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How to take STEM from Activities to Interdisciplinary or PBL

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How to Take STEM from Activities to Interdisciplinary or PBL



Presented by Kaija Spencer and Tanisha Taylor



Agenda/ Overview

- Science activity vs STEM activity
- STEM activity vs Interdisciplinary
- Interdisciplinary vs PBL experience
- The steps to move from one to the next

Science Activity 01

A science activity is any hands on task that provides learners the opportunity to acquire a science concept via application or process.



Fred the Fish Science activity to demonstrate the effects of water pollution.

What do our students learn from Science activities?

- Do they have a purpose during instruction?
- Does it have to be a hands on experience for every student for learning to occur?

STEM Activity 02

A STEM activity encompasses all the components of STEM (Science, Technology, Engineering, and Math). All these components are utilized in the given task to solve a problem. These task may not be completed in one day or class period.

Cane Toad Trap Engineering Design Challenge



Challenge

Congratulations! Your team was just hired as mechanical engineers to figure out a way to trap cane toads that have invaded the Okefenokee Swamp. Your design must attract or lure cane toads in a humane manner, without injuring them in the process. The trap must also not capture any other animals.

Let's compare the Science and STEM activity

- What was added to the activity?
- What would be new for the teacher? / What does the teacher need to learn?
- What do the students need to learn?

“Many special areas can contribute effectively to solving today’s problems of teaching and learning. Our common concern, no matter what the approach, is how to create a setting that will enable all specialist to devote their finest efforts toward solution of these problems”

—Dorothy McCuskey and Winifred Jensen Conaway

Interdisciplinary Activity 03

An interdisciplinary activity utilizes multiple disciplines that may include but are not limited to STEM. All these disciplines are utilized in the given task to learn about a given topic. These task may not be completed in one day or class period.

Invasive Species

Reading Integration



Standard

ELACC4RI9 – Compare and contrast the treatment of similar themes and topics and patterns of events.

EALCC4W2: Write informative/explanatory texts to examine a topic and convey ideas and information clearly.

ELACC4SL1: Engage effectively in a range of collaborative discussion (one-on-one, in groups, and teacher-led) with diverse partners on grade 4 topics and texts, building on other ideas and expressing their own clearly.

54L1d. Predict effects on a population if some of the plants or animals in the community are scarce or if there are too many.

Task

Students will demonstrate their understanding of compare and contrast by completing a short paper comparing and contrasting two different invasive species. They will identify the two different invasive species identified within the texts: (1) The Python (2) Cane Toads. They will also need to include a picture of each species and the environment in which they live.

Rubric Expectations

Exceeds	Student identified the two types of invasive species within the given texts. The student effectively compared and contrasted each species using 3-4 paragraphs including details from the texts. The student included a picture that reflects what was written.
Meets	Student identified the two types of invasive species within the given texts. The student effectively compared and contrasted each species using 1-2 paragraphs including details from the texts. The student included a picture that reflects what was written.
Do not meet the standard	Student did not identify the two types of invasive species within the given texts. The student ineffectively compared and contrasted each species from the texts. The student did not include a picture that reflects what was written.

Let's compare STEM and Interdisciplinary

- What do teachers need to learn? / What Professional Development needs will be needed?
- What instructional changes are needed?
- How do instructional meetings and conversations need to change?

Problem Based Learning Activity 04

Problem based learning is student-centered. Students typically work together in small groups to solve a problem. The solving of this problem leads to students learning more about the topic.

Redesigned Football Helmet
Engineering Design Challenge



Challenge

Congratulations! Your team was just hired as engineers to figure out a way to reduce the amount of concussions in the NFL. Your design must reduce the amount of impact to the brain when a player is hit or falls on their head.

Track and Graph

Standards: MGSE4.MD.4 and ELA6SE4W2 Line graph and Informational/Explanatory Writing



1. Research and find data about the amount of concussions over the past 5 years in the United States.
2. Record the data and plot it on the line graph.
3. Answer the question: What can you infer about the data that you recorded?
4. Create an informational ad about concussions and their risk.

Let's compare Interdisciplinary and Problem Based Learning

- What do teachers need to learn? / What Professional Development needs will be needed?
- What instructional changes are needed?
- How do instructional meetings and conversations need to change?



Activity



Classroom Example



Business as Usual

S.T.E.M.: Present



Work on your company website. Be sure your website reflects your brand and what you are trying to present to the consumer.

Helmet Madness

Standards: MSDEA.MD.3- Area and Perimeter



Remember Area= Length x Width

Perimeter= Total Length Around (+)

1. Complete the activity on area and perimeter (task cards).
2. Sketch your helmet design on the blank grid paper.
3. Find the area and the perimeter of your team's helmet.

...more of the AJC's extensive coverage on the death penalty system in Georgia at myAJC.com. From "Secrets of the death penalty" to a guide to the state's executions, take part in an interactive look at the issue.

STUDENTS SEEKING SOLUTIONS



Students in Tanisha Taylor's fourth-grade STEM class at the McNair Discovery Learning Academy are designing traps to catch the Cane toad, an invasive species in Georgia.

BOB ANDRES / AJC

Students get jump on toad-catching project

McNair STEM class could see effort have practical applications.

The students are learning all they can about the Cane toad, an invasive species found mostly in Australia, so they can develop prototypes for humane traps.

By Marlon A. Walker



School-wide Example



Standards



PBL: Food Desert

Foundations of Engineering and Technology

Technology and Society	ENGR-STEM2 – Students will identify the impact of engineering and technology within global, economic, environmental, and societal contexts. (a) Describe the social, economic, and environmental impacts of a technological process, product, or system.
Design	ENGR-STEM3 – Students will design technological problem solutions using scientific investigation, analysis and interpretation of data, innovation, invention, and fabrication while considering economic, environmental, social, medical, medical health and safety, manufacturability, and sustainability of design. (a) Demonstrate fundamental principles of design. (b) Design and conduct experiments along with analysis a (c) Identify and consider realistic constraints relevant to a component, or process.
Abilities for Technological World	ENGR-STEM4 – Students will apply principles of science, mathematics, interpersonal communication, and teamwork to solve technological problems. (a) Work cooperatively in multi-disciplinary teams. (b) Apply knowledge of mathematics, science, and engineering (c) Demonstrate strategies for identifying, formulating, and solving problems.
Reading	ENGR-STEM6 – Students will enhance reading by developing comprehension skills associated with text materials, prot laboratory activities associated with engineering and technology. (a) Reading in all curriculum areas. (b) Discussing books. (c) Building vocabulary knowledge. (d) Establishing context.
Leadership Development	ENGR-STEM7 – Students will develop leadership and interpersonal skills through participation in co-curricular activities associated with Student Association. (a) Demonstrate effective communication skills. (b) Participate in teamwork to accomplish specified organizational goals.

PBL: Food Desert Art Standards

Kindergarten	VAE.CR.4 Understand and apply media, techniques, and processes of three-dimensional art. a. Create sculpture using a variety of media and techniques. VAL.CN.2 Integrate information from other disciplines to enhance the understanding and production of works of art. a. Explore universal concepts (e.g., self, family, community, world) inspired by other subject areas.
First Grade	VA1.CR.4 Understand and apply media, techniques, and processes of three-dimensional art. a. Create sculpture using a variety of media and techniques. VA1.CN.2 Integrate information from other disciplines to enhance the understanding and production of works of art.



PBL: Food Desert Social Studies Standards

Kindergarten	SSKE3 Explain how money is used to purchase goods and services. a. Distinguish goods from services. SSKE4 Explain that people must make choices because they cannot have everything they want.
First Grade	SS1E1 Identify goods that people make and services that people provide for each other. SS1E2 Explain that scarcity is when unlimited wants are greater than limited resources. SS1E3 Describe how people are both producers and consumers.
Second Grade	SS2E1 Explain that because of scarcity, people must make choices that result in opportunity costs. SS2E2 Identify some ways in which goods and services are allocated (such as price, majority rule, contests, force, sharing, lottery, authority, first-come-first-served, and personal characteristics).
Third Grade	SS3E1 Define and give examples of the four types of productive resources. a. Natural (land) b. Human (labor) c. Capital (capital goods) d. Entrepreneurship (risk-taking and combining natural, human, and capital resources in an attempt to make a profit) SS3E4 Explain the concept of opportunity cost as it relates to making a saving or spending choice.
Fourth Grade	SS4E1 Use the basic economic concepts of trade, opportunity cost, specialization, voluntary exchange, productivity, and price incentives to illustrate historical events.
Fifth Grade	SS5E2 Describe the functions of four major sectors in the U. S. economy. a. Describe the household function in providing resources and consuming goods and services. b. Describe the private business function in producing goods and services. SS5E3 Describe how consumers and producers interact in the U. S. economy. a. Describe how competition, markets, and prices influence consumer behavior.



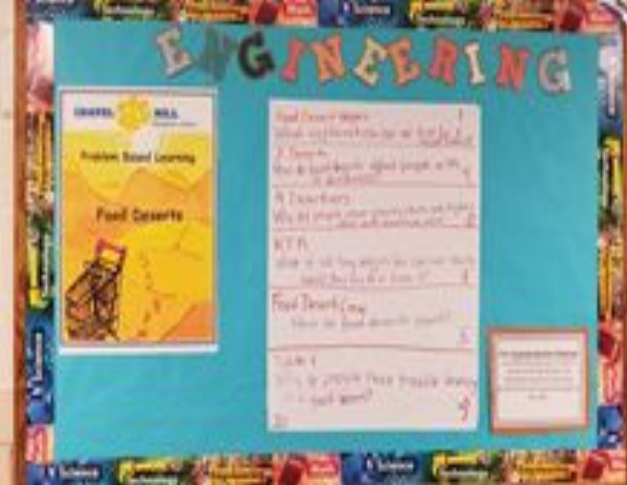
PBL: Food Desert Science Standards

	Georgia Standards of Excellence	Next Generation Science Standards
Kindergarten	SK1 Obtain, evaluate, and communicate information about how organisms (alive and not alive) and non-living objects are grouped.	4.KS1-1. Use observations to describe patterns of what plants and animals (including humans) need to survive. 4.KS1-2. All animals need food in order to live and grow. They obtain their food from plants or from other animals. Plants need water and light to live and grow.
First Grade	1.S1.1 Obtain, evaluate, and communicate information about the basic needs of plants and animals. a. Develop models to identify the parts of a plant—root, stem, leaf, and flower. b. Ask questions to compare and contrast the basic needs of plants (air, water, light, and nutrients) and animals (air, water, food, and shelter). c. Design a solution to ensure that a plant or animal has all of its needs met.	1.S1S1-1. Make observations (firsthand or from media) to construct an evidence-based account for natural phenomena. Young plants and animals are like, but not exactly like, their parents.
Second Grade	2.S1.1 Obtain, evaluate, and communicate information about the life cycles of different living organisms. b. Plan and carry out an investigation of the life cycle of a plant to growing a plant from a seed and by recording changes over a period of time.	2.S1S1-1. Plan and conduct an investigation to determine if plants need sunlight and water to grow. 2.S1S1-2. Cause and Effect Events have causes that generate observable patterns.
Third Grade	3.S1.1 Obtain, evaluate, and communicate information about the similarities and differences between plants, animals, and habitats found within geographic regions (Blue Ridge Mountains, Piedmont, Coastal Plains, Valley and Ridge, and Appalachian Plateau) of Georgia. c. Use evidence to construct an explanation of why some organisms can thrive in one habitat and not in another.	3.S1S1-4. Organisms have unique and diverse life cycles but all have in common birth, growth, reproduction, and death.
Fourth Grade	4.S1.1 Obtain, evaluate, and communicate information about the roles of organisms and the flow of energy within an ecosystem. a. Develop a model to describe the roles of producers, consumers, and decomposers in a community.	4.S1S1-4. Construct an argument that plants and animals have internal and external structures that function to support survival, growth, behavior, and reproduction. 4.S1S1-4. Plants and animals have both internal and external structures that serve various functions in growth, survival, behavior, and reproduction.
Fifth Grade		5.PS1-1. Energy in animals' food (used for body repair, growth, and motion) and to maintain body warmth) was once energy from the sun. 5.S1S1-4. Support an argument that plants get the materials they need for growth chiefly from air and water.

SWAY Presentations for Lessons

<https://sway.office.com/D08TmBvVAT71yoks?ref=Link>

Bulletin Boards





Question and Answer

