

Using action learning to support the development of primary teachers' mathematical knowledge

Aims of the project

The aim of this doctoral project (with Sussex University) was to improve the mathematical performance of an inner city primary school (Hawksbridge - pseudonym) by developing the subject knowledge, pedagogical skills and the curriculum content knowledge of its teachers. By focusing on professional development the Hawksbridge headteacher/researcher hoped to:

- improve teacher's confidence in the teaching of mathematics;
- share and develop professional expertise; and
- raise school standards in mathematics.

The rationale behind this was that if Hawksbridge staff could improve teacher performance in the classroom then they should begin to raise pupils' standards throughout the school.

Dimensions of the study

The decision was taken by the researcher/headteacher to set up an experimental action learning model with five primary headteachers and their mathematics coordinators. This was known as Set One. The challenge was to develop action learning techniques that could be transferred into a manageable format before taking the project into Hawksbridge school. This would be known as Set Two. Headteachers from Set One were also encouraged to use the model back in their individual schools.

Summary of main findings

Analysis of transcripts from Set One, the original model, suggest that:

- providing an opportunity for teachers to practise the skills

of open-ended questions in a forum such as action learning helped develop the capacity of teachers to reflect on classroom action;

- Set One members were able to recognise the power of open-ended questioning in allowing a presenter to take ownership of their issue; and
- collaboration was an essential feature of action learning which in turn, was key to successful team building.

Hawksbridge school is no longer in the 99th percentile for mathematics; it is in the first. In 2009 it reached 97% Level 4s in the Key Stage 2 SATs and in 2010 it reached 100%.

Background and context

The national strategy was not working well at Hawksbridge and the school did not know why. Situated at the 99th percentile in 2004, a radical re-think became necessary about the way they approached mathematics. Four of the senior managers (including the researcher/headteacher) believed that it was important to experiment with new approaches to learning. They planned to immerse themselves in action learning techniques for a year, in a collaborative project with staff from four other schools. They believed this would enable them to reflect on and evaluate what worked well, and identify what was worth transferring to Hawksbridge. Setting up the experimental action learning model with experienced heads and their coordinators would also expose the much less experienced Hawksbridge staff to sustained high level professional development.

The reason the action learning approach was constructed with other schools was that Hawksbridge school was, at this stage of its development, too fragile to experiment with. It is situated in an area of high deprivation. FSM (Free school meals) is over 60% and its EAL (English as an additional language) intake is over 80%. There are over 30 different languages in the school. Crime on the estate where the school is situated is relatively high. Moreover Hawksbridge has a mobile pupil population and at the beginning of the research, had a mobile staff too. Hawksbridge needed time and space to put sustainable structures in place and establish a team of teachers who would commit to the school.

Teaching processes and strategies

Set One members met once every half term for a year. Sessions generally lasted for about 45 minutes to an hour. One member of the group presented a mathematical problem that they were struggling with in their practice. On one occasion it was, "My children find it very difficult to tell the time". Another member of the group acted as facilitator, deciding whether questions were properly open-ended or not and the remainder questioned the presenter of the issue. All questions had to be open-ended. Good examples of questions were:

- What do you know about their previous experience that you could build on?

- What kind of skills do you think your children need, to be able to do this work?
- Can you unpick that a bit more?
- How are you going to help the children make those connections?

End of session questionnaires and debriefs made it possible to investigate whether asking these open-ended questions was having any impact on a teacher's mathematical thinking, pedagogical skills and curricular knowledge.

The findings

The model provided a means of professional development for all the Hawksbridge staff involved in Set One which enabled them to grow in confidence as mathematics teachers. They commented that they now know more about what happens in other year groups and they can appreciate the lines of mathematical development.

Early analysis suggests action learning has the potential to be powerful professional development. Attendees made a number of positive comments such as:

Mmmm it's the drilling down and I think that's the bit that's changed me.

It's like coming out into a little oasis really where you can shut the world out and think okay we're here to talk about maths, it's not often we have the luxury of talking about a subject we're passionate about with supportive colleagues,...just a chance to talk and reflect.

I think we struggled with the open-ended questions. It was also hard not to tell people what to do...but I think...yes, the questioning, and digging deep. And sometimes we struggled because we were trying to ask questions to make that person think the way we wanted them to think.

Set Two, which consists solely of Hawksbridge staff, has now been operating for 18 months. Teachers' questioning skills have improved significantly and the ability to listen and respond to children's answers and ideas in lessons is much improved. Teachers are more inclined to unpick mathematical concepts and consider what the child knows rather than simply use the national strategy.

Research methods

Action learning sessions were taped and then transcribed. Follow-up debriefing sessions were also taped and transcribed. Questionnaires were collected at the end of Set One sessions with questions such as: "What could have gone better?" and "What have you found useful?"

Validity was determined by the return of transcripts to participants in meetings and all names were removed. The researcher plans to

give the findings of Set One to the participants.

Conclusion

Set One developed a model for professional development that was intended to enable teachers to improve their subject knowledge, pedagogic skills and mathematical content knowledge. This workable model was then transferred into Hawksridge.

The research provided evidence that action learning can enable teachers to develop their pedagogic skills and their curricular knowledge but there was not enough evidence to suggest that it can develop subject knowledge. This was partly because of its limited time frame (one year) and partly because the issues that were raised were all connected to the practice of teaching and this dominated the conversation.

This action research affirms the importance of teacher reflection and a rich mathematical dialogue. It begins to show how teacher-teacher dialogue can act as a catalyst for change and that it is as effective as a professional learning activity.

Suggestions for further reading

Rowland, T., Turner, F., Thwaites, A., & Huckstep, P. (2009) *Developing Primary Mathematics Teaching*. London: Sage Publications.

Brockbank, I. & McGill, A. (2004) *The Action Learning Handbook*. London: RoutledgeFalmer.

Walshaw, M. & Anthony, G. (2008) *The Teacher's Role in Classroom Discourse: A Review of Recent Research into Mathematics Classrooms*. Available at: <http://rer.sagepub.com/cgi/content/abstract/78/3/516>.

Wenger, E. (1998) *Communities of Practice: Learning, meaning and identity*. Cambridge: Cambridge University Press.



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