



Inquiry Learning: Math

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Inquiry: what does it look like?

Take a moment with your table group and think about what inquiry looks like to you (within your classroom)?

Inquiry: what does it look like?

Reading:

MTPYPH: Read pages 28 - 29

"Why is a commitment to inquiry and the construction of meaning important?"

"What does inquiry look like?"

Visible thinking routine: word, sentence, phrase

Inquiry: what does it look like?

- exploring, wondering and questioning
- experimenting and playing with possibilities
- making connections between previous learning and current learning
- making predictions and acting purposefully to see what happens
- collecting data and reporting findings
- clarifying existing ideas and reappraising perceptions of events
- deepening understanding through the application of a concept
- making and testing theories
- researching and seeking information
- taking and defending a position
- solving problems in a variety of ways

The inquirer in all of us!

How children learn mathematics in the PYP

"It is fundamental to the philosophy of the PYP that, since it [mathematics] is to be used in real-life situations, mathematics needs to be taught in relevant, realistic contexts, rather than by attempting to impart a fixed body of knowledge directly to students."

How children learn mathematics in the PYP

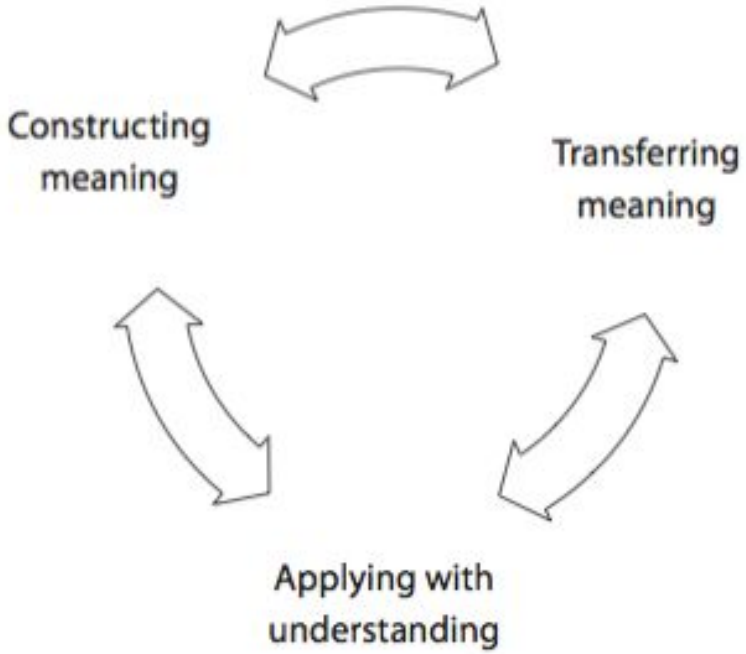


Figure 1
How children learn mathematics

Constructing meaning about mathematics

Through inquiry learners:

- are ACTIVE
- construct meaning on previous experience
- reflect on interactions with objects and ideas
- engage in conversations
- interact with manipulatives
- interact with mathematical concepts

Constructing meaning about mathematics

Children need ***many*** opportunities to interact with mathematical concepts before they form a **deep** understanding of them.

Constructing meaning about mathematics

Constructing meaning of the mathematical concept of *patterns*

What do these images have in common?

Constructing meaning about mathematics

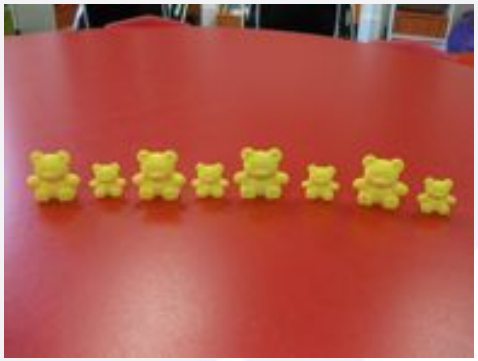
Constructing meaning of the mathematical concept of *patterns*

Where have you seen patterns before?
(possible student responses)

Constructing meaning about mathematics

Constructing meaning of the mathematical concept of *patterns*

Using the manipulatives, build a pattern. Describe your pattern.



Transferring meaning into symbols

- Takes place only when learners have constructed their ideas about a mathematical ***concept***

- Symbol notation can take the form of pictures, diagrams, modelling with concrete objects and mathematical notations

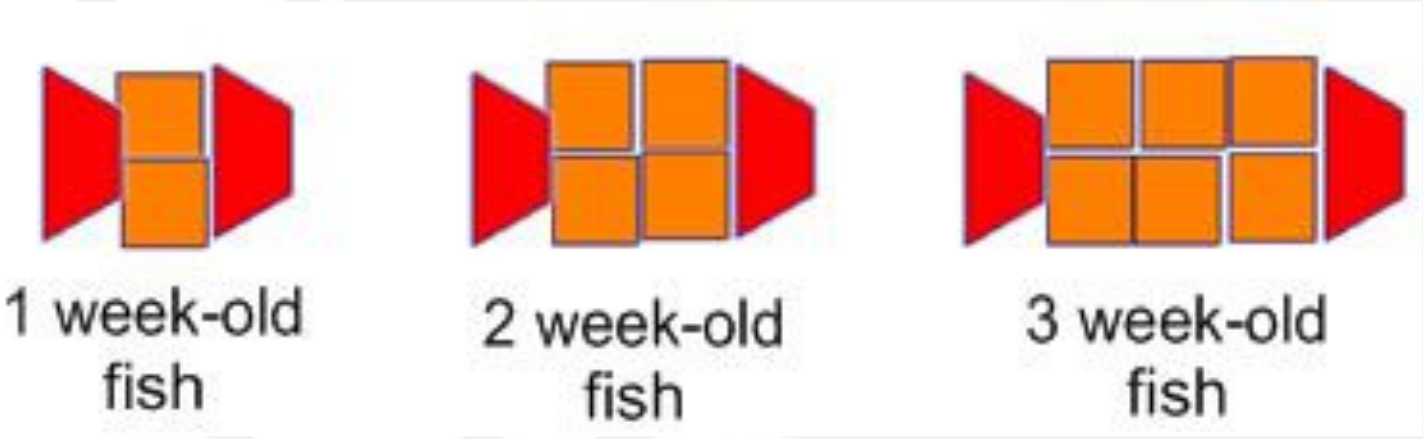
Math concepts

Mathematical concepts

number proportion ratio scale probability perimeter rate domain vectors rotation	slope equivalence symmetry shape congruence area fractions range coordinates expression	intersection distribution unit of measure line point correlation chance decimals series trends	properties risk sampling function variable angle average odds symbols perspective relative magnitude

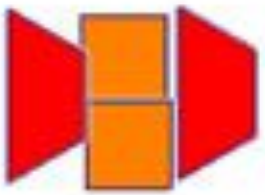
Transferring meaning into symbols

What would the pattern look like when the fish is 4 weeks old? 6 weeks old? What happens every week as the fish gets older?



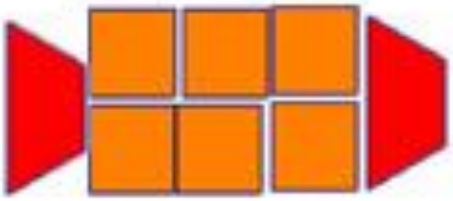
What is the mathematical ***concept?***

Transferring meaning into symbols



1 week-old fish

2 week-old fish



3 week-old fish

2

2 + **2** = 4

4 + **2** = 6

Extension: 3 x 2 = 6

Applying with understanding

- Viewed as learners demonstrating and acting on their understanding
- Authentic activities: real-life situations
- Demonstration of mathematical thinking

Applying with understanding

Real-life situation - pose a problem!

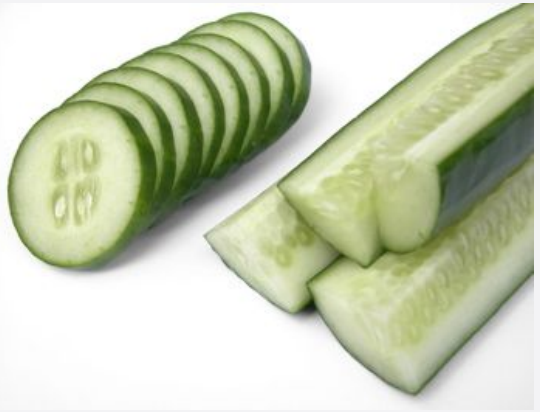
You and your friends are making a salad for the class shared lunch.

Think about:

- What does each person need to bring?
- How much do they need to bring?
- How will they prepare the salad?

What math ***concepts*** would students engage with?

Applying with understanding

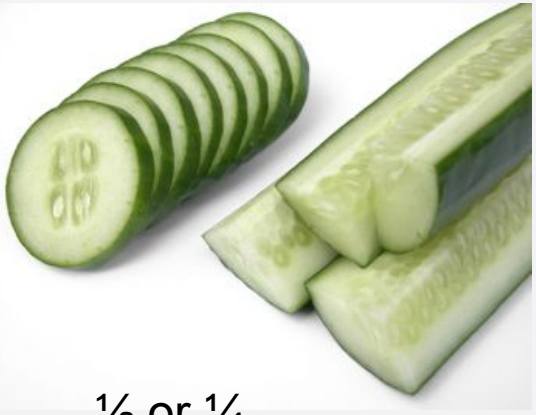


Applying with understanding

Whole

Parts of whole

1 whole



⅛ or ¼

half

quarter

YUMMY!

Bringing the stages together...

Mathematical reasoning:

- They use patterns and relationships to ***analyse*** the problem situations upon which they are working
- They make and ***evaluate*** their own and each other's ideas
- They use models, facts, properties and relationships to ***explain*** their thinking
- They ***justify*** their answers and the processes by which they arrive at solutions.

A mathematical inquiry…
CONSTRUCTING

Constructing

Have you ever seen or visited a suspension bridge?

What can you observe about them? What do you wonder?

A mathematical inquiry…
CONSTRUCTING

A mathematical inquiry…
CONSTRUCTING

As an inquirer, what do you observe about the bridge?

A mathematical inquiry…
CONSTRUCTING

Suspension Bridge!

In your group of 4, use the 6, 60cm strips to consider how they can be cut to make a bridge representing these fractions:

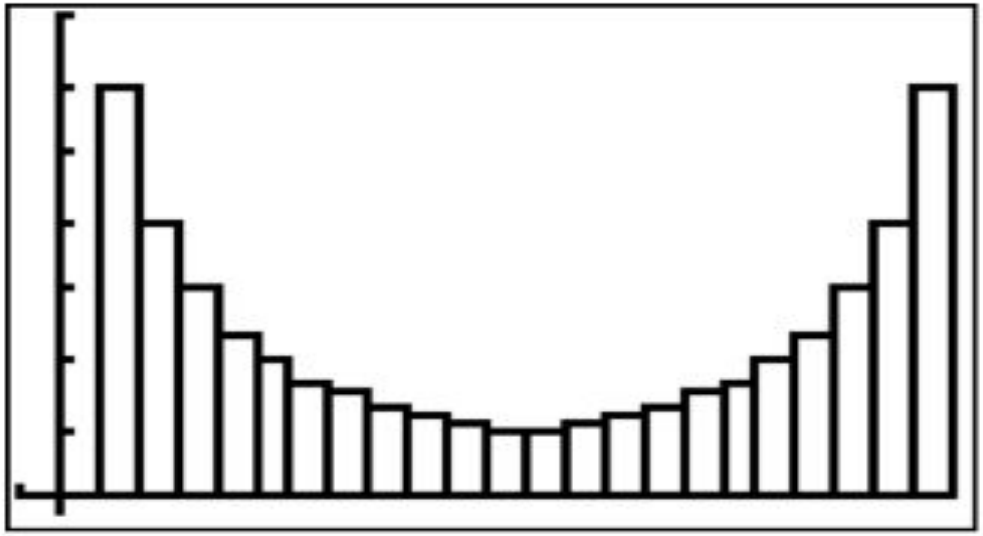
½, ⅓, ¼, ⅕, ⅙, 1/7, ⅛, 1/9, 1/10, 1/11, 1/12, given that each strip represents one whole unit.

Each pair in your group makes these fractions from three strips, then combines their fractions with the other pair to create a suspension like bridge. It is not necessary to use all pieces of the strips.

A mathematical inquiry…
CONSTRUCTING

Suspension Bridge!

What is the mathematical *concept* being addressed?



Think abc

you engage in

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Transferring meaning into symbols

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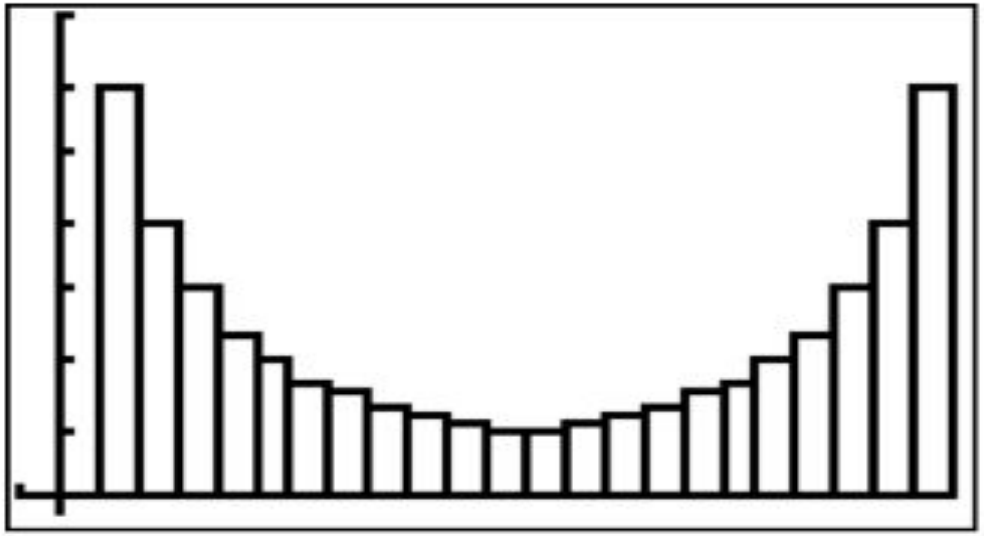
A mathematical inquiry…
TRANSFERRING

Label your bridge with the appropriate fractions.



Applying with understanding

- Viewed as learners demonstrating and acting on their understanding
- Authentic activities: real-life situations
- Demonstration of mathematical thinking

A mathematical inquiry…
APPLYING

Using your understanding of the mathematical *concept* of fractions (parts of a whole), you need to construct a structure using using a maximum of four 1m long wood pieces.

You must make a design plan that shows how the wood will be cut, indicating the lengths (in cm) and the fraction of the whole that the length would represent.

A mathematical inquiry…
Connecting to the curriculum

Standards (Gr 6):

Ma.6b Order positive and negative integers, decimals and fractions; use the number line as a model for ordering of the real numbers

Ma.6i. Show terminating decimals and their corresponding fractions (such as 3.5 and 7/2 or 0.375 and 3/8)

Ma. 6j. Define percentage as ‘number of parts per hundred’, interpret percentages and percentage changes as a fraction or a decimal, express one quantity as a percentage of another, compare two quantities using percentages, and work with percentages greater than 100%

A mathematical inquiry…
Connecting to the curriculum

Scope & Sequence:

Conceptual understanding (Phase 3): Fractions and decimals are ways of representing whole-part relationships.

- model equivalent fractions
- use the language of fractions, for example, numerator, denominator
- model decimal fractions ti hundredths and beyond

Conceptual understanding (Phase 4): Fractions, decimal fractions and percentages are ways of representing whole part relationships.

- model improper fractions and mixed numbers
- simplify fractions using manipulatives
- model decimal fractions to thousands and beyond
- model percentages
- understand the relationship between fractions, decimals, and percentages

In conclusion...

- Build mathematicians through *constructing* meaning first, then *transferring* meaning to symbols and *application* of understanding

- Think about, “what inquiry looks like?” and the opportunities you are facilitating to engage in multiple ways of developing/deepening understanding(s)

- Focus on authentic, “real-life” mathematical situations

In conclusion...

Fostering curiosity...the trait of a natural inquirer!