Differentiate Learning of Number and Addition/Subtraction Facts via Representation
NCTM Annual Conference, New Orleans -- April 10, 2014

Ways of Using Models/Representations **"**the mathematics that emerges from a model depends on what features of the model are stressed/ignored" *[Mike Askew, "Models in Mind." Primary Mathematics (Autumn 2012):3]*

- **Models of Situations**
  Use model to help learners gain <u>insight</u> into mathematical structure, concepts and properties (not just getting right answers)

- **Models for Representing Students' Thinking**
  Learners may solve problems different ways and teacher provides mathematical model(s) to represent student thinking

- **Models as Tools for Thinking**
  The model itself become a tool for thinking/problem solving

Planning: Which Representations/Tool to Use?
- What is the underlying mathematical goal of my lesson? What representations might I incorporate into the lesson to help children meet this goal?
- Which representation [or translation among representations] will help children see underlying mathematical structure or relationships or will it be used primarily as a tool to find an answer?
- What representations will I use to <u>pose</u> task?* What representations will children use to <u>solve</u> the task? What representations will I use to <u>record/document</u> students' strategies?
- Will I let students choose the representations/models to use to solve the task or will I encourage the use of a particular representation(s)?
- In what order does it make the most sense to introduce (or invite the use of) the different representations?*

Evaluating Students' Thinking and Uses of representation
- How do students use representations to explore mathematical concepts?
- How do my students represent the mathematical ideas of the lesson?**
- Do my students use these representations in meaningful ways to communicate their understanding of concepts?
- What does my student's representation tell me about that his/her understanding of the mathematics?**
  - ***How do students make connections among representations?***
- Were any translations among representations particularly challenging or helpful for students? *
- Can students translate among representations to demonstrate understanding of concepts?
- How did the representations and connections among them support the students' mathematical reasoning and flexibility in their thinking?*

*questions taken from: Clements, Lisa. "A Model for Understanding, Using, and Connection Representations." *Teaching Children Mathematics*, (September 2004): 97-102.
** questions taken from: Fennel, Francis & Rowan, Tom. "Representation: An Important Process for Teaching and Learning Mathematics." *Teaching Children Mathematics*, (January 2001): 288-292.

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CDC Workshop Planning Form

Standards:	**Materials Needed**
GOAL	

REVISITING/CONNECT BACK:

EXPLORATION (provocation/activity**):**

Anticipated Responses	**Differentiation of Task**

SUMMARIZE/REFLECT:

Key Ideas to Come Out During Summary Discussion	**How to Facilitate Summary** **(Mathematician's Chair (Students/Teacher**

Reflection Question(s):

Homework/Follow up:

Vocabulary	Groupings/Organization	Representations	
		Context	Written
		Objects	Symbols
		Pictures	Drama/Role Playing
		Verbal	