

Discussion Prompt: "Math is fun"

- In contrast to "Math gives me anxiety", students may seem to enjoy math, perform well on the subject, and enjoy their classes.
- From the parents point of view, they do not really mind that the students are having fun in math, as long as (for Asian parents) get that A+ in mathematics.
- To the teachers, they would try to make each math class seem more engaging to the point their class becomes fun and where the students may or may not enjoy the fun.

Discussion Prompt "Math should always be fun"

- When the teachers say that math should always be fun, may give students anxiety with the concept, especially for those who are in high school and maybe at a university level.
- Maybe at a younger age, when the teachers say that math should always be fun, the students will tend to believe that the math they are learning is going to be fun.
- Fun in math should have a ton of engagement, i.e in proofs, say in a tutorial you give the students an activity related to proof-writing. Given a conjecture, we can provide groups with "building blocks" to complete the proof as an engaging activity among peers and even the tutorial leader or instructor.

Announcements:

- Weekly Reading #2 switching tonight
- Weekly Reading #3 due on March 11.
- Reflection Assignment 1 Due tonight

Mathematical Activity How many alien dolls can be made from 45 heads and 55 feet, when one alien must have one head and three feet and the other alien must have four heads and two feet?

- Students would get distracted with the manipulative provided and will start to make their own aliens for fun and not completing the objective.
- The manipulative provided may not be as helpful and not totally related, to the point you do not need it. Only a distraction

Intended Learning Outcome (Grade 8 class).

Use different problem-solving strategies

- Trial and error
- Building equations for the first time.

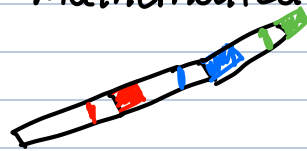
What do you think the teachers learned from the case study?

- Reluctant to solve the problem
- Second class used more problem solving skills than the first class.
- Second class relied more on pencil and paper and students in the first class relied more heavily on together blocks.

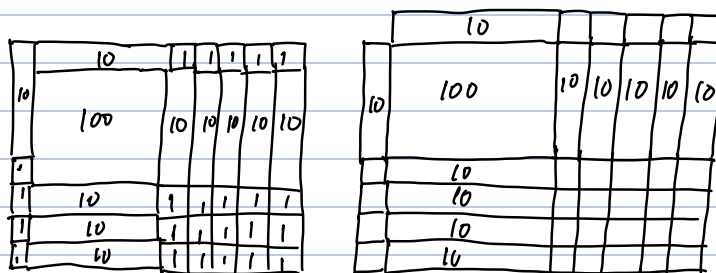
Quote: The majority of the students did not learn any new mathematical concepts, nor were any previous concepts reinforced. Once they were allowed to use the manipulatives, it became an exercise in matching heads and feet.

Dangers of Manipulatives

- Manipulatives more effective for 7-11 year olds than 3-6 year olds or over 11's.
- Larger effect on retention than problem-solving, transfer and justification.
- Manipulatives used as "little more than a diversion [when] teachers were not able to represent mathematical concepts themselves.
- Teachers had concerns about their competency using manipulatives and worried about classroom control, noise, tidying up, resources and time.
- Manipulatives viewed as tools to help students make sense of problems or crutches to help them complete an often poorly understood procedure.



Markers as a sword...



Base 10 Blocks

What is going on here? The students are trying to multiply 14 by 15 by using the base 10 blocks. The student on the left did

not put the blocks correctly because there is some overlap.

Some may also decompose it as

$$\begin{array}{r|l} & 10 + 4 \\ 10 & 100 \quad 40 \\ + & \text{---} \quad \text{---} \\ 5 & 50 \quad 20 \end{array}$$

and then add up all the values together.

Thought what was the easiest,

Activity changed to a gallery wall. Modelled the problem incorrectly.

Used manipulatives but did not make the connection to math.

Student: First we have to know what the answer is before building.

Four Principles:

(i) Begin with highly transparent concrete representations and move to more abstract representations over time.

- Manipulatives more effective for outcomes related to reproducing basic procedures than for outcomes related to transfer.
- For some students, the answer and the non traditional procedure to obtain the answer became two separate processes

(ii) Explicitly explain the relation between the manipulative and the math concept.

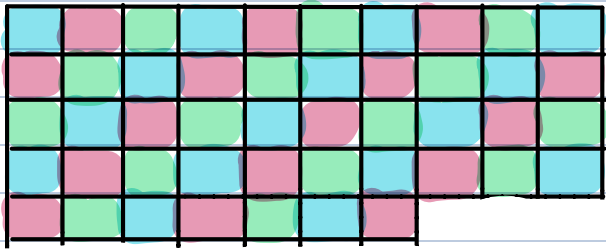
- Let students use limited cognitive resources focusing on the math rather than trying to abstract the relation
- Students have no way of knowing which features of the manipulative are important and which are not.
- When the students are given little guidance in the hope that

they will, in the course of loosely structured exploration, discover key concepts in math and science, outcomes are usually disappointing compared with situations using more explicit instruction. (Laski 2015)

Grade 3 Case Study

What mathematical topic do you think the teachers were teaching that motivated them to choose this book as a manipulative?

- Fractions, patterns and sequences, multiplication, division.



The book choice was a poor one
it was focused on skip counting
and grouping numbers rather

than the place value.

(iii) Use manipulatives consistently, over a long period of time.

Learning Cycle

- Manipulative helps establish entry-level understanding.
- This then promotes deeper insights into how the material related to the concept.
- This deeper insight helps establish better understanding of the mathematical topic.

(iv) Avoid manipulatives that resemble everyday objects or have distracting irrelevant features.

- Manipulatives Aid Understanding when attention is on the

relevant feature (Willingham 2017)

- When a manipulative is basic, children direct all their attention to thinking about the relation to the mathematical concept it represents. (Laski 2015)