## Title

BRIDGING THE GAPS: LONG TERM OUTCOMES OF AN ACTION
RESEARCH PROGRAMME TO IMPROVE NUMERACY

## What did we ask? (Research Questions)

The Project was conducted in two phases, the teaching and implementation phase
and the follow up phase. This paper focuses on the follow-up phase. The
outcomes of phase one are provided in Morrison & McLafferty (2018).

The key research questions are:
1. Did pupil skills and knowledge in numeracy and mathematics, or other
   targeted area for intervention improve as a result of the Bridging the Gaps
   programme?
2. Was there evidence of teachers implementing the research skills and
   knowledge taught in the programme?

## What is the evidence base?

Research evidence of the interventions successful in improving attainment is
continuing to grow (e.g. Hattie, 2017; Education Endowment Fund and the
Scottish Government Improvement Hub). The research strongly indicates the
success of these interventions is dependent on a wider set of cultural and system
circumstances. Marcus (2016) noted the need to put the child at the centre;
address individual needs; encourage schools to use creativity; and allow them to
develop their own strategies for learners.

Multiple research sources highlight the importance of contextual circumstances in
closing attainment gaps, including high quality teachers and teaching, strong
school leadership, reflective practice and research, a network of support and
collaboration, effective assessment and evaluation through using data and
rigorous monitoring and early intervention (e.g. Baker, Gersten & Lee, 2002;
Boaler, 2016; Knowles, 2017; Kunsch, Jitendra & Sood, 2007; Onu et al., 2012;
Slavin & Lake, 2008). It can also be argued that the very paradigm of intervening
in the attainment gap reinforces and reproduces the educational and social
inequity by design, and what is required is a paradigm that cultivates strengths of
individual students, rather than fixing their deficits (Zhao, 2016). Therefore, how
approaches are implemented as well as what approaches are implemented are
central to success and need to be carefully designed to ensure inequity is not built
in.

The Coach Consult Method has been found to be effective in improving teachers' research skills, knowledge and confidence, (Balchin, Randall and Turner, 2006; Randall, Turner and McLafferty, 2015; Morrison & McLafferty 2018). There is limited research available on the effectiveness of teachers as action researchers in improving pupil outcomes.

It is widely recognised that research skills in the form of practitioner enquiry are valuable for teachers and their ongoing professional learning (GTCS 2019). This is an identified improvement priority of the Scottish Government (Scottish Government, 2017).

Where the data in this study has been examined in relation to a poverty related attainment gap this paper has identified children as belonging to a poverty group based on decile 1 of the Scottish Index of Multiple Deprivation (SIMD) (Scottish Government 2016c). This is similar to the approach used in Sosu and Ellis (2014).

## What did we do?

In Phase 1, teachers from 13 schools participated in Bridging the Gaps, a professional learning programme using the Coach Consult Method (12 twilight sessions). The teachers learned about action research, learning, numeracy and mathematics. There were 4 projects with multiple teachers and/or schools. Each project designed their own intervention and evaluation. The participants reported significant gains in their learning within the programme. See Morrison and McLafferty (2018).

In Phase 2, 12 months after the completion of the Bridging the Gaps programme each project provided anonymised data according to their intervention plan: pre and post measures, tracking data and any additional data. This data was analysed at the project team level and an overview analysis was undertaken for this study.

## What did we do?

There were two projects that completed to follow-up.

Project A was a cluster project - teaching fractions for 159 P7 pupils.
**Key features**
- active learning approaches
- high level of real-world applicability
- The use of manipulatives and visual representations.
- Increased level of consistency in teaching across P7 classes in the cluster.

Project B involved teaching maths language and problem-solving to 10 target pupils in P3 and P4 and across the whole school.
**Key features:**
- key vocabulary weekly;

- daily rehearsal/discussion about key vocabulary;
- activities, visual wall displays on vocabulary - same, similar or opposite meanings;
- methodical approach to extract and interpret vocabulary within mathematics work before attempting;
- targeted support for children with additional barriers to literacy on mathematical vocabulary;
- homework and family learning on maths vocabulary.

## What have we found?

Both projects showed gains in attainment for the target pupils and evidence of a positive effect in closing the poverty related attainment gap within a context of improved attainment for all. Project A demonstrated this through the pupils in decile one having the largest improvement in reducing errors, and an overall improvement (see Table 1). Project B demonstrated this through more children achieving high performance, as measured by SNSA, for the P1 and P4 group compared with "neighbourhood schools", i.e. those matched by SIMD. The neighbourhood has a high proportion of children in decile 1 (~20%). Further analysis would be required to clarify specifically whether the children in decile 1 made gains particularly and to clarify the factors for P7 children.

### Table 1 – comparison of pupil error by decile in SIMD (Project A)

| SIMD decile | Average Number of errors (Pre) | Average Number of errors (Post) | CHANGE | Percentage of learners with reduced errors |
|---|---|---|---|---|
| *1 (n=8)* | *19.5* | *13.75* | *-5.75* | *88%* |
| 2 (n=8) | 9.75 | 10.5 | +.75 | 63% |
| 3 (n=30) | 11.18 | 8.33 | -2.85 | 80% |
| 4 (n=15) | 10.33 | 8.27 | -2.06 | 87% |
| 5 (n=25) | 9.72 | 7.12 | -2.6 | 80% |
| 6 (n=7) | 8 | 4.29 | -3.71 | 100% |
| 7 (n=6) | 4.83 | 5 | +0.17 | 67% |
| 8 (n=18) | 9.28 | 6.33 | -2.95 | 89% |
| 9 (n=32) | 6.03 | 4.56 | -1.47 | 81% |
| 10 (n=10) | 5.9 | 1.8 | -4.1 | 80% |
| WHOLE SAMPLE (n=159) | 9.25 | 6.82 | -2.43 | 82% |

### Table 2 - SNSA 2017/18 Numeracy (P1, 4, 7) for Project B school

| | | % low | % med | % high |
|---|---|---|---|---|
| School | P1 | 0% | 13% | 87% |
| Neighbourhood | | 1% | 23% | 76% |

| | | 1% | 26% | 73% |
|---|---|---|---|---|
| **Falkirk** | | 1% | 26% | 73% |
| *School* **\*** | | **10%** | **46%** | **44%** |
| Neighbourhood | P4 | 12% | 54% | 34% |
| **Falkirk** | | 11% | 51% | 38% |
| School | | 13% | 65% | 23% |
| Neighbourhood | P7 | 6% | 45% | 49% |
| **Falkirk** | | 5% | 39% | 56% |

*P4 includes some of target group

Both projects evidenced use of increased action research skills. Participants used multiple methods for identifying gaps and identifying whether the interventions had made a difference, see table 3.

**Table 3 – research methods used within projects**

| Project | Method | Key finding |
|---|---|---|
| Project A | *Attitude survey* | More enjoyment of fractions |
| | *Pupil self-evaluation on fractions* | 73% of children increased rating |
| | *Fractions ability measure* | See table 1 |
| Project B | Tracking measures (CEM, SNSA) | Findings of SNSA in Table 2 |
| | *Word and number problems assessment* | 90% of Target pupils improved on word problems |
| | Reading age (target pupils) | Used as needs analysis |
| | *Children using Run Charts* | Used in class |

*Italics indicates participant designed methods*

It is suggested that there is a *critical mass* of teacher continuity for change and collective efficacy to be effective. The Coach Consult Method was effective in helping teachers address the variability within school using school needs analysis. If it can be brought to scale this could have far reaching implications for how educational psychology services provide their services.

**Summary**

Our findings indicate that:
1. participants used action research to identify gaps and design interventions and measures in numeracy
2. children made gains in the targeted area of numeracy;
3. children affected by poverty made gains in numeracy;
4. the Coach Consult Method was an effective method in promoting teacher research;
5. continuity of staff and leaders within schools, a critical mass of staff, is vital for improvement to be implemented, evidenced and sustained.

## What do we plan to do next?

Each project team has considered how to sustain improvements evidenced in their project and incorporated them within their school and cluster improvement plans.

The Educational Psychology Service will implement this methodology regularly within its service delivery to promote attainment with more focus on:
- effectiveness of the planned intervention (e.g. pre and post measures)
- consistency of personnel (contingency planning for personnel change).

It will also highlight the need for the education culture to promote long term relationships with staff and pupils in schools.

We would like to acknowledge and thank Dr Susan Morrison for her contribution in designing and delivering the original **Bridging the Gaps** programme and all the participants for their enthusiasm and effort in implementing their action research.

## References

This study has also contributed to a Meta-Study identifying Psychological factors within the Regional Collaborative. That study is also published on the Improvement Hub

The full reports of all five studies are published on the local authority Educational Psychology Service website:
https://blogs.glowscotland.org.uk/fa/epservice/how-we-work/research/ and the regional improvement collaborative blog:
https://blogs.glowscotland.org.uk/glowblogs/fvwlric/

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