# How does the use of manipulatives (concrete resources) in primary mathematics lessons promote inclusion within the classroom?

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2023

Economic and Social Inclusion

## Introduction

### What is maths 'mastery'?

'The first thing to bear in mind about mastery is that it is a contested concept' (Garry, 2020, p.3). 'The idea of the existence of a single definition is a myth' (NAMA, 2015, p.20).

### Bloom's *Learning for Mastery (1968)*

Five mastery learning strategies:

1. Aptitude for Particular Kinds of Learning
2. Quality of Instruction
3. Ability to Understand Instruction
4. Perseverance
5. Time Allowed for Learning

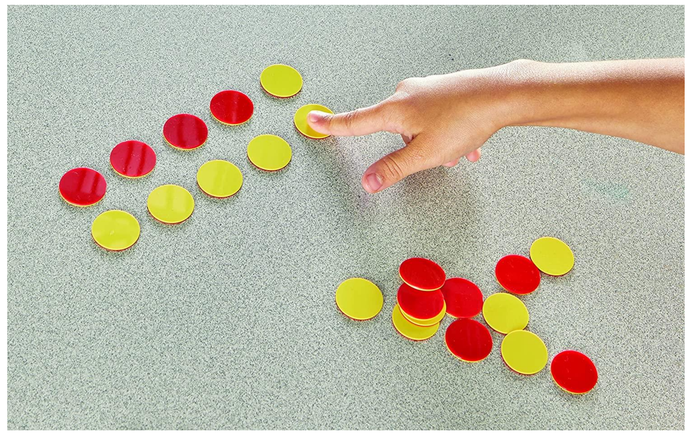
### Concrete – Pictorial – Abstract (CPA)

Builds on the ideas of Piaget (1962) and Bruner (1966)


*doing* *seeing* *symbolic*

## Literature review

The use of manipulates or 'concrete' resources is a well-established approach within the domain of mathematics education (Carbonneau et al., 2013; Education Endowment Foundation, 2020). Following the introduction of the revised 'National Curriculum in England' in 2014 (DfE, 2013), the use of manipulatives has become widespread in primary schools as part of the 'mastery' curriculum. Some children find it challenging to contextualise the abstract concepts required to develop mathematical reasoning. In particular, younger children and those with special educational needs and disabilities (SEND) are predicted to experience more difficulty when provided instruction that consists exclusively of symbolic representations (Carbonneau et al., 2013; Bouck & Park, 2018). The assumed cognitive benefits of manipulating concrete objects to represent mathematical concepts should be greater for these learners, who are still developing proficiency with higher level representations.



*Two-sided counters; Base ten (Dienes) rods (Microsoft online stock images)*

## Methodology and methods

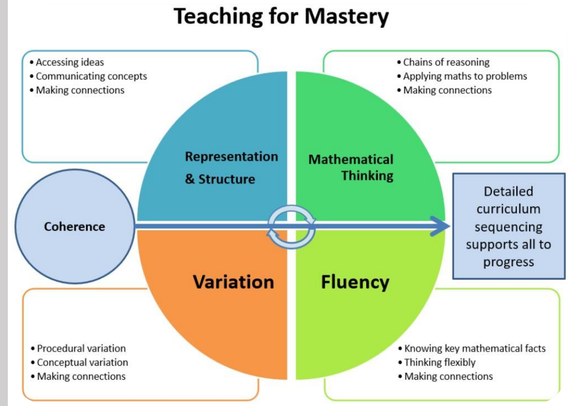
### Proposed methodology:

A **single, critical case study approach** will be adopted: single, as one unit of analysis will be used and critical, as there are a clear set of circumstances (primary school teachers within the Maths Hub) within which the propositions are believed to be true (Yin, 2018).

### Proposed data collection methods:

A sample of primary mathematics teachers who have attended Teaching for Mastery (TfM) CPD at a regional Maths Hub.

- **Semi-structured interviews** explore the rationale teachers give for selecting particular manipulatives
- **Document analysis** of lesson planning will establish how each use of a manipulative is mapped to the relevant curriculum objective
- **Non-participant observations** will document the way the teacher deploys manipulatives within the classroom




*https://www.ncetm.org.uk/teaching-for-mastery/mastery-explained/five-big-ideas-in-teaching-for-mastery/*

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## Research Questions

1. **Which manipulatives do primary mathematics teachers select and deploy in their lessons? What are the reasons for their use?**
2. **Are decisions based on Continuing Professional Development (CPD) and a knowledge of Teaching for Mastery (TfM)?**
3. **What are the implications for future training?**

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