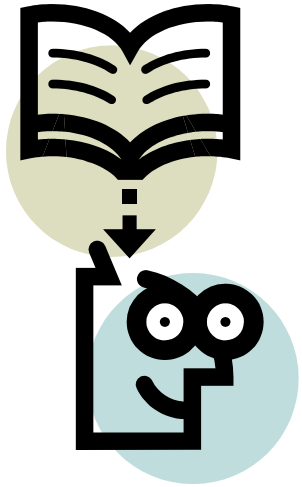
Examining Kindergartners' Play with Manipulatives for Instances of Possible Mathematics Instruction

Is play-based curricula applicable to today's content driven kindergarten?

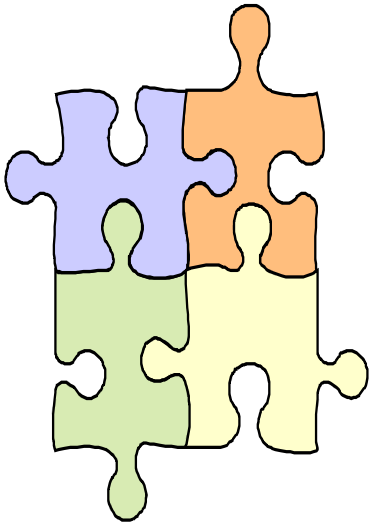
My Experience

Kindergarten Curriculum Debate

Direct Instruction



VS



DAP

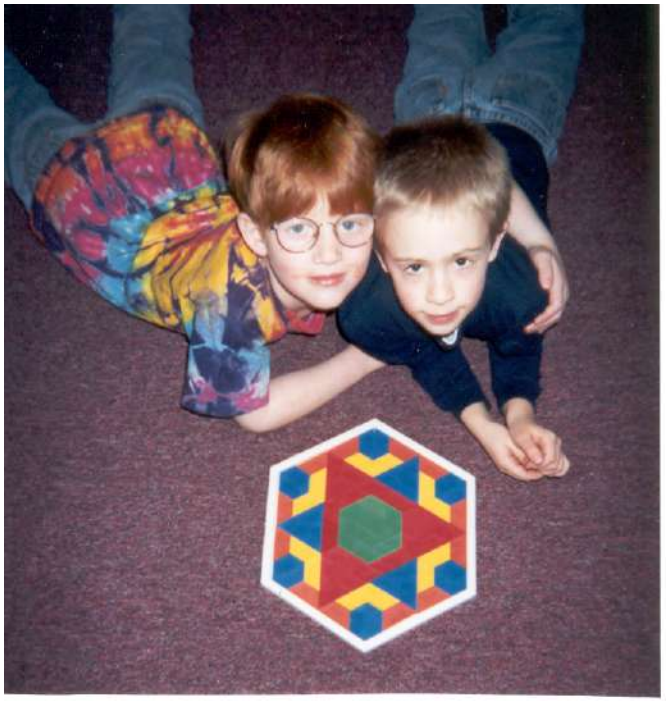
blend many teaching strategies

Relevant Research

- unit blocks enhance math foundation
- manipulative instruction more successful
- much math in play
- especially blocks, Legos, puzzles, constructive & pattern play

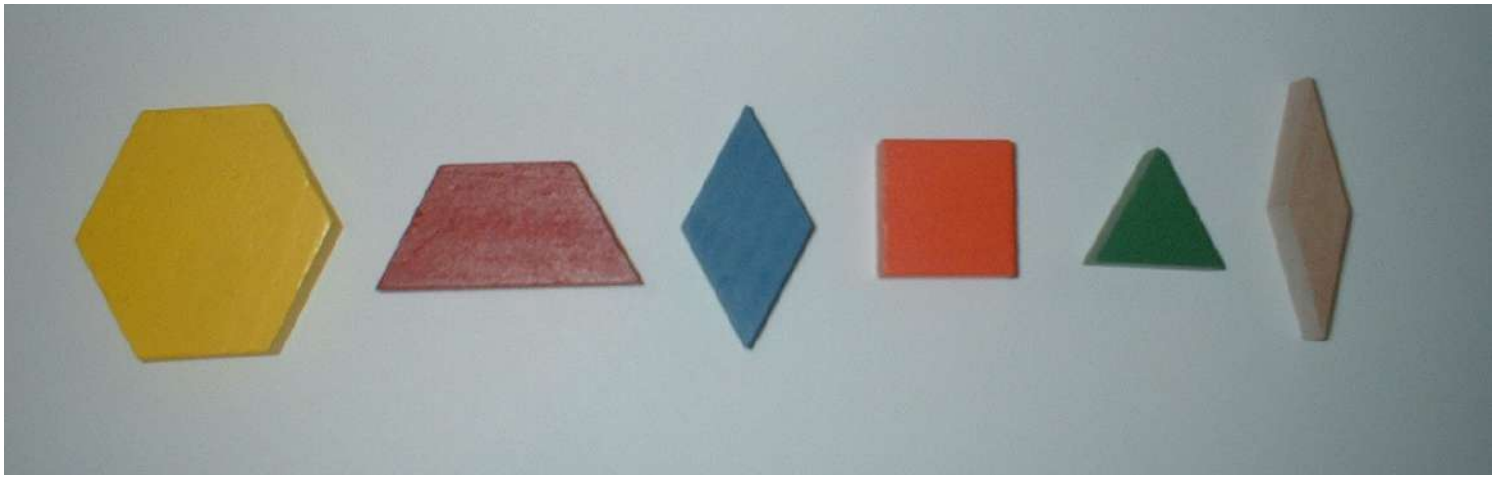
Suggestions from Research

- teachers should utilize spontaneous math encounters
- unfortunately
  - teachers not involved in children's play
  - teachers not aware of informal mathematics
  - teachers underestimate children's ability



Research Purpose and Design

case study of kindergartner's play with pattern blocks in order to inform teachers' practice and administrators' knowledge

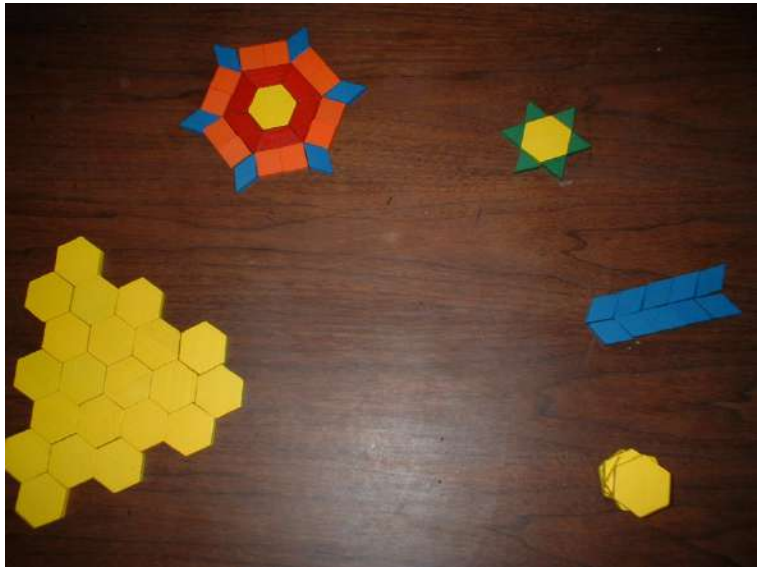


Data Collection and Analysis

- Collection
  - 180 minutes of videotaped observation
  - 20 minute of stimulus recall interviews
  - field notes
- Analysis
  - three data sets
  - inductive and deductive coding
  - readings, coding, themes, narrative, conclusions

Social Findings

- Associative Play

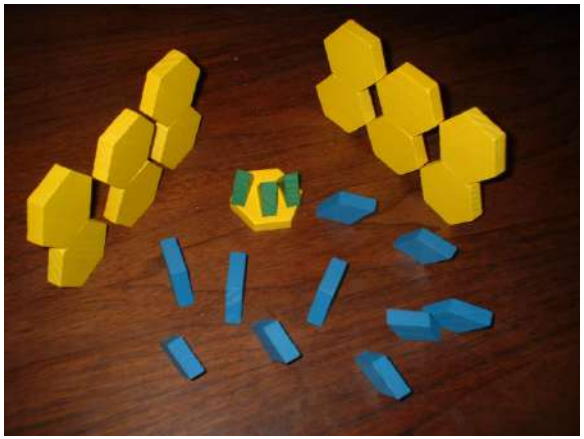


- Cooperative Play

Sharing Independent Creations

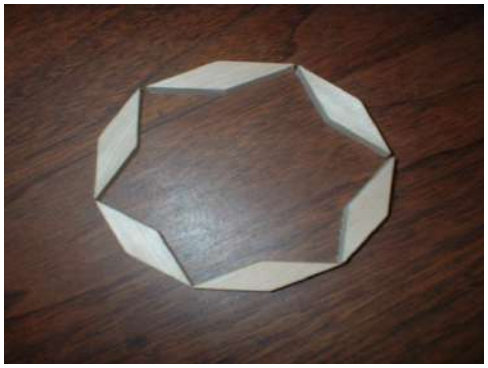
Star Wars robot

the club

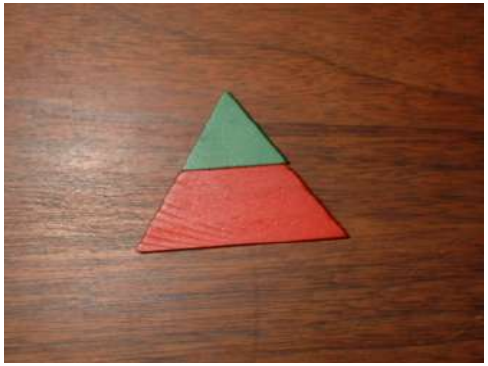


birthday story

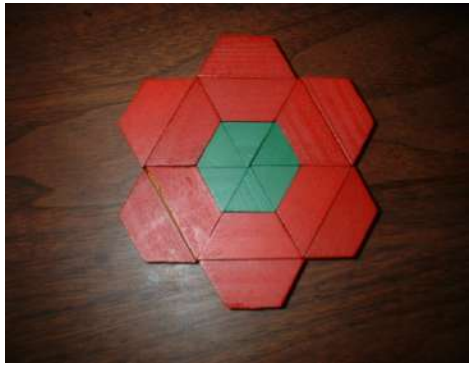
Discourse About the Blocks

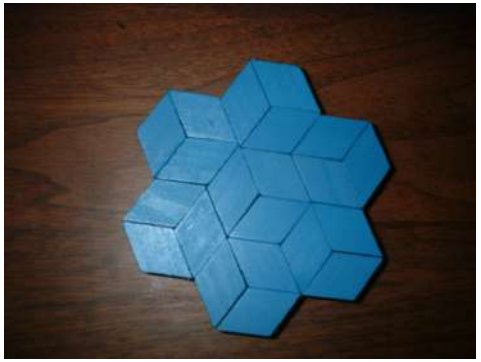


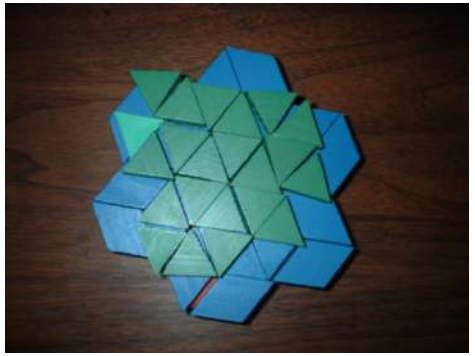
Noah's frame



Noah's triangle



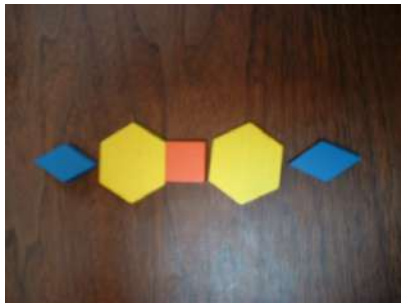




Ally's flower

Imitation

towers



Carl's

Ally's

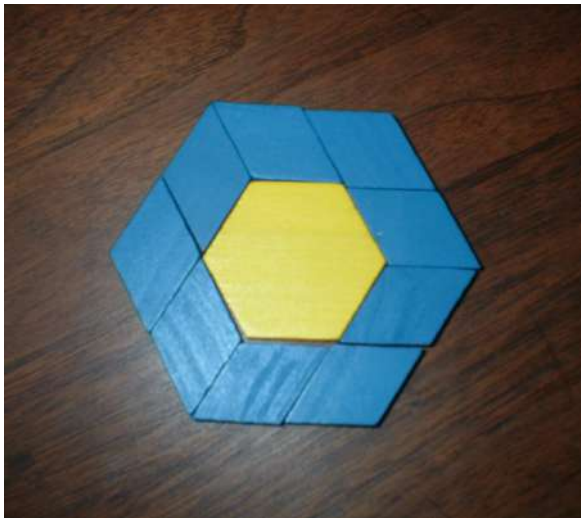
Ron's

yucky sandwiches

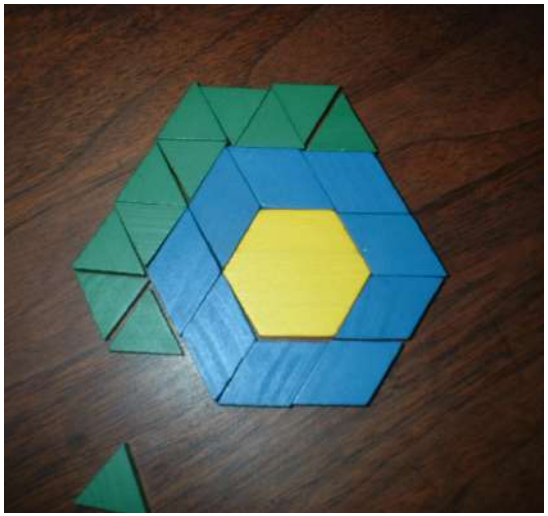
Ron's

Carl's

Carl: "I'm making something a little like Noah did last time."



Noah's

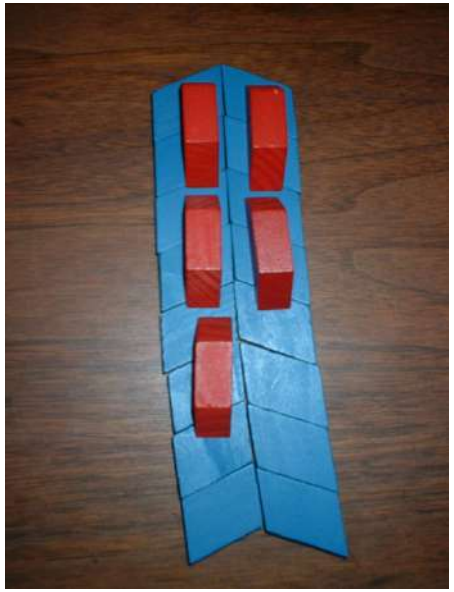


Carl's

Partnerships

Ally and May

castle



arrow

Groups

sorting

pushing

Carl's Games

New Hope Set

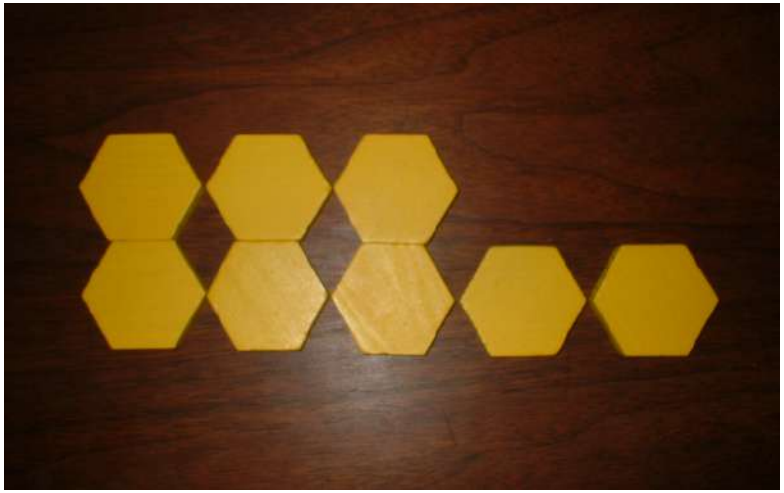
Triangle
Pyramid a
Dooma Pooma

Mathematical Findings

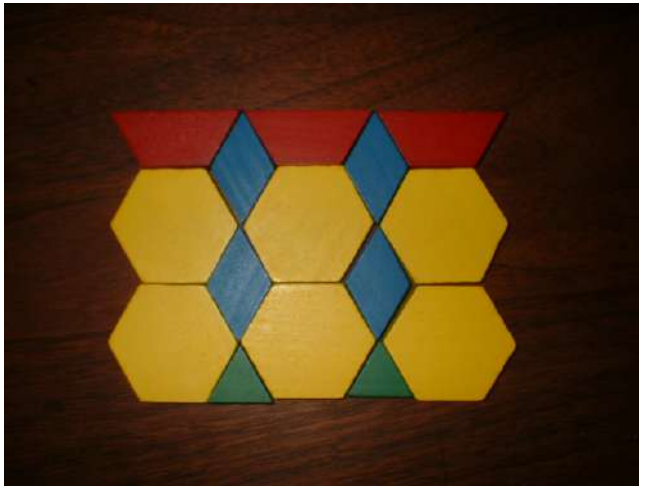
- Geometry
  - Dynamics
  - Symmetry
  - Spatial Relations
  - Shape and Color
- Algebra
  - Classification
  - Pattern
- Number

Dynamics

May: "My triangles are turning into diamonds."

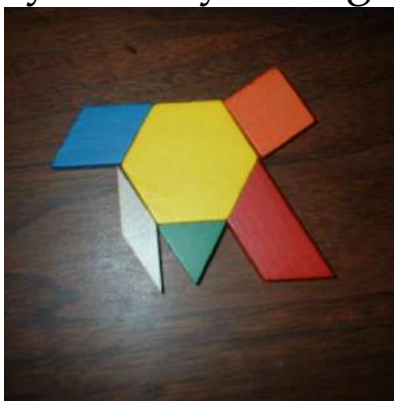


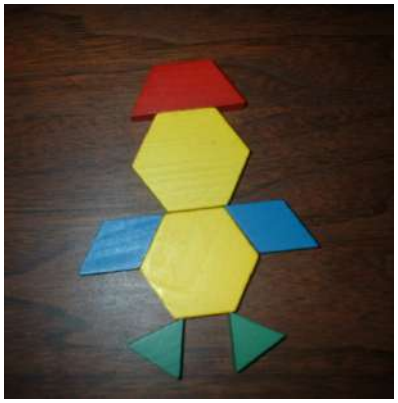
Carl: "How bout you put the diamonds in there and take these two and then that could happen?"



Line Symmetry

May's funny little guy

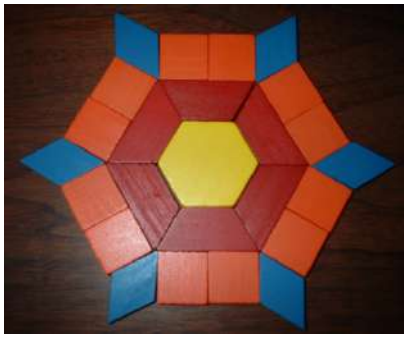




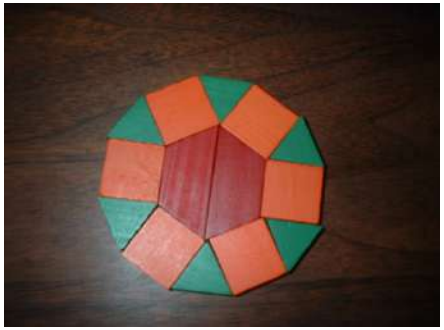
Carl: "It's symmetrical. If you cut it in half …"

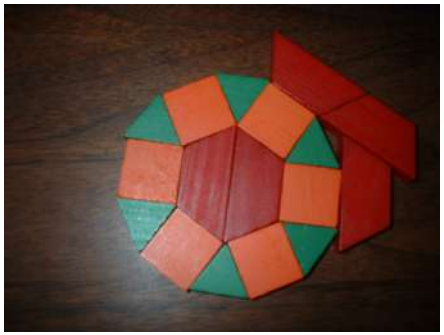
Rotational Symmetry

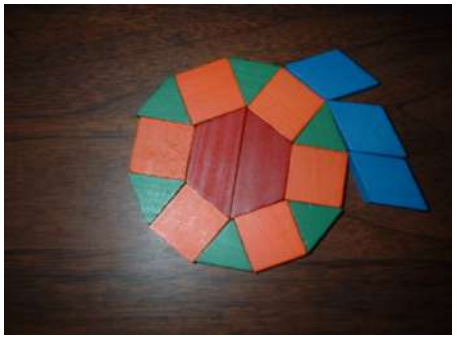
Noah's design and star



Ally: "A flower. But I can't find anything to go around it."







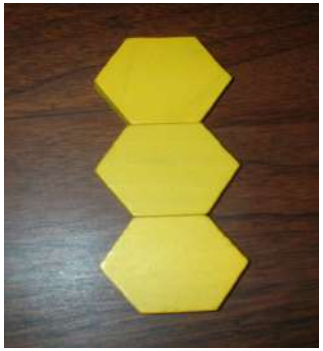
Spatial Relations

Noah: “We can’t get the crystal. We all know which one is the crystal. Sometimes it’s the top and sometimes it’s the middle. So we do not know.”

Shape and Color

color

Ally: "Look, I made a stop sign. Actually these are the stop lights. Look, I made stop sign, red, yellow, blue."



color instead of shape

Noah: "I need all the … I need all the tri… I need all the greens."

insist on shape name

Ally: It's a trapezoid. Call it a trapezo

color and shape

May: "I need the orange, orange, squares. Squares please, squares please."

rhombus or diamond?

Ron: It's a diamond kinda, but it broke. It's a rhombus. I forgot that, but it's a rhombus.

Classification

Ron's sorted stacks

Group Sorting

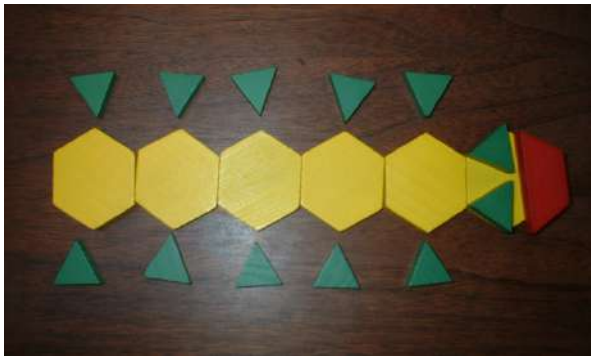
Carl: "I get the yellows and the green."
Ally: "I get, I get the…"
May: "I get, I get, I get these two."

May & Ally's Hexagon Flowers

Pattern

Ally & May's ordered stacks

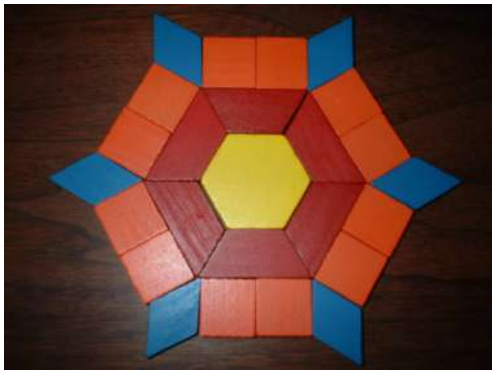
May's caterpillar



May: "Mine just goes up and up and up. Design up! Cool design, right? It goes yellow, orange, red, green.

Ron: "It's called a sandwich pattern." "It was just going bread, pepperoni, bread, pepperoni. "

Number



Description

Ally: "Look Mrs. A., I used orange pieces, blues pieces, red pieces, and yellow pieces… One yellow piece."

Game Play

Carl: "It's called one triangle in a row."
"You have to try to get to 100."
"It's time for a second level, This is the second one."
"Now you have twenty-hundred lives."

Counting

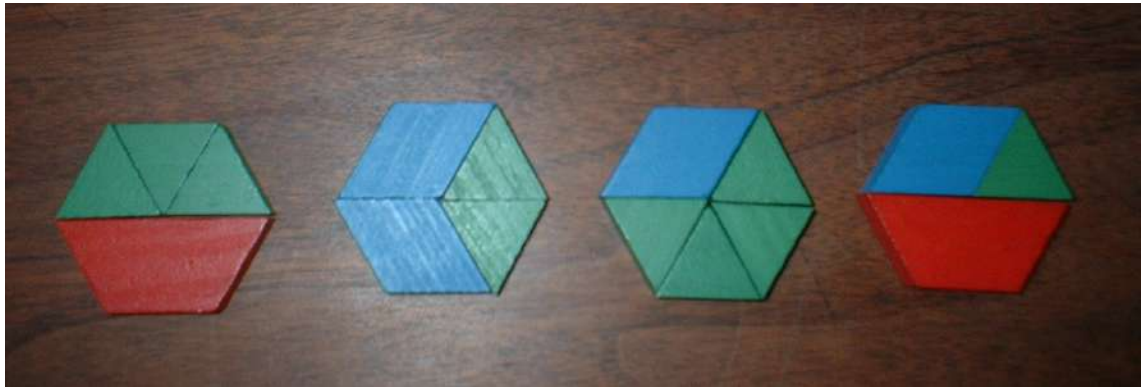
Ron: "Everybody concentrate, concentrate, concentrate. May, concentrate. 1 concentrate. Concentrate. It's counting. So count, 1, 2, 3, 4, 5, 6, 7, 8, 9, 10."

Implications for Instruction

- Access to Materials
  - set-up the environment
  - allow extended time to play
  - math aspects increase in intensity over time
  - use more than one material
- Opportunities for Socialization
  - children seek out socialization
  - powerful math discourse and scaffolding
  - planful grouping by interest and ability

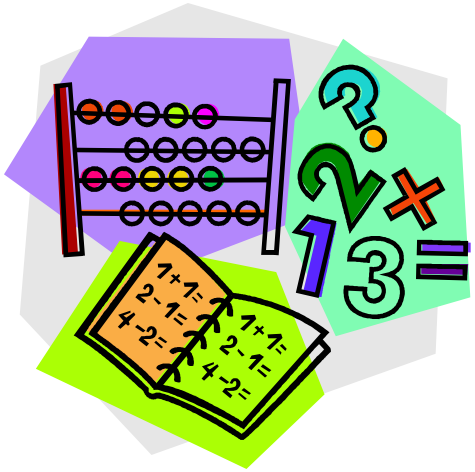
Implications for Instruction

- Teacher Support
  - offering answers and clarification
  - asking questions
  - posing challenges



Limitations & Significance

- researcher contrived setting
- short time frame
- only one material



- contribution to the research base
  - children's natural math encounters
  - everyday experiences with math
  - acceptance for teacher-supported play

Future Research

- identify the naturally occurring mathematics of young children
- document the use of these mathematical occurrences as an instructional tool