# Title

Promoting numeracy pedagogy and parental engagement to improve numeracy skills for vulnerable learners

## What did we ask? (Research Questions)

- Does the Numicon ‘Breaking Barriers’ Teaching pack and apparatus improve children’s numeracy skills?
- Does Numicon ‘Breaking Barriers’ Teaching pack and apparatus support development of teachers’ numeracy pedagogy?
- Does Numicon ‘Breaking Barriers’, promote children’s engagement and wellbeing during numeracy lessons?
- Does parental engagement support numeracy outcomes for vulnerable learners?

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

The Doran Review (Doran, 2012) recommended that professionals across multiple levels should be involved in leading and developing learning communities that have the capacity to upskill teachers and school support staff working with children who have complex additional support needs. In addition, parents across Scotland have expressed concern regarding the access to specialist support and interventions for their children which they perceive to be dwindling and fear losing completely (Doran, 2012). Research suggests that parental involvement has a positive influence on pupil achievement (Sheldon & Epstein, 2005) and this can be promoted when coupled with strong links between school and home (Groves, Mousley & Forgasz, 2006). Muir (2018) states that many schools are now cognizant of parental involvement and encourage it in many ways, however mathematics and numeracy remains a curricular area that parents take a less active role in with regards to their child’s education. However, efforts can be made to provide parents with numeracy learning materials to promote the use of mathematics and numeracy in the home learning environment as a way of strengthening the pedagogy and learning experiences provided in class (Merttens, 2005). The Numicon ‘Breaking Barriers’ teaching pack and apparatus has been selected as it is designed with the intention to support, plan for and assess children with additional support needs in mathematics (Wing et al., 2015). Ewan and Mair (2002) highlight that it is common for children to be moved quickly towards learning abstract numerical concepts and symbols, and suggest that in order for children to progress here, establishing a firm number concept through concrete and pictorial materials may crystallise their thinking in numeracy more greatly.
What did we do?  200 words

Teaching staff, a senior educational psychologist and a trainee educational psychologist (TEP) attended two twilight Numicon training sessions. The participating school is a specialist provision to support children with complex learning needs, is located in quintile 5 as per the Scottish Index of Multiple Deprivation and was selected to further explore the use of mathematics intervention work with children with complex learning needs. The school staff completed an implementation readiness questionnaire to provide quality assurance that the school as an organisation was in a position to complete the pilot study. Three pupils were selected of similar academic profiles by the class teacher who suggested that while all children in the class are in need of additional support, those selected for the study are most likely to attend consistently (Ages 9, 9 and 11) to allow for a case study method to be applied, promoting a more in-depth analysis of the pedagogy and learning outcomes for the pupils (Robson, 2002).

The teacher completed a self-report questionnaire of current numeracy practice designed to establish their current pedagogical approaches. The concrete-pictorial-abstract (CPA) model of numeracy development underpins the Numicon approach and is grounded in the work of Bruner (1966). A pre-intervention baseline observation of a numeracy lesson was completed using an observation schedule devised from the CPA approach which was designed and utilised by the TEP. Telephone interviews with parents of the pupils were carried out to identify current levels of home-school partnership working and sharing of pedagogical approaches for numeracy activities within the home learning environment. Pupils completed a pre-intervention assessment, Numicon Breaking Barriers Assessment Tool A, to establish a baseline of current numeracy ability. Parental consent has been granted to conduct video work pre and post intervention to determine pupil engagement and well-being using the Leuven Scale (Laevers, 2005). The class teacher and TEP collaboratively devised numeracy packs with resources and activities recommended for use at home for the duration of the intervention.

What have we found?  200 words

- A pre-intervention classroom observation of a typical numeracy lesson revealed that children are mainly being asked to think abstractly using numerical symbols.
- A class teacher self-report questionnaire regarding the concrete-pictorial-abstract approach to numeracy revealed that:
  - The CPA approach is employed inconsistently
  - The school wants to improve numeracy attainment and seek guidance on how to better develop the numeracy outcomes of pupils
- An initial assessment prior to receiving the intervention was completed using the Numicon Breaking Barriers Assessment Tool A identified that:
  - All children could copy and devise repeated patterns.
Action Enquiry Summary 2017

- All children were able to compare length using words like “smallest” and “longer”.
- All children could count accurately to 20.
- Children could not accurately identify whether numbers were odd or even.

- Thematic analysis of parental conversations is yet to be completed, but preliminary findings suggest that sharing numeracy pedagogy and ways to track pupil progress between home-school is an area worthy of further intervention. Parents highlight that they have limited strategies to maintain their child’s engagement at home. It is anticipated that the video work using the Leuven Scale will provide further information about key activities or pedagogical approaches that best engage children’s attention.

What do we plan to do next? 100 words
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<th>Pre-intervention next steps</th>
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<td>- Video recordings during a numeracy activity are scheduled to record children’s engagement lasting approximately 10 minutes using the Leuven Scale</td>
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**Implementation phase**

The Numicon approach will be implemented in the class and reflective log books noting significant information will be kept by the teacher

Fidelity checks will be carried out using observation and analysis of the reflective log books

Home packs will be designed and sent home to parents.

The teacher will establish a link with the parents to provide fortnightly guidance on maths work to encourage parental engagement.

Parents have agreed to keep a reflective log similar to the class teacher to note points of interest.

**Post-intervention next steps**

- Children will complete the Numicon Breaking Barriers Assessment Tool A to identify areas of progress or gaps in learning.
- Video recordings during a numeracy activity are scheduled to record children’s engagement lasting 10 minutes using the Leuven Scale - as Pre- Intervention Stage
- A classroom observation of a typical numeracy lesson will be carried out using the devised CPA observation schedule
- A class teacher self-report questionnaire regarding the CPA approach will be completed
- Parents will be contacted by phone again for telephone interview to gauge the impact of the home learning packs and thematic analysis used to identify next steps.

- Analysis of reflective log books from class teachers and parents will be analysed to identify next steps for intervention.

Through ongoing reflections that are recorded by the class teacher involved in this study, it has been reflected numerous times through consultation with the TEP that there is a desire to implement Numicon ‘Breaking Barriers’ at a school-wide level.
References

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Number of words

1099 words excluding references