

Title

Developing numeracy pedagogy to improve numeracy attainment for pupils with Additional Support Needs (ASN) in Challenge and mixed SIMD schools

What did we ask? (Research Questions)

1. Does implementation and evaluation of a Concrete-Pictorial-Abstract (CPA) approach, aimed at pupils with ASN, improve numeracy attainment in Challenge and mixed SIMD schools?
2. Does implementation and evaluation of the CPA approach, aimed at pupils with ASN, have a differential impact on numeracy attainment in Challenge relative to mixed SIMD schools?

What is the evidence base? (link to your definition of the poverty gap)

Promoting attainment in numeracy has been highlighted as a national priority in Scotland within the National Improvement Framework. Also highlighted as a national priority within this framework is closing the poverty related attainment gap. In Scotland, the attainment gap refers to 'the gap in attainment between the most and least advantaged children' (Scottish Government, 2014). Focussing specifically on numeracy, there is evidence that a considerable poverty-related attainment gap exists that is evident prior to school entry and persists and widens throughout education (Scottish Government, 2013). Therefore, numeracy pedagogy across these stages is indicated as an area for intervention and development.

The Concrete-Pictorial-Abstract (CPA) pedagogical model has been found to be effective when applied to numeracy (Hoong, Kin & Pien, 2015; Safro et al. 2014; Watt, 2013; Witzel, 2005). This strategy, based on Bruner's learning theory, consists of three stages; (1) concrete (learning through real objects); (2) pictorial/representational (learning through image representation); and (3) abstract (learning through abstract writing) (Bruner, 1966). Bruner stressed that for full conceptual understanding, it was necessary to teach material through this cycle. This study looks at the impact of the application of this pedagogy on the numeracy attainment of pupils with ASN.

One resource was selected to support the implementation of the CPA model with this population. The approach was selected as it is underpinned by the CPA model and identifies multi-sensory approaches and concrete manipulatives as hallmarks of effective numeracy pedagogy (Askew et al. 1997; Fuson, 1992; Williams Review, 2008), and offers a differentiated learning programme for ASN learners (Oxford Press University, 2011). The resource has been found to promote

attainment in numeracy in children with ASN (Oxford University Press, 2011) and 97% of primary school maths teachers found that it helped them support lower ability children (Oxford University Press, 2013). It was therefore believed that this approach would be appropriate to pilot, with the aim of promoting the numeracy attainment of pupils with ASN, and supporting the reduction of the attainment gap for this population.

What did we do?

This project ran from September 2018-May 2019 using a simple pre- post design.

Key classes across 4 schools (2 Challenge and 2 mixed SIMD) were identified based on attainment levels. Staff completed training in the approach and agreed to implement in P5 and P6 classes indicated by attainment data. Due to unforeseen circumstances one Challenge school could no longer engage with the project. However, data was collected from 1 Challenge school and 2 mixed SIMD schools.

Evaluation

- Assessment Tool A - numeracy attainment assessment

What have we found? 200 words

1. Does implementation and evaluation of the CPA approach, aimed at pupils with ASN, improve numeracy attainment within Challenge and mixed SIMD schools?

Mean Assessment Tool A Score		<i>p</i> -value
Pre	Post	
15.65	22.53	<0.05

Numeracy performance scores were statistically significantly higher at post-test, suggesting the CPA approach significantly improved numeracy attainment outcomes for pupils with ASN.

2. Does implementation and evaluation of the CPA approach, aimed at pupils with ASN, have a differential impact on numeracy attainment in Challenge relative to mixed SIMD schools?

	Mean Assessment Tool A Scores		<i>p</i> -value	Mean Change Score	<i>p</i> -value
	Pre	Post			
Challenge School	2.75	9.88	<0.05	6.67	0.847
Mixed SIMD School	27.11	33.78	<0.05	7.13	

Statistical analysis was conducted to compare pre- and post- performance on Assessment Tool A of the Challenge and mixed SIMD schools. Mean performance was higher overall in the mixed SIMD schools. Findings suggest the CPA approach statistically significantly improved numeracy performance of pupils with ASN in both mixed SIMD and Challenge schools.

No significant differences were found, suggesting the impact of the CPA approach on numeracy performance in children with ASN does not differ by SIMD.

What do we plan to do next?

A proposed next step for South Ayrshire Council to continue to support the evidence-informed CPA pedagogy and resources utilised in this study to maintain efforts to close the poverty-related attainment gap and support ASN learners.

References

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