

# The Effective Use of Manipulative Resources

by Ms Josianne Borg  
Ms Maria Spiteri



‘The importance of the **use of apparatus** to help children form mathematical concepts is well known. Using apparatus provides a foundation of **practical experience on which children can build abstract ideas**. It encourages them to be inventive, helps to **develop their confidence** and **encourages independence**.’ (pg. 15)



# Cognitive Development

According to Piaget, children between the ages of 7 to 11 are in the stage of concrete operational, which is demonstrated through the use and manipulation of concrete objects.

Piaget's theory explained that “by manipulating objects and by exploring what is new and unfamiliar, they discover and adapt to the world around them”.



**Jean Piaget**  
9/08/1896 - 16/09/1980

### STAGE 1

0  
1  
2  
3  
4  
5  
6  
7  
8  
9  
10



Children from birth to 2 years learn through trial & error.

### STAGE 2

## **Preoperational**

Children develop language, memory, and intuitive intelligence through make believe play between 3 and 7 years of age.



# Piaget's 4 Stages of Cognitive Development

### STAGE 3

Logical thinking and concrete referencing develops from 7 to 11 years.



## **Concrete Operational**

### STAGE 4 **Formal Operational**

Adolescents and adults attain lifelong intellect through hypothetical and abstract thinking.



Think...



How many of you have learned to drive the car by just watching the instructor driving the car?

Why is this important to the classroom?



# Role of the teacher



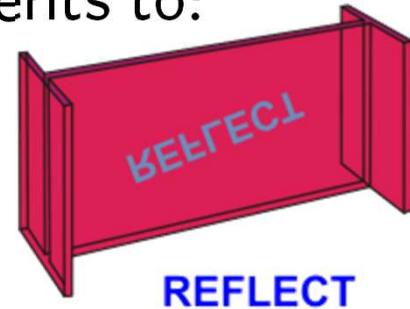
“The mere use of manipulatives does not guarantee that students understand concepts and procedures and be able to connect these concepts to abstract symbols without teachers making these connections explicit.”

(Reimer & Moyer 2005)

# Why use Manipulatives?

Using manipulatives to construct representations helps students to:

- Motivate them;
- See patterns and relationships;
- Make connections between the concrete and the abstract;
- Prompt discussions about math ideas;
- Allow teachers to see students at work doing mathematics;
- Increase engagement;
- Lead to conceptual learning for at-risk students;
- Accommodate various learning styles  
Visual, Logical, Bodily (moving), Tactile (touching) and Kinesthetic (doing) learners.



# Concrete Representation

The **Enactive Stage** - a child is first introduced to an idea or a skill by acting it out with real objects.

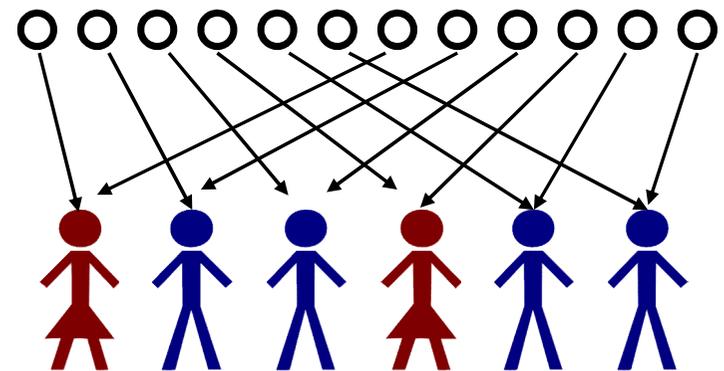
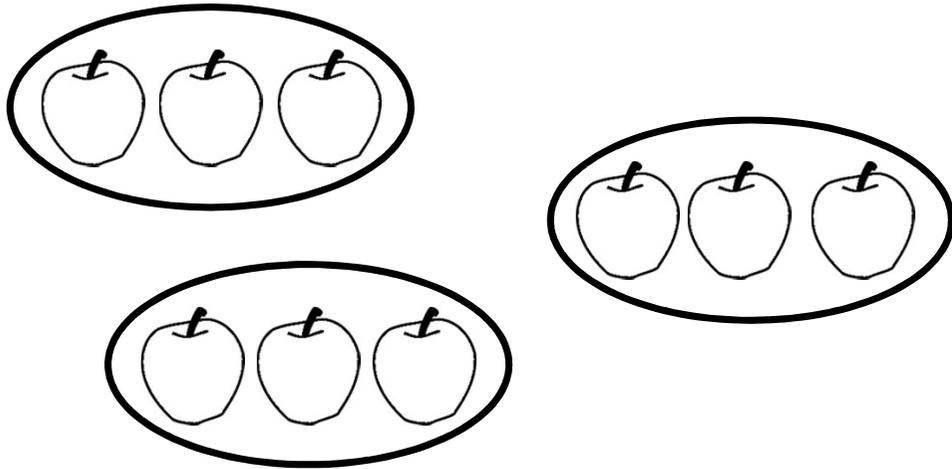
In division, for example, this might be done by separating 9 apples into groups of 3 or by sharing 12 biscuits amongst 6 children.



This is a 'hands on' component using real objects and it is the foundation for conceptual understanding.

# Pictorial Representation

The **Iconic Stage** - a child has sufficiently understood the hands-on experiences performed and can now relate them to representations, such as a diagram or picture of the problem.



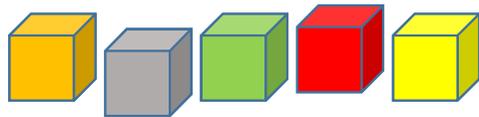
# Abstract Representation

The **Symbolic Stage** – a child is now capable of representing problems by using mathematical notation.

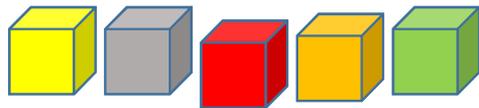
$$9 \div 3 = 3 \text{ groups}$$

$$12 \div 6 = 2 \text{ biscuits}$$

Concrete → Pictorial → Abstract



$$5 + 5 = 10$$



$$2 \times 5 = 10$$

Manipulatives → Representation → Symbols

## Points to Consider

- **All types of learners** benefit from having manipulatives as a component of mathematics lessons.
- The time consumed in planning and conducting the lesson is **worth it** as students will understand the material better.
- **Be selective** with the types of manipulatives chosen for the lesson.
- Find out the **most efficient** and **effective** way to work with them **before** using the manipulatives in class.
- **Be open** to learning about different and new manipulatives.
- **Share knowledge** of new and creative ways of using manipulatives in the math lessons.

How can you represent this number?



Think...

...concretely

...pictorially

...abstractly



“Education is not the filling of a pail but  
the lighting of a fire.”

William Yeats