

BCME - Research Presentation

Learning fractions through visual representations - a Ph.D. research with low-achieving secondary students

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Introduction

Achievement is not equitably spread throughout society; children from less affluent homes do disproportionately worse than those brought up in relative affluence. [. . .] Much research has attempted to articulate this relationship, whilst much more has ignored it, through denial, or the misguided belief that by supporting the affluent all will benefit through the 'trickle down' principle. (Gates, 2015)

- Research with low achieving students for low achieving students.

- Students from three low sets in an underperforming secondary school in East Midlands;
- Teachers were investigated by Rita Santos Guimaraes¹
- Topic: Addition and subtraction of fractions.

¹F12 - Investigating teachers' changes in practice with low-achieving students

The lessons

The lesson plans

- 12 lessons plans grouped into 3 packs (one per term);
- Worksheets + Comments for the teacher + cut-outs;
- Topics covered:
 - equivalent fractions,
 - comparison of fractions,
 - addition and subtraction,
 - mixed numbers and improper fractions,
 - word problems.

Three design principles

1. The lessons should enable students to build their knowledge about fractions on visual representations;
2. Students should have opportunities to solve the tasks without being told how to do it beforehand;
3. Keep the lesson plans coherent with participant teachers' current practices.

Outline of the lessons (1)

You can download the second version of all the lesson plans at barichello.coffee/bcme2018.

- Pack 1:
 - Lesson 1.1: introduction of rectangular area model,
 - Lesson 1.2: fractions ($1/2$, $1/4$, $1/8$ and $1/16$),
 - Lesson 1.3: fractions ($1/3$, $1/6$, $1/9$ and $1/18$),
 - Lesson 1.4: new denominators,
 - Lesson 1.5: diagrams.

Data analysis and conclusion

1 - Interference of visual abilities

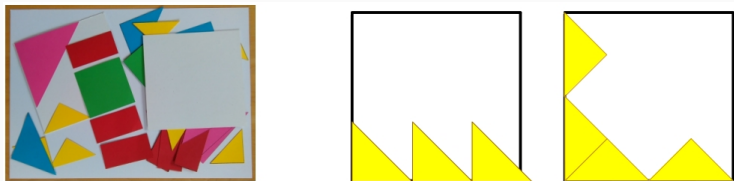


Figure 1: Rotating cut-outs was very demanding

5 - Whole number bias

- Gone!
- Just a few mistakes related to the whole number bias;
- Some “doubling”, but only when questions were conducive.

Why?

- Meaning beyond symbolic.

References

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Thank you!

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