BLACKHAWK SCHOOL DISTRICT

Course: **STEAM**
Grades: **4**
Periods per week: One
Authors: **Barb Brown**
Date: **2015-2016**

MISSION STATEMENT:

The goal of STEAM education is to develop within students an interest in STEAM subjects at an early age. This should be beneficial to them when they enter the jobs market, and in turn it should benefit the greater economy.

COURSE DESCRIPTION:

STEAM is designed to introduce basic science, technology, engineering, arts, and math concepts for problem solving and everyday use. This course challenges students to use the design process, Ask, Imagine, Plan, Create and Test, and Improve to think/create beyond the first possible solution, to persevere in their process and to create an end product that goes beyond the bare minimum.

PA Common Core Standards for Reading and Writing in Science and Technical Subjects:

Pennsylvania Department of Education has released standards that describe what students in the science and technical subjects' classrooms should know and be able to do with the English language in reading and writing, grade 3 through 12. The standards provide the targets for instruction and student learning essentials for success in all academic areas, not just language arts classrooms. Although the standards are not a curriculum or a prescribed series of activities, Blackhawk School District has used them to develop this science curriculum.

ESSENTIAL QUESTIONS:

Essential questions are the heart of the curriculum. Essential questions are conceptual commitments that teachers will use to guide instructional decision-making. In addition, they are kid friendly so that students can easily understand them. Essential questions are meant to be shared with students in either discussion or posting in the classroom. Essential questions provide the focus for teaching and learning. The following are the Essential Questions for this class:

Assessing Essential questions is key to a robust curriculum. If Essential Questions are the focal point of learning, how then do we assess students? The following is an overview of recommended assessments to the Essential Questions. In addition, Differentiated learning opportunities are embedded as well.

ROBUST VOCABULARY

Robust vocabulary words are Tier 2 words, meaning that they are complex, powerful, and generalizable. Robust vocabulary words support language development of both lower and high level learners. In addition, robust vocabulary instruction helps prepare students for SATs, upper level high school classes, and college. "Studies showed that robust instruction was quite effective not only for learning the meanings of words but also for affecting reading comprehension." (p. 2 *Bringing Words to Life*)

Teachers are asked to commit to teaching and students USING these words throughout the entire year. Using a variety of instructional strategies, students will learn the meaning of these words in a deep and meaningful way in this content and across other content areas.

Standard Category_____ Standards: Anchor	Essential questions [EQ?] Essential Question Assessment.{EQA]	Proposed labs Including examples with the understanding the projects will change but projects will continue to meet the standards.	Resources / Materials
Science Technology and Engineering **Grade 4** 3.1.4.A1 **Classify plants and animals according to the physical characteristics that they share.** 3.1.4.A2 **Describe the different resources that plants and animals need to live.** 3.1.4.A3 Identify differences in the **life cycles** of plants and animals. 3.1.4.A5 **Describe common functions living things share to help them function in a specific environment.** 3.1.4.A8 MODELS Construct and interpret **models** and diagrams of various animal and plant **life cycles.** 3.1.4.A9 • **Distinguish between scientific fact and opinion.** • **Ask questions about objects, organisms, and events.** • **Understand that all scientific investigations involve asking and answering questions and comparing the answer with what is already known.** • **Plan and conduct a simple investigation and understand that different questions require different kinds of investigations.** • **Use simple equipment (tools and other technologies) to gather data and understand**	[EQ] What allows some populations of organisms to change and survive while others cannot?	Horticulture Project Plant and Animal Unit- Including but not limited to: Germination/Planting/Pollination/Hays Eagles Insect Project Observation/Recording Sheet	Grounds at BIS Seeds/Seedlings and planting medium Internet Access Teacher created materials/Discussion

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that this allows scientists to collect more information than relying only on their senses to gather information. • **Use data/evidence to construct explanations and understand that scientists develop explanations based on their evidence and compare them with their current scientific knowledge.** • **Communicate procedures and explanations giving priority to evidence and understanding that scientists make their results public, describe their investigations so they can be reproduced, and review and ask questions about the work of other scientists.** 3.1.B: Genetics 3.1.4.B1 **Describe features that are observable in both parents and their offspring.** 3.1.4.B2 **Recognize that reproduction is necessary for the continuation of life.** 3.1.4.B5 PATTERNS Identify observable patterns in the physical characteristics of plants or groups of animals. 3.1.4.B6 • **Distinguish between scientific fact and opinion.** • **Ask questions about objects, organisms, and events.** • **Understand that all scientific investigations involve asking and answering questions and**	[EQ] What allows some populations of organisms to change and survive while others cannot?	Horticulture Project Plant and Animal Unit- Including but not limited to: Germination/Planting/Pollination/Hays Eagles Insect Project	Grounds at BIS Plant sprouting/planting/care Frugal Fun for Boys

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comparing the answer with what is already known. • **Plan and conduct a simple investigation and understand that different questions require different kinds of investigations.** • **Use simple equipment (tools and other technologies) to gather data and understand that this allows scientists to collect more information than relying only on their senses to gather information.** • **Use data/evidence to construct explanations and understand that scientists develop explanations based on their evidence and compare them with their current scientific knowledge.** • **Communicate procedures and explanations giving priority to evidence and understanding that scientists make their results public, describe their investigations so they can be reproduced, and review and ask questions about the work of other scientists.** 3.2.4.B1 **Explain how an object's change in motion can be observed and measured.** 3.2.4.B2 **Identify types of energy and their ability to be stored and changed from one form to another.** 3.2.4.B3 **Understand that objects that emit light often emit heat.** 3.2.4.B4	[EQ]How could you demonstrate that a force can change an object's motion (speed or direction)?	Inertia Experiments – Bowling Bottle Electric and Sound exploration	Teacher Designed Material Balls of varying sizes Observation and experiment recording sheets Teacher created materials Circuit Boards

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Apply knowledge of basic electrical circuits to the design and construction of simple direct **current** circuits. Compare and contrast series and parallel circuits. Demonstrate that magnets have poles that repel and attract each other. 3.2.4.B5 Demonstrate how vibrating objects make sound and sound can make things vibrate. Demonstrate how light can be reflected, refracted, or absorbed by an object. 3.2.4.B7 • **Distinguish between scientific fact and opinion.** • **Ask questions about objects, organisms, and events.** • **Understand that all scientific investigations involve asking and answering questions and comparing the answer with what is already known.** • **Plan and conduct a simple investigation and understand that different questions require different kinds of investigations.** • **Use simple equipment (tools and other technologies) to gather data and understand that this allows scientists to collect more information than relying only on their senses to gather information.** • **Use data/evidence to construct explanations and understand that scientists develop explanations based on their evidence and compare them with their current scientific knowledge.**		Bubble Show Project	Expanding Engineering is Elementary to solve real work problems.

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• **Communicate procedures and explanations giving priority to evidence and understanding that scientists make their results public, describe their investigations so they can be reproduced, and review and ask questions about the work of other scientists.** **3.1.C: Evolution** 3.1.4.C1 Identify different characteristics of plants and animals that help some populations survive and reproduce in greater numbers. Describe how environmental changes can cause **extinction** in plants and animals. 3.1.4.C2 **Describe plant and animal adaptations that are important to survival.** 3.1.4.C3 CONSTANCY AND CHANGE Compare fossils to one another and to currently living organisms according to their anatomical similarities and differences. 3.1.4.C4 • **Distinguish between scientific fact and opinion.** • **Ask questions about objects, organisms, and events.** • **Understand that all scientific investigations involve asking and answering questions and comparing the answer with what is already known.**		Insect Project/Hays Eagles	Frugal Fun for Boys Internet Access

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• **Plan and conduct a simple investigation and understand that different questions require different kinds of investigations.** • **Use simple equipment (tools and other technologies) to gather data and understand that this allows scientists to collect more information than relying only on their senses to gather information.** • **Use data/evidence to construct explanations and understand that scientists develop explanations based on their evidence and compare them with their current scientific knowledge.** • **Communicate procedures and explanations giving priority to evidence and understanding that scientists make their results public, describe their investigations so they can be reproduced, and review and ask questions about the work of other scientists.** • **3.2.A: Chemistry** 3.2.4.A1 Identify and classify objects based on their observable and measurable physical properties. Compare and contrast solids, liquids, and gases based on their properties. 3.2.4.A2 **Demonstrate that materials are composed of parts that are too small to be seen without magnification.** 3.2.4.A3 Demonstrate the conservation of **mass** during physical changes such as melting or freezing. 3.2.4.A4	[EQ] How do scientists identify and sort materials?	Physical Properties Mass/Weight activities Atom Video Microscope activities States of Matter Activities Melting/Freezing	Teacher created materials Balances Gram Weights Varied items to measure Recording Sheet Bill Nye Atom Video

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Recognize that combining two or more substances may make new materials with different properties. 3.2.4.A5 <u>MODELS</u> Use models to demonstrate the physical change as water goes from liquid to ice and from liquid to vapor. 3.2.4.A6 • **Distinguish between scientific fact and opinion.** • **Ask questions about objects, organisms, and events.** • **Understand that all scientific investigations involve asking and answering questions and comparing the answer with what is already known.** • **Plan and conduct a simple investigation and understand that different questions require different kinds of investigations.** • **Use simple equipment (tools and other technologies) to gather data and understand that this allows scientists to collect more information than relying only on their senses to gather information.** • **Use data/evidence to construct explanations and understand that scientists develop explanations based on their evidence and compare them with their current scientific knowledge.** • **Communicate procedures and explanations giving priority to evidence and understanding that scientists make their results public, describe their investigations so they can be**		Recording Sheet completion/review	Video clips Recording Sheet Standard/customary/metric measurement tools for capacity, distance, weight

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reproduced, and review and ask questions about the work of other scientists. **3.2.B: Physics** 3.2.4.B1 **Explain how an object's change in motion can be observed and measured.** 3.2.4.B2 **Identify types of energy and their ability to be stored and changed from one form to another.** 3.2.4.B3 **Understand that objects that emit light often emit heat.** 3.2.4.B4 Apply knowledge of basic electrical circuits to the design and construction of simple direct **current** circuits. Compare and contrast series and parallel circuits. Demonstrate that magnets have poles that repel and attract each other. 3.2.4.B5 Demonstrate how vibrating objects make sound and sound can make things vibrate. Demonstrate how light can be reflected, refracted, or absorbed by an object. 3.2.4.B6 ENERGY Give examples of how energy can be transformed from one form to another. 3.2.4.B7 • **Distinguish between scientific fact and opinion.**	[EQ] How does energy change from one form to another as it moves through a system? [EQ]What is the evidence that magnets and electricity produce forces?	Inertia Experiments – Bowling Bottle Electric and Sound exploration Magnets and Motion Electric and Sound exploration Insect project	Teacher Designed Material Balls of varying sizes Observation and experiment recording sheets Circuit Board Kits Teacher created materials Design magnetically driven device Engineering Design Model Circuit Board Kits Electrical wiring/batteries/insect construction supplies Mathematical Art-O-Facts by: Kuhns

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• **Ask questions about objects, organisms, and events.** • **Understand that all scientific investigations involve asking and answering questions and comparing the answer with what is already known.** • **Plan and conduct a simple investigation and understand that different questions require different kinds of investigations.** • **Use simple equipment (tools and other technologies) to gather data and understand that this allows scientists to collect more information than relying only on their senses to gather information.** • **Use data/evidence to construct explanations and understand that scientists develop explanations based on their evidence and compare them with their current scientific knowledge.** • **Communicate procedures and explanations giving priority to evidence and understanding that scientists make their results public, describe their investigations so they can be reproduced, and review and ask questions about the work of other scientists.** **3.3: Earth and Space Sciences** **3.3.A: Earth Structure, Processes and Cycles** 3.3.4.A1 Describe basic landforms. Identify the layers of the earth.		Layers of the Earth- trifold diorama	poster board/variety of different building/shading materials

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Recognize that the surface of the earth changes due to slow processes and rapid processes. 3.3.4.A2 Identify basic properties and uses of Earth's materials including rocks, soils, water, and gases of the **atmosphere.** 3.3.4.A3 **Recognize that fossils provide evidence about the plants and animals that lived long ago and the nature of the environment at that time.** 3.3.4.A4 Recognize Earth's different water resources, including both fresh and saltwater. Describe phase changes in the forms of water on Earth. 3.3.4.A5 Describe basic weather elements. Identify weather patterns over time 3.3.4.A6 <u>MODELS/SCALE</u> Identify basic landforms using models and simple maps. <u>CONSTANCY/ CHANGE</u> Identify simple changes in the earth **system** as air, water, soil and rock interact. <u>SCALE</u> Explain how basic weather elements are measured. 3.3.4.A7 • **Distinguish between scientific fact and opinion.** • **Ask questions about objects, organisms, and events.** • **Understand that all scientific investigations involve asking and answering questions and**	[EQ]	Atmospheric Layers-Atmosphere balloon Water Cycle Experiment Weather maps (http://www.scholastic.com/kids/weather/sim/game.htm)	Balloons and Markers Bill Nye Atmosphere Video Plastic bags/water Interactive weather maps/iPads/iPods/Computer lab

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comparing the answer with what is already known. • **Plan and conduct a simple investigation and understand that different questions require different kinds of investigations.** • **Use simple equipment (tools and other technologies) to gather data and understand that this allows scientists to collect more information than relying only on their senses to gather information.** • **Use data/evidence to construct explanations and understand that scientists develop explanations based on their evidence and compare them with their current scientific knowledge.** • **Communicate procedures and explanations giving priority to evidence and understanding that scientists make their results public, describe their investigations so they can be reproduced, and review and ask questions about the work of other scientists.** **3.3.B: Origin and Evolution of the Universe** 3.3.4.B1 Identify planets in our **solar system** and their basic characteristics. Describe the earth's place in the **solar system** that includes the sun (a star), planets, and many moons. Recognize that the universe contains many billions of galaxies and that each galaxy contains many billions of stars. 3.3.4.B2 SCALES	[EQ]What is the evidence that the earth's systems change?	Solar System Part of 4th grade Classroom Instruction	

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Know the basic characteristics and uses of telescopes. <u>PATTERNS/PHASES</u> Identify major lunar phases. <u>PATTERNS</u> Explain time (days, seasons) using **solar system** motions. 3.3.4.B3 • **Distinguish between scientific fact and opinion.** • **Ask questions about objects, organisms, and events.** • **Understand that all scientific investigations involve asking and answering questions and comparing the answer with what is already known.** • **Plan and conduct a simple investigation and understand that different questions require different kinds of investigations.** • **Use simple equipment (tools and other technologies) to gather data and understand that this allows scientists to collect more information than relying only on their senses to gather information.** • **Use data/evidence to construct explanations and understand that scientists develop explanations based on their evidence and compare them with their current scientific knowledge.** • **Communicate procedures and explanations giving priority to evidence and understanding that scientists make their results public, describe their investigations so they can be**	[EQ]What predictable patterns of change can be observed on and from earth?	Presentation of projects as deemed appropriate depending on project and topic. Recycling Project	Student created props for presentation Rubric designed with students Engineering is Elementary

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reproduced, and review and ask questions about the work of other scientists. **3.4: Technology and Engineering Education** **3.4.A: The Scope of Technology** 3.4.4.A1 **Understand that tools, materials, and skills are used to make things and carry out tasks.** 3.4.4.A2 **Understand that systems have parts and components that work together.** 3.4.4.A3 Describe how various relationships exist between **technology** and other fields. 3.4.B: Technology and Society 3.4.4.B1 Describe how **technology** affects humans in various ways. 3.4.4.B2 Explain how the use of **technology** affects the environment in good and bad ways. 3.4.4.B3 Explain why new **technologies** are developed and old ones are improved in terms of needs and wants. 3.4.4.B4 **Describe how the history of civilization is linked closely to technological development.** **3.4.C: Technology and Engineering Design** 3.4.4.C1	[EQ] In what ways do humans create, use, and modify technologies? [EQ] How does technological design help create inventions and innovations?	Math Art Problem Solving Project- Fractions in a Square iPod/iPad activities Engineering Project- Bubble Bonanza	Math Art-O-Facts by Kuhn Rube Goldberg App Engineering by Design Engineering Design Process

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Understand that there is no perfect **design.** 3.4.4.C2 Describe the **engineering design process**: Define a problem. Generate ideas. Select a solution and test it. Make the item. Evaluate the item. Communicate the solution with others. Present the results 3.4.4.C3 **Explain how asking questions and making observations help a person understand how things work and can be repaired.** **3.4.D: Abilities for a Technological World** 3.4.4.D1 **Investigate how things are made and how they can be improved.** 3.4.4.D2 Recognize and use everyday symbols (e.g. icons, simple electrical symbols measurement) to communicate key ideas. Identify and use simple hand tools (e.g., hammer, scale) correctly and safely. 3.4.4.D3 Investigate and assess the influence of a specific **technology** or **system** on the individual, family, community, and environment. **3.4.E: The Designed World** 3.4.4.E1 **Identify tools and devices that have been designed to provide information about a healthy lifestyle.** 3.4.4.E2 Identify the **technologies** in agriculture that make it possible for food to be available year round. 3.4.4.E3	[EQ] How do the structures and functions of living things allow them to meet their needs? [EQ] How do scientists identify and sort materials?	Engineering Project – Bubble Bonanza Physical Property Experiment Tools Expanding Soap Experiment Horticulture Project Recycling Project/Green Car	Engineering by Design Engineering Design Process Assorted Scientific Tools used with experiments Grounds at BIS Engineering is Elementary

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Identify types of energy and the importance of energy conservation. 3.4.4.E4 **Explain how information and communication systems allow information to be transferred from human to human.** 3.4.4.E5 Recognize that a transportation **system** has many parts that work together to help people travel and to move goods from place to place. 3.4.4.E6 **Identify key aspects of manufacturing processes (designing products, gathering resources and using tools to separate, form and combine materials in order to produce products).** 3.4.4.E7 **Understand that structures rest on foundations and that some structures are temporary, while others are permanent** 4.1: Ecology .1.4.A Explain how living things are dependent upon other living and nonliving things for survival. • **Explain what happens to an** organism **when its food supply, access to water, shelter or space (**niche / habitat**) is changed.** • **Identify similarities and differences between living** organisms**, ranging from single-celled to multi-cellular** organisms **through the use of microscopes, video, and other media.** 4.1.4.B Identify how **matter** cycles through an **ecosystem**.	[EQ] How does technological design help create inventions and innovations?	Recycling Project Horticulture Project Planting/Germination/Sustainability	Grounds at BIS- varied planting opportunities/seeds/seedlings

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• **Trace how death, growth, and decay cycle** matter **through an** ecosystem 4.1.4.C **Explain how most life on earth gets its energy from the sun.** 4.1.4.E Explain that **ecosystems** change over time due to natural and/ or human influences. 4.2: Watersheds and Wetlands 4.2.4.A Describe the physical characteristics of a **watershed.** • **Identify and explain what determines the boundaries of a** watershed**.** • **Identify water systems and their components as either** lotic **or** lentic. 4.2.4.B Describe the characteristics of different types of **wetlands.** 4.2.4.C Explain how freshwater **organisms** are adapted to their **environment.** • **Explain the life cycles of** organisms **in a freshwater** environment 4.2.5.A Explain the **water cycle.** 4.3: Natural Resources 4.3.4.A Identify ways humans depend on **natural resources** for survival. • **Identify resources used to provide humans with energy, food, employment, housing and water.**		Material Covered in 4th grade classroom Water Cycle Project Water cycle simulation	Info Barrel

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• **4.4: Agriculture and Society** 4.4.4.A **Describe the journey of local/global agricultural commodities from production to consumption.** 4.4.4.B Describe how humans rely on the **food and fiber system**. • **Identify Pennsylvania's important agricultural products.** 4.4.4.D Identify how **technology** affects the development of civilizations through agricultural production. 4.5: Humans and the Environment 4.5.4.A Identify how people use **natural resources** in **sustainable** and non-sustainable ways. 4.5.4.C Describe how human activities affect the **environment.** 4.5.4.D Describe a **waste stream.** **Identify sources of waste derived from the use of** natural resources. **Identify those items that can be** recycled **and those that can not.** **Describe how everyday activities may affect the** environment		Recycling Project/Green Car	Engineering is Elementary