

Developing Pupils' Conceptual Understanding of Number in South Ayrshire

Intended Outcome:

To develop the approach to 'Number Talks' across the Authority to improve the learning and teaching of mental maths strategies and develop mathematical mind-sets on a large scale through implementing methodologies which improve children's conceptual understanding of number from Early through to Third Level with the priority of closing the poverty related attainment gap in deciles 1 and 2.

Rationale

The Numeracy Community of Practice was set up during session 2015-16 to engage members in research based case studies with a focus on pedagogy in relation to teaching numeracy.

The research and case studies highlighted many of the issues reported in the SSLN (Numeracy) analysis, the PISA report and provided an insight into the issues regarding the dip in local attainment from P5 to S2 in relation to attainment in CEM Mental Maths assessments. These observations included:

- Significant problems regarding pupils' conceptual understanding of number.
- Pupils' using vertical algorithm as their mental calculation strategy.
- Teachers had difficulty in un-teaching 'bugs' in pupils' numeracy strategies.
- Community members developing the Number Talks strategy in classes recognised and recorded significant improvements in attainment and attitudes to numeracy.
- Members recognised Number Talks as a vehicle to improve mindsets towards numeracy. (Pupils were enjoying it)

The Numeracy Development Team recognised that they needed to improve the confidence of teachers and support staff so that they can conduct effective numeracy conversations within lessons and effectively teach the concepts on number to develop numeracy strategies in order to improve pupil attainment in P6. This would be achieved through:

- The provision of high quality CLPL opportunities.
- Development Officers supporting every school to provide coaching and modelling practice for staff.
- Sharing good practice, resources and implementation plans on the Numeracy Strategy Glow Hub.
- Developing partnerships with the Early Years Team, ASN services, Educational Psychological Services, Speech and Language Therapy to develop supports and

interventions for young people in regard to their development of numeracy concepts.

Project Activities

The research and case studies from the Numeracy Community of Practice highlighted that teachers adopting a 'Number Talks' pedagogy in relation to developing mental calculation strategies were reporting improved levels of attainment and improved pupil attitudes to numeracy. The case studies confirmed that the structure of a 'Number Talk' also provided an opportunity to develop mathematical (growth) mind-sets as they encouraged pupils to try out different strategies, make mistakes and make connections in their number concepts.

A team consists of 8 Development Officers (1 for each school cluster) was formed to support all schools across South Ayrshire to implement 'Number Talks' in all P6 classes. The funding allowed each Development Officer a secondment of 1 day per week for the session 2016-17. Each of the 42 Primary Schools and 8 Secondary Schools have a nominated numeracy champion who is the Development Officer's point of contact in each school. The numeracy champions liaise with the Development Officer to determine particular supports that can be offered by the Development Officer. Development Officers have worked with all P6 teachers, in particular, across the authority to model practice and coach staff. All primary schools have implemented Number Talks beyond P6 and the majority of schools have implemented Number Talks across P1 to P7. Development Officers have also adapted the strategies to implement subitising in the nursery through play.

The aims for this project were:

- to improve the numeracy attainment of P6 pupils and to improve numeracy attainment for pupils in SIMD 1 and 2.
- To promote Mathematical Mindsets in pupils' and improve confidence and attitudes in regard to numeracy.

The numeracy development team have designed, developed and implemented:

- Initial Number Talks twilight training was delivered to about 150 primary and secondary teaching staff by the Numeracy Hub Champion.
- Mathematical Mindset training for Development Officers and numeracy champions..
- Number Talks twilight training to pupil support teachers.
- Number Talks and Mathematical Mindset training to all NQT's.
- Number Talks and Mathematical Mindset sessions for the South Ayrshire Parent Forum.

The development Officers have modelled Number Talks from Nursery to P7 in primary schools and modelled Number Talks in S1/2 secondary school classes. Secondary schools

are focussing on S1 using Number Talks as an intervention strategy. Some Secondary Schools are using the Number Talks pedagogy within problem solving activities.

The Numeracy Development Team developed a 16 week plan for schools to implement Number Talks focussing on addition, subtraction, multiplication and division.

All schools were equipped with a class set of rekenreks and tens frame trains to use to develop conceptual understanding of number. These resources have been well received and Development Officers have provided support to schools in the use of these resources in the classroom.

A Numeracy Strategy Hub was designed, developed and is currently used to share resources, implementation plans, advice, website links and video of good practice in relation to Number Talks pedagogy. Maths Mindset resources are also shared through the Glow site.

All schools engaged in baseline assessments before implementing Number Talks. For all P6 pupils the P5 Mental Maths CEM assessment is being used as a baseline measure. Many schools have also used their own/authority assessments. RAFA schools and satellite partner schools used GL assessments. These assessments have allowed schools to track attainment before and during the implementation of this project. For this project all P6 classes will be assessed using P6 Mental Maths assessments in May. This data will be compared to the P5 Mental Maths CEM assessment to measure impact.

Development Officers, acting on feedback from staff, offered twilight sessions in February and March. The sessions focused on teaching particular numeracy strategies within addition, subtraction, multiplication and division. Feedback from these sessions have been extremely positive with many teachers reporting that they feel more confident teaching numeracy strategies.

Numeracy Development Officers have collaborated with the authority Early Years Team to develop and deliver training to Nursery staff to implement Number Talks strategies through play. These sessions will take place in January/February. Once again, feedback from staff has been very positive and nursery staff are developing strategies within the nursery setting.

Impact

Development Officers have reported on the impact that the project has had since being implemented in August 2016. The officers have reported that:

- All primary schools are implementing Number Talks.
- Most schools are implementing from P1 to P7.
- Secondary schools are implementing Number Talks as an intervention strategy for pupils and some schools are using the pedagogy within problem solving activities.

- There is a 'buzz' around numeracy. Teachers have been very positive and report that Number Talks are improving confidence, resilience and fluency in numeracy tasks.
- Feedback from twilight sessions highlight that teachers feel more confident in teaching strategies to pupils'.
- Feedback from training sessions with pupil support staff and classroom assistants have been very positive and staff report a confidence in supporting pupils' during interventions.
- Pupil voice tells us that pupils' are enjoying Number Talks and say they like being able to use different strategies and have the opportunity to explain how they calculate. They also recognise mistakes are good and are opportunities to learn.
- Teachers are telling us they able to make thinking visible within number talks and can address misconceptions easily. They are also saying that the pedagogy is being used in other areas of teaching and learning.
- Pupils are making comments like 'making mistakes makes my brain grow'.
- All schools are using data to measure impact. Schools that have carried out baseline assessments and re-assessments are finding there is a significant impact on attainment within numeracy.
- The project has helped to develop a numeracy network in the authority with direct lines of communication to share practice, seek support and provide guidance to teachers.
- Teachers have direct links to lead professionals who are supporting teachers developing their pedagogy.

The P6 CEM, GL Assessment and Authority Baseline Assessment data should provide the project team with hard data to confirm the success of the project that the soft measures highlight.

Next Steps

The Development Officer team recognise that to improve attainment in numeracy there is a need to build on the successes of this session and continue to support our schools to improve teaching and learning in numeracy. To build on the work of the development team this session:

- Development Officers will continue to support schools in implementing Number Talks pedagogy. Modelling practice and coaching will continue to be the focus of the Development Officers work in schools. The team will continue to recognise and share good practice through the Numeracy Strategy Hub. Officers will continue to provide twilight training for teachers on teaching numeracy strategies and improve teacher confidence.

- The Early Years Team and Development Officers will continue to develop and deliver twilight training for Early Years staff on developing children's concept on number through play.
- Numeracy Development Officers will develop plans to implement Number Talks in enhanced learning bases and severe and complex needs schools across the authority.
- The Numeracy Development Team will facilitate parental engagement and liaise with CLD Team to plan appropriate inputs regarding numeracy.
- Development Officers will support staff to develop Number Talks in groups/pairs and pupil led Number Talks.
- The local authority will conduct baseline assessment analysis with the focus on impact on SIMD 1-2.
- Numeracy Development Officers will provide training in Promoting Mathematical Mindsets for all staff and pupils.
- Numeracy Development Officers will develop implementation plans for the Fractions, Decimals and Percentages Number Talks resource and support schools to implement the strategies.
- Development Officers will develop plans to incorporate Numicon into Number Talks strategies within P1 to P3.
- Numeracy Development officers will develop sustainable leadership by encouraging numeracy champions in schools to lead numeracy developments.