

INCORPORATING STEAM INTO SCHOOL LIBRARIES

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PIONEER CENTRAL SCHOOLS**

PRESENTATION ROADMAP

- Introduction to STEAM in libraries
- Elementary STEAM Projects
- Middle School STEAM Projects
- High School STEAM Projects
- District-Wide Initiatives

LIBRARIES AND STEAM: A PERFECT PAIRING!

- Libraries house books and a wealth of technology resources.
- Librarians are trained in inquiry skills (AASL Standards for the 21st-Century Learner, Empire State Information Fluency Continuum).
- Libraries are a flexible space in which students can explore STEAM concepts (either within the traditional school day or during after school time).
- Many school libraries house or support makerspaces.
- Literature can be paired with STEAM concepts within a school library.
- Librarians have the ability to collaborate with teachers of various subjects and grade levels.

WHAT'S STEM GOT TO DO WITH IT?

SCHOOL LIBRARIANS AS STEM SUPER STARS!



LET KIDS DESIGN AND BUILD LIBRARY DISPLAYS FEATURING STEM TEXTS!

BUILD A STEM RICH COLLECTION!

FILL YOUR SHELVES WITH HIGH QUALITY, PRINT AND DIGITAL RESOURCES THAT HELP CONNECT KIDS WITH SCIENCE, TECHNOLOGY, ENGINEERING AND MATH.

ADD SHELF TALKERS THAT REMIND KIDS HOW TO TACKLE SPECIFIC TEXTS: "THIS IS HOW YOU READ A MATH TEXT..."

CREATE STEM LEARNING SPACES!

FROM LEGOS TO ROBOTICS, FILL YOUR LIBRARY WITH SPACES WHERE KIDS CAN IMAGINE AND CREATE!

CREATE PHYSICAL SPACES FOR KIDS TO CREATE, COLLABORATE, COMMUNICATE AND THINK CRITICALLY. MAKE THE LIBRARY A PLACE WHERE KIDS CAN TRANSFORM THEORY INTO PRACTICE.

SCIENCE

TECHNOLOGY

ENGINEERING

MATH

MODEL INQUIRY BASED INSTRUCTION!

CREATE AND DELIVER INSTRUCTION THAT BUILDS BRIDGES BETWEEN STEM AND THE HUMANITIES, TAPS INTO STUDENT PASSIONS, UTILIZES TECHNOLOGY, SUPPORTS MEANINGFUL FAILURE AND ALLOWS KIDS TO SOLVE REAL WORLD PROBLEMS.

HELP GROW STEM STORYTELLERS!

SPONSOR STEM THEMED BOOK CLUBS WHERE KIDS GET TO TALK ABOUT HOW STEM IMPACTS LITERATURE AND LIFE!

MAKE YOUR LIBRARY A PLACE WHERE KIDS CAN PRACTICE AND HONE THE COMMUNICATION SKILLS THEY NEED IN ORDER TO TELL THE STORY OF HOW STEM IS IMPORTANT TO THE WORLD AND TO THEIR LEARNING.

FROM PODCASTS TO VODCASTS GIVE KIDS THE TOOLS TO SHARE THEIR STORIES!

HELP BUILD STEM PARTNERSHIPS!

COMMUNITY PARTNERSHIPS ARE AN IMPORTANT PART OF EVERY STEM INITIATIVE. MAKE THE LIBRARY A SPOT FOR GROUPS TO ACCESS RESOURCES, COLLABORATE AND SHARE STORIES. USE YOUR SKILLS AS A MASTER COLLABORATOR TO HELP GENERATE AND CULTIVATE THESE POSITIVE AND PRODUCTIVE RELATIONSHIPS.

ARCADE ELEMENTARY

K-2

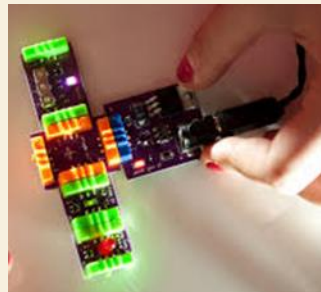
- Five week unit during library classes.
- First week is spent introducing students to the devices through videos and real life examples.
- Students are split into groups and stay with the same group for a four week rotation between centers. Students remain in the same center for the entire class time.
- Devices are available again during the final weeks of the school year during library class time.
- Devices are available for teacher check out.



ARCADE ELEMENTARY

3-4

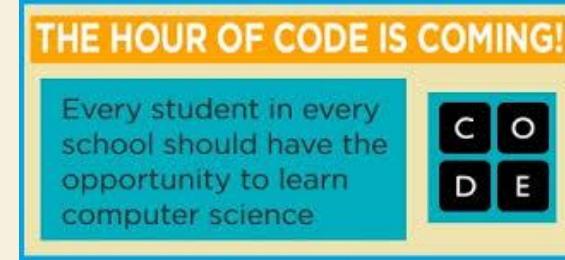
- Students have 1:1 Windows tablets.
- “Library Fun Days” throughout the school year during library class time.
- Devices are available throughout the library as well as websites on their tablets.
- Students can do whichever activity they want and they have the right to change their minds.
- Devices are available for teacher check out.



ARCADE ELEMENTARY

2-4 HOUR OF CODE

- After school during Computer Science Education Week.
- Students have choices!
- Hour of Code website, Bee-bots, Cubelets, iPad cart with Kodable app and new this year, Littlebits.

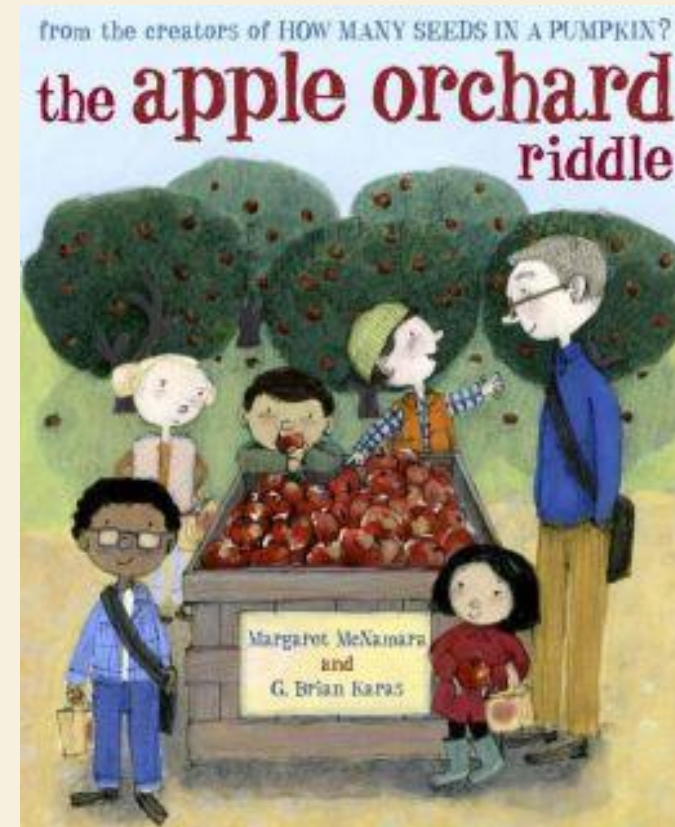


DELEVAN ELEMENTARY

- STEAM initiatives are supported through library class experiments and hands-on challenges.
- STEAM concepts are explored through weekly small group enrichment classes.
- Library collection development is aligned with STEAM initiatives.
- Teachers have access to STEAM kits to loan from library.

AGRICULTURE AND OXIDATION

- Students learned about the growing process of apples through a storybook read-aloud.
- To learn about the oxidation process, students placed pieces of apples in various liquids (water, oil, vinegar, lemon juice). Students then made predictions about what they believed would happen.
- Using beginner aspects of the scientific method, students observed then recorded which liquid stops oxidation process in fruits.



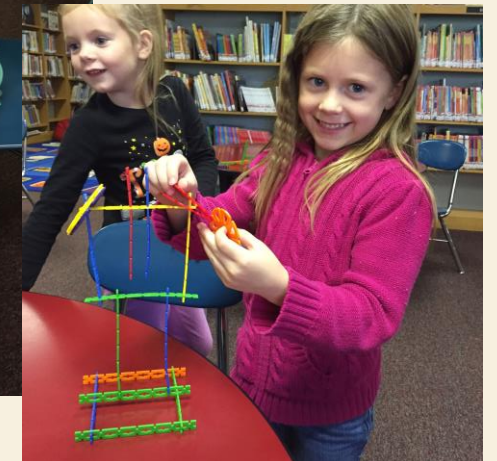
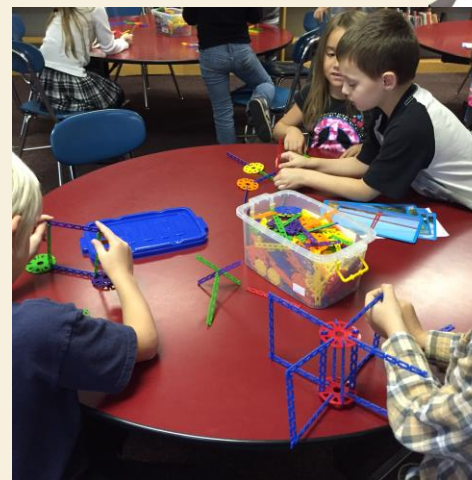
POLLUTION AND SOLUTIONS

- Students learned about different types of pollution through non-fiction Earth Day texts.
- To learn more about water pollution, students watched a video clip about oil spills.
- Students performed a mock oil spill experiment:
 - Cooking oil placed in bowl with water.
 - Students used various materials to clean oil.
 - Students used predicting observing, and recording skills to show results.



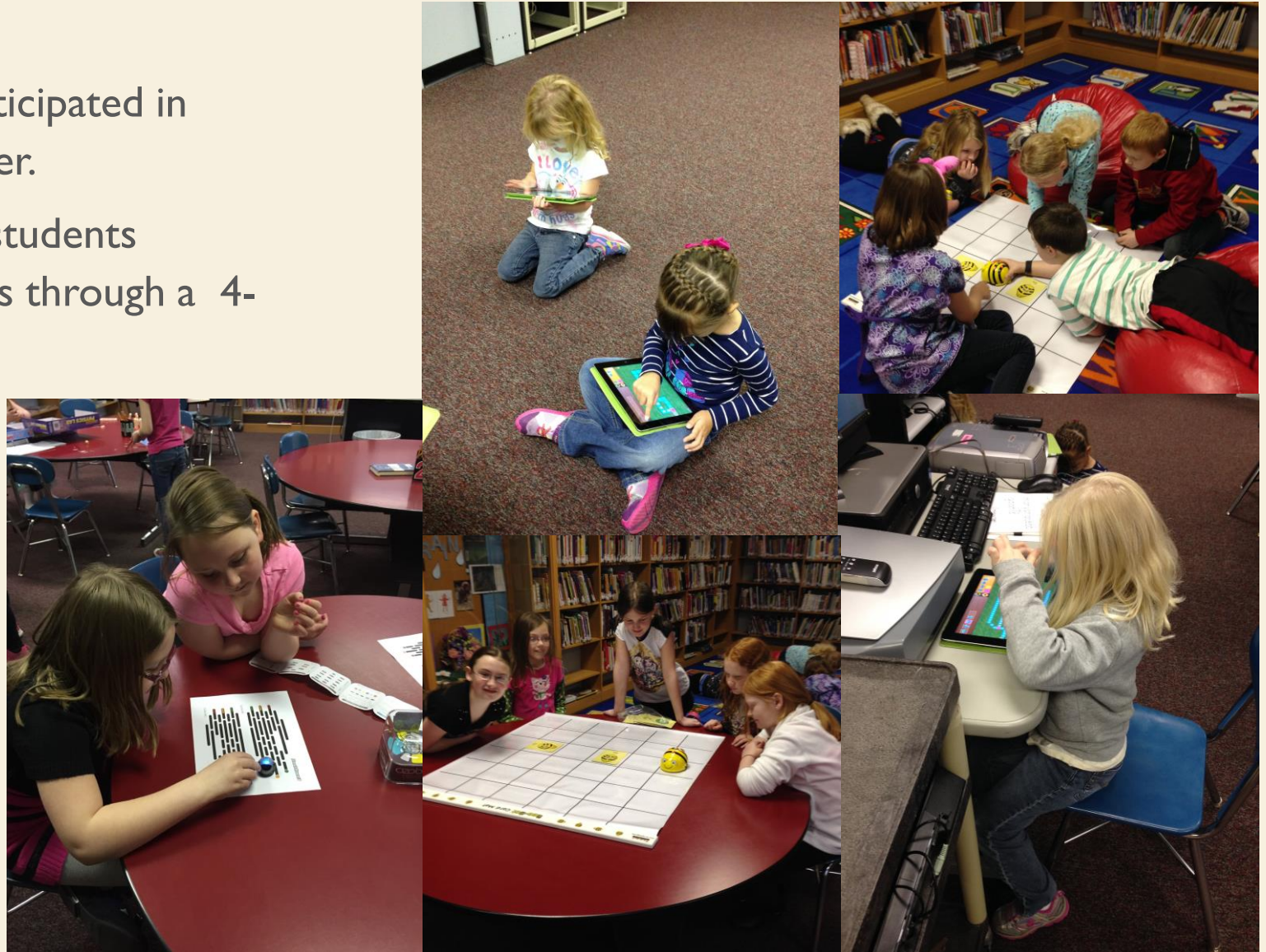
ENRICHMENT: HANDS-ON CHALLENGES

- To promote critical thinking, creativity, and problem solving skills, students are given various hands-on challenges.
- Students must work in group to come up with a solution and product.
- Students present their product.
- Class tests and evaluates product.



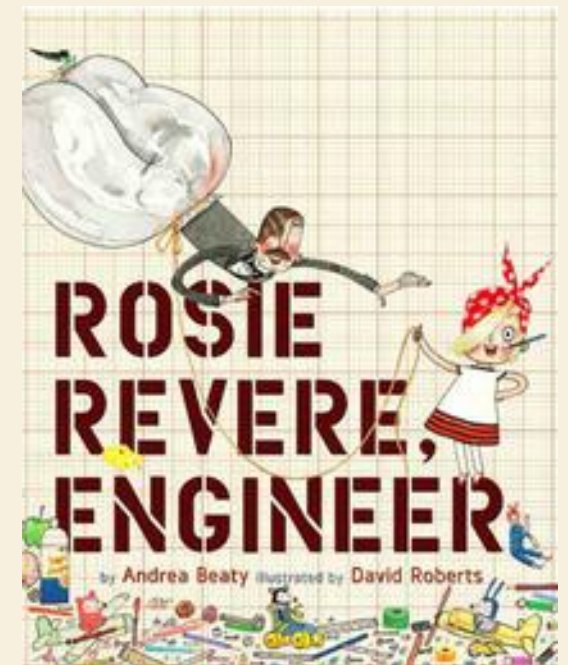
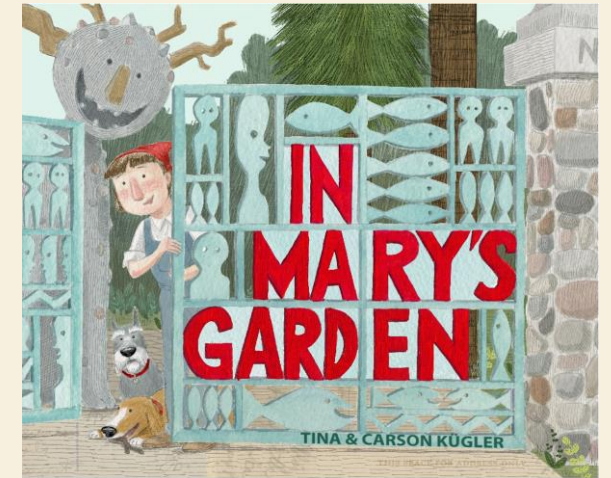
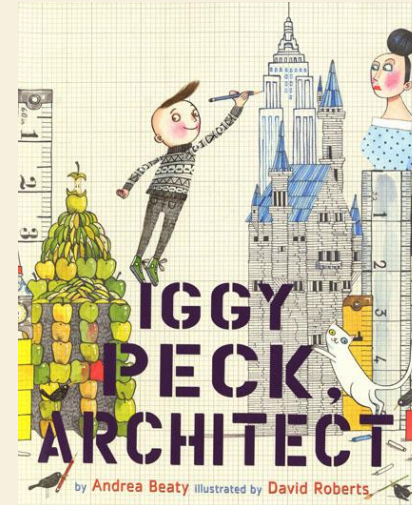
K-4: HOUR OF CODE/CODING UNIT

- Every student in K-4 participated in hour of code in December.
- Following hour of code, students explored coding concepts through a 4-6 week unit.
- Unit resources:
 - Robot turtles game
 - Beebots
 - Code.org
 - Roamer Jrs.
 - Kodable app
 - Ozobots



BOOKS SUPPORT STEAM!

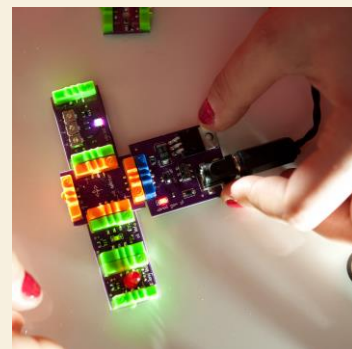
- Maker Books
 - Origami
 - Crafting
 - Cooking
- Science Books
 - Experiments
 - Informational text
- Picture Books
 - Rosie Revere Engineer
 - The Most Magnificent Thing
 - Iggy Peck Architect
 - In Mary's Garden



WE WANT YOU... TO CHECK OUT A STEAM KIT!



- Roamer Jr.
- Magnetism
- Robotikit: Solar Robot
- Beebots
- Hummingbird kit
- Robohand
- Freshwater filtration
- Littlebits circuit kit
- Human body
- Snap circuits



- Bridge building
- Structure building
- Vehicle building
- Force and gravity
- Buoyancy
- Earthquakes
- Ozobots (borrowed from BOCES)

PIONEER MIDDLE SCHOOL

- STEAM initiatives are supported through classroom projects across subjects and grade levels
- After school Maker Club, Science Olympiad, and FIRST Lego League teams support STEAM outside of the classroom.

SPECIAL EDUCATION: BOATS AND BUOYANCY PROJECT

- Using nonfiction books and the World Book Kids databases, students gathered information about boats.
- Students then focused on learning more about a specific boat and created a model of their boat.



Name: _____

Use page 5 of *Traveling Machines: Boats and Ships* to answer the following questions about boats.

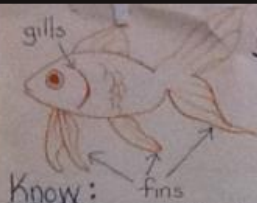
What are some uses for boats?

What is a hull?

What is a rudder?

SPECIAL EDUCATION: FISH TANK INQUIRY

- Students brainstormed what they wanted to know in the classroom and brought their questions to the library for research assistance.
- Students used real world skills of:
 - Budgeting
 - Researching, including asking an expert
 - Using a search engine
 - How to compare prices to find the better bargain



Problem: Our fish tank is boring! We want it to be pretty but safe.

Knew:

- Fish live in the water
- There are lots of decorations to choose from
- 3 Goldfish

Find Out More:

- Interviews
- brochures
- books
- computers

Want to know:


- What decorations are the safest?
- What is a "bottom feeder"?
→ Do we need one?
- How can we clean the tank?
- Do we have too many fish?
→ Can we get more?
- What types of fish are friendly with goldfish?
- How much food should we feed a fish? What kind?

• Buy from a pet store - they are SAFE

• Fish can learn to come when you whistle 🎵

• Too much HOT or Cold Water hurts fish

• Goldfish should live with other goldfish!



SPECIAL EDUCATION: GLOBAL READ ALOUD

- Using tech tools such as blogs and padlet, students participated in the Global Read Aloud by sharing their projects and reflections with schools from around the world.



Global Read Aloud - Amy Krouse Rosenthal Author Study
 Welcome to our Padlet! Pioneer Middle School is excited to participate in our first Global Read Aloud. Mrs. Proudman's class will be focusing on Amy Krouse Rosenthal during library visits. We hope to connect with other students reading these books. To share your experiences with us, please email mmuhlbauer@pioneermsd.org for details.

Introducing the MABIN GRADE ONES
 Hi! We're the Grade 1s at Mabin School in Toronto, Ontario in Canada. We'd really like to hear you report back after reading our comments.

Introducing the Pioneer Middle School Students
 Hello! We are Mrs. Proudman's class from Pioneer Middle School in Yorkshire, NY. Our school is about an hour south of Buffalo, NY. We are looking forward to hearing about your experiences reading Amy Krouse Rosenthal books!

Mabin's Thoughts on CHOPSTICKS
 -We think the chopsticks are very nice people because when one chopstick snapped his friend stayed with him.
 -One chopstick tried out new things without his friend. That chopstick took a responsible risk.
 -Some chopsticks are wise in the book. (The guy who took a responsible risk.)
 -The chopsticks say puns!
 -Chopsticks is a very good book! Do you like it too?

Chopsticks at Pioneer Middle School
 Good morning! We read *Chopsticks* on Wednesday, October 8th. Our class agrees that *Chopsticks* was a very good book.
 After reading the story, we brainstormed different activities we like to do alone and activities we like to do with friends.
 We then practiced using chopsticks on our own! Using our chopsticks, we moved fruit snacks from a napkin to a cup. The best part was eating the fruit snacks! Are you looking forward to reading next week's book?

Week 2 at Mabin
 We liked reading everyone's comments. We are excited for the next book!

Things we like to do alone:
 Play
 Take care of chickens
 Take care of horses
 Play video games
 Drive a tractor

Things we like to do with others:
 Play with others
 Help people
 Teach someone how to sing
 Teach others how to play video games
 Work in the garage and fix cars
 Sleepovers

Photo: A group of students sitting around a table, engaged in an activity.

Hello Amy Rosenthal fans:
 This is Mme Wray's 1-2 French Immersion class from Lasalle, Ontario, Canada. We read the book "Duck, Rabbit" in both of Canada's official languages. We surveyed many of the primary grades to see whether they thought it was a duck or a rabbit and today we will graph the results with a pictograph. The grade ones recorded the votes for rabbit and the grade twos recorded the votes for duck on ten frame

Duck! Rabbit! at Pioneer Middle School
 We had a lively debate about whether the animal was a duck or a rabbit! Four students thought the animal was a duck and one student thought the animal was a rabbit. We then created our own pictures of what we thought the animal really was. We had a great time reading your posts and are already looking forward to next week's class.

Duck? Rabbit?
 Michael thinks it is a duck because it has a beak.
 David thinks it is a rabbit because it is a rabbit.
 Vincent thinks it is a duck because his beak is orange and because his feet are black.

Duck! Rabbit! at Mabin
 Today we read the 2nd book. When we voted 15 of us thought it was a rabbit and 4 of us thought it was a duck. We recorded our vote on the official GRA voting site and can't wait to see what other classes thought at the end of the week!
 Some people think it's about perspective. If you look from the left side, you're facing the duck bills. If you're looking from the right side, you're facing the rabbit face.
 We are wondering what you think it was?

To It a Duck Or A Rabbit? - Take the Official Poll! #GRA15 #GRAAmy

SPECIAL EDUCATION: THE MITTEN AND MATH

- Paired *The Mitten* by Jan Brett with math skills.
- Students used estimation and counting to use pom poms and mittens for a math activity.



SPANISH 8: TECHNOLOGICAL TOUR

- Using Aurasma, an Augmented Reality app, students took a “virtual walking tour” of areas of technological advancements in Spanish-speaking places.



FRENCH 8: COMMUNITY AND NEIGHBORHOOD UNIT

- Students were divided into groups. Each group was responsible for assembling all buildings in a paper neighborhood.
- Students then used their French vocabulary to provide directions to and from different locations within the neighborhood.
- Individually, students used Nearpod for a vocabulary assessment and project reflection.



Some helpful verbs for giving directions:

Verb	Vous form	Means?
aller	allez	go
continuer	continuez	continue
arrêter	arrêtez	stop
tourner	tournez	turn
traverser	traversez	cross
passer par	passiez par	pass by

SPANISH 7: COMPUTER CODING AND LANGUAGES

- Student groups learned the basics of computer coding with BeeBots.
- They learned how to program the BeeBot to reach specific destinations on the mat.
- For a greater degree of difficulty, grouped programmed complete sentences into the BeeBot.
- For assessment, students reviewed the Habits of Mind used during the project.

Name: _____
Period: _____

Spanish 7: Rubric for the Community and Neighborhood Project

DAY 1 ACTIVITY: Learning about the Bee Bots = ____ / 20

- All group members are able program the Bee Bots: ____ / 10
- Group can demonstrate how to code the Bee Bots to get to a specific destination: ____ / 10

DAY 2 ACTIVITY: Making Questions and Sentences Using the Bee Bots = ____ / 50

- All groups write two sets of comprehensible questions and answers in Spanish: ____ / 20
- Each group then uses the Bee Bots to code the questions and answers: ____ / 20
- Groups attempt to create the longest sentence using the Bee Bots: ____ / 10

****Extra credit: Complete additional questions and answers.** = ____ / 5

DAY 3 ACTIVITY: Reflection, Kahoot, and Coding Practice = ____ / 30

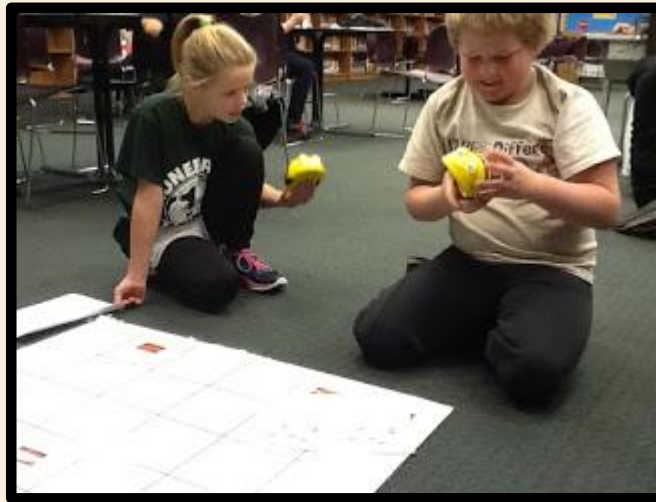
- A project reflection is thoughtfully completed: ____ / 10
- Point values are assigned based on the order groups place in the Kahoot activity: ____ / 10
- Student exhibits proper behavior and effort during the Kahoot activity: ____ / 5
- Student works on various coding activities for the remainder of class: ____ / 5

= ____ / 100



FAMILY AND CONSUMER SCIENCE 5: STEM CAREER EXPLORATION

- Using Kodable and BeeBots, students received hands-on experience with coding.
- Students then used their tablets to view videos about various STEM careers.
- Individually, students filled out a reflection sheet based on their coding experiences and the 21st Century Skills used during the activity.



1. What did you enjoy about Kodable?
It was easy but challenging and I definitely learned from my mistakes.

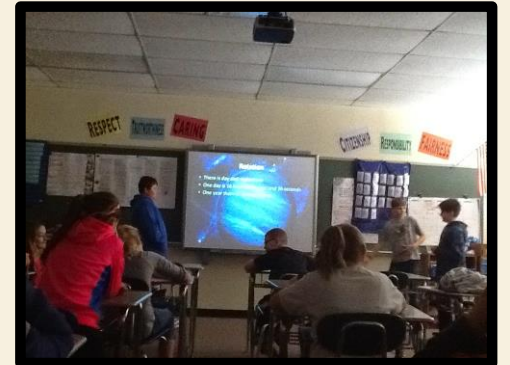
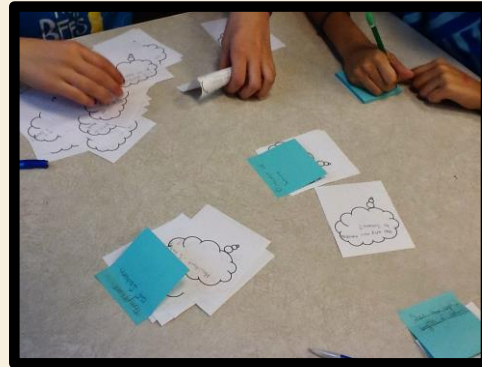
2. What part of Kodable did you find most challenging?
Being able to be able to get used from the settings changing.

3. Read the 21st Century Skills listed on the graphic organizer. Choose three bulleted items that you practiced while playing Kodable. How did you display these traits while going through Kodable?

1. Generate Ideas... I had to have creative ideas and think of different ones each time.
2. Use Information... I used the information I was told to code.
Independent
3. Show Initiative... I worked independently to get through my work.

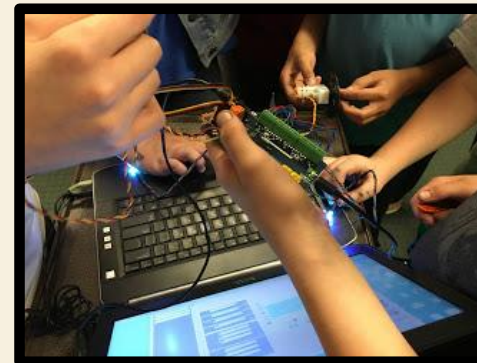
SCIENCE 6: PLANET INQUIRY PROJECT

- Student groups brainstormed research questions of interest to them personally.
- Groups sorted and selected the questions to be used for their research.
- Books, databases, and websites were used to gather information.
- Groups prepared and executed lessons for their classmates (complete with homework!)



AFTER SCHOOL MAKER CLUB

- Libraries are a natural choice for maker activities. Instead of simply finding information, library users are a social community of learners.
- After school Maker Club provides an inclusive atmosphere for all students.
- Hour of Code, robotics/coding, Legos, and crafts are popular projects.
- Student-led sessions or guest speakers come in on select Thursdays.

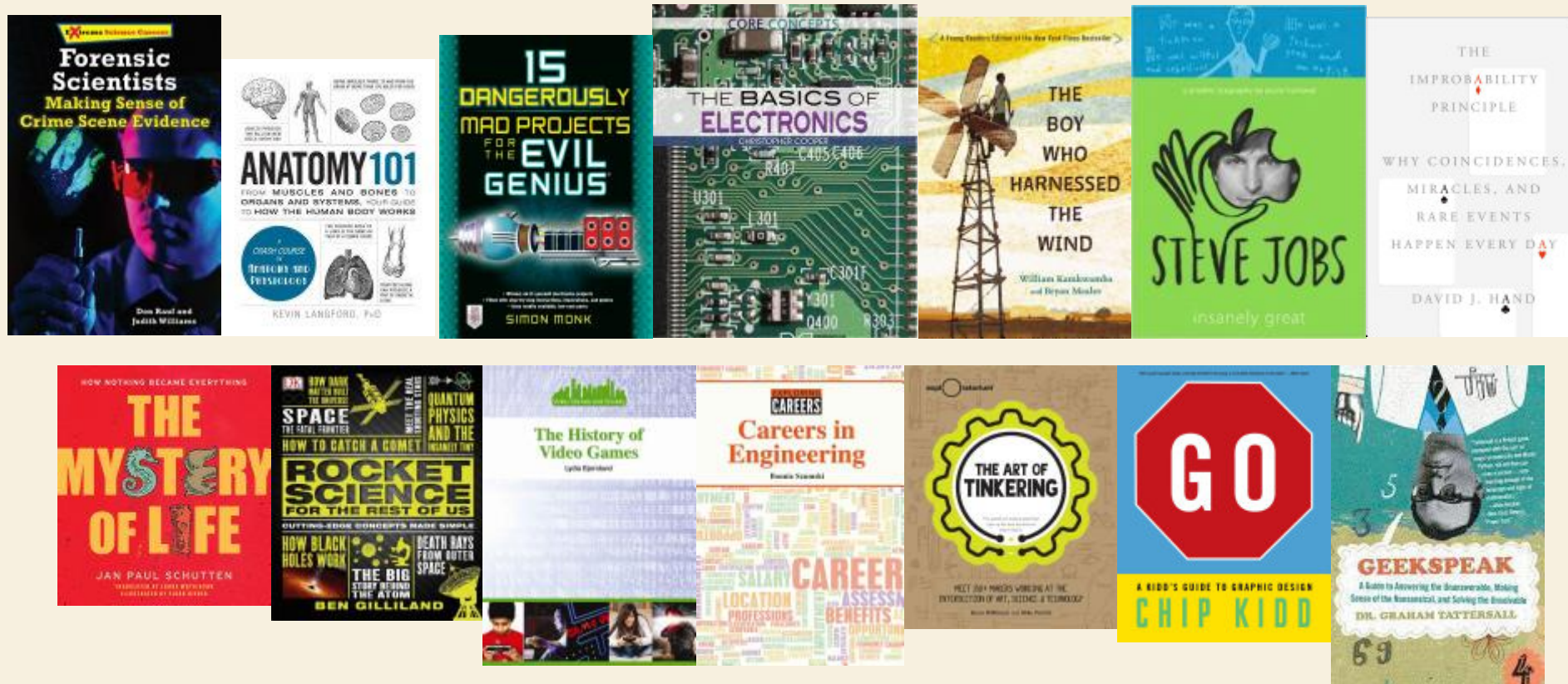


PIONEER HIGH SCHOOL

- STEAM topics are highlighted in collection development
- STEAM initiatives are supported through classroom projects
- Maker resources are available for faculty and student use in the library support STEAM outside of the classroom.

STEAM & COLLECTION DEVELOPMENT

- Through strategic STEAM collection development, numerous books on the sciences, technology, engineering, art, and math have been added to the collection for student and staff use.

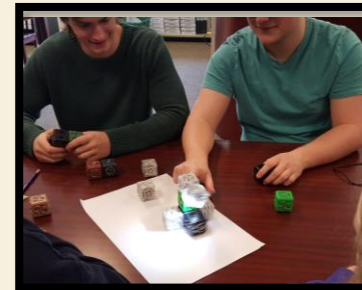


STEAM & RESEARCH

- English 10: Environmental Issues
 - Students used books, databases, and websites to locate information on a variety of environmental issues including invasive species, energy, and climate change.
- English 10: Health and Wellness
 - Students used books, databases, and websites to locate information on numerous health and wellness issues, such as GMOs in food, the use of bovine growth hormones, and the benefits of exercise.
- Health: Diseases and diets
 - Librarian preselected and pulled reliable resources for students to use while researching.
- AP Biology: Hereditary diseases
 - Individual reference sessions with students to use the science databases and resources available in the library.

PROBLEM SOLVING MATH: HOUR OF CODE WITH CUBELETS

- Using cubelets, students from Problem Solving worked together during Hour of Code week.
- Students received learning adventures that they had to complete using the cubelets.
- Examples of the learning adventures:
 - Create a lighthouse
 - Draw a circle
 - Create a vehicle that does not run into walls
 - Create a vehicle that only moves when it's own light shines on it



MUSIC: CO-TEACHING & INCORPORATING TECHNOLOGY

BEFORE COLLABORATION

- This project included writing a paper after watching pieces of films to see how music impacts the mood and reflects the theme.
- The teacher wanted a more engaging project.

AFTER COLLABORATION

- The project introduced technology (Windows Live Movie Maker, Mixcraft)

MUSIC: CO-TEACHING & INCORPORATING TECH

- Task One: Students were tasked with finding videos from Internet Archive and creating music that matched the mood of the clip.
- Task Two: Once students had successfully completed task one, they had to create music that changed the mood of the clip.
- Task Three: Students researched poetry and then wrote their own poem and created music to match the intended mood and theme of their poems.
- Tools and Tech:
 - Internet Archive
 - Windows Live Movie Maker
 - Mixcraft
- Goals
 - Students will have a better understanding of the impact of music

STEAM & MAKER RESOURCES

Available in the library:

Technology

- Makey Makeys
- Cubelets
- GPS units
- Hummingbird Kit
- VR goggles

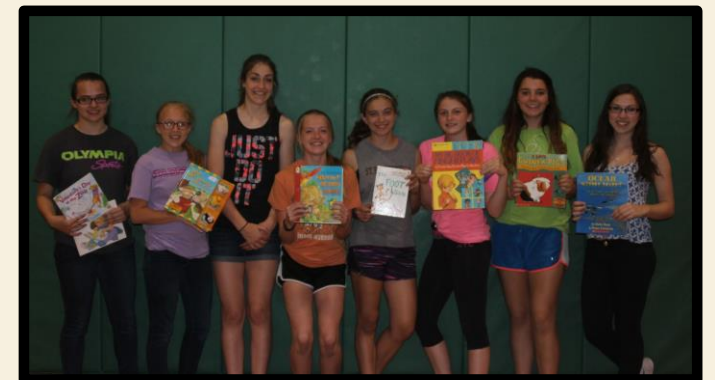
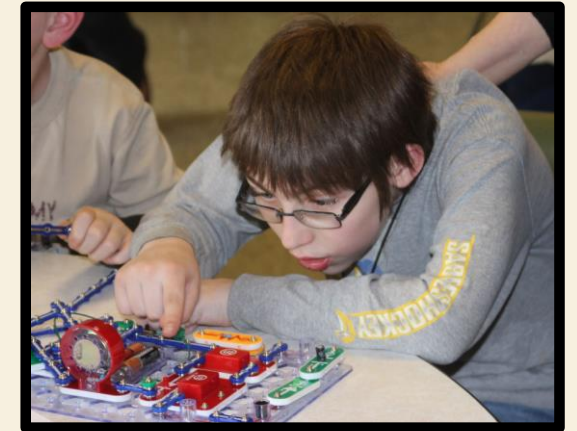
Crafting

- Silhouette Cameo
- Felt and sewing materials
- Modeling clay
- Duct tape
- Origami (old book pages)
- Flower arrangement supplies



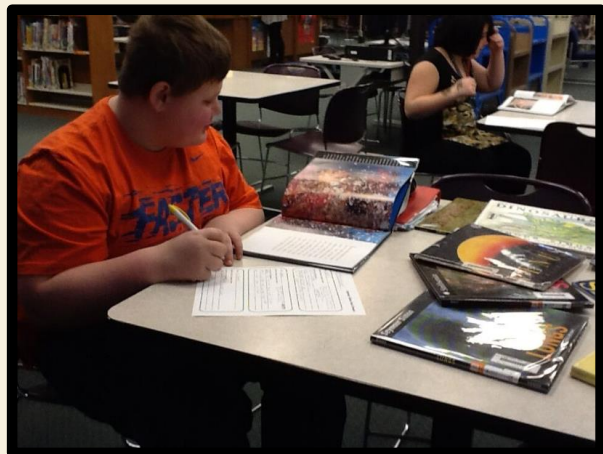
DISTRICT WIDE INITIATIVES: FAMILY READING NIGHT

- The theme for Pioneer's fifth annual Family Reading Night was *Make Time for Reading*.
- All activities centered upon literacy and STEAM/maker activities.
- The Buffalo Museum of Science presented four hands-on science stations for attendees.



DISTRICT-WIDE INITIATIVES: SEYMOUR SIMON AUTHOR VISIT

- Students in grade preK-7 enjoyed a visit from Seymour Simon, author of nearly 300 nonfiction books for children.
- Prior to Mr. Simon's visit, students spent time in the library exploring the science concepts presented in his books.



THANK YOU!

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