IS RESEARCH REACHING THE CLASSROOM?

Alison Parish

Many results of research are not reaching and being implemented by practising teachers, especially the non-mathematical specialist in the primary phase.

Mathematical educational research appears, at times, to be at odds with what is happening in classrooms. Whilst both teachers and researchers are concerned with improving learning and teaching of mathematics, but in different ways, many results of research are not reaching and being implemented by practising teachers, especially the non-mathematical specialist in the primary phase. Ainley uses the expression 'parallel paths' which, she says, might move together 'in a different mathematical universe', to describe this [1].

Why not?

One of the key factors for research not reaching the classroom is the semi-isolation of teachers in many schools, especially small ones [2]. In the past, teachers have looked for enlightenment, support and discussion opportunities with colleagues from other schools through local meetings and INSET courses. The courses provided the input of research results via dissemination from advisory teachers or invited speakers. This facility has been gradually eroded as funding has been diverted to the many new (Government and local) initiatives.

Another issue is the time factor in implementing these initiatives. For teachers, particularly those in primary schools, initiatives currently include national literacy and numeracy strategies, foundation stage profile, target setting etc. These expected changes leave many teachers feeling overwhelmed and de-skilled. Looking at research tends to be voluntary and done outside the working day and normally at teachers' own expense. Membership of professional organisations, such as the Association of Teachers of Mathematics and the Mathematical Association, provide a forum for an exchange of ideas for those really interested in a subject area, such as mathematics. However this does not cater for general class teachers who may be teaching and following developments in up to ten subjects.

What is presented?

It is, perhaps, not the research itself that is at odds with what is happening in classrooms but the way it is presented to the populace at large. Education is not immune from political posturing and party politics. In recent years there has been much debate on standards [3] and subsequently the introduction of the national curriculum and more recently the national literacy and numeracy strategies, in an attempt to raise standards. The use of statistics and selective reporting of mathematics research eg, the TIMSS report of 1997 [4] and the International Numeracy Survey [5], have been used to support political ideas. These are often presented from a negative aspect when English pupils' progress is compared with that in other countries, often with different expectations and social structures. Usually no mention is made how they might perform if they had been following our curriculum. More prominence was given to the first TIMSS report than the third (which dealt with practical, investigative, problem solving and analytical skills) on which English pupils fared better [6]. Saying that teachers in England 'could do better' creates an antagonistic view of research. At the same time there is often other research in the public domain to counteract these statements, but these go unreported [1].

An example of politicisation of mathematics education is the government's press releases concerning the use of calculators. The report of the numeracy task force [7] states (para. 112) that: *the*

use of calculators should be limited, particularly for younger pupils. However the government's press release stated, *. . . a ban on the use of calculators by children up to the age of eight and restricted use throughout the remainder of the primary school* [8, Appendix 2]. This conflict is a problem for teachers, especially those who have been using calculators in the manner recommended in the national curriculum (and national numeracy strategy), as an effective tool for learning about numbers and number systems. Professor Margaret Brown (a member of the task force) in an interview for BBC on-line, recognised the problems that this conflict caused teachers. Many teachers who have been teaching for a number of years and seen numerous changes are becoming sceptical about research, especially that which does not support their own views or ideas of good practice. This produces a tension between theory and practice. Those who are not used to reflecting upon their own practice will be reluctant to change from 'what has worked in the past' to something that, in their view, is new and untried. To suggest change removes their security and they feel uncomfortable, a scenario many will try to avoid as they feel pressurised from so many sources [2]. Indeed should they be made to change?

What is education for?

An allied question that should be considered is, 'What and who, are we educating pupils for?' There is a tension between universities seeking academic excellence, industry and commerce who are looking for numerate people with practical problem-solving skills and the need to equip young people with life skills, an issue discussed by many writers including Boaler [9] and Seely Brown et al. [10]. The skills students need for universities, industry and commerce are not necessarily the skills people need to enable them to cope with the mathematics necessary for everyday living, so on what should the emphasis of teaching be – for life skills, for further study, for the requirements of employers – and who decides?

In the selective days of grammar and secondary modern schools with GCE O-levels and the Certificate of Secondary Education (CSE) respectfully, the curriculum was slanted to accommodate the needs of those who were likely to follow a course of further study and those who were seen as needing mathematics for 'basic life skills'. Even after their combination as the General Certificate of Secondary Education (GCSE), political influence, social stigma and class attitudes remain with respect to curriculum content [3]. Checking through textbooks there is still evidence of this. For example, ***National curriculum mathematics, book 7*** [11], aimed at GCSE grade C, still gives questions based on 'real life' tax, profit and loss accounts that are not relevant to many 14-year-old pupils nor applicable to all social classes. Indeed many textbooks offer a very closed approach to learning, especially for classes aiming at GCSE, with teachers aiming to get pupils 'through the hoops'. This poses a tension for teachers when designing the curriculum, especially in determining the balance between 'pure' and 'applied' mathematics.

When the national curriculum was last rewritten there was a debate concerning keeping in the *Using and applying* attainment target. I was invited to attend one of the SCAA meetings, where the feeling was its retention would give a degree of prominence to the application of mathematics, which, if included within the other attainment targets, it would not have. It was hoped that by the time of the next revision, teachers would feel more confident in using open ended tasks and using and applying mathematics could therefore be included within the other attainment targets. From research evidence (e.g. Holt, [12]) it was felt that if pupils are able to reason, question and think about mathematics their learning and understanding would be improved. The problem was (and still is) in getting this message to the teachers involved. It is interesting to note the consistency in the 'messages' being sent to teachers in various research based reports saying that the understanding of mathematics is enhanced when pupils are able to reason, question and think, including reports of Cockcroft, the Assessment and Performance Unit (APU), the national curriculum, national numeracy strategy and the report into the CAME project [13]. The lack of time and/or teacher's willingness to change, means many research findings are not known of, or implemented, in the classroom.

Establishing credibility

Another problem for researchers is establishing credibility. In many ways researchers who are currently, or have been, involved in classrooms (such as Love [14] Selinger [15] and Ainley [1]) have the advantage of being able to present situations that seem more authentic to the teacher reader through their appreciation of the real problems facing teachers. By including references to the more academic research in their writing it can be filtered through to the classroom teacher. The dissemination of research results to classroom teachers can be met with scepticism. One of the media often used for

this is video material. Having watched videos of researchers in action, teachers' common comments include:

- Where are the rest of the children?
- What are the others doing? Who is watching them?
- I could do that if I had a small group.

This scepticism is not confined to videos. Whilst reading research material a teacher's reaction to some articles might be to be defensive, as the views do not correspond to their experience. Other points arising out of articles include:

1 The feeling that some teacher-researchers may have some prejudices concerning the pupils they are interviewing (a point at which a researcher has an advantage).
2 Some research has dubious sample size, for instance, does writing an article based on your own two children's development constitute a valid research argument? (If I judged children's development based on my own son and daughter I would be well off the line!)
3 Is the sample truly reflective? We realise that the researcher could have got different results by selecting the sample – have subjects been chosen to support (or otherwise) an argument?
4 When considering achievement, what is their background – is it their ability or previous teaching?
5 Is the research appropriate to all situations, can the research task be repeated? Will similar results be obtained?
6 Is the paper in an 'account-of' or an 'account-for' style? What is really being said once the emotive language is removed?

Reaching the teachers

If researchers wish their work to be read and used by people who teach mathematics it must be:

- Headed with a title that invokes interest
- Written so teachers can identify with it, and can relate to it from their own experience
- Not dictatorial or patronising
- Easy to read and understand and include everyday examples
- Concise
- Interesting with perhaps a touch of humour
- Demonstrating an awareness of curriculum constraints
- Written as if the researcher appreciates the functionality of classrooms and the pressures facing teachers
- Practical – suggestions for changing practice must be realistic and backed up with authentic research.

Researching your own classroom (including teaching practices, pupils' and personal learning) gives a way of identifying areas for improvement whereby change can be introduced with reduced conflict. It provides a method for continuous appreciation of the need to modify and develop teaching practices with a view to constant improvement. However, legislation, finance and resources may drive modification and development, as well as pupils' needs.

Alison Parish is second in mathematics at Stowmarket High School, Suffolk.

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for mathematics educators
primary, secondary and higher

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Every classroom is different. It is this complexity in which they operate in that provides a compelling reason for teachers to look more closely into their own teaching practice. One way for them to do so is to conduct research, right in their own classroom.Â Hairon dubs teachers the â€œsuperheroes in the classroomsâ€ because of the challenging and ever-changing nature of the work they do every day. But to stay adaptable, even these superheroes have to learn, unlearn and relearn.Â â€œThe advantage of teacher research is that it brings teacher learning and teaching really close together.â€ When teachers attend workshops and seminars and hear about new teaching ideas, they would be thinking to themselves: â€œHow do I translate this in my classroom?â€ Action research is very different. Teachers do not have to wait to find articles by designated experts from outside the classroom. They take a problem that is occurring in their classroom, sort through possible interventions, choose one to try and evaluate the results. If it works, great! If it doesnâ€™t, then another intervention can be tried until the problem is solved. So real change does happen in the class or classes where the research is done. The research is not objective since the researcher is involved in the problem they are trying to solve, so it is not good for making traditional cla Many results of research are not reaching and being implemented by practising teachers, especially the nonmathematical specialist in the primary phase. Mathematical educational research appears, at times, to be at odds with what is happening in classrooms.Â One of the key factors for research not reaching the classroom is the semi-isolation of teachers in many schools, especially small ones [2]. In the past, teachers have looked for enlightenment, support and discussion opportunities with colleagues from other schools through local meetings and INSET courses. The courses provided the input of research results via dissemination from advisory teachers or invited speakers.