

From Prague to Nottingham: Building on Best Practice Internationally

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> Aim

To adopt and adapt the best practice in mathematics teaching from the Czech Republic within classrooms in the City of Nottingham and Nottinghamshire Education Authorities.

> Dimensions of this Development Project

Six teachers from three schools in two education authorities observed the practices of teachers and pupils in Czech Republic schools and trialled and videoed the development of these practices in their own classrooms.

> Summary of Learning Points from this Development Project

The following criteria were identified as important in developing materials and strategies for classrooms in England:

- the expectation of precision at all times, both in written and spoken mathematics;
- the expectation of participation at all times by all members of the teaching group;
- the extensive use of pupil misconceptions as teaching points;
- the introduction of mathematical hypothesis and argument from an early age; and
- placing responsibility with the pupils, for equipping themselves for lessons and making decisions about note taking and the roles they take within the lessons.

Introduction

In recent years, results from the Third International Maths and Science Survey (TIMSS) and the ensuing debate, sparked by studies from, among others, David Reynolds, and the introduction of the National Numeracy Strategy, have generated considerable interest in the role and nature of effective whole class teaching.

OFSTED's (1996) review of research in mathematics education drew attention to the fact that learning is more effective when common misconceptions are addressed, exposed and discussed in teaching and that effective questioning can raise achievement. Both of these issues are demonstrated in the practice becoming known as interactive whole class teaching. This is a model that is also used in many ex-Eastern Bloc countries. However, the review also warns that the countries with the highest achievement scores also have the most negative attitudes to the subject.

The Project

This project aimed to adopt and adapt ideas that seemed likely to transfer readily from the Czech Republic to classrooms in the Nottingham City and Nottinghamshire Education Authorities. This was carried out through a series of observations in a range of classrooms in Prague, followed up by trying out in our own classrooms what we had observed in Eastern Europe and using video to record the results. Such was the interest and excitement generated, first amongst the teachers involved and later amongst colleagues in other schools in the LEA, that the development rather than the enquiry goals remained dominant.

The 6 teachers, taking part in the project, spent a week visiting a variety of classrooms in the Czech Republic, observing lessons and interviewing teachers and pupils. The same lesson was viewed by all the teachers but from the following aspects:

- teacher actions;
- pupil responses;

- pupil/teacher interactions;
- questioning techniques; and so on.

After spending a day in schools the evening was spent reflecting on what had been observed. Through this technique, rich data became available so that a fuller description of the classroom to be analysed could be built. The key points could then be drawn out which were applicable and adaptable to UK contexts. These findings were then evaluated and used to devise a series of model lessons which were taught in a range of classrooms in Nottingham City and Nottinghamshire and recorded on video. The videos were used as the basis for further discussion amongst the teachers involved in the study. Through discussion of new ways of working, strategies were developed further and a continuous cycle of professional development was commenced.

"Once we started exploring our classroom practice, it became a habit!"

Interactive Whole Class Teaching

This teaching strategy has recently come to prominence both through comparative research and through its recommendation within the National Numeracy Strategy; and in the recent government Green paper: Excellence in Schools. It has been suggested that:

direct teaching is appropriate, in principle, for comprehension, problem solving and other complex forms of academic work for which the underlying processes can be explained or demonstrated by teachers and practised by students (4);

and, with particular reference to the teaching of mathematics:

direct instruction is best equipped for well-structured school subjects like mathematics, where subjects can be divided into smaller units. In this area the model is very successful, especially for students from disadvantaged backgrounds (5).

In the United States, the National Council for Teaching of Mathematics suggested that:

by modelling respect for students' thinking and conveying the assumption that students make sense, teachers can encourage students to participate within a norm that expects group members to justify their ideas.

Observations

The key question underpinning our research was, "to what extent can the practices used in mathematics classrooms in the Czech Republic, such as whole class interactive teaching and language rich environments, be adapted and used in a range of classrooms in Nottingham City and Nottinghamshire?"

Through our visits to schools which represented the range of schooling in the Czech Republic, the predominant features of mathematics teaching to emerge were:

- lessons were tightly structured with a clear focus;
- lessons were taught at the pace of the slowest in the class, but the content was at the level of the best;
- the content of the lessons was not vast but it was covered at a tremendous depth;
- students were expected to take notes during teacher exposition of problems;
- it was normal for students to present work to the rest of the class and, for example, show how to solve a particular problem, making their thinking explicit;
- the atmosphere in the class was supportive;
- the teacher had a very prominent role in all lessons observed, insisting on precision in use of mathematical language; and
- there seemed to be strong mutual respect between teachers and pupils.

Teaching environment

It may have been significant that in the Czech Republic 6% of students attend special schools, as compared to 0.5% in Nottinghamshire (NASUWT Newsletter: 53). Teachers appeared to have very little paperwork and no pastoral role. Uniform, equipment and behaviour were never an issue in the schools. Teachers did not appear to be under any stress, even with 10 observers in the classroom. It seemed that under these working conditions teachers were able to channel their energies into the content and structure of their lessons.

Development strategies

After detailed daily evaluation of our visits, we proposed the following as being important in developing materials and strategies for classrooms in England:

- the expectation by the teachers of precision at all times, both in written and spoken mathematics so that pupils began to use mathematical thinking and mathematical language;
- all teachers involved in the project expected the pupils to participate fully in mathematics lessons at all times, so that all the pupils felt involved;
- the extensive use of pupil misconceptions as teaching points;
- the introduction of mathematical hypothesis and argument from an early age; and
- placing responsibility with the pupils, for equipping themselves for lessons and making decisions about note taking and the roles they take within the lesson.

The complexity of classroom practice and of the process of developing it was revealed within the project. After the visit to Prague, one teacher described the growing awareness that there were no simple answers to improving classroom practice and that the supposition that there were simplistic solutions to the complex problems within teaching was misleading and ultimately detrimental to teachers' professional development.

Participation

One of the strongest aspects of the project was its participatory nature. Czech colleagues who supported the work of this project used English practice, both pedagogic and academic, as a mirror for their own work. The pupils who worked with the teacher researchers in Prague have maintained links with the UK through a link project, developed since the initial visit. The pupils in the teacher-researchers' classrooms became co-participants in the development of good practice by:

- actively participating in making the video; and
- analysing the changes in pedagogic practice in terms of their own learning.

The visit to Prague showed that there was a multiplicity of interesting questions in mathematics that could be worked on collaboratively by teachers and pupils. This finding was very exciting for teachers who were used to working within the narrow confines of more traditional mathematical contexts.

Implications for practice in our schools

The research has convinced us that:

1. active teaching in mathematics is a key to increasing motivation and learning in our pupils. Alongside this, is an expectation by the teacher, of the pupils, that the pupils are responsible for their own learning and for organising themselves to ensure that learning takes place; and
2. as teachers we are the ones that should take responsibility for researching our classrooms. We should not simply accept what others tell us is good practice without trying strategies and evaluating their worth in our own classrooms, modifying as necessary.

"Through placing ourselves in situations that at first seemed strange, we were better able to see how we teach in our own classrooms and how we could improve our own practice."

The following are the practices we have begun to adopt in schools in Nottingham City and Nottinghamshire:

Talking mathematics

Mathematics is taught and learnt through talk, argument and explanation and the responsibility for this talk lies with the pupils and the teacher.

Beginnings and endings of lessons

The opening of a lesson can be used to bring the whole class together and to present learning as a shared activity. A plenary at the end of a lesson allows the teacher and/or pupils to summarise what has been learnt.

Challenge

It is important to challenge all pupils, allowing lower attainers to access complex mathematical ideas but at an appropriate level.

Teaching as learning

Pupils work out problems on the board that they had not fully thought through. The process of 'doing mathematics' in this public way, supported by the teacher and peers is beneficial to pupils' learning, not just for the pupil at the board but for other pupils in the class.

Extended projects

Pupils working at higher levels are given complex mathematical tasks to work on over a number of weeks, which they then present to the class.

Intellectual honesty

Mathematics is presented in a formal way from the outset. Pupils' understanding and images of mathematics and mathematical processes are used and translated into formal notation by the teachers. Our aim throughout the school is for mathematics to be experienced as a subject developing through conjecture, argument, and proof.

The full report contains examples of strategies which have been used successfully in our schools to improve:

- listening and questioning skills;
- the use of correct mathematical language;
- presentation of mathematical solutions;
- constructive criticism and collaboration; and
- confidence when talking about mathematics.

The changed practice in our classrooms led us to believe that the success of the project had to be measured by convincing others, both learners and colleagues, of the value of new approaches and our clearer thinking around terms such as 'whole class interactive teaching' or 'language rich environments.' Evidence of this success is beginning to emerge through the very positive feedback received from pupils in the mathematics lessons and colleagues who have taken part in courses we have run.

Method and Methodology

The teachers engaged in the research representing 3 schools in two education authorities met regularly to disseminate and discuss classroom practice. This commitment to change culminated in a bid to the TTA to enable a visit to a country, seen as succeeding internationally, in order to make interventions to improve teaching strategies in the teachers' own context.

Individual practitioners analysed their own practices using other classrooms as a mirror. This self analysis and reflection process was then shared with other practitioners in order to develop practice.

The research was validated by pupils and teachers in classrooms in which the teacher-researchers worked. Pupils were involved in discussions about the visit and the changes in practice ensuing. All the teacher-researchers disseminated the ideas through school in-service training. This was made easier by the making of a video of classroom practice. A cascade of dissemination allowed the continuous validation of the work and cycle of action research to continue.

Acknowledgements

I wish to acknowledge the contribution made by my colleagues who took part in this research project: Debbie Clarke, Sam Colbourn, Viv Sloan and Surinder Kaur Samra.

I wish to thank Dr Tony Cotton of the University of Nottingham for his strong support and encouragement throughout the project.

Further Reading

Carr, W. and Kemmis, S. (1994) *Becoming Critical*. The Falmer Press

Elliott, J. (1991) *Action Research for Educational Change*. Oxford University Press

Reynolds, D. and Farrell, S. (1996) *Worlds Apart? – A Review of International Studies of Educational Achievement involving England*. London: HMSO for OFSTED

Askew, M., et al (1997) *Effective Teachers of Numeracy: Final Report*. Kings College London

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Publication number 180/12-00

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