collaborate, explain, analyze, think critically and creatively, and communicate. Science provides the opportunity for all children to be engaged and solve problems which require these skills.

Over the past two years we have implemented new curriculum in the areas of reading and mathematics. Both of these curriculum areas are critical to student success. Science skills and processes give students real situations to apply what they have learned in reading, writing, and mathematics. Technical writing is necessary when students record their observations, record their analysis of data, and develop conclusions and reports. Integration of the subject areas is critical.

A committee of district teachers met over the past six months to discuss science in our schools, review the Arizona Science Standards, make recommendations regarding the teaching of science, discuss the need for materials, and to develop a science curriculum framework for our schools. According to the committee's analysis, science instruction is scarce in most elementary classrooms, if taught at all. There are classrooms where science is taught regularly. This was a pleasant finding. **The committee is recommending that science be taught a minimum of 90 minutes per week for all students beginning with the 2015-2016 school year.**

A common question is, "How will we fit this in?", or, "What should we give up?" in order to teach science. *You will be given the flexibility to reduce some of the time spent on reading and/or math in order to teach science.* Many creative scheduling ideas have come up when teachers begin to talk about how to fit the teaching of science into the day/week.

We introduce the **Amphitheater Elementary Science Curriculum** guides. These guides lay out the Arizona Science Standards by grade level, list important academic vocabulary in science, give suggestions for materials and resources and provide many other details for teachers as they prepare their science instruction. We added engineering standards to our curriculum because we know that this type of thinking and "doing" is an important part of STEM education. Inquiry and the Engineering Design Process are the two main threads from Kindergarten through fifth grade. The new curriculum guides will be available electronically and in print. Each school will be scheduling a time to review and discuss the guides, allocate time and resources toward science, and to inventory their science materials.

The guides are not all inclusive. There are many more resources in the community that are not listed, and many more materials that are very effective and practical. We hope to add to these as teachers contribute what they use in their classrooms.

Thank you for all you do to teach science to our youngest scientists!

Sincerely,

Dr. Roseanne Lopez, Chief Academic Officer Elementary Education

Amphitheater Elementary Science Curriculum Plan	
Grade: K-2	**Strand: 1 Inquiry Process (Science Lab)**

Enduring Understandings (Big Idea)

Inquiry is the scientific process used to conduct a complete investigation which is embedded into all areas of science.

Essential Questions

What is the process for conducting an investigation?
What evidence should be in a science journal during a complete investigation?
How do we use scientific investigations to find answers to questions?

Understanding the Content of this Standard	Essential Knowledge, Skills, and Processes
1. Identify a problem	• Make **observations** using multiple senses • Ask questions about a simple problem • Collect **research/**information • **Predict** the **results** in a **hypothesis** (using "if-then" language)
2. Scientific testing	• Demonstrate safe behavior and appropriate procedures • Find and list materials and tools • With guidance list the complete steps to conduct the **investigation** • Participate in the **investigation** • Make **observations** and measurements • Record **data** in a **data chart** (chart, table, list, log)
3. Analyze data and draw conclusions	• Organize the data into **graphs** (bar, pictograph, tally chart) • **Interpret** the results of the data • **Compare** the results to the **hypothesis** • Generate **questions** for possible future **investigations**
4. Communication	<u>Explain the results</u> • Create a display of the complete **investigation** • Include a science journal with all parts of the **inquiry process** including **research**, testing, and **analysis** • Present the results with others (classroom, grade level,

	Science Fair)

Science Vocabulary
inquiry, question, scientific process, experiment, investigation, opinion, hypothesis, observations, data chart, graphs, results, compare, communication, research, predict, data, models, patterns, conclusion, evidence, classify, sequence, label, diagram, etc.

Assessment
Research report Science Fair projects (individual, group, or class) Interpretation and evaluation of data and graphs to answer the relevant question Science journal showing reflections throughout the inquiry process Presentation of the complete inquiry process Teacher observation

Materials	**Resources and Ideas**
Research materials specific to each design	Research sites for kids: • www.factmonster.com • www.kidsclick.org • www.ipl.org/div/kidspace • www.kidrex.org www.sciencebuddies.org/ www.sarsef.org/ *(volunteers are available through SARSEF)* www.powershow.com/view/26bf93-Mzg0N/LPS_Science_Fair_Bill_Nye_the_Science_Guy_powerpoint_ppt_presentation FOSS kits Engineering is Elementary units Teachers Pay Teachers BrainPop

Amphitheater Elementary Science Curriculum Plan	
Grade: K	**Strand: 4 Life Sciences**

Enduring Understandings (Big Idea)

Understand the characteristics of living things and how they change over time.

Essential Questions	
What are the parts of the human body? How do we use our senses? How do children resemble their parents? What do animals look like? What do they need to survive? What types of animals thrive in Arizona? How do they change as they get older?	What does a plant need to grow? What tools can I use to grow my plant? What types of plants will grow in Arizona? What will my plant be like when it's grown? How can I record my results? What do plants grow from? Who takes care of our plants, grass, and trees?

Understanding the Knowledge and Content of this Standard	Essential Skills and Processes
Distinguish between living things and nonliving things- living things need **water, food, air,** and change over time	**Compare and contrast** living and nonliving things.
The parts of the human body are – **head, shoulders, arms, elbows, wrists, hands, fingers, legs, hips, knees, ankles, feet, heels,** and **toes.**	**Identify** parts of the human body. **Investigate** the functions of different human structures.
The parts of a plant are – **roots, stem, leafs,** and **flowers.**	**Identify** parts of a plant. **Investigate** the functions of different plant structures.
The five senses are – **sight, hearing, smell, taste,** and **touch.**	**Investigate** the five senses and their related body parts.
Most plants and animals will grow to physically resemble their parents.	**Compare and contrast** the difference between young and old.
There are plants and animals that exist in the local environment.	**Identify** local plants and animals.
Plants and animals need the following to grow – **food, water, air,** and **space**	**Identify** that plants and animals have needs to survive.
There are changes in a small system (ant farm, plant terrarium, aquarium)	**Describe** changes observed in a small system.
Simple tools can make a task easier such as a **shovel, rake,** and **watering can** K.SC.3.2.1	**Investigate** how simple tools can help when planting and caring for plants.
Diverse people use science daily K.SC.2.1.1	**Identify** community helpers that work with people, plants, and animals.
Diverse people make /made important contributions to scientific innovation K.SC.2.1.2	**Identify** scientists and inventors who have contributed to scientific innovation with people, plants, and animals.

Science Vocabulary		
Human Body Head Shoulders Arms Elbows Wrists Hands Fingers Legs Hips Knees Ankles Feet Heels Toes Senses Eyes - Sight Ears - Hearing Nose - Smell Tongue - Taste Skin - Touch	Animals Different Coverings Movements Predator/Prey Habitats Names for youth vs. adult Basic Needs Food Water Air Space Community Helpers Gardener Grounds Keeper Zoo Keeper Doctor Nurse Dentist	Plant Parts Seed Seed Coat Stem Leafs Flower Basic Plant Needs Soil Water Sunlight Air Tools Shovel Rake Watering Can

Assessment	
Class discussion and participation	Plant journal
Informal record of responses	Writing journal

Materials and Resources	
Resources: Concept Books Student recording sheet Reading Street Extend your day Scholastic Let's Find Out Dr. Jean Harry Kindergarten National Geographic for Kids	Field Trip: Reid Park Zoo Apple Orchard Local farm
Materials: Student recording sheet Concept Maps Journal Pages Outdoor growing area	Activities: Grow sunflowers for Mother's Day Draw and write animal facts Colored water for carnations Hands on Learning – apples/senses Self-Portraits

Amphitheater Elementary Science Curriculum Plan	
Grade: K	**Strand: 5 Physical Science**

Enduring Understandings (Big Idea)

Understanding the characteristics and materials of objects.

Essential Questions

How are objects different in shape, texture, and size, type of material, color, and position?
How do we describe objects by shape, texture, size, type of material, color, and position?
What effects how things move?
How can I investigate different forms of energy to make things move?

Understanding the Knowledge and Content of this Standard	Essential Skills and Processes
Observable properties of objects using the senses are - **shape, texture, size,** and **color**	**Investigate** the properties of objects using senses.
Observable properties are – **size, color,** and **type of material**	**Investigate** the properties of objects.
Spatial relationships of objects are – **above, below, next to, left, right, middle,** and **center**	**Identify** the relationship of two or more objects using appropriate vocabulary.
Applied forces can make things move – **push** and **pull**	**Investigate** forces through push and pull.
Forces can make things move without another thing touching them – **magnets, static electricity**	**Investigate** forces that can make objects move without touch.
Some things are **attracted** by magnets	**Identify** materials that are attracted to magnets.
There are daily uses for magnets	**Identify** daily objects that use magnets.
Diverse people make /made important contributions to scientific innovation K.SC.2.1.2	**Identify** scientists and inventors who have contributed to scientific innovation

Science Vocabulary

<u>Properties</u>	<u>Force</u>
Shape	Push
Texture	Pull
Size	Magnets
Color	Static Electricity
	Attract
<u>Relationships</u>	Repel
Above	Incline
Below	Distance
Next to	
Left	
Right	
Middle	
Center	

Assessment	
Class discussion and participation	End of chapter assessments in mathematics
Informal record of responses	
Materials and Resources	
Resources: Concept books Teachers Pay Teachers Harry Kindergarten Math Curriculum Shapes in the real world Sheep in a Jeep Dr Jean	Activities: Stem magnet kit Stem motion kit Attribute block activities Building
Materials: Pages out of magazines Magnets Ramps with cars Air Popcorn Poppers Outdoor Slide Balloons Marbles	

Amphitheater Elementary Science Curriculum Plan	
Grade: K	**Strand: 6 Earth and Space**

Enduring Understandings (Big Idea)

The Earth has structure and a place within the solar system and universe.

Essential Questions

What are some of the observable materials of Earth?
What is the difference between natural and man-made objects?
What types of things can be reused or recycled?
What is temperature?
How does weather affect us?
What are the different types of weather?
Who informs us about the weather?

Understanding the Knowledge and Content of this Standard	Essential Skills and Processes
Basic Earth materials – **rocks, soil,** and **water**	**Investigate and identify** different materials
Basic Earth materials have physical properties – **color, texture,** and **capacity to retain water**	**Investigate** the physical properties
Objects are **natural** or **man-made**	**Compare and Contrast** natural verses man-made materials
Objects can be **reused** or **recycled**	**Identify** objects that can be reused or recycled
Weather has different aspects – **temperature, wind, precipitation,** and **storms**	**Identify** different types of weather
There are observable changes in weather	**Investigate** weather changes
Weather affects people's daily activities	**Describe** how changes in weather affect people in their daily activities
Simple tools can make a task easier K.SC.3.2.1	**Investigate** how simple tools can be used
Diverse people use science daily K.SC.2.1.1	**Identify** community helpers
Diverse people make /made important contributions to scientific innovation K.SC.2.1.2	**Identify** scientists and inventors who have contributed to scientific innovation

Science Vocabulary

Rocks	Temperature – thermometer
Soil	Wind
Water	Precipitation
Color	Storms
Texture	Weather
Capacity	Thunder
Natural	Lightning
Man-made	Fog
Reuse	Snow
Recycle	Wind
	Rain
	Clouds
	Monsoon

Assessment	
Class discussion and participation	Informal record of responses
Materials and Resources	
Resources: Concept Books Student recording sheet Reading Street Extend your day Scholastic Let's Find Out Teachers Pay Teachers	Materials: Outdoor Space/Playground Thermometer Magnifying glasses Recycle Bins/Recyclables

Amphitheater Elementary Science Curriculum Plan	
Grade: K-5	**Engineering Design Process**

Enduring Understandings (Big Ideas)

- Defining and Delimiting Engineering Problems
- Developing Possible Solutions
- Optimizing the Design Solution

Essential Questions

How might we define a simple design problem reflecting a need or a want?

What are the constraints/criteria?

How might we generate and compare possible solutions to a problem?

How might we plan and carry out fair tests?

How might we improve upon our design?

Understanding the Content of this Standard	Essential Skills and Processes
Students will be able to use the **Design Process.** *(italics denote K-2 language)*	**Design Process:** Students will understand how technology solves problems and makes work easier. Identify the problem (*Ask)* Do research Develop possible solutions *(Imagine)* Choose one solution Design and construct a prototype *(Plan and Create)* Test the prototype *(Test)* Evaluate and redesign *(Improve)* Communicate results
Identify the problem (*Ask)* ***Research*** Find a design problem, based on the fact that peoples' needs and desires change over time as well as their demand for new technologies.	• Identify & create a solvable **design problem/need/want** • Explain why that problem is relevant • Conduct research
Create or identify criteria for success and	• Understand & explain that there are

constraints.	**constraints** on **material**, **time** and **costs**
Develop possible solutions *(Imagine)* Generate and compare possible solutions to a problem.	• Work within the criteria while **generating** possible **solutions** • Judge solutions against constraints • Identify solution(s) that best fits problem
Design and construct a prototype *(Plan and Create)* Plan the model or prototype based on chosen solution(s). Create the model prototype.	• Design a **model**. • Communicate the design of a model (written on paper, whiteboard, or computer software, etc.) • Construct a model using available resources.
Test the prototype *(Test)* Design and conduct fair tests with controlled variables.	• Plan and conduct **fair tests** using **prototypes** • **Control variables** • Consider **failure points** found through testing
Evaluate and redesign *(Improve)* Evaluate & redesign model.	• Use failure points to identify parts of a model that can be improved • Make changes to the model (**redesign**). • Repeat testing process
Communicate results Communicate results.	• Explain your results using data • Gather input from peers • Describe successes and failures • Suggest improvements based on the criteria and failure points
History of Engineering and Innovation	
How have individuals contributed to engineering innovations?	• Research the various contributions of scientists and innovators in this field (e.g., Wilber and Orville Wright, Leonardo da Vinci, Thomas Edison, Benjamin Franklin, Steve Jobs, Bill Gates, Mary Anderson-windshield wiper, George de Mestral-velcro, Alan Turing-computer science/cryptologist, Hedy Lamarr- basis for wi-fi). • Describe how science, engineering and technology have improved the lives of people. • Critique the benefits and risks related to the use of technology. • Investigate careers related to engineering & design.
Science Vocabulary	
prototype, model, design, process, predict, evaluate, technology, record, research, create, problem, solution, design problem, want, need, individual, community, global, technology, criteria, constraints, materials, cost, generate, compare, options, reasonable, plan, blueprints, investigate, variable, fair test, control, failure points, redesign	

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<tr><th colspan="2">Assessment</th></tr>
<tr><td>Formative</td><td>Summative</td></tr>
<tr><td>Reflections
Center activities (teacher observation)
Engineering Journals</td><td>Performance assessment
Presentation of design</td></tr>
<tr><th>Materials</th><th>Resources</th></tr>
<tr><td>Engineering is Elementary Units
Various materials for making models and prototypes</td><td>Discovery Education
Reading Street Leveled Readers (on-line)
Reading A-Z leveled readers
Khan Academy
http://www.sciencekids.co.nz/engineering.html
www.teachengineering.org
http://www.childrensengineering.org/
http://www.childrensengineering.com/freeresources.htm
https://www.teachengineering.org/googlesearch_results.php
http://betterlesson.com/lesson/620237/the-wonderful-towers-of-watts-building-background-knowledge?grade=14&subject=2&from=bl_directory_no-keywords_second-grade_technology-and-engineering_mt-lesson_620237_title
http://www.engr.ncsu.edu/theengineeringplace/educators/k8plans.php
https://drive.google.com/folderview?id=0Bzm8D1yH2vdZXzlERWhDYTFFLXc&usp=sharing
YouTube videos
Nasa For Kids: Intro to Engineering
The Engineering Process: Crash Course Kid
National Science Foundation Resources: https://www.nsf.gov/news/classroom/engineering.jsp
Teachers Pay Teachers</td></tr>
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