

2010 Heartland Convention (October 7, 2010)

2010 Protestant Reformed Teacher's Institute (October 8, 2010)

## The Virtual Age of Hands-On Mathematics

### 1 - INTRODUCTION

### 2 - CATEGORIES OF MANIPULATIVES

- Concrete (Physical)
- Virtual
- Why the distinction?

### 3 - WHY MANIPULATIVES?

- Concrete → Abstract
- Clarify misconceptions and representations
- Increased achievement
- Increased retention and problem solving
- Improves student attitudes toward mathematics

### 4 - WHY VIRTUAL MANIPULATIVES?

- Personal and engaging
- Easy to use and interactive
- Immediate feedback
- Enhances enjoyment of math (a great anxiety fighter?!)
- Expand children's experiences
- Large volume of available tools
- More manageable, flexible, and extensible
- Some are FREE!
- Can be used at home
- Time saver
- Can be altered easily

### 5 - RESEARCH ON THE EFFECTIVENESS OF VIRTUAL MANIPULATIVES

- Native or Immigrant?
- Promising potential
- Limited...but growing
- Students who use virtual manipulatives demonstrate:
  - Greater sophistication in classification and logical thinking
  - More complex, richer understanding of concepts
  - Works great for ELLs (translates into Spanish and French)
  - Increases conceptual understanding
- Comparison studies between concrete and virtual manipulatives
  - 3<sup>rd</sup> grade algebra
  - 1<sup>st</sup> grade geometry
  - Kindergarten patterns

## 6 - BARRIERS TO TEACHERS ADOPTING VIRTUAL MANIPULATIVES

- Preparation time
- Delivery time
- Insufficient skills
- Technology availability
- Resource inflexibility
- Context switching
- Grain size mismatch
- Search difficulties
- Resource unfamiliarity

## 7 - TIPS FOR CHOOSING VIRTUAL MANIPULATIVES

- Proper use is essential
- Questions to ask:
  - Does it lend itself to differentiation?
  - How much manipulating is possible? (static or dynamic)
  - What type of feedback do they provide?
  - Will teachers need to provide feedback and support?
  - How clear are the instructions for use?

## 8 - TIPS FOR USING VIRTUAL MANIPULATIVES

- Time for student exploration
- Teacher knowledge/skill
- Work with virtual does NOT need to be preceded by the concrete experience
- Students need GUIDANCE! – no inherent meaning
- Model use:
  - Find reusable resources
  - Understand found resources
  - Organize class materials
  - Write activity instructions
  - Ensure reliable access to materials
  - Assess student performance
  - Share resources

## 9 - WHAT QUESTIONS DO YOU HAVE?

## 10 - REFERENCES: See next page

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