

EGYPTIANS & ENGINEERING:

ELEMENTARY We Say!

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Council Rock School District
Newtown, PA
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Evolution:

Sixth Grade Egypt Quest



Need for higher order thinking

STEM-

Science, Technology, Engineering, & Mathematics

Multidisciplinary learning

Project based learning

Collaborative teaching



Common Core Standards for Mathematical Practices

- Make sense of problems and persevere in solving them
- Reason abstractly and quantitatively
- Construct viable arguments and critique the reasoning of others
- Use appropriate tools strategically
- Attend to precision



Essence: Who, What, & How??

Funded by grant from Council Rock Education Foundation
 Egyptians & Engineering: ELEMENTARY We Say!
 Materials purchased:
 LEGO Mindstorms kits- 5
 LEGO Mindstorms software
 World of Goo apps for iPad lab
 Weights/ Materials for inclined plane
 8 week Club experience for 13 – 15 sixth graders to occur yearly
 Background in simple machines and ancient Egypt desirable but not necessary



Problem Based Learning

The Great Pyramid: How Was It Built?



Many mysteries surround the pyramids.
 How were the ancient Egyptians able to create this incredible monument in so little time?
 Great Pyramid is over 450 feet tall and is constructed of about 2,300,000 blocks.
 Many of the blocks weigh 3 tons or more.
 Introduced to all.

New Spin on Our Egyptian Studies

Bring your knowledge of today, science, social studies, and mathematics to design something to move the pyramid stones. Be creative.



www.bbc.co.uk - 106 x 146

Engineers Wanted

Willing to come during a recess and IDR period weekly



Student Engineering Application

NAME: _____

Date: _____

1. Why are you interested in this experience?



Share your talents & bring a positive energy to the group!

Engineering Design Process

- Identify the problem
- Research
- Brainstorm
- Choose & Plan
- Create



Project Worksheet: Study Device Design

Date: _____
 1. Brainstorm your design. (10 minutes)
 2. Draw a sketch of your design. (10 minutes)
 3. Build your design. (10 minutes)
 4. Test your design. (10 minutes)

Sturdy Device Design

You must construct a device that is strong enough to drag weight up an inclined plane.

Which device

...will be able to hold the most weight while being pulled up the ramp?

...is the most cost efficient?

...is the most creative?

Create



"I'm always up for a challenge.."



"Science is my favorite subject so to have a second period would be a lot of fun....."

Test & Revise



"45 minutes is not enough science time"

Success!

"I love science and math."



"I like to challenge myself and try new things."



Community Support

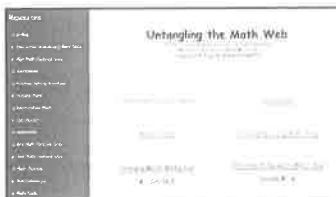
Parents
Businesses: Lockheed Martin
D'Huy Engineering
High School: STAR Program (volunteers)
Math Honor Society
Science Honor Society
Bucks County Intermediate Unit
Council Rock Education Foundation



Materials & Resources


K'NEX
LEGO Mindstorms
Recyclable materials
World of Goo

K'NEX User Group
LEGO sites
PBS Building Big



Math Moments

www.crsd.org/mathmoments



The screenshot shows the Goodnoe Elementary School website. The 'Resources' section is highlighted, listing various math activities and links. The page is titled 'Goodnoe Elementary School' and includes a navigation menu on the left.

Enhancements Year 2 Take 2!

More girls

World of Goo

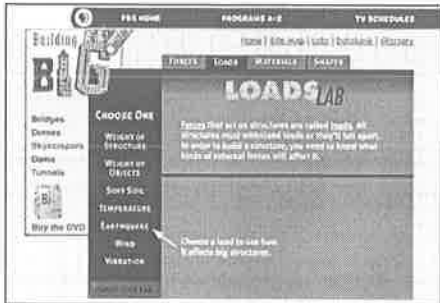
New materials

Expand learning

Real world connections

More time

Building Big- PBS



The screenshot shows the PBS website for the 'Building Big' program. The 'LOADS LAB' section is highlighted, featuring a 'CHOOSE ONE' button and a list of activities. The page includes a navigation menu on the left and a 'TV SCHEDULE' link at the top right.

Structures in the Real World



Shapes in Structures



World of Goo



Multiple award winning physics based puzzle/ construction game
Drag and drop globs of goo to build structures.



Chapter 1- The Goo Filled Hills

Worked on Level 1- Going Up
To
Level 7- Tumbler



Welcome to THE
WORLD
GOO
#GooWorld
Name: _____
Partner: _____
Date: _____
The First Challenge: The Goo Filled Hill
Level 1- Going Up
Your challenge is to build a structure to reach the top and collect
the Goo rewards!

K'NEX

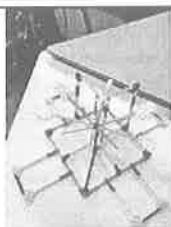


Forces: Loads



Fan Powered!!

Success or Not



Process Begins Again



Another Egypt Quest!



Thanks for attending!

Enjoy the rest of the conference.

Email us @ mdoherty@crsd.org

chills@crsd.org


Visit www.crsd.org/mathmoments.

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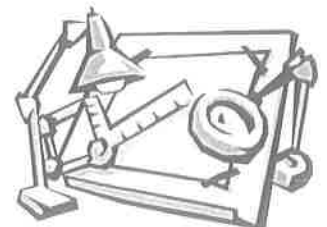
Student Engineering Application

NAME: _____

Date: _____

1. Why are you interested in this experience?

2. What traits/ skills do you have to offer a design team?



Name:

Date:

Section:

How Did The Egyptians.....



build the great pyramids?

We believe.....

--

Engineering Design Process

1. Identify the problem
2. Research
3. Brainstorm
4. Choose & Plan
5. Create

Now it's on YOU!

Bring your knowledge of today, science, and mathematics to design something to move the pyramid stones. Follow the above 5 steps.



Project Worksheet: Sturdy Device Design

NAME: _____

Date: _____

1. Brainstorm your design (label important features). You are constructing a device that is strong enough to drag weight up an inclined plane. Will your design be able to drag the most weight?

2. Write a short paragraph on the important features of your design.

Project Worksheet: Final Sturdy Device Design

TEAM NAME: _____

Materials Scientist & Engineer _____

Product Development Manager _____

Robotic Engineer _____

























Technologist _____

Date: _____

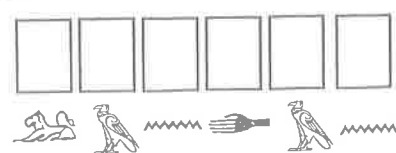
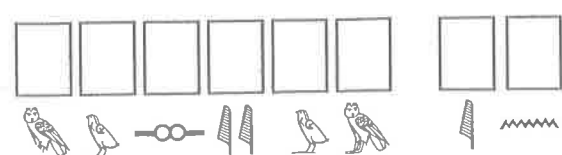
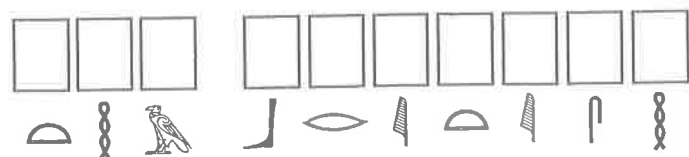
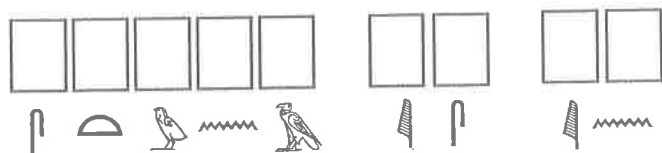
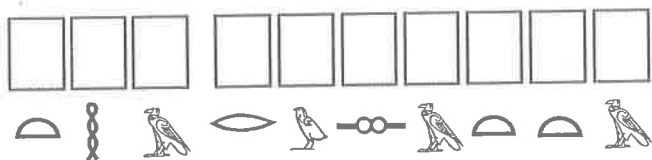


1. Draw your final design (label important features). Can it handle the weight?

2. Write a short paragraph on the important features of your design. What changes were necessary with your device?

 VULTURE SHORT SHORT SHORT A E O	 ARM LONG A	 LOWER LEG B	 FOLDED CLOTH SOFT SOFT C S	 BASKET WITH HANDLE HARD C K	 HAND D	 PAIR OF REEDS LONG VOWEL E Y (LONG)	 VIPER F V
 COBRA SOFT G J	 JAR STAND HARD G	 TWISTED WICK H	 SINGLE REED HARD VOWEL I Y Y (LONG)	 LION L	 OWL M	 RIPPLE OF WATER N	 CHICK LONG SHORT O U W
 REED MAT P	 BASKET + CHICK Q	 MOUTH R	 DOOR BOLT HARD S Z	 GARDEN POOL SH	 BUN T	 REED + CHICK LONG U	 BASKET + CLOTH X

Use the hieroglyphs to decode this secret message!



Hieroglyphs Today?

While no one communicates using hieroglyphs today, scientists and mathematicians use symbolic representations all the time. The key to becoming fluent in science and math is to understand the signs and symbols used in the fields.

Just as Ancient Egyptians could look at a hieroglyph and immediately know what it meant, scientists and mathematicians can instantly translate the symbolic representations of their work.

Can you match these symbols commonly used in science and math with their meaning?

∞	Square root
Σ	Ohms
π	Change
$\sqrt{\quad}$	Wavelength
$ \dots $	Sum
Δ	Infinity
λ	Pi
Ω	Absolute Value



Windmill Challenge



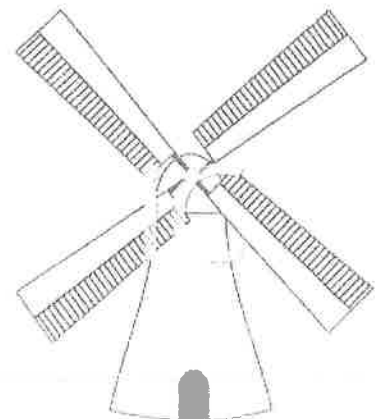
Name: _____ Homeroom: _____

Partner: _____

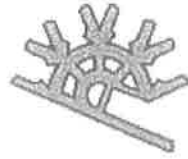
Date: _____

Make a windmill that will turn in the wind.

Sketch your design here. List features that make your windmill structurally sound, allow it to turn and/ or make it special.



K'NEX CONNECTIONS



Name: _____ Homeroom: _____

Partner: _____

Date: _____

What's your K'NEX knowledge?

Identify & sketch:

connectors

rods

tires

hubs/ pulleys

trim

Work with a rod and connector. There are three connection methods. Can you find all the methods? Sketch your work below.

The names of the three connection methods:

1. Sn
2. St
3. Thr

Not black and blue, but purple and blue Connectors.....

Use two of each color or one purple and one blue connector to try the last connection: Slide and Click connection. Did you discover it? Describe it.

NOW GET READY FOR A STRONG WIND....

Show your "stuff" by doing each of the four K'NEX connections. Then all attach all together to get ready for the wind.

Predict what effect wind might have on your structures and specific connections.

Going Fractal

Laura

If you've heard people talk about "fractals" and are wondering what the heck that means, you've come to the right place. Fractals take a basic pattern and repeat it on a bigger and bigger scale, so whether you zoom in on a small part or step back to look at a huge piece, it always looks the same. Snowflakes are fractal, and so are clouds – which is why when you fly in a plane above clouds, it's impossible to tell how far below you they are. Well, Bedtime Math fan Chloe C. decided to make fractal Lego pyramids. As you see here, the first pyramid used 3 blocks, with 1 stacked on top of the other 2. In the next step, she used that *pyramid* as a block, and stacked 1 of those on top of 2 others in the same way...then in the next step, she took *those* pyramid clusters and used that as a block, and so on. Whether you step back or zoom in, it's always a pyramid, limited only by your Lego supply.

Wee ones: How many colors Legos do you see in the pictures?

Little kids: If you take a 3-piece pyramid, and stack 3 of those in a pyramid, how many Lego pieces do you have?

Bonus: If your Lego box has 20 pieces in it, how many pieces will you have left for another iteration?

Big kids: Chloe also made 3-dimensional pyramids into a fractal, by arranging 4 pieces in a square with 1 more piece centered on top. She then arranged 4 of those pyramids in a square with 1 more pyramid on top, and so on. How many Lego pieces did that second-level fractal have? *Bonus:* How many would the next level have, where each of these pyramids becomes a block in a new bigger pyramid?

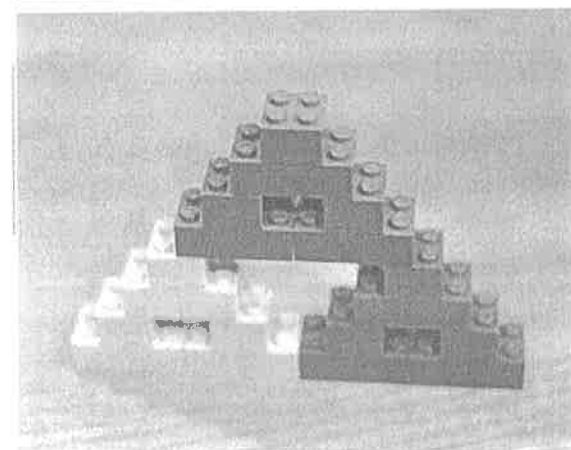
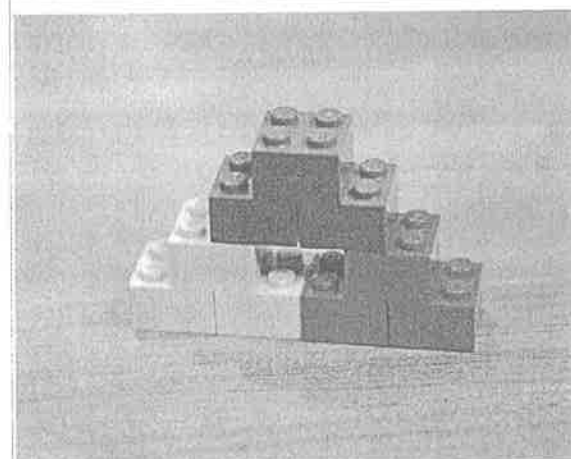
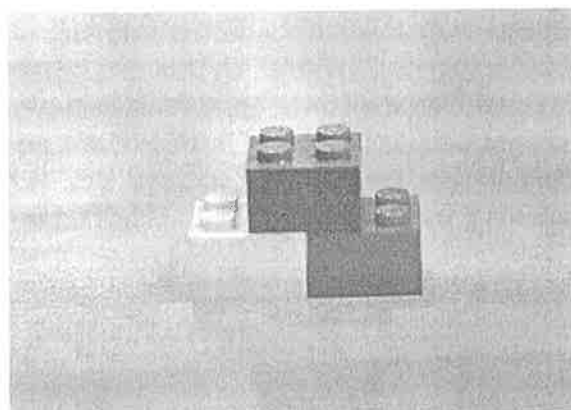
Answers:

Wee ones: 3 colors: red, yellow and green.

Little kids: 9 Lego pieces. *Bonus:* 11 pieces.

Big kids: 25 pieces: 5 pyramids each with 5 pieces.

Bonus: 125 pieces...there's a 25-piece pyramid at each of the 4 corners, and 1 more 25-piece pyramid on top.



And thank you to Chloe C. and family for the great math problem as part of our Moon and Stars campaign!

About the Author

Laura Bilodeau Overdeck is founder and president of Bedtime Math Foundation. She knows a little something about numbers. As a child, she sat and memorized perfect squares for fun, back before it was cool. She went on to get a BA in astrophysics from Princeton University, and an MBA from the Wharton School of Business, and continues to star-gaze today. When not playing with numbers, Laura's other interests include her three lively children, chocolate, wine, extreme gravity stunts, and Lego Mindstorms.



Photos: Chloe C. and her dad Rob



Leave a Reply

Welcome to *The*



Name: _____

Homeroom: _____

Partner: _____

Date: _____

The First Chapter: The Goo Filled Hills

Level 1- Going Up

Your challenge is to build a structure to reach the pipe and allow the Goo to travel up.

With some challenges you will receive clues from the Sign Painter. Make sure to note these clues.

Notes:

Info: You will first encounter Black Goo, which have two legs. Black Goo can not move once they are placed on a structure.

Sketch of your structure. Label parts.

A large, empty rectangular box with a thin black border, intended for a student to draw and label their structure.



Score/Goals: _____

of Goos collected: _____

of moves: _____

Time: _____

Take 2! Try again! Can you improve?

What will you do differently? List your improvements and why they are necessary.

Did any factors affect your structure &/or success/problems?
