

# IN18-02 The use of colour to support understanding in mathematics

Ruth Trundley and Neil Vincent Work Group Leads

Jurassic Maths Hub

## Work Group summary

When maths is represented visually, colour can have significant impact. It can both support and undermine understanding depending on how it is used. This group considered how colour can be used to enhance learning in three different contexts: resources (manipulatives), board work and pupil recordings

Teachers involved, from EYFS to post-16, made explicit decisions about the use of colour and considered how they could use colour to draw attention to mathematical structure. They also identified potential issues arising when colour is present but not consciously considered by the teacher.

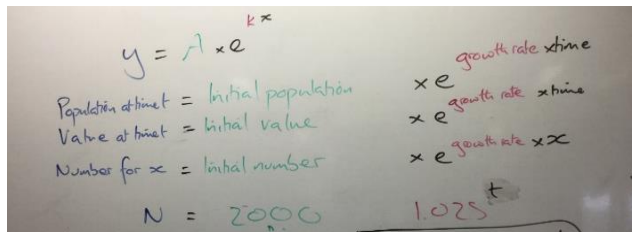
## Research informing the Work Group

The group engaged with three articles:

- The effect of colour as a visual aid in mathematics instruction J.L. Valinote 2002
- What Makes Mathematics Manipulatives Effective? Lessons from Cognitive Science and Montessori Education Elida V. Laski<sup>1</sup>, Jamilah R. Jor'dan<sup>2</sup>, Carolyn Daoust<sup>3</sup>, and Angela K. Murray<sup>4</sup> 2015
- Focus on...numbers in colour (Cuisenaire rods) NCETM Secondary Magazine Issue 60

## Development of teachers' pedagogy

Colour allowed students to communicate their thinking and to identify different aspects of the problem involved more easily.



*This research has certainly opened my eyes to the importance of planning colour and image to the same*

*level that we plan other elements of our lessons. If we are choosing numbers carefully to develop a true understanding of a concept, we need to ensure that we are using image and colour in the same manner.*

*The use of colour really did draw my students' attention to the idea of equality through the examples during this lesson.*

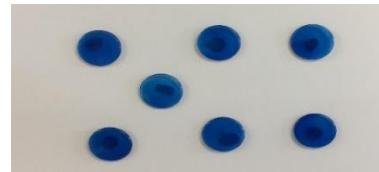
## Development of teachers' subject knowledge

*When we observed pupil working with coloured vs plain dienes, it struck me that the coloured manipulatives might help pupil to see the one/ten/hundred-ness of, for example, a three-digit number (120 has 1 hundred, 2 tens and 0 ones) but may stop them seeing the one-ness of a three-digit number (120 ones) or the ten-ness of a three-digit number (12 tens).*

## How did pupils respond to the use of colour?

For the primary teachers, one of the most striking realisations was that with regard to manipulatives the pupil often did not see what the teachers thought they would see. Colour was selected to draw attention to a specific structure and the pupil saw something else. Asking what they saw was essential; this led to a key research question related to pedagogy:

*Are we supporting the pupil's understanding or just demonstrating our own?*



For example: What do you see? Five and two? The pupil saw six and one; can you see why?

Secondary teachers observed that intentional use of colour for board work did not often translate into pupils' books and that an element of training is required for

pupils to effectively employ colour for themselves.

## Experiences of running the workgroup

The work group was structured around small episodes of lesson study followed by teachers exploring ideas in their own classroom, which revealed many things, not all about colour.



Which one shows 18 most clearly? What role does colour have in each of the representations? What role does layout have?

## Good practice highlights

- Awareness of the presence of colour when teaching and making conscious decisions about how to use this to expose structure.
- Asking pupil what they notice, what they see and how they can use colour to aid understanding.

## Recommendations for future

Further research questions arose from the work which could be explored:

- When two colours are used, do pupil think there is something they are supposed to notice which they don't think when more than two colours are used?
- How does spacing within an image have an impact on what pupils see and notice?
- Does colour get in the way of seeing the whole if it is used to identify the parts? Does this leave pupil thinking of things like addition as input and output rather than equivalence?

*jurassicmaths@woodroffe.dorset.sch.uk*