Illuminate Your Classroom and Teach Conceptually Using Free Virtual Manipulatives

2014 NCTM Regional Conference – Houston David Barnes

dbarnes@nctm.org

@DavidBarnes360



Introductions

Who am I? Who are YOU?





Today's Topics

- How do apps and conceptual development fit together?
- What can they do for me? My students?
- What, What if's and Why?





Principles to Actions: Ensuring Mathematical Success for All

- Specific teaching practices, that are essential for a highquality mathematics education for all students
- What it will take to turn the opportunity of the Common Core into reality in every classroom, school, and district





Guiding Principles for School Mathematics

- Teaching and Learning
- Access and Equity
- Curriculum
- Tools and Technology
- Assessment
- Professionalism



Guiding Principles for School Mathematics

Teaching and Learning

An excellent mathematics program requires effective teaching that **engages students** in meaningful learning through **individual and collaborative experiences** that promote their ability to **make sense of mathematical ideas and reason mathematically**.



Effective Mathematics Teaching Practices

- 1. Establish mathematics goals to focus learning.
- 2. Implement **tasks** that promote reasoning and problem solving.
- 3. Use and connect mathematical **representations.**
- 4. Facilitate meaningful mathematical **discourse**.
- 5. Pose purposeful **questions**.
- 6. Build **procedural fluency** from conceptual understanding.
- 7. Support **productive struggle** in learning mathematics.
- 8. Elicit and use evidence of student thinking.



http://illuminations.nctm.org

Lessons

122 ILLIMINATIONS	
Activities Lessons Standards Web Links	
NCIH Resources About	Terms of User Search Join NCTH
Too Big or Too Small?	vand Comment About this Page
In this lesson, students develop number sense through a sense of three hands-on activities. Students explore the following concepts: the magnitude of a million, fractions between 0 and 3, and the effect of decimal operations.	AA
® Learning Objectives	3 periods
¹⁰ Materials	NCTM Resources
Instructional Plan	Strength The Name of
Biolicity have a selection of problem and coloristic, gopprovide for the mobile grades closerases, for which the underlying theme is the development of under terms. These activities are below a used ways to provide discussion and is extend under themps grade number visited concepts. The discussion that areas as shadens devote their thereing will exist ways insight into their divelopment of water services and concepts. The discussion that areas as shadens devote their thereing will custavely give neight into their divelopment of anything used and anything shaden's devolution terms.	Aurobeck", (Mathematica Teaching in the Middle School, April 2002)
Activity 1: Exploring The Size of a Million Dollars	
No altern protective shade one address of the grant and the state. If the how have address and the states north hard more than a state on the how and the states of the st	
Begin the investigation by Isling the following story:	
Not as you dealed to go to bed one regist, the phene regist and a fixed offers you is chance to be a relifensate, see test your fine win 32 beams in a context, the more yeas and to the net here here the structures, such contexts [31 addre in an ordinal balls, ine will give you doe success of money if your mon or did will drive here for the apport to pick it you. Cread your frend be beling you find your. Can her make you a milliourant?	
biolive students in formulating and exploring questions to investigate the truth of this claim. For example:	
 Can \$1,000,000 in one-dollar bits fit in a standard-sized subcasis? If not, what is the smallest demonstration of bits you could use to fit the money in a subcase? 	
 Could pay bit the matrices if it contained \$1,000,000 in one-dollar billst Extinute its weight. Calculates should be available to facilitate and expedite the computation for analysis. 	

Activities



Brainteasers





Monthly E-Newsletter







Who is a little off center?



http://himlerapp.com/wp-content/uploads/2013/09/hands-raised.jpg



What Tasks/Questions Could We Ask?



What, What if.., Why

• What - What questions about the situation – What do we know? What can we figure out?

All come with a "Why?" question.

 "What if..." what things might you be able to ask? Wonder about?

• Why? Explain your thinking.



What Tasks/Questions Could We Ask?

- Is it possible that two weights could not be balanced singly?
- If ____ weighs ____ how much would ____ weigh?
- If you put one of each on the left, how many different solutions could be used on the right to balance?
- How do the ratio of the balanced shapes compare with the weights of the shapes?



What Tasks/Questions Could We Ask?

 Create a task with 2 objects where you give show some balances and we figure out the relationship.

 Create a task with 3 objects where you give show some balances and we figure out the relationship.



What are students learning?

What are students developing?

- Concepts
- Persistence
- Problems/Tasks
- Critical Thinking
- Construct Arguments and Critique Others
- Reason Quantitatively and Abstractly

Coin Box

What Questions could you ask?

Questions

- What are some different ways you can break down a quarter?
- I paid for a 70¢ item with a \$1 bill. What are the possible coins I could receive in change?
- I have some nickels, dimes and quarters and 8 pennies. What are possible values for the amount I could have?

How does the Coin Box help conceptual understanding?

Illuminations Video

https://www.youtube.com/watch?v=yYWNQFKleZA&list=HL1366809476&feature=mh_lolz

http://illuminations.nctm.org/Lesson.aspx?id=3762

What Questions can you ask?

What Questions can you ask?

 How does counting vertices, edges and faces work on a net work the same or different than on a 3D shape? Could you generate a rule?

 In a net which edges correspond to each other on the 3D shape?

POLYHEDRON	Name of Each Face	Number of Sides on Each Face	Number of Faces	Number of Vertices	Number of Edges
Tetrahedron					
Cube					
Octahedron					
Dodecahedron					
Icosahedron					
Firegular Polyhedron					

Spatial Visualization

• How does the app help?

Why Apps?

- Provide a means for class discussion and problem solving.
- May be easier to manage?
- Offer experiences that may not be available without?
- Because they provide the opportunity for good tasks, good questions, good learning.

Questions? Comments ?

dbarnes@nctm.org

