The Secrets of Shanghai Mathematics Teaching

Mastering an educational objective amounts to discerning and taking into consideration its necessary aspects.

Misconceptions originate from the fact that we discern some critical aspects but not others.

Shanghai Teaching

Identify necessary/critical aspects of learning

Identify all possible misconceptions

Collaboratively plan and analyse sequences of lessons around key concepts and misconceptions

Variation Theory

Conceptual variation

Concept – non concept

Procedural variation

Teaching with Variation

The central idea of teaching with variation is to highlight the essential features of the concepts through varying the non-essential features.

Gu, Huang & Marton, 2004

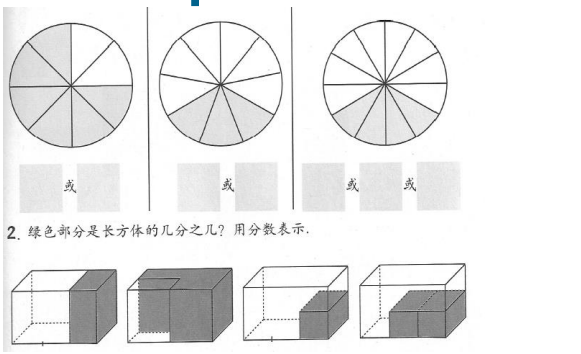
Variation theory is posited on the view that "when certain aspects of a phenomenon vary while its other aspects are kept constant, those aspects that vary are discerned".

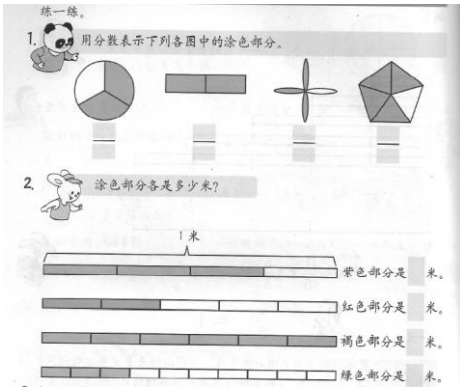
Lo, Chik & Pang, 2006

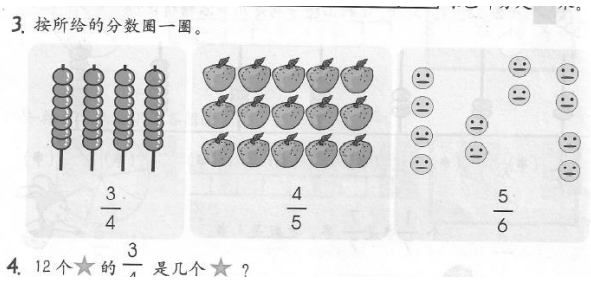
Conceptual Variation

Conceptual variation (see Lo & Marton, 2012; Leung, 2003) aims at providing students with multiple perspectives and experiences of mathematical concepts (Gu, Huang & Marton, 2004).

Conceptual Variation

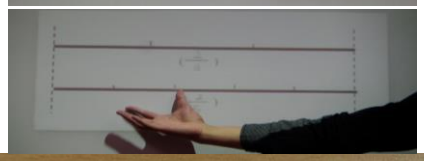


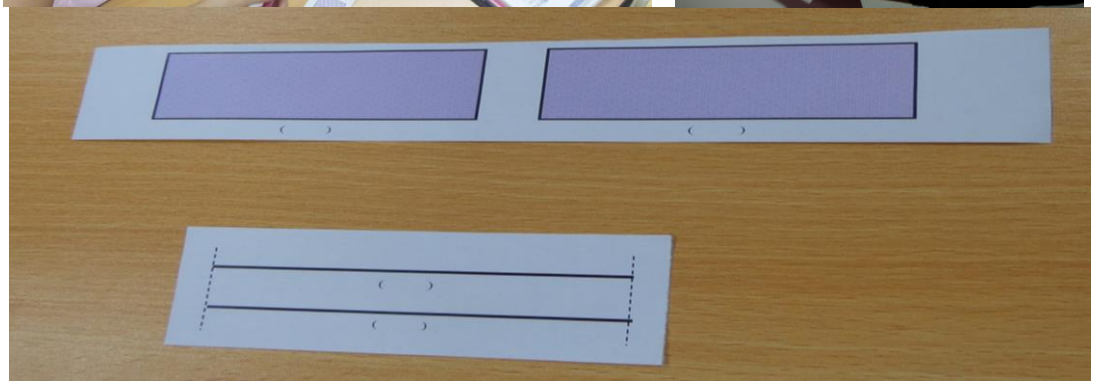




Conceptual Variation – Grade 4 -Shanghai 2015

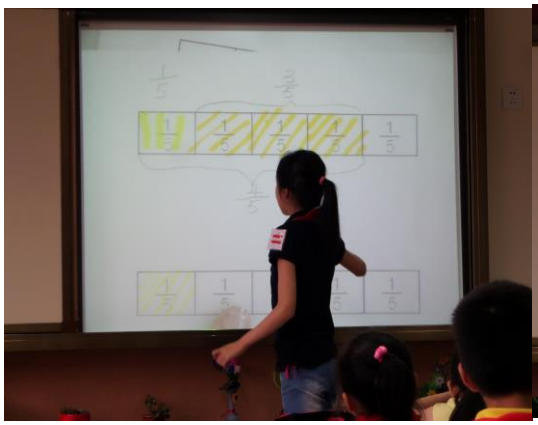
Represent 2/5 and 1/3

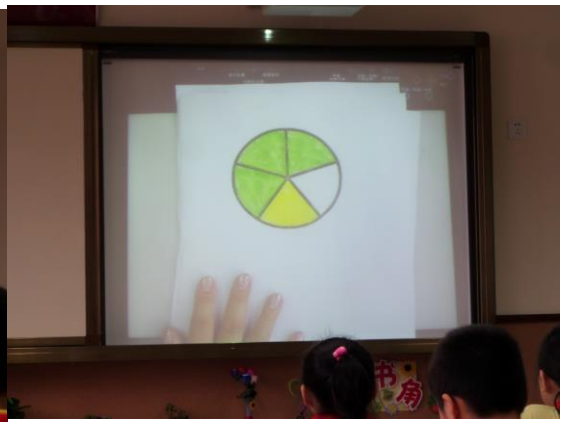




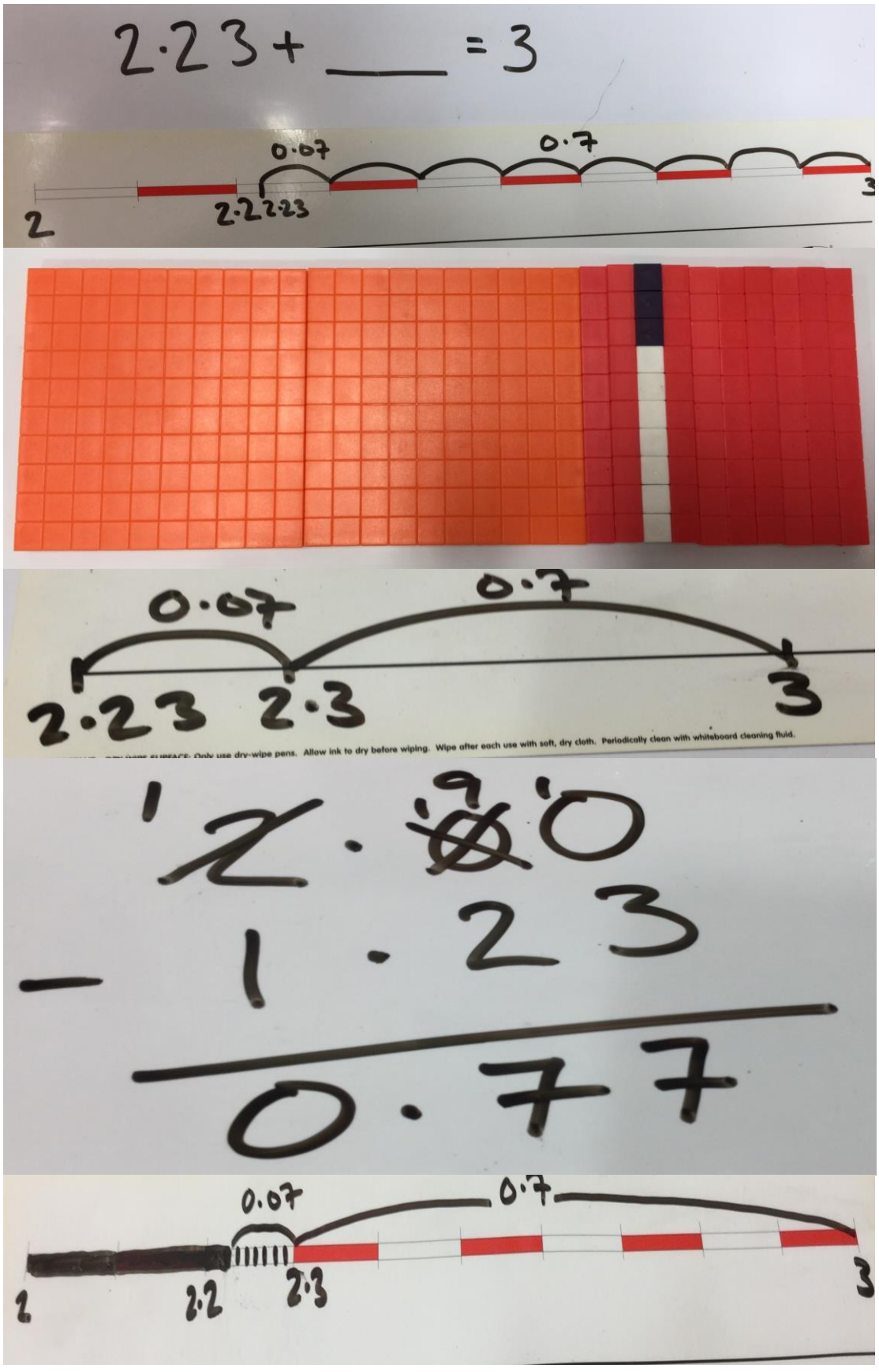
Conceptual Variation – Grade 4 - Shanghai 2015

3/5 + 1/5 and 3/5 – 1/5





Conceptual variation – Year 7 - MKA 2015



Conceptual Variation in

Concept – Non-Concept

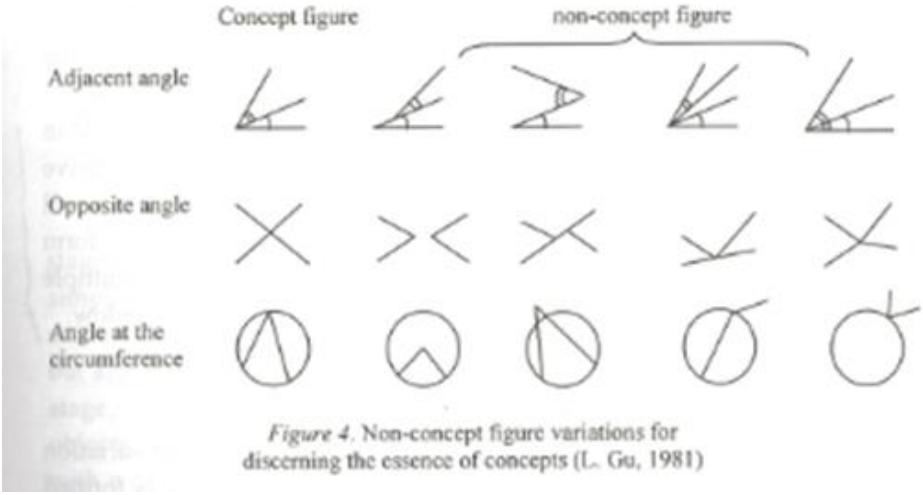
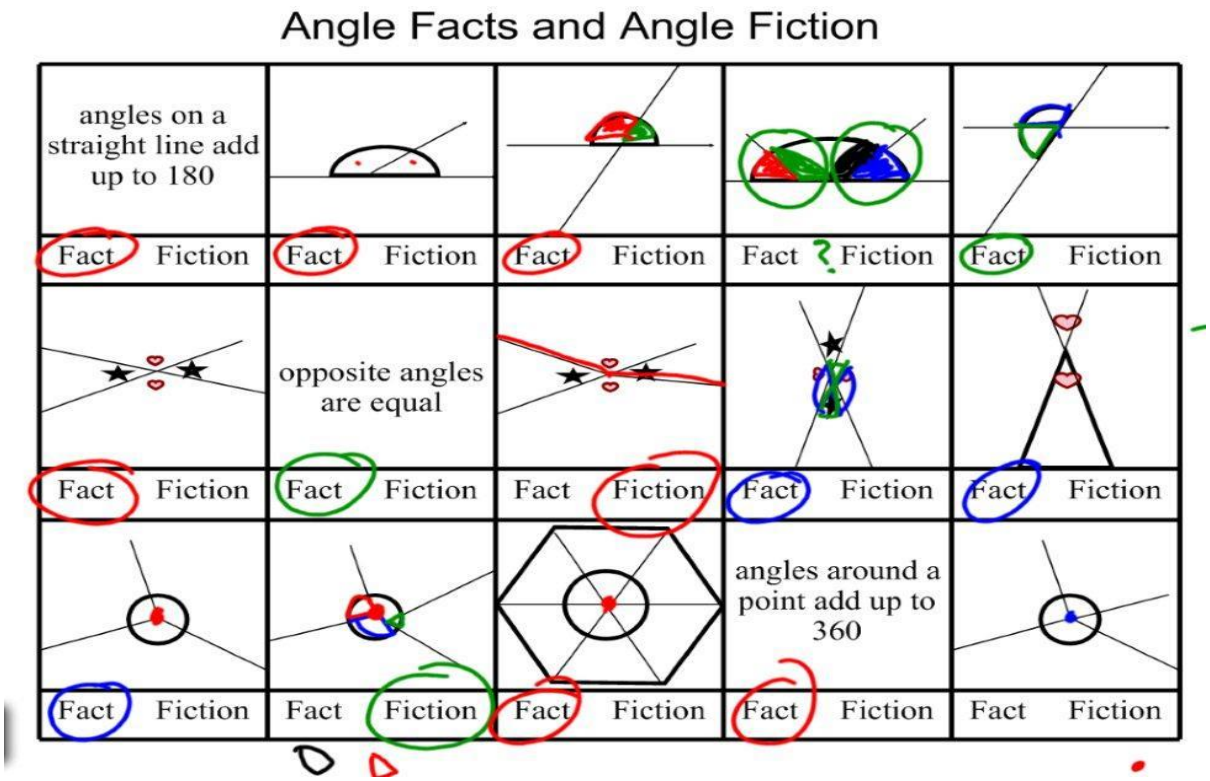


Figure 4. Non-concept figure variations for discerning the essence of concepts (L. Gu, 1981)

Show examples of concept and non-concept simultaneously. This draws out misconceptions at the very start. Students learn what the concept is by comparing to what it is not.



Concept and Non-concept in

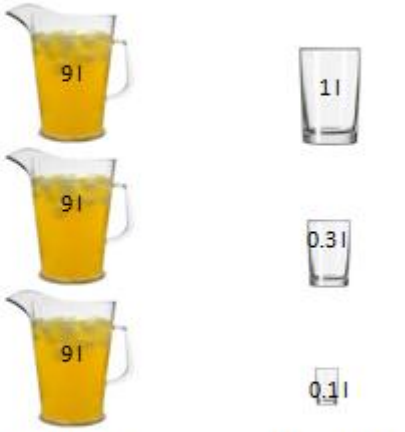
Procedural Variation
Variation and Invariance

Variance and Invariance in

Procedural Variation

What stays the same?

What's different?



invariant variant

Teaching for Mastery in Shanghai

Think carefully about

- the best **real-world (concrete) representation / model** to introduce the **(abstract) concept**
- The **reasoning** and **discussions** that should take place in lessons
- the **misconceptions** the pupils **will** have, and how these can be cleared up
- **intelligent practice** (questions and problems) to give **fluency** and **deep understanding**

Teaching for Mastery in

Name: **Department:**

What aspects of Mastery will you try in your lesson?

What support will you need?

WWW

EBI