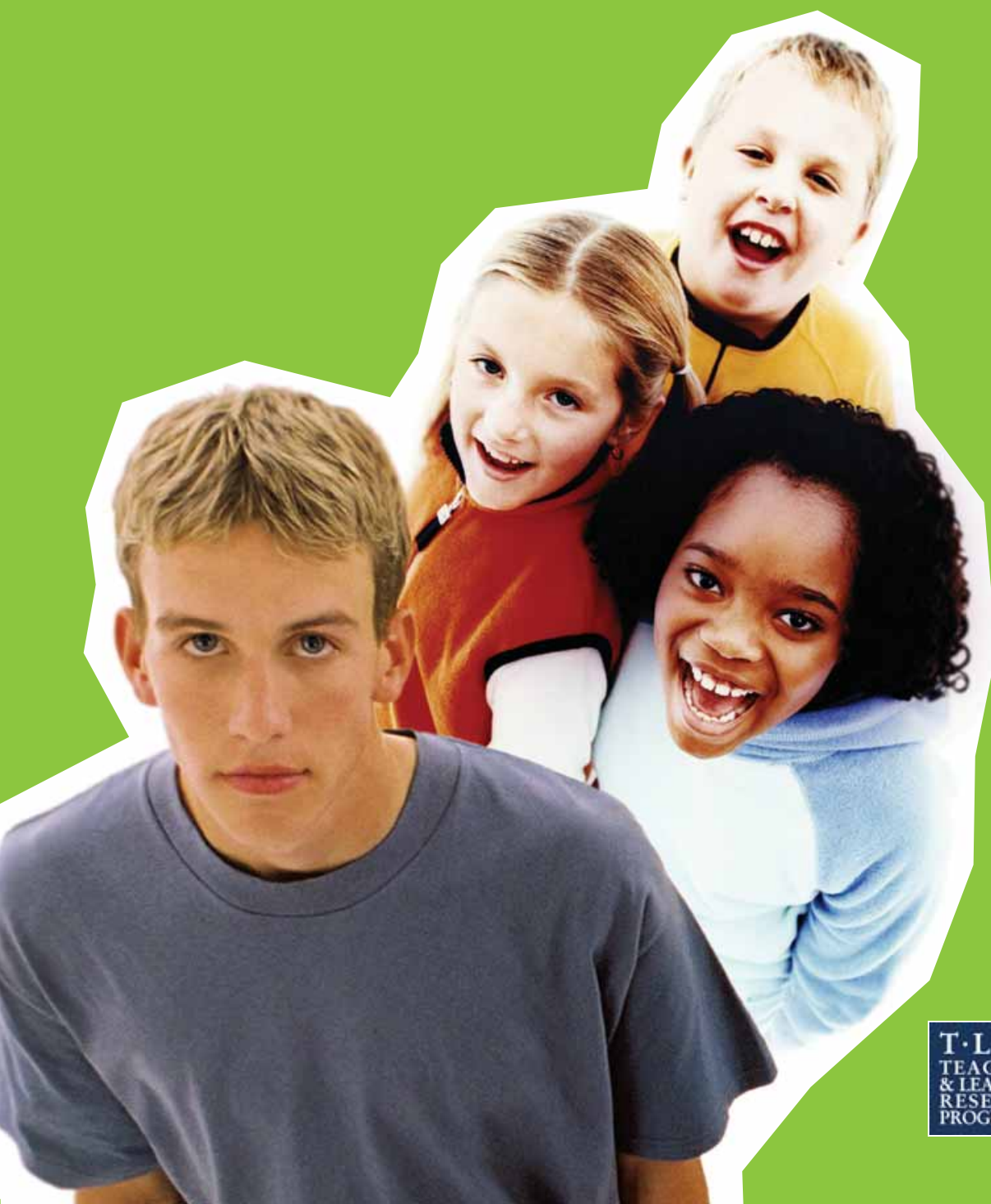




Improving teaching and learning in schools

A Commentary by the Teaching and Learning Research Programme



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Schools are the most vital social institution in any advanced society. How well they work is a concern for teachers, parents, managers, politicians, employers and most of all, pupils. For this reason, the effectiveness of our schools is a principal focus for the Teaching and Learning Research Programme, the biggest research initiative in ESRC's portfolio.

In this publication, the second TLRP Commentary, researchers describe what they have found out about improving education in UK schools. Some of their work has concentrated on solving classroom problems, such as spelling and the understanding of fractions. Some has looked at the best ways of using new technology in schools. It points the way to more successful uses of information technology in class and in pupils' wider lives. Another strand of TLRP research looks at ways of involving pupils more successfully in schools, as learners and as participants with valid views about what should happen to them during this most formative period of their lives. Another looks at the links between home and school and how they can be strengthened to improve educational outcomes.

The breadth of TLRP's work makes it possible to derive overall findings about the improvement of teaching and learning – such as the 'ten principles' which Mary James and Andrew Pollard offer in their introduction. An important implication is that policy-makers' concerns about how schools should be funded, governed, organised and held accountable, are only part of the story. At least as important are forms of support for teaching and learning processes which are based on evidence-informed educational principles.

We hope you find this Commentary of interest. We would be pleased to receive your response to it via the TLRP web site, www.tlrp.org.

Professor Ian Diamond FBA AcSS
Chief Executive
The Economic and Social Research Council



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Principles for teaching and learning

Mary James and Andrew Pollard

Promoting the learning and achievement of pupils is a main aim of school education. Teaching is the main way of achieving this. Teaching and learning are what ultimately make a difference in the mind of the learner, and thus affect knowledge, skills, attitudes and the capacity of young people to contribute to contemporary societies.

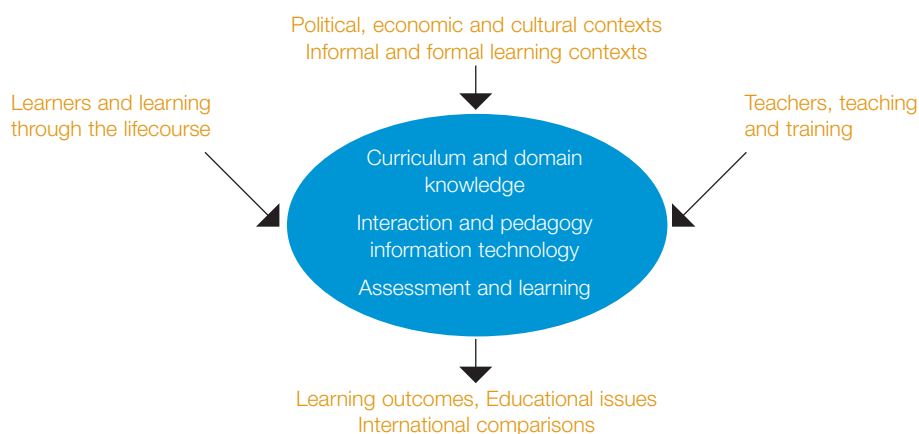
Most teachers retain a strong sense of commitment to teaching and learning, despite workload pressures and often unwelcome external requirements. Many work assiduously to improve the effectiveness of their practices, for instance through undertaking classroom inquiry and other reflective activities. From this perspective, the role of education policy is to provide guidance, resource and accountability to support high quality teaching and learning. Educational research complements it by using careful description and analysis to offer insights and new knowledge about educational processes and outcomes. The Teaching and Learning Research Programme is one such contribution.

In 2000, an initial group of TLRP projects was funded to investigate aspects of teaching and learning in formal and informal educational settings in England, Scotland, Wales and Northern Ireland. By 2010, all phases of education, from early years provision to the learning of older people, will have been investigated. Because many of the early projects were concerned with teaching and learning in schools, we can conduct a 2006 'stock-take' of some of the big themes which are emerging in relation to this sector. Twenty school-focused projects, networks of projects and individual research fellowships are drawn on, directly or indirectly, in this TLRP Commentary. Further analyses will be published in due course.

This TLRP Commentary has two main purposes. It provides highlights to date from each project in the schools' portfolio. In addition, it looks across all TLRP projects to present ten 'Evidence-informed Principles of Teaching and Learning'. Producing them has involved reviewing what individual projects have found out and what the Programme as a whole has found. This cross-programme thematic work is being taken forward in many ways (see <http://www.tlrp.org/themes/index.html>) and will continue for some years.

TLRP's framework for analysis

As TLRP has developed, the key concerns investigated by projects, and the relationships between them, have become increasingly clear. They are represented in the conceptual framework below.





All of our projects can locate their work somewhere in this space although they have different, but often overlapping, emphases. All have some findings related to the key concepts and processes in the centre. Most have something to say about the factors that surround it.

There are numerous ways in which the TLRP's projects can be grouped together. Here we distinguish those that focus closely on classroom practice from those that broaden their focus to the wider environment for teaching and learning including wider social groups. If one imagines innovations in teaching and learning as being like a pebble thrown into a pond, the first ripple might be the changes this brings about in classroom processes and outcomes. These in turn have implications for teachers' roles, values, knowledge and skills (the second ripple) which may require change in professional training and development and the environment for learning (the third ripple). Changes in approaches to professional learning often require or stimulate change in school structures and cultures (the fourth ripple) which, in turn, can be constrained or enhanced by local and national policy at system level (the fifth ripple).

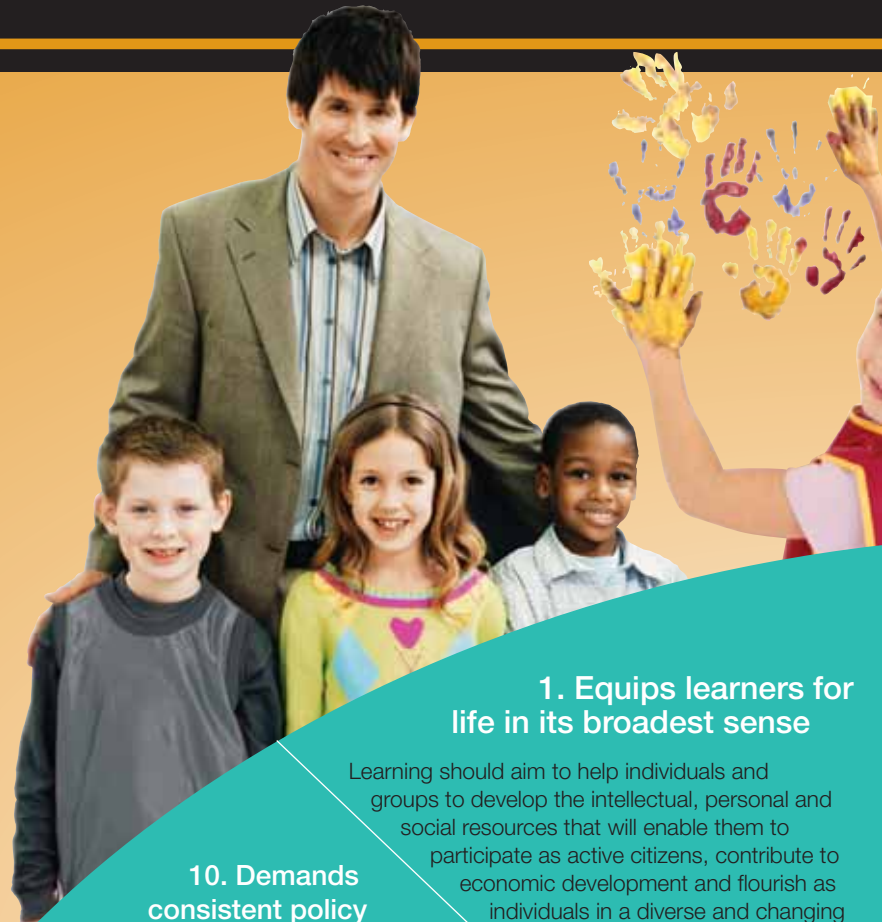


All TLRP projects range across these levels in one way or another. These relationships emphasise an important truth about attempts to bring about educational change in schools – and attempts to research them. Unlike aspects of medicine, with which education is sometimes compared, educational changes almost always involve adjustments at several levels. There are implications beyond a new prescription or a change in dose. For example, educational innovation may require teachers to re-evaluate their beliefs, accept new commitments, develop new skills and adopt new forms of practice. They may have implications for forms of school organisation, inspection, national strategies and government policy. At the classroom level, such changes are not always difficult to achieve. Some TLRP projects have demonstrated how small but specific changes can have substantial positive outcomes (see for example the work on fractions described in this Commentary).

The key point is that changing one aspect very often has implications elsewhere. This tends to make educational innovation multilayered. Researching it is complex too.

Despite this complexity, we believe that it is possible to identify some general, evidence-informed educational principles which are of great importance in achieving high quality teaching and learning.

Effective teaching and learning



1. Equips learners for life in its broadest sense

Learning should aim to help individuals and groups to develop the intellectual, personal and social resources that will enable them to participate as active citizens, contribute to economic development and flourish as individuals in a diverse and changing society. This may mean expanding conceptions of worth while learning outcomes and taking seriously issues of equity and social justice for all.

10. Demands consistent policy frameworks with support for teaching and learning as their primary focus

Institutional and system-level policies need to recognise the fundamental importance of teaching and learning and be designed to create effective learning environments for all learners.

9. Depends on teacher learning

The need for teachers to learn continuously in order to develop their knowledge and skill, and adapt and develop their roles, especially through classroom inquiry, should be recognised and supported.

8. Recognises the significance of informal learning

Informal learning, such as learning out of school, should be recognised as being at least as significant as formal learning and should be valued and used in formal processes.

7. Fosters both individual and social processes and outcomes

Learners should be encouraged and helped to build relationships and communication with others for learning purposes, to assist the mutual construction of knowledge and enhance the achievements of individuals and groups. Consulting learners about their learning and giving them a voice is both an expectation and a right.



2. Engages with valued forms of knowledge

Teaching and learning should engage learners with the big ideas, key processes, modes of discourse and narratives of subjects so that they understand what constitutes quality and standards in particular domains.

3. Recognises the importance of prior experience and learning

Teaching and learning should take account of what the learner knows already in order to plan their next steps. This includes building on prior learning but also taking account of the personal and cultural experiences of different groups of learners.

4. Requires the teacher to scaffold learning

Teachers should provide activities and structures of intellectual, social and emotional support to help learners to move forward in their learning so that when these supports are removed the learning is secure.

5. Needs assessment to be congruent with learning

Assessment should be designed and implemented with the goal of achieving maximum validity both in terms of learning outcomes and learning processes. It should help to advance learning as well as determine whether learning has occurred.

6. Promotes the active engagement of the learner

A chief goal of teaching and learning should be the promotion of learners independence and autonomy. This involves acquiring a repertoire of learning strategies and practices, developing positive learning dispositions, and having the will and confidence to become agents in their own learning.



Evidence-informed principles for teaching and learning

Here we set out a number of general findings which are beginning to emerge from the TLRP's school-focused projects. In each case, we refer to some of the evidence in specific projects that support them.

We hope that these principles will help teachers, school leaders and policymakers to decide how best to direct their efforts and resources for the benefit of pupils' learning and achievement.

Effective teaching and learning	TLRP evidence
<p>1. equips learners for life in its broadest sense</p> <p>Learning should aim to help individuals and groups to develop the intellectual, personal and social resources that will enable them to participate as active citizens, contribute to economic development and flourish as individuals in a diverse and changing society. This may mean expanding conceptions of worthwhile learning outcomes and taking seriously issues of equity and social justice for all.</p>	<p>TLRP projects acknowledged the importance of academic attainment but sought to broaden the concept of outcomes beyond those defined by a narrow standards agenda (Project 18). Pupils' capacity to learn and to use thinking skills, especially metacognitive strategies, was promoted and assessed (Project 5) and shown to have a positive relationship with attainment and effort, although the effect needed time to build and was not uniform across all learner groups. Learning how to learn was investigated as a valued outcome (Project 6).</p> <p>Learning dispositions and confidence were found to be crucial (Project 8) and gains in social-emotional relationships, behaviour and participation, as well as higher conceptual learning, were observed from engagement in group work (Projects 11 & 12).</p> <p>No TLRP project was sufficiently long or wide to fully evaluate the impact of school learning on life after school. However these expanded conceptions of valued learning outcomes are expected to benefit learners beyond school and enhance lifelong and life-wide learning.</p>
<p>2. engages with valued forms of knowledge</p> <p>Teaching and learning should engage learners with the big ideas, key processes, modes of discourse and narratives of subjects so that they understand what constitutes quality and standards in particular domains.</p>	<p>Teachers need to possess both a good understanding of the subjects they teach and of the best ways to teach these subjects – what has been called 'pedagogical content knowledge'. TLRP projects that focused on teaching in particular subjects offer teachers advice on practical classroom activities.</p> <p>In mathematics, an understanding of rational numbers (proportion and ratio) is important but difficult for primary pupils to master. Relatively small teaching sequences can boost achievement (Projects 1 & 2). Similarly, spelling improved through teaching pupils explicitly about rules of morphology (units of meaning) (Project 1).</p> <p>In science, nine key themes were identified that should be taught as part of the school curriculum (Project 3). This research showed that insights from research were used by teachers when they were transformed into worked examples.</p> <p>However, giving teachers practical strategies is not always enough for the development of professional expertise. Practice can become ritualised if teachers do not understand the principles that underpin it. Therefore continuous professional development depends on fostering an understanding of practice and some theory. 'Awareness' and making learning explicit is important for both pupils and teachers.</p>
<p>3. recognises the importance of prior experience and learning</p> <p>Teaching and learning should take account of what the learner knows already in order to plan their next steps. This includes building on prior learning but also taking account of the personal and cultural experiences of different groups of learners.</p>	<p>Pressures for 'delivery' and 'coverage' of an overloaded curriculum militate against deep and secure learning and enhanced motivation. Teachers need time to diagnose learning difficulties and help pupils to improve. This is a foundation principle of assessment for learning (Project 6) and underpinned the focus on developing diagnostic questions in science (Project 3).</p> <p>It was also the basis on which a number of projects encouraged teachers to challenge their assumptions about the prior knowledge and experience of certain groups of children (see, for example, Project 18 on inclusive practice, Project 13 on home-school knowledge exchange, and Project 14 on pre-school settings).</p> <p>A project investigating interaction with ICT in early years (Project 8) found, contrary to expectations of a 'digital divide', that children in high income families do not necessarily have more access to computers.</p>



Effective teaching and learning	TLRP evidence
<p>4. requires the teacher to scaffold learning</p> <p>Teachers should provide activities and structures of intellectual, social and emotional support to help learners to move forward in their learning so that when these supports are removed the learning is secure.</p>	<p>The way that teachers plan and structure activities in the classroom, and the role of classroom dialogue in scaffolding, was a theme of a number of projects. For example, activities characterised as 'high organisation based on ideas' were found to be an important new dimension of assessment for learning practice to set alongside the more familiar emphasis on questioning, feedback, sharing criteria and self-assessment (Project 6).</p> <p>The teachers' role in scaffolding learning was found to be crucial in early years learning with ICT (Project 8). This was confirmed for older pupils too, across the whole range of school subjects (Project 7; Project 9 continues this work) because it promoted sustained mindful engagement. The role of mediating tools and artefacts to support such collaborative dialogue, such as a computer-based concept-mapper (Project 10), showed gains in learning and achievement.</p>
<p>5. needs assessment to be congruent with learning</p> <p>Assessment should be designed and implemented with the goal of achieving maximum validity both in terms of learning outcomes and learning processes. It should help to advance learning as well as determine whether learning has occurred.</p>	<p>Testing that focuses on factual recall often overestimates students' understanding of key concepts. Project 3, on learning in science, showed that understanding cannot be measured by a single question.</p> <p>Likewise the attempt to construct a simple test of 'learning how to learn' proved problematic (Project 6). Complex learning behaviours and outcomes need more subtle measures which require observation over time and across different contexts. This is an argument for taking a critical view of summative assessment that is reliant on tests and considering ways of enhancing the role of teachers in assessment. Teachers are also in the best position to use assessment formatively so that it promotes learning, rather than stifles it.</p>
<p>6. promotes the active engagement of the learner</p> <p>A chief goal of teaching and learning should be the promotion of learners' independence and autonomy. This involves acquiring a repertoire of learning strategies and practices, developing positive learning dispositions, and having the will and confidence to become agents in their own learning.</p>	<p>Most TLRP school projects emphasised the importance of developing learning awareness, explicit learning practices, positive learning dispositions, and learning autonomy (for example, Projects 1, 5, 6, 11, 13) and built this focus into their development strategies. However, as some projects found, whilst teachers want to promote learning autonomy in their pupils, they find it difficult because of constraints. Those who were most successful were those who adopted an inquiry approach to their own learning and took responsibility for what happened in their classrooms and for pupils' learning.</p>
<p>7. fosters both individual and social processes and outcomes</p> <p>Learners should be encouraged and helped to build relationships and communication with others for learning purposes, to assist the mutual construction of knowledge and enhance the achievements of individuals and groups. Consulting learners about their learning and giving them a voice is both an expectation and a right.</p>	<p>New technologies have exciting potential to help teachers and schools tailor programmes of study to learners' needs and interests. However, TLRP projects, including those on uses of ICT, emphasised the importance for effective learning of learning relationships and opportunities to construct knowledge with other learners. The development of schools as communities of learners is crucial, even in the electronic age.</p> <p>The TLRP group work projects (Projects 4, 11 & 12) demonstrated the benefits of efforts to improve the quality of group work and children's mastery of cooperation and collaboration. Pupils involved in these developments made significant academic gains, which were seen across schools in different social contexts. This confirms the importance of dialogue and peer mediation of learning.</p> <p>Other projects examined the benefits of making space for teachers to consult pupils about their learning and take their perspectives into account. Project 15 found that consulting pupils and taking their views seriously enhances self esteem and agency and improves learning opportunities. However these researchers also found that some pupils have more communications competence and are 'heard' more than others. Teachers need to be alert to class and gender differences. Project 16, which extended these themes, concluded that the concepts of space, voice, audience and influence (from the UN Convention on the Rights of the Child, Article 12) provided a useful framework for understanding the possibilities and limitations for offering pupil engagement, participation and consultation in classrooms.</p>



Effective teaching and learning	TLRP evidence
<p>8. recognises the significance of informal learning</p> <p>Informal learning, such as learning out of school, should be recognised as being at least as significant as formal learning and should be valued and used in formal processes.</p>	<p>At classroom level, teachers can be encouraged and helped to value and build on informal learning. Project 7, investigated two-way knowledge exchange between home and school and observed that young people draw on school experience, and develop it at home, and bring home experience into school. For example, teachers sometimes underestimate pupils' computer expertise derived at home.</p> <p>The explicit home-school knowledge exchange activities of Project 13 also produced evidence of how these impact on outcomes. This impact is mediated by social class, gender and attainment factors. Thus, valuing and using informal learning needs to be handled with sensitivity in order to avoid negative consequences for particular groups of pupils.</p>
<p>9. depends on teacher learning</p> <p>The need for teachers to learn continuously in order to develop their knowledge and skill, and adapt and develop their roles, especially through classroom inquiry, should be recognised and supported.</p>	<p>Most TLRP school based projects produced substantial evidence on teachers' professional development and learning. In subject areas, as in relation to more generic approaches to learning, teachers were found to need opportunities to develop their own knowledge, beliefs and values. The development of competences, narrowly defined, was inadequate. Project 6 found that teachers need to possess frameworks of concepts and principles to guide the decisions they make in the unpredictable situations they often encounter in classrooms. They 'need to know what to do when they don't know what to do'. TLRP evidence suggests this is best achieved through teachers' critical inquiry, with colleagues, into practice in classrooms. For example, Project 17 focused on Research Study Lessons as one model for CPD that is school-based, longer term, collaborative and based on inquiry. Project 18 noted that a culture of reflection developed in schools when teachers engaged with evidence about their practice. Visits from teachers in other schools were valued for questioning assumptions. However, this can be challenging. As Project 19 found, teachers have to deal with uncertainty in changing their practice. Their levels of commitment and resilience (Project 20) are important conditions for this.</p> <p>Schools with traditions of staff participation, cultures of inquiry and professional networks (Projects 3 & 6) are in a good position to support change. They benefit from help from local and national providers.</p> <p>Projects found that specific targeted professional development materials and courses were valued. For example, Project 1 concluded that teachers need to understand mathematics and spelling rules themselves if they are to teach effectively. Thus targeted professional development in areas where explicit conceptual knowledge is limited makes a difference. Project 11 found that offering teachers and schools a package of practical relational strategies with support for setting up, managing and improving the effectiveness of group work is a successful approach to the integration of group work in everyday classroom settings. Similar practical materials were produced for use in In-Service Training by a number of other projects.</p>
<p>10. demands consistent policy frameworks with support for teaching and learning as their primary focus</p> <p>Institutional and system-level policies need to recognise the fundamental importance of teaching and learning and be designed to create effective learning environments for all learners.</p>	<p>If effective teaching and learning are the core functions of schools, they should be the focus of policy at institutional and system level. This would give other policies coherence and consistency.</p> <p>A number of TLRP projects investigated the implications for school policy. Most noted that when senior management support innovation it becomes sustainable (see Project 13). However, head teachers (Project 6) revealed their concerns about leading learning in their schools within the context of prescriptive government policy. All schools were implementing government policies but with varying degrees of enthusiasm, locating themselves on a spectrum from compliance to subversion. The greater the external pressure, the greater was the desire for flexibility, diversification and agency. There was sometimes a perception that progress was being made despite government policy rather than because of it.</p>



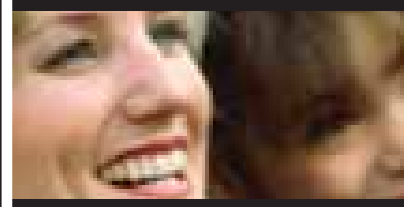
Applying evidence-informed principles for teaching and learning

In 1997 the New Labour government promoted 'standards not structures' as a new vision for the direction of education policy. After years of attempts to engineer improvements by changing the way the school system was structured and managed, this seemed at last to be recognition that, despite structural 'reforms', standards will only rise if core processes of teaching and learning are given appropriate priority. Although structures are necessary they are never sufficient to secure improvements in teaching and learning, and thereby higher standards. Structures should support these fundamental processes, including provision for professional development of teachers and leadership for learning. Structures which are inconsistent with what is known about teaching and learning, or which enhance conditions only for some social groups, are likely to disappoint or differentiate unnecessarily.

UK governments have invested enormous amounts of financial and political capital in education in recent years. Many of the resulting initiatives are broadly consistent with the principles for teaching and learning which we have identified – certainly at a rhetorical level.

In England, the recent emphasis on 'personalised learning' in schools affirms the centrality of teaching and learning processes, and the DfES seeks to maintain this priority through the National Strategies and initiatives such as the Gifted and Talented Guidance. Taken as a whole, changes in curriculum, assessment and other elements of the Five Year Strategy for Children and Learners are being designed to reduce prescription and increase flexibility, as is the increased integration of children's services. A similar emphasis is to be found in the new standards for teachers being created by the Training and Development Agency for Schools, and in much of the work of the DfES Innovation Unit. However, the benefits from such initiatives take time to be realised and political pressures sometimes press for more rapid outcomes. Indeed, some have suggested that the 2005 Schools White Paper, with its controversial proposals on choice and admissions, indicated that the government had reverted to prioritising structural change as a lever for raising standards. Certainly, the Education and Inspections Bill 2006, though presented in terms of parental choice and school empowerment, derived its underlying rationale from the proposition that the establishment of independent 'foundation' schools would increase educational standards by challenging existing providers. For those who were concerned that some communities would be disadvantaged by these measures, a tighter national admissions code was offered. Local Authorities would commission new schools but could only establish their own with the prior agreement of the Secretary of State. Other parts of the Bill addressed behaviour, 14-19 diplomas, school food, youth provision and the integration of inspection services.

In Scotland, a thorough review of the school curriculum, published as A Curriculum for Excellence, is intended to produce a de-cluttered 3-18 curriculum with more space for responsive teaching and learning. Consistent with Scotland's National Priorities, the provision is intended to be both more challenging and more enjoyable for pupils. In Wales, teaching and learning issues were prioritised by The Learning Country and are being developed through Aiming for Excellence, a programme of guidance and support for schools, as well as through other initiatives. Assessment reform to ensure that it directly supports learning is well advanced and a National Pedagogy initiative was recently launched to affirm and spread good practice. Northern Ireland's Curriculum Review again reduces statutory prescription, building on new understandings of how children learn, and is intended to make it easier for teachers to respond to specific pupil needs. In all four countries of the UK, the General Teaching Councils continue to support evidence-informed development of practice and policy, with a particular emphasis on teacher inquiry and research.



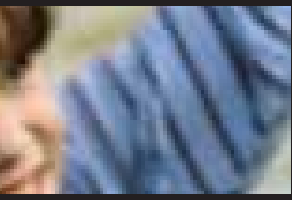
Even this brief review of government initiatives shows the commendable energy of policy-makers. However, such policies have ultimately to be turned into practices which bring about improvements in learning and achievement for individuals and groups – the output for the input. The key challenge is to ensure that the various elements and contributions, at each level of the system and from each stakeholder, are as consistent as possible with what we know about effective teaching and learning. This is not always achieved, as practising teachers are often only too aware.

We hope that the ten principles which we have identified will be helpful in evaluating such policy proposals. They could be applied to the policies of any government department or agency, to a school, or to a classroom. We hope that they will generate debate. But they are offered with due humility. They are the result of an interim analysis of key findings across TLRP's projects, some of which are still active. Conclusions in this complex field will always be conditional. The learning of pupils, teachers, schools, communities, researchers and governments are bound up together. In various ways, we all need to learn better if children are to succeed.

In the review of TLRP's school-focused research that follows, we have clustered projects under five headings representing a progressive widening of focus. They are:

- Learning in specific curriculum areas
- Learning across the curriculum
- The use of ICT to enhance learning
- Environments for better learning
- Schools and improvement





Learning in specific areas of the curriculum

Our first group of projects tackles the development of particular forms of knowledge, skill or competence. Our projects on the development of literacy and numeracy concentrate on fractions in mathematics and spelling in written English, subjects that pose particular problems for children in the UK. They show that relatively short sequences of lessons aimed at increasing awareness of reasons for rules can improve achievement. Similarly, projects on the teaching of big ideas in science show how teaching sequences and diagnostic questions can help pupils improve their learning.

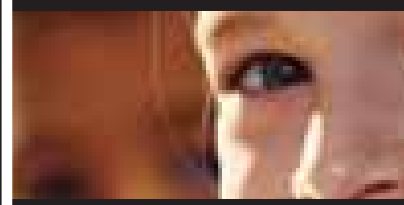
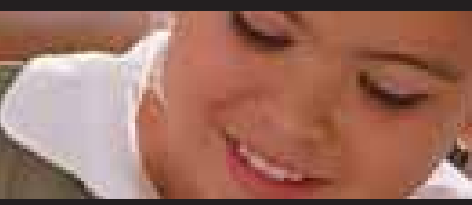
The message of these projects is that the techniques or formulae are rarely enough to ensure real deep learning. Pupils need to develop a more aware and strategic approach to their learning, based on key ideas, processes and principles which provide continuity. Learning that is grounded in this way takes less time. Learners with appropriate tools for problem-solving do not have to memorise information which becomes meaningless or is forgotten.

Learning to spell: the role of morphemes Project 1a

The English language uses units of meaning called morphemes to form words. The word 'magician' consists of two morphemes, the stem, 'magic', and a suffix, 'ian'. This research project showed that literacy in primary schools can be helped by an awareness of how morphemes make words and are represented in spelling. Morphemes give an indication of the meaning of words and also have a fixed spelling. If you know about them, words such as magician that would seem to have an unpredictable or irregular spelling start to seem regular.

Primary school children of all ages have difficulties with spelling words when the spelling cannot be predicted from the way the word sounds. Teaching which makes children more aware of morphemes has a positive effect on their vocabulary growth and promotes spelling and language development in the classroom. In our project, we surveyed 7,377 primary school children in Years 5 and 6 in the County of Avon. What we found showed that children do not simply catch the spelling of words like 'magician' and 'electrician'. They cannot tell when word endings that sound the same – like 'emotion' and 'electrician' – should be spelled with 'ion' or 'ian'.

Working with several schools in Oxford, we analysed how children's awareness of morphemes relates to spelling and whether it is possible to improve children's spelling by boosting their awareness of morphemes. Later, with the participation of schools in the Hillingdon Cluster of Excellence, we also analysed whether it is possible to improve children's vocabulary and their word attack strategies for interpreting novel words by boosting their awareness of morphemes.



New teaching approaches

We designed a programme to teach children how to identify the morphemes that compose multi-morphemic words in order to analyse their meaning and spell them correctly. Our materials, which were delivered using IT and a game format, required them to add and subtract morphemes, making analogies, count morphemes, guess the meaning of invented words made with real morphemes in non-existing combinations, and discover the grammatical categories to which words with the same morphemes belonged. Teachers and pupils enjoyed these exercises. More than 1,000 children were involved at different stages of the research on the development and assessment of the programme. The programme is effective in improving children's spelling of words whose spelling cannot be predicted from the way they sound. It helps both children in the higher and lower ability groups. The programme also has positive effects on children's vocabulary and provides them with a word attack strategy that helps them analyse and interpret novel words. Its approach is compatible with current curriculum demands and extends them in a valuable way.

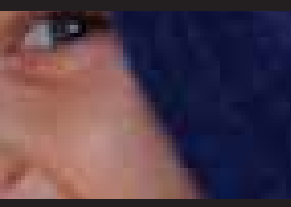
Our work with teachers

To ensure our research is used, these techniques need to be adopted by teachers. We did this successfully during the course of this project. Teachers were invited to attend a 10-session course in literacy with a Master's degree or during professional development. Of the 17 teachers for whom we had data at the beginning and the end of the course, only three defined a morpheme fairly accurately at the beginning but 16 out of 17 did so at the end. At the start of the module, teachers tended to consider phonological awareness as 'an essential foundation in the learning of reading and spelling', but did not refer to morphological awareness. At the end, they felt that teaching children about morphology also had important benefits for 7 to 11 year olds. All but one of the teachers reported that the course had changed their approaches to teaching spelling.

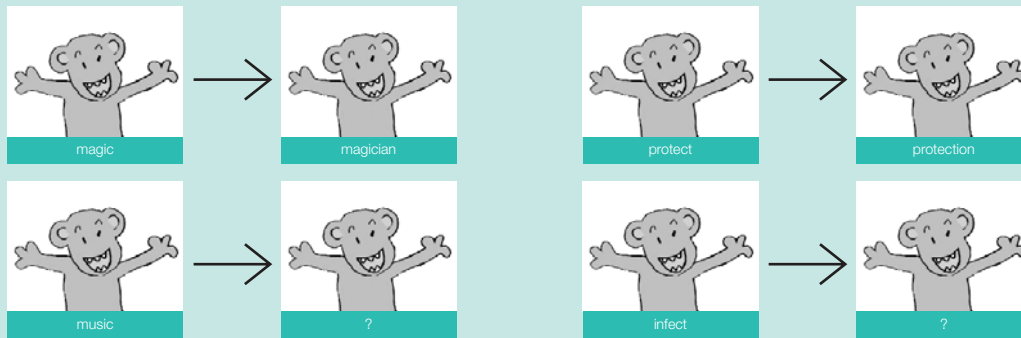
Our research demonstrates that knowledge of morphemes can help children learn to spell English words, and that it is quite easy to promote this knowledge in pupils in an attractive and interesting way. We have also shown that for the most part teachers themselves are not explicitly aware of the importance of morphemes, but with the help of special courses can easily incorporate instruction about morphemes into their teaching of spelling.

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www.tlrp.org/proj/phase11/phase2h.html
[www.brookes.ac.uk/schools/social/psych/childlearn/!](http://www.brookes.ac.uk/schools/social/psych/childlearn/)





Example of an Analogy Game that helped with the distinction between 'ion' and 'ian'



Helping children think about prefixes and how they can give a clue to meaning

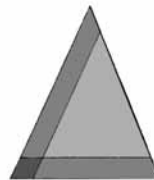
What is the most important difference between a **bicycle** and a **tricycle**? What is it about the word that gives you a clue to this difference?



Are there similar clues in these words? Identify these clues. What do these clues suggest?



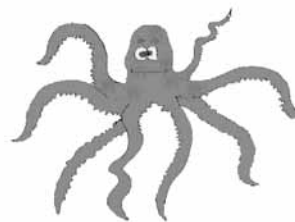
Binoculars



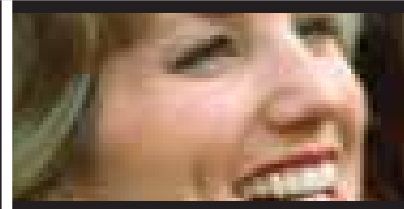
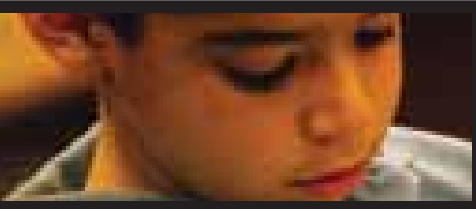
Triangle



Uniform



Octopus



Fractions: difficult, but crucial to mathematics learning

Project 1b

We can easily count how many oranges are in a bag or how much money we have in our pocket. But fractions cause difficulty to most people because they involve relations between quantities. What is a half? One half of what? If Ali and Jazmine both spent half of their pocket money, they may not have spent the same amount of money each. Two linked TLRP projects in England and Scotland have developed a teaching programme which boosts pupils' understanding of the relative nature of fractions.

Most pupils in Years 4 and 5 have not grasped the nature of fractions. This challenge must be confronted by schools because fractions are important in everyday life, in the world of work, and when pupils study mathematics in secondary school.

The problem with understanding fractions stems from their relative nature. The same fraction may refer to different quantities ($\frac{1}{2}$ of 8 and $\frac{1}{2}$ of 12 are different), or different fractions may be equivalent ($\frac{1}{3}$ and $\frac{3}{9}$, for example). Many pupils think that $\frac{1}{3}$ of a cake is smaller than $\frac{1}{5}$ because 3 is less than 5. Yet most children recognise that a cake shared among three children gives bigger portions than the same cake shared among five.

Because children show good insight into some aspects of fractions when they are thinking about sharing, mathematics educators have asked whether sharing could be used as a starting point for teaching fractions. We examined whether pupils who are starting to learn about fractions in school have intuitions about them that could be used as a basis for further learning. We presented them with problems in two types of practical situation: part-whole, the method normally used to teach fractions, and sharing.

Our research in schools in Oxford and London showed that pupils were much better at the sharing problems, about which they had received no systematic teaching, than at solving part-whole problems, although they had encountered these in the classroom.

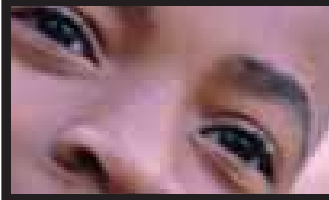
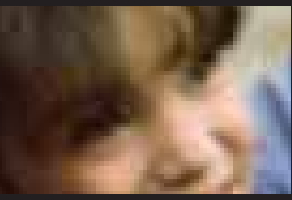
We worked with small groups of pupils to find out why they were more successful at sharing problems. In one problem they were told that six children went to a pizzeria and ordered two pizzas. They were asked to suggest different ways in which the pizzas could be shared fairly. After they had done so, they were asked whether the children would eat the same amount either way.

The children's arguments were often based on the logic of division: they argued that if the pizzas were shared fairly and exhaustively, the way in which the pizzas were cut did not matter. For example, one child said: 'They're the same amount of people, the same amount of pizzas, and that means the same amount of fractions.' Another child argued: 'Because first we did one pizza and did it in six pieces, we found out that two sixths was one third, so if we used both of them then we could just use one third each.' But the children also argued that the number of pieces and the size of pieces compensated for each other: $\frac{2}{6}$ and $\frac{1}{3}$ are just 'a different way in fractions, and it [$\frac{2}{6}$] doubled [the number of pieces] to make it littler, and halving [the number of pieces] makes it bigger'.

We carried out two experiments. In one, researchers taught the children in small groups outside the classroom and in the other, teachers in five other classrooms in four schools used sharing problems to introduce fraction concepts. Between five and eight teaching sessions were required for the children to go through all the problems. These taught groups significantly outperformed the comparison groups in the same fractions test. Children who had been above and below the mean both benefited.

Although the number of lessons used in our intervention study might seem large at first glance – five to eight lessons were necessary – this is a small investment when we consider that the lessons were used to set the conceptual basis for the understanding of a new way of thinking about numbers.

Contact: Professor Terezinha Nunes, contact details above.



Understanding ratio and proportion Project 2

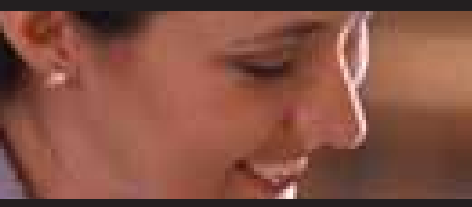
A Scottish extension of this research, led by Christine Howe at Strathclyde University, has shown that two or three hours of teaching can boost children's understanding of intensive quantities, multi-part numbers such as miles per hour or kilogrammes per cubic metre, and their ability to use fractions in intensive contexts.

The distinction between intensive quantities that relate two or more variables (speed as miles per hour) from extensive quantities that extend one variable (distance as added miles) is recognised elsewhere in the world, for instance in Japan, a centre of excellence for pupil attainment in mathematics. The distinction has been neglected in the UK, including Scotland. In the absence of formal instruction, children often treat intensive quantities as if they were extensive. A common response to 'What happens if you mix a tub of hot water with another tub of hot water?' is that the water will become even hotter, so temperature, an intensive quantity, is thought of as extensive.

A baseline survey showed that in the absence of formal teaching, primary school children of all ages have difficulties with intensive quantities. It was followed by an intervention study that contrasted alternative approaches to teaching. The intervention used four lessons. It was designed to help children consider the variables that are inversely proportional to outcome, as well as those that are directly proportional, to adopt appropriate language to represent intensive quantities, develop appropriate computational strategies, and apply knowledge developed in previous lessons to new contexts.

The intervention study made modest demands upon classroom time, two to three hours in total. Yet, in that time, most pupils advanced their understanding of intensive quantities, and virtually all improved their ability to name fractions in intensive contexts.

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Evidence based practice in science

Project 3

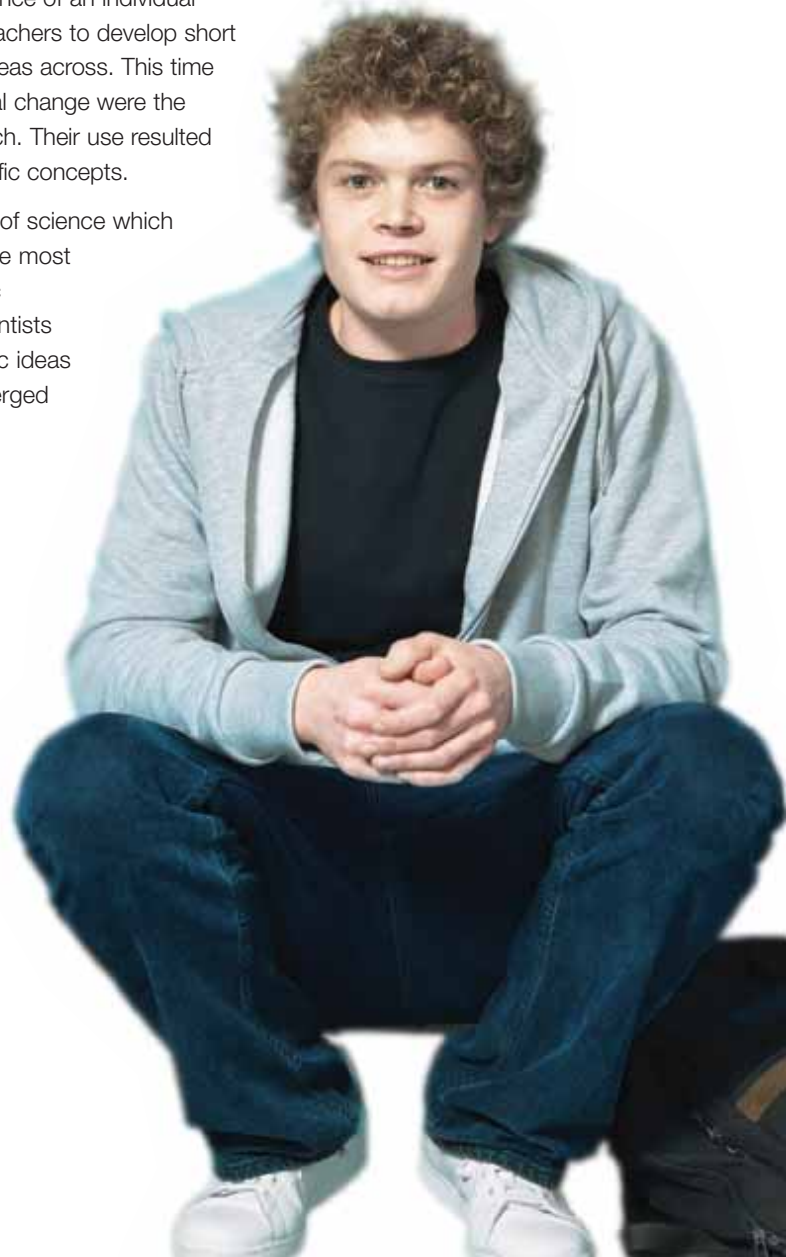
Everyone agrees that the UK needs a more scientifically-literate society, and that schools should respond to this need. A project within the Teaching and Learning Research Programme, Towards Evidence-Based Science Education (EPSE), was designed to produce novel research findings to illuminate what children know about science and how their learning can be enhanced.

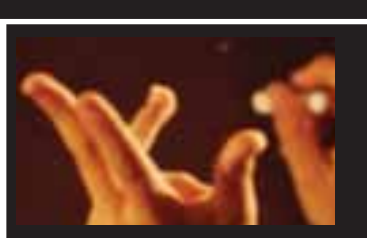
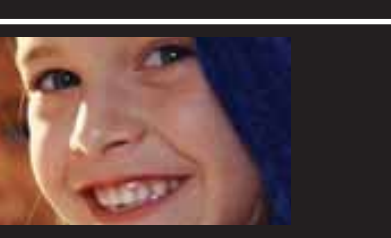
Running from 2000 to 2003, it looked at students' understanding of scientific ideas and how it can inform teaching, and developed teaching content tailored to audiences' scientific knowledge.

Coordinated by Professor Robin Millar of the University of York, ESPE worked mainly in secondary schools. It began by assembling banks of questions intended to help teachers learn what children know about science, focussing on electric circuits, the atomic nature of matter, and force and motion.

We found that understanding of many key ideas in these science topic areas is low, and sometimes changes little with age. Current approaches to science teaching appear not to lead to widespread understanding of many core ideas, and current assessment practices do not highlight this problem. Several properly-structured questions are needed to provide sound evidence of an individual student's knowledge and reasoning. We worked with teachers to develop short teaching sequences that would help get key scientific ideas across. This time electric current, plant nutrition and chemical and physical change were the ideas chosen. The sequences lasted up to six hours each. Their use resulted in pupils improving their grasp of these important scientific concepts.

In addition to looking at ways of increasing the amount of science which school students learn, EPSE examined their grasp of the most important concepts in science and where their scientific knowledge comes from. They began by consulting scientists and others about what they regard as the main scientific ideas which everyone should learn in school. Consensus emerged about the top nine concepts, listed in the box.





The nature of scientific knowledge

1. Science and certainty

Much scientific knowledge, particularly that taught in school science, is well-established and beyond reasonable doubt. But other scientific knowledge is more open to question. Current scientific knowledge is the best we have. But it may be subject to change in the future, given new evidence or new interpretations of old evidence.

2. Historical development of scientific knowledge

Students should be taught some of the historical background to the development of scientific knowledge.

Methods of science

3. Scientific methods and critical testing

Science uses the experimental method to test ideas, and employs basic techniques such as the use of controls. A single experiment is rarely sufficient to establish a knowledge claim.

4. Analysis and interpretation of data

The practice of science involves skilful analysis and interpretation of data. Scientific knowledge claims do not emerge simply from the data but through a process of interpretation and theory building that can require sophisticated skills. It is possible for scientists to come legitimately to different interpretations of the same data, and to disagree.

5. Hypothesis and prediction

Scientists develop hypotheses and predictions about natural phenomena. This process is essential to the development of new knowledge claims.

6. Diversity of scientific thinking

Science uses a range of methods and approaches and there is no one scientific method or approach.

7. Creativity

Science involves creativity and imagination as much as many other human activities, and some scientific ideas are enormous intellectual achievements. Scientists, as much as any other profession, are passionate and involved humans whose work relies on inspiration and imagination.

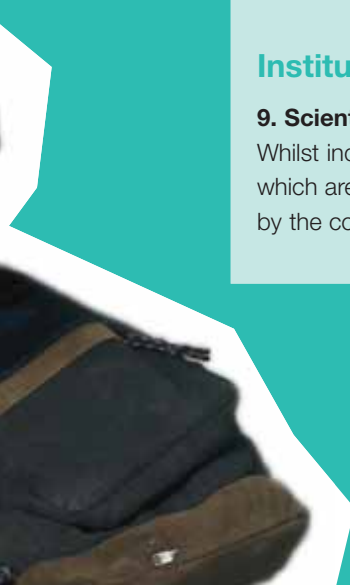
8. Science and questioning

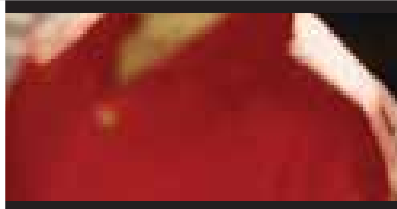
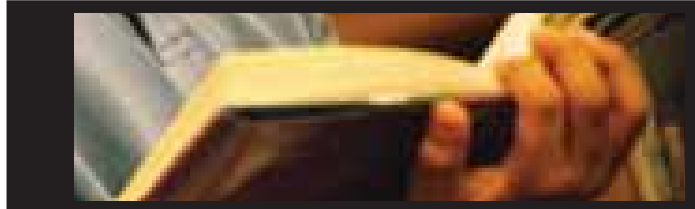
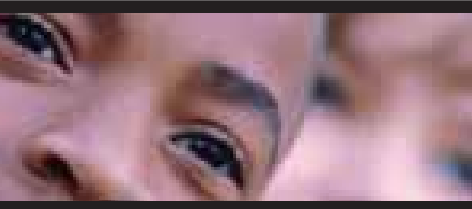
An important aspect of the work of a scientist is the continual and cyclical process of asking questions and seeking answers, which then lead to new questions. This process leads to the emergence of new scientific theories and techniques which are then tested empirically.

Institutions and social practices in science

9. Scientific work is a communal and competitive activity

Whilst individuals may make significant contributions, scientific work is often carried out in groups, which are often multidisciplinary and international. New knowledge claims are shared. To be accepted by the community, they must survive critical peer review.





EPSE researchers worked with teachers to develop teaching materials on these themes and help the teachers' own understanding of them. The teachers' success in lessons on these subjects turned out to be highly dependent on their teaching style, and in particular upon their ability to create dialogue in the classroom.

The final EPSE experiment looked at teachers' willingness to incorporate new research into their work. Using focus groups, one-to-one interviews and other devices, we explored whether practitioners knew about education research, found it plausible, and might make use of it in their everyday practice.

We discovered that research is more likely to influence practice where there is a professional culture which encourages awareness of research and experimentation with practice. Professional networks which bring researchers and practitioners together were frequently mentioned as facilitating practitioners' awareness of research and making it more likely to influence their practice.

Few teachers identified specific research influences on their teaching. Teachers do not read original research. They are more likely to be influenced by research-informed teaching materials or practice guidelines than by reports of research findings.

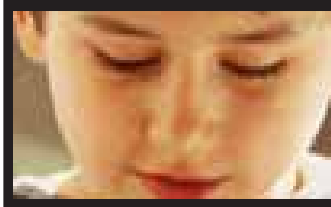
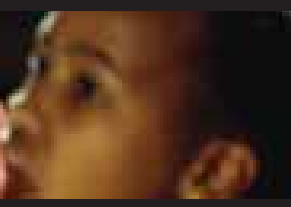
Contact: Professor Robin Millar, rhm1@york.ac.uk
<http://www.tlrp.org/proj/phase1/phase1bsept.html>
<http://www.york.ac.uk/depts/educ/projs/EPSE>

Rituals in science education Project 4

Much of our understanding of how children come to understand the world has arisen from research on what they say when they interact with each other, and how it corresponds to what they know and understand. The initial focus of this research project was on how seven-year-old children interact in groups whilst undertaking science tasks. From these observations it became clear that the rules by which they interact, known in research as the interaction order, were often overlooked in the literature. Previous researchers had regarded these rules as a matter of how children interact with each other, not what they learn whilst doing so.

The focus of the research project was shifted to allow us to investigate these rules in Key Stage 1 classrooms. The author undertook four contrasting ethnographic studies of classroom practices in England and in Germany, and the resulting field notes and video evidence were brought together as a series of narratives. They describe two basic forms of classroom ritual, Hegemonic and Identity rituals. These processes shape the way children are able to find meaning in classroom activities, or in many cases are excluded from doing so. More research is needed to find out how these forms of interaction affect the way that children learn in these classrooms. This research was conducted as a Research Training Fellowship associated with the TLRP group work project (see Project 11).

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Learning across the curriculum

These projects concentrate on the development of skills and practices associated with analytical, critical and creative thinking, assessment for learning and learning how to learn. The approach adopted was not to create separate courses and lessons about thinking skills or learning to learn, but to provide teachers with practical approaches for infusing these skills and practices into the whole curriculum.

The projects have shown that thinking skills and knowing how to learn are not separate abilities. They are practices and strategies that are used for learning different subject matter. This helps us think more clearly about teaching and about learning how to learn.

Building thinking skills

Project 5

The ACTS II – Activating Children's Thinking Skills in Sustainable Thinking Classrooms – project created methods to improve learning in primary schools by enhancing children's thinking skills. It developed methods that enhanced general thinking and subject understanding at the same time.

A group led by Professor Carol McGuinness at Queen's University, Belfast, developed methods to help children's learning by developing their ability to become proactive about their learning, and to plan, monitor and appraise their own thinking.

The project carried out an intervention process to enhance children's thinking and learning, and evaluated the effects on both pupils' and teachers' learning. In a second study, thinking lessons were recorded to identify the sort of teaching that helped children's thinking skills the most. The group also designed a professional development programme for teachers and wrote curriculum material for them.

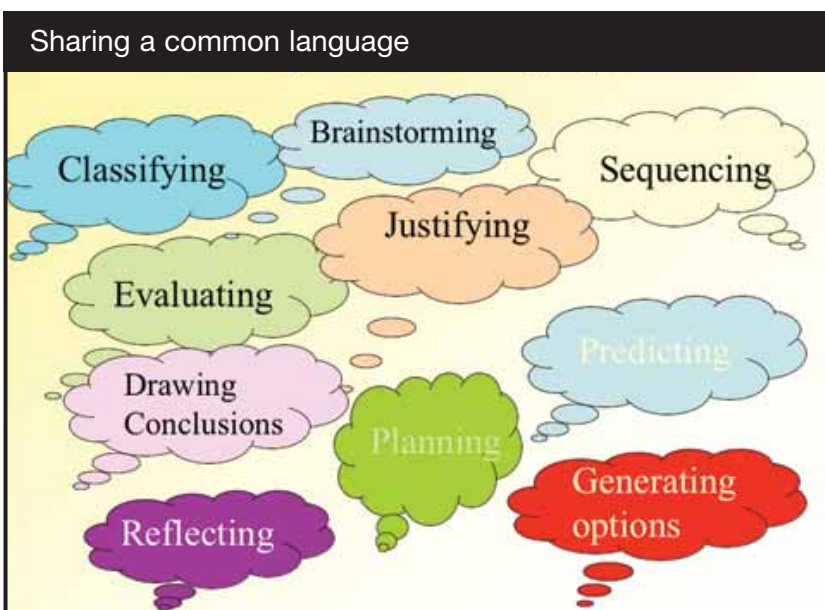
134 teachers of different ages and experience, from schools of different sizes and management types, participated in five ACTS professional development days throughout each school year. They planned, designed and taught hundreds of 'infused thinking lessons' to 8-11 year old children (Key Stage 2 in Northern Ireland) from a variety of social backgrounds. Teachers reported substantial shifts in their classroom practices, in the benefits for children, and in their conceptions of themselves as teachers.

Our main study showed that participating in ACTS had a positive effect on how children rated their learning strategies and their willingness to work harder. For example, ACTS children rated themselves higher than others on items such as 'I ask myself questions when I do my work to make sure I understand', 'I spend some time thinking about how to do my work before I begin it', and they rated themselves lower on items such as 'When I do work I just want to get it done as quickly as possible'.

But we also found that only children who participated in ACTS for three years benefited – there were no effects for those who participated for one or two years. In addition, the positive benefits were not the same for all children. Moderate to high ability children (who represented 80 per cent of the sample) benefited most. No positive outcomes were identified for low-ability children, and the benefits we measured were small when compared to the impact of other variables such as prior attainment. This raises questions about the way in which factors such as social class mediate the effects of teaching.



Video recordings of thinking lessons were conducted with a sample of 21 teachers. Analyses of the videos showed that the ACTS teachers arranged their classrooms in ways that supported opportunities for children's talk and created conditions for positive approaches to thinking. These teachers engaged children in cognitively demanding tasks and made thinking more evident in classrooms. They talked about thinking and modelled thinking in concrete situations. Good thinking lessons gave learners opportunities to talk about thinking, to work together on it, to evaluate their thinking and to make connections within and beyond the curriculum.



The evidence from the video recordings was backed up by teachers' reports about changes in their classroom practices. 94 teachers who participated in the ACTS professional development programme reported substantial changes in the quantity and quality of group work in class, increases in children's talking and listening, higher-quality of questioning and, overall, more pupil involvement and independence. They also reported significant changes in their images of themselves as teachers – an increased awareness of the importance and value of teaching thinking, being more open to alternative approaches and allowing children to be more independent in their learning.

A Handbook was prepared that included the general ACTS framework and methods, together with example lessons scripted by teachers. The handbook will be published as part of the TLRP's Improving Practice Series.

Sister projects have been launched in Wales (Ceredigion, Carmarthenshire), England (Surrey), and Scotland (East Ayrshire).

National curriculum planners across the UK and elsewhere are now engaged in revising and redesigning their curricula and writing guidance materials to help schools move in the direction of developing children's thinking. The methodology and findings from the ACTS project are informing their policies and practices (e.g., CCEA in Northern Ireland, ACCAC in Wales, NCCA in the Republic of Ireland). The biggest challenge will be to find ways of making long-lasting changes in the classroom that promote and sustain children's capacity to become independent and self-regulated learners. The research findings from ACTS show the way but also prove that there are no quick fixes.

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www.tlrp.org/proj/phase11/phase2g.html

www.sustainablethinkingclassrooms.ac.uk

Learning how to learn – in classrooms

Project 6

Can Assessment for Learning (AfL) help pupils learn how to learn? Previous research on assessment for learning had shown substantial gains in pupil achievement, but this evidence had come from small-scale studies involving intensive work with teachers. We wanted to find out whether earlier classroom research on AfL could be scaled up and still have the same impact. We worked with staff in 40 infants, primary and secondary schools. We attempted to answer these questions through the use of large-scale questionnaires, interviews and classroom observations.

We found that implementing 'the spirit', the underlying principles, of AfL was hard to achieve. Most teachers adopted the letter of AfL, in the shape of its procedures or techniques, for example by sharing the criteria with learners and implementing peer and self-assessment. But few did so in a way which enabled the pupils to become more independent as learners, which is a defining characteristic of AfL and, by extension, learning how to learn.

The teachers who did capture that spirit shared key characteristics. They all had a strong belief in pupil autonomy and constructed activities that provided scaffolding for learning opportunities. But perhaps more interestingly, they each articulated a clear conviction that they were responsible for ensuring that it happened. When asked what impediments to learning might occur they all looked to themselves to answer the question rather than external factors such as the school culture, the exam system or the ability or disposition of the pupils. Identifying their own responsibility to help pupils learn seems to encourage them to view nothing as fixed or beyond their control. They take this philosophy with them into the classroom and communicate it to pupils through the way in which they teach.

“

AfL has been a joy. It is intellectually profound, yet eminently practical and accessible. The project has enhanced the learning of us all. I have no doubt that our children are now better taught than ever before. It has been the best educational development of my career.

Secondary school headteacher

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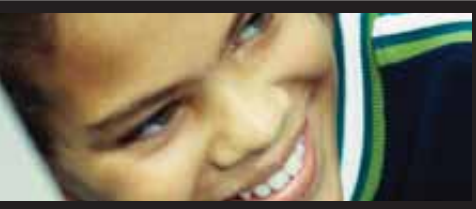
These findings, taken from a small sample, put flesh on the bones of the results from our staff questionnaires. In the first round, about 80 per cent of 558 classroom teachers showed a gap between what they valued and what they felt was practised, particularly in the promotion of pupil autonomy. Only around 20 per cent felt able to practise what they believed to be important, a similar percentage to those identified through classroom observation and interview. Conversely, most teachers felt constrained to meet performance requirements in a way that was not conducive to their beliefs about learning.

While a smaller gap between values and practices still existed by the time of the second survey, its reduced size suggests that our development work with teachers and schools had an effect. The materials we created to support development are being published in a book in the TLRP Improving Practice series.

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<http://www.tlrp.org/proj/phase11/phase2f.html>

<http://www.learntolearn.ac.uk/>



The use of ICT to enhance learning

Learning in classrooms is mediated by tools and artefacts. These include books, film, objects, language and people. In the twenty-first century, ICT has an especially prominent, and growing, role. In March 2005, the DfES published its e-Strategy 'Harnessing Technology: Transforming learning and children's services'. This describes the use of digital and interactive technologies to achieve a more personalised approach to education and children's services.

A group of school-based TLRP projects has explored the uses of ICT in teaching, learning and assessment in different subjects, and from pre-school settings to the end of secondary education.

ICT is not intrinsically good or bad, but depends for its value on how it is used. Quality learning requires attention to be paid to the relationships between the use of new technologies and subject matter, the nature of the learner, and approaches to teaching and assessment.

Interactive education Project 7

An important aspect of schooling is to enable students to enter new knowledge worlds – the world of history, of English, of foreign languages, of science, of music, or of mathematics. In the InterActive Education project we have worked in partnership with teachers in primary and secondary schools and in further education to find out how information and communications technology can be used to enhance subject knowledge.

Schools have been told to use more Information Communications and Technology (ICT) in education. In the past they have regarded this instruction as a licence to acquire equipment. Now policy-makers and senior managers should prioritise support for teaching and learning with ICT in schools rather than equipment.

International research has shown that many teachers do not succeed in using ICT to enhance learning in class. We approached the problem of doing so by establishing Subject Design Teams to develop ICT applications to produce specific learning outcomes.

We know that the spread of ICT in domestic life means that there is now a two-way flow of expertise in which children bring knowledge of ICT from the home into the classroom as well as vice versa. Our project, led by Professor Rosamund Sutherland at the University of Bristol, was designed to explore the educational potential of this exchange.

One problem we tackled was the spelling of 'hard words' by 10 and 11 year olds, using WordRoot, a multimedia sound and vision package, and the familiar presentation package PowerPoint. We developed a system for analysing the structure and etymology of such words. Later tests show that students' spelling of them improved.

Another language-related problem that we tackled was to improve writing in German. Here 13 and 14 year old students used drop-down menus in Word to help support their writing. They wrote more with this assistance and their German writing improved, both on screen and on paper.

In other examples, 10 and 11 year old students used a spreadsheet to represent data, which allowed them to enhance their grasp of statistics. An older group, of 13 and 14 year olds, used geometry software alongside PowerPoint to learn about proof in geometry.

Working with a broader age range, we used software to help both primary and secondary schoolchildren to learn more about composing music.



A key distinction which the project found was between 'intended' learning in which a learner follows a designed course of study, and the individual and idiosyncratic learning that tends to result from self-guided study.

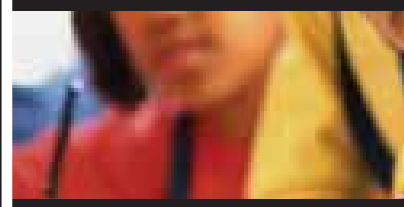
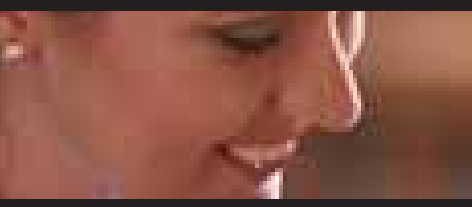
Analysis of our video data of children in classrooms shows that they find it possible to use computers and other ICT equipment for long periods of time. The issue we investigated was just what they were learning while they did so. They can certainly spend long periods at the computer whether a lesson is about music, mathematics or German. But even when students are ostensibly studying the subject of the lesson, they are not always following the intended learning. In our research, for example, we found one student supposedly studying the Renaissance who was in fact finding out about Florence – not the city in Italy but one of the same name in the United States. Or students can use computers to short-circuit the learning they are supposed to obtain. In the geometry case just mentioned, they took to measuring dimensions instead of using geometrical logic to work them out. And students using WordRoot to investigate tricky words sometimes generated incorrect rules about them.

We concluded that although ICT can be used to help learning, it cannot do so on its own. We disagree with the view that students can guide themselves from informal to structured knowledge. Instead, a teacher is needed to help make the connections, however much computer power is available. Without the support of a teacher, students are unlikely to develop knowledge of mathematical proof from their everyday reasoning, knowledge of the Italian Renaissance from knowledge of popular culture, knowledge about the etymology of the English language from everyday experiences of speaking and writing English, or knowledge of science from game-like simulation software.

Our project approached this problem by creating Subject Design Initiatives for specific subjects. The idea was to build bridges between idiosyncratic and systematic learning. It involved teachers in recognising idiosyncratic learning and helping pupils to connect it to a more systematic body of knowledge. This work was carried out with the whole class and sometimes involved students in presenting their knowledge of a topic to the class for discussion, to see how it might lead to more systematic learning.

However, this process has to be guided by the teacher. When it does not succeed, the reason is often that the teacher overestimated the scope of the computer to organise knowledge for children. In successful cases, the teacher created a 'community of learning' where children could place their individual knowledge in context.





Home computer ownership and internet access were high in the schools we studied. 88.1 per cent of students from partner schools reported home computer ownership and 72.5 per cent reported home internet access in 2003. The home remains the main site for computer use outside school, with 78 per cent of the sample reporting that they use a computer at home at least once a week, and 58 per cent reporting that they go online at home at least once a week.

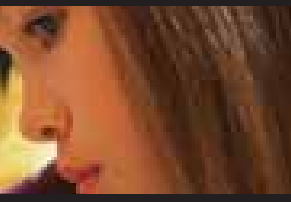
In comparison with earlier studies (Facer et al, 2003), the home interviews highlighted a two-way traffic between home and school, in which young people drew on school experiences to widen their engagement with digital technologies and then developed these at home. At the same time, they brought home experiences into school.



The first time I tried PowerPoint (at school), after a few weeks I really got used to it and I thought: “This will be fun if I can show Mary (sister) and my dad”. When I went home, I checked on my web page and I didn’t have it. And so I said “Oh Dad, have we got PowerPoint?” and he went onto his page and he had it, he never used to know what it was. So I had to go and show him everything, which took ages. He kept complaining, and then I said “It’s simple ‘cos I know”. And so I finally persuaded him to download it.



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Preschool IT Project 8

The Interplay project, based at the University of Stirling, has been looking at how to enhance young children's encounters with information and communication technologies (ICT) in nurseries. Child-led play is the dominant medium for learning in Scottish nurseries. Sessions consist of extended periods of free play with some brief adult-led group activities. Nursery practitioners are less constrained by the demands of testing and assessment than teachers.

Many children need help to learn skills such as operating the controls on a digital camera, using a mouse or interpreting icons. In our research, practitioners extended their role beyond guidance on such skills, and supported children to become independent users of ICT.

Practitioners involved in Interplay became increasingly confident and their self-esteem and belief in their professional practice grew.

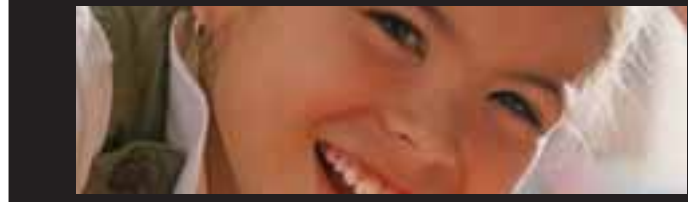
We have broadened the definition of ICT beyond computers to include digital still and video cameras, mobile phones, electronic keyboards and toys that simulate ICT. This expanded concept makes ICT more affordable, helps demonstrate its role across all curriculum areas, increases practitioners' confidence and introduces children to a broader range of technologies and to uses for them such as communications, self-expression and entertainment. New purchases during the project included a digital projector, a computer microscope, a karaoke machine, disposable cameras, walkie-talkies, a dance mat and an electronic music keyboard.

Our emphasis is not on what children can learn about ICT, but on how their interactions with it can be supported by adults to enhance learning, by promoting sustained, mindful engagement and providing support for positive dispositions to learning. Our research demonstrates that enhancing learning includes providing support not just for operational skills but also for dispositions towards learning such as persistence, engagement and pleasure, and that a broad concept of ICT is central to achieving this. Most children of three or four had more exposure to a broader range of technologies at home than they did at pre-school.

Interplay has challenged the belief that free play is a sufficient condition for learning in the context of ICT. Although practitioners are not comfortable with the idea that they should direct learning as teachers might, they see the need for action once they appreciate the potential of ICT to enhance children's learning.

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www.tlrp.org/proj/phase111/Scot_extc.html <http://www.ioe.stir.ac.uk/Interplay/index.htm>



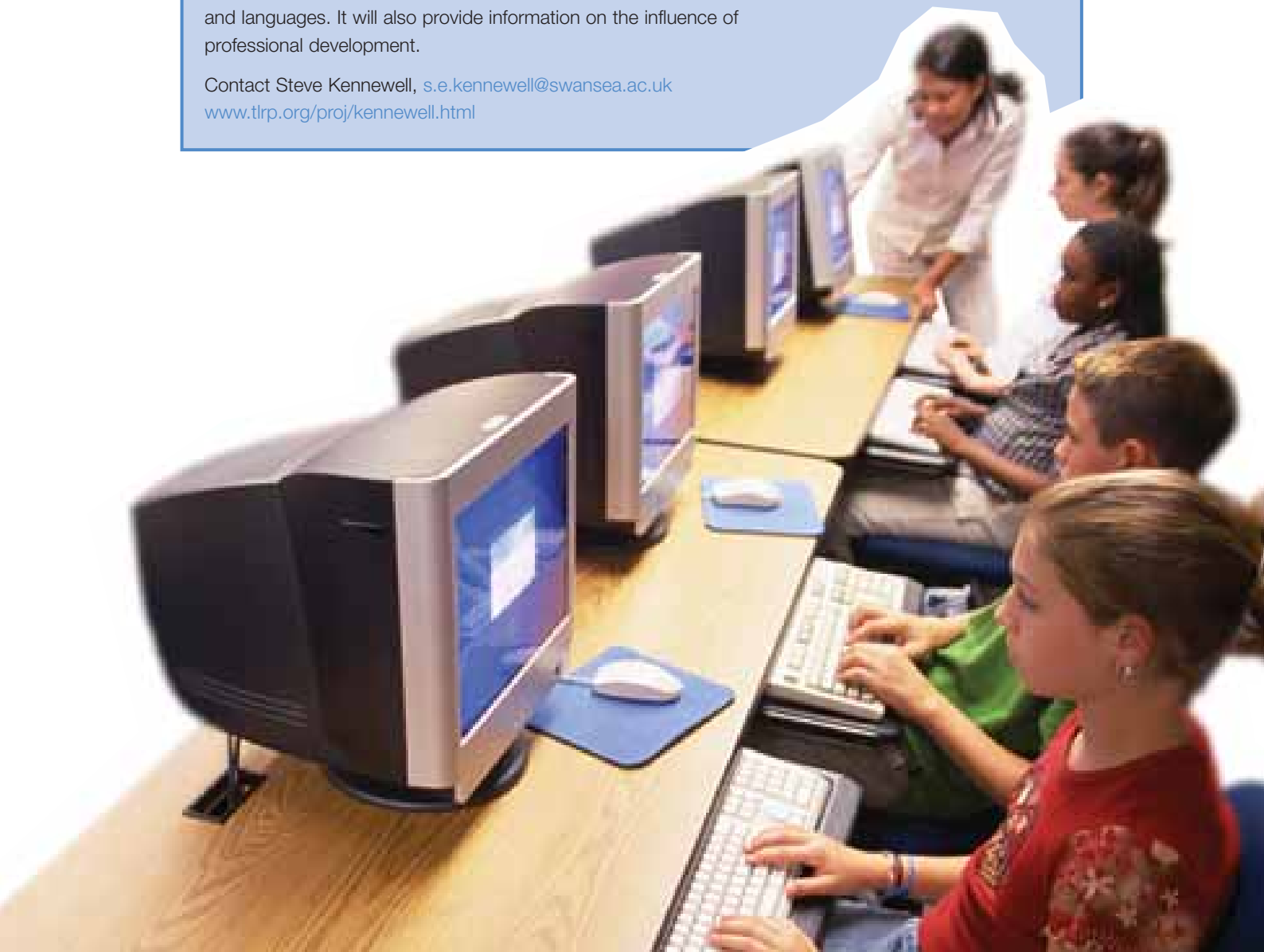
Interactive teaching and ICT Project 9

This project aims to characterise differences in teaching, learning and attainment brought about by the adoption of ICT. Steve Kennewell and colleagues are working with pairs of teachers in a wide variety of primary and secondary schools in south and mid Wales. They are investigating the differences in teaching approaches, and the learning which takes place, when similar classes are taught by good teachers using ICT and non-ICT approaches. Next year, the same teachers will all work with ICT, so that the researchers can explore the difference in teaching approach and learning outcomes when a teacher adopts ICT.

The project involves assessing pupils before and after the teaching, interviewing teachers and pupils, and observing lessons. Lessons are also video recorded. Researchers discuss recordings with the teacher and with small groups of pupils to find out how teachers take decisions in class and to see the effects on learning of classroom activity. They expect the arrival of ICT to have an impact on how interactive lessons are.

The work will look for differences in attainment that result from using ICT, and help identify the most effective teaching strategies for particular curriculum topics in mathematics, science and languages. It will also provide information on the influence of professional development.

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Concept mapping Project 10

Concept mapping allows students to represent their increasing knowledge and understanding through adaptable diagrammatic structures on-screen. A project being carried out by TLRP research training fellow Robin Bevan, deputy head of King Edward VI Grammar School, Chelmsford, is investigating how computerised concept mapping can be effectively deployed in pupil learning, across a variety of secondary school contexts.

Developments in computer technology have provided schools with extensive opportunities to exploit approaches to learning through ICT, but the nature of software design has led to a situation where learning through ICT is dominated by sequences of closed tasks, many disguised by being quite advanced in their complexity and appearance, and by skills-based training – learning how to use applications software for word-processing, spreadsheets and other tasks.

Research in a number of separate disciplines has recently been combined to provide teachers with increasing knowledge of how people learn. In this project theories concerning learning and the construction of knowledge have been used to inform the design and deployment of a prototype version of the CRESST knowledge-mapper developed at UCLA.

The implementation of the main study has allowed various ways of using computerised concept mapping to be separately examined: the use of the knowledge-mapper alone, collaboratively, and with or without scoring feedback.

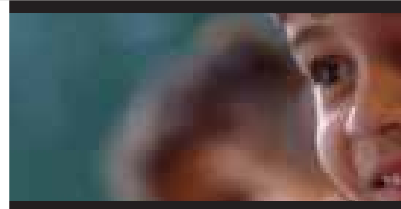
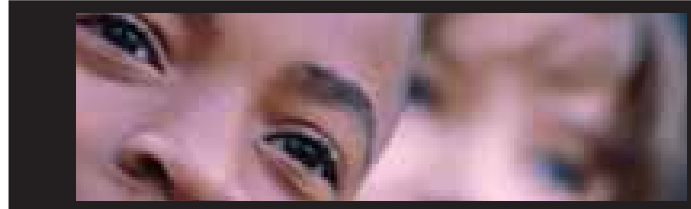
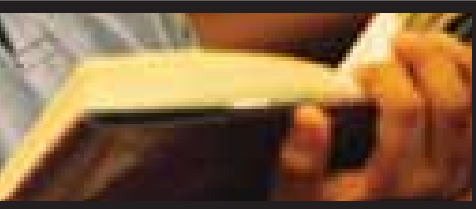
Our analysis of this data suggests that the knowledge-mapper alone has minimal effect, but that it is an effective agent in promoting constructive collaboration between pupils (irrespective of whether they are given 'scores') which in turn enhances their subsequent test performance.

The class who used the software individually and with no feedback scores showed almost no gain relative to the class who had no access to the software at all. In contrast, the two groups who were allowed to collaborate in creating their computerised concept maps both outperformed the other groups by a significant margin on a final essay assignment, equivalent to at least a grade at GCSE, whether or not they received the automated feedback.

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<http://www.tlrp.org/project%20sites/rbevan/index.html>



Environments for better learning

The idea that classrooms are settings whose features interact to promote or inhibit learning is reflected and extended in a number of TLRP projects that specifically examine dimensions of the environment for learning. A cluster of associated projects focus upon group work in the classroom and explore the social dimension of teaching and learning. They conclude that pupils trained to work collaboratively not only enjoy doing so but also improve their results. These are significant and very important new findings.

Another project extends this focus to relationships with the home and demonstrates how learning can be enhanced when home and school exchange knowledge of learners, their experience and their achievements. A TLRP associate project, funded from other sources, compares the learning benefits of different structures for provision in the early years – another environmental factor.

This group of projects shows that giving peers, parents, carers and assistants roles as active agents to support the learning of pupils can improve achievement. However, this challenges the established identities and roles of teachers and pupils and change needs to be managed carefully.

Improving pupil group work in classrooms Project 11

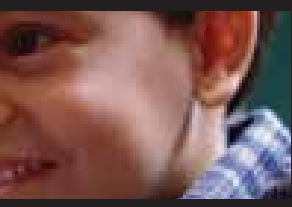
There is a wide gap between the potential of group work and its limited use in schools. The TLRP's SPRinG project aimed to find out why and suggest solutions.

We showed that offering teachers and schools a package of practical strategies and support for group work allows it to prosper in class. Involvement in the SPRinG project had positive effects on pupils' academic progress and on their higher conceptual learning.

We showed that group work can influence academic progress more positively than other forms of teaching and learning. It can raise engagement in learning, encourage children to become more actively engaged in the learning process, and facilitate more thoughtful learning. This suggests an alternative to the current approach to school discipline, where the trend is to concentrate on whole-school managerial solutions designed to control rather than eliminate the problem.

The SPRinG (Social Pedagogic Research into Group work) project has developed a programme that applies group work across the curriculum, over the school year. We aimed to integrate group work into the fabric of the school day. This meant working with teachers to develop a programme of group work that could form part of school life. It was evaluated by examining pupil progress over a full school year and drew on experience in educating pupils from 5 to 14 years.

Our approach was that group work skills have to be developed. We cannot put children into groups and expect them to work well together. Successful group work must be integrated into classroom organisation and management. This includes three main elements. The first is the combination of classroom, class size and seating arrangements in the classroom. Second are the characteristics of groups such as their size, frequency, composition and stability over time. Third are the activities and curriculum.



These strategies, and activities for developing pupils' group work skills, were set out in a Handbook for teachers, one at each school we worked at. The handbooks have evolved over time and demand for them in the UK and overseas is growing.

We evaluated this work by asking whether the group work programme led to increases in learning and attainment, more favourable motivation and attitudes to learning, and behaviour and dialogue supportive of learning.

What we found

There is evidence that involvement in SPRinG had positive effects on pupils' academic progress in comparison to traditional classroom practices. At KS1 benefits were seen in reading and mathematics. At KS2 group work seemed to benefit all types of knowledge in science but especially conceptual understanding and inferential thinking. At KS3 the success of group work depended on the topic, but appeared to benefit higher cognitive understanding.

We applied this research in a later stage of the project, developing and sustaining whole-school approaches to group work.

Schools with high levels of SEN pupils, poverty, English as an additional language and mobile populations often withdraw from initiatives such as group work in favour of individual work and whole class teaching. One team worked with teachers to explore ways of adapting the group work programme to facilitate inclusion of children with special educational needs, while another focused on the sustainability of SPRinG in schools in such circumstances.

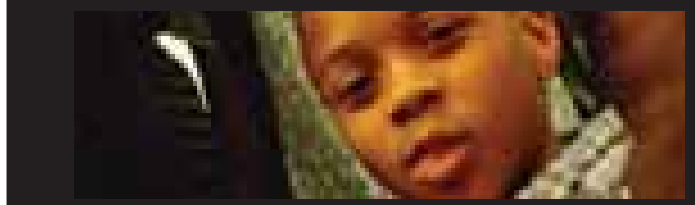
This is the first study of group work in the UK to show positive attainment gains in comparison to other forms of learning. It shows that group work can be used routinely in primary and secondary school classrooms. Personal relationships between teachers and the class and between pupils within the class improve, provided teachers take time to train pupils in the skills of group working. Effective group work has important implications for current concerns about school discipline, where the trend is to concentrate on whole-school managerial solutions designed to control rather than eliminate the problem.

The project also had positive benefits for teachers. Their teaching repertoire was extended and they offered insightful evaluations of the effect of the group-work training on pupil-pupil interaction and support. There were unexpected benefits. As pupils demonstrated group working skills, teachers reported that they had been freed from many of their ordinary duties and were now able to reflect on their teaching and think strategically about it. Pupils found new areas in which to apply their group working skills, especially on the playground and in other spontaneous activities.

Current approaches favour teacher-led situations and individual work. The prevalence of this approach has been exacerbated by concerns with performance indicators and national tests. But our research shows that peer-based interaction can be a very productive part of classroom activity and that it offers learning possibilities for pupils not provided by either teacher-led or individual work. It can contribute to easing national concerns about attitudes to work and classroom behaviour.

SPRinG is part of a project in Hong Kong which attempts to introduce group work into reduced size classes (from 40 to 20 pupils), and is being used for the improvement of attainment and participation in the Caribbean. Similar extensions have begun with pre-school aged children in England and across continental Europe.

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Supporting group work in Scottish schools Project 12

ScotSPRinG was a TLRP Scottish Extension Project linked particularly to the KS2 component of SPRinG. The team from the Universities of Strathclyde and Dundee focused on the impact of collaborative group work in science in Scottish primary schools. The project extended the work of SPRinG by comparing the effectiveness of group work in widely different schools. The 600 children who participated in the study were from 24 primary schools located across eight local authorities. The sample comprised equal numbers of classes from urban and rural schools and equal numbers of mixed-age and single-age classes. Thus the study examined two new variables, the impact of established patterns of social relationships and the age composition of classes.

The findings confirmed that the SPRinG approach to supporting group work provided an effective framework for learning science in Scottish primary classes. In particular, it was found that:

- Gains made in science were attributable to the quality of collaborative dialogue in groups
- Successful group work in science is associated with children sharing, discussing, agreeing and recording
- Successful group work is also associated with a non-directive, supporting role on the part of the teacher
- High quality preparation for and implementation of group work yields benefits in social relationships and some measurable effects in self-esteem
- There is evidence of tension between cognitive and relational outcomes: social gains tend to be moderated as cognitive demand increases

A follow-up study, Group Work through Transition from Primary to Secondary School, has been designated a TLRP Progression Project. It is funded by the ESRC and the Scottish Executive Education Department.

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Home-school knowledge exchange Project 13

Involving parents in their children's education has been advocated for a long time by policy makers, both in the UK and internationally. But research evidence that it will raise school attainment has been missing. We did research in Bristol and Cardiff that shows its value. We worked in three priority areas: primary literacy, primary mathematics, and transfer from primary to secondary school.

Our research recognised the skills and knowledge which reside in homes and communities and attempted to draw on these 'funds of knowledge'. We also aimed to identify teachers' funds of knowledge, and to look for ways in which parents and teachers could exchange knowledge through a process of 'home school knowledge exchange'.



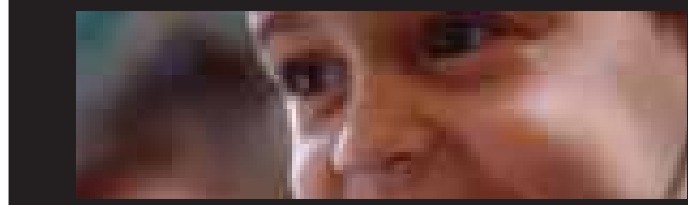
In the home, funds of knowledge are held by parents and by other members of the extended family, including grandparents, siblings and the children themselves. They are embedded in national and ethnic cultures, in family history, and in the experiences of all family members. Popular culture is an important influence on children's funds of knowledge.

Teachers are often unaware of the funds of knowledge which children can draw upon outside of school, while parents are often unaware of much that happens in school, and how they might support school learning at home. They may lack confidence in their own knowledge (particularly in mathematics), or be concerned about confusing their children by using approaches different from those used in school.

In each strand we successfully developed and implemented Home-School Knowledge Exchange activities. They included school-to-home activities, which can make parents more knowledgeable about what happens to their children in school, and home-to-school activities, which can help teachers understand more about children's and parents' out-of-school lives. Home-to-school activities are not easy to put into practice. The teacher needs to recognise the value of such an approach; the idea has to be turned into a practical activity involving 30 or more children, and the knowledge gained has to be linked up with the curriculum. We have shown that such activities are feasible and useful. They can have a significant impact on children's attainment, although this effect was not found across every strand of the project.

Students who attended a school where these activities had taken place (primary, secondary, or both) made significantly greater progress in reading from Year 6 to 7 than students who had not. Students who attended an action primary school appeared to settle down more quickly at secondary school than with students who had not.

- Parental help for reading is one obvious type of home-school knowledge exchange. But parents vary in their approach to it. One covered up the pictures, implying that the use of this cueing system was 'cheating', although teachers felt that using non-textual knowledge to help interpret the text was an important strategy in learning to read.
- The children drew extensively on their knowledge of popular culture in the form of TV programmes, films, nursery rhymes and popular books such as 'Harry Potter', which helped them develop their ideas about topics such as genre, character and plot. Parents and teachers were never fully aware of the influence of this area of their children's literacy.
- One school mounted an exhibition of literacy materials in the entrance hall of a supermarket near the school. This provided easy access for parents and extended family members who would not normally have attended such events in school.
- Parents were asked to keep a literacy log in which they recorded all literacy events in which their children were involved at home. The teacher provided parents with ideas of what might count as a literacy activity.
- Children used disposable cameras to take photographs out-of-school which related to class topics such as 'living things' or 'the local environment'. Their photographs were used in writing activities at school, in some cases involving parents and siblings.



Shoeboxes

Children used shoeboxes to bring significant objects from home into school. One teacher thought that some children made 'literacy breakthroughs' as a result. It also altered how children perceived each other in school. One child brought in artefacts relating to his pet budgerigars. The others regarded him as the 'class expert' on birds and asked him for information on them.

In another school the activity led a teacher to reflect more deeply on her own practice:

“

If you look at these boxes you can see all the differences in just a small group of children...all too often this diversity is closed down in schools. Do we make them conform too much?’

”

Exchanging mathematics knowledge

Approaches we tried included class newsletters about topics to be covered in the next month or half-term, including sections on how parents could help, a home-school folder which could travel between home and school providing information about mathematics topics, which allowed parents to provide regular feedback, and videos produced by children describing the mathematics they were doing in school and explaining the methods they were using.

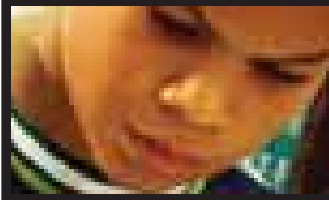
In an Everyday Maths activity, children took photographs of out-of-school activities which involved mathematics in some way. The children then discussed these in school and wrote captions explaining how maths was involved in each activity. We also had a Family Maths Trail around the school in which parents worked alongside their children, sharing their maths knowledge to deal with practical maths problems.

One teacher said: 'The hard-to-reach parents are now coming into school for open evenings and supporting some of our cultural or social events, and even this morning, we've had a group of parents in to our Eid Assembly who a few years ago we wouldn't have seen there. We also have a women's group now for literacy and a women's group for IT, and these have sort of come out from them coming in to support children in the project, working in class.'

Supporting pupil transfer

To support pupil transfer to secondary school, videos were made about life in secondary school and shown to groups of Year 6 parents, children and teachers. They helped them obtain more accurate knowledge about the secondary school, and to discuss their responses to the video in a group setting. Children constructed 'passports' of the skills they might need in secondary school. This required the children to reflect on themselves as individuals, to imagine themselves in the new setting, and to offer themselves 'advice'. Year 6 parents were invited to an informal evening at the primary school with Year 7 parents from the secondary school.

In the holiday between Years 6 and 7, children took photographs of their out-of-school lives during the summer holidays and brought them into secondary school at the start of term. The photographs were intended to provide an insight into the children's out-of-school lives for the benefit of their new teachers and other students. Parents were invited to small informal parents' evenings early in autumn term. This enabled them to meet their children's teachers and to find out how the children had settled at a very early stage in their secondary school career. One secondary school with a large Somali population held an event in the school which celebrated the Somali parents' cooking and other skills.



These activities were well-received and many became embedded in their routine. In one school, the photograph activity was continued in subsequent years at the school's expense. It was developed further as part of the project's Gulbenkian-funded follow-on project.

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<http://www.tlrp.org/project%20sites/HomeSchool/index.htm>

What counts in childhood development?

Project 14

The EPPE 3-11 study runs from 2003 to 2008. It is following the development of 3000 randomly selected children in 141 preschool settings. It has shown the contribution to children's development of attendance at different types of early childhood provision. It has also investigated the effects of duration of pre-school provision, and the contribution to children's outcomes of different pedagogical strategies and different levels of staff qualification. It also demonstrated the important contribution of family factors to children's development, including demographic influences such as social class and behavioural influences such as family activities that enhance young children's learning. By combining the 'education' and the 'social background' analyses, the positive influence of early childhood education has been demonstrated, especially for children from disadvantaged backgrounds and those at risk of developing special educational needs.

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<http://k1.ioe.ac.uk/schools/ecpe/eppe/eppe3-11/eppe3-11intro.htm>





School conditions for the improvement of teaching and learning

A final cluster of TLRP projects focuses on conditions in schools, and across networks of schools, that support improvements in teaching and learning. Some of these projects promote and examine strategies for pupil consultation, building on the groundswell of interest in previous work on 'student voice'.

Others focus on the development of inclusive practices. Another explores the kinds of school management and professional training policies and practices that promote pupil autonomy in learning how to learn in classrooms. All of these have relevance to issues raised by the 2005 Schools White Paper in England. They are also relevant to the implementation of Article 12 of the United Nations Convention on the Rights of the Child which challenges States to 'assure to the child who is capable of forming his or her own views the right to express those views freely in all matters affecting the child, the views of the child being given due weight in accordance with the age and maturity of the child'.

We have found that teachers who are supported to develop critical reflection through classroom-focused inquiry are better able to help pupils become more independent and autonomous. They also change their teaching more flexibly in the light of feedback from pupils and others. This has implications for school management and the professional development of staff. But we also find evidence of policy tensions that need to be resolved if progress is to be expanded and sustained.

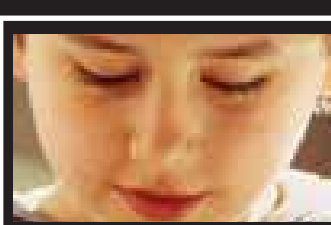
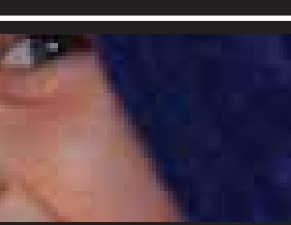
Consulting pupils about teaching and learning Project 15

There is a growing recognition that young people have a right to be heard, and have something worthwhile to say. At a global level, the UN Convention on the Rights of the Child included children's rights to be heard as one of its four basic principles. In the UK it is seen as integral to the Citizenship curriculum, to lifelong learning and to personalised learning.

The Consulting Pupils Project (2000–2003) recognised that schools have changed less in the last 20 years than young people's lives. Consulting pupils can help to bridge this gap by recognising pupils' social maturity and harnessing their ability to make a greater contribution to their own learning and to school improvement.

The aims of our research were to:

- Identify strategies which help teachers consult pupils
- Gather evidence on the power of pupils' comments to improve teaching and learning and the conditions of learning
- Gather evidence on the impact of consultation
- Develop ways of building consultation into school organisation



We ran six linked 'mini-projects' on:

- How teachers respond to pupil commentaries on teaching and learning
- What teachers can learn from consultation about how different sub-groups of pupils experience learning
- Strategies for consulting pupils
- The potential of students as researchers
- The organisational conditions for developing consultation
- A sixth project which offered schools small grants for innovative work on pupil voice

Consultation takes on different forms depending on its purpose. They can include:

- A wide angle approach, such as a school-wide referendum on a significant issue
- A way of spotlighting issues of concern for particular groups, for example, the disengaged, high achievers, under achievers, girls, boys
- A way of evaluating new strategies and interventions
- A way of personalising support for individuals who are experiencing difficulties with learning
- A way of establishing a more democratic school system, for example by setting up forums where pupils in all year groups can contribute to planning

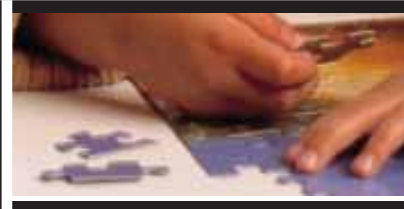
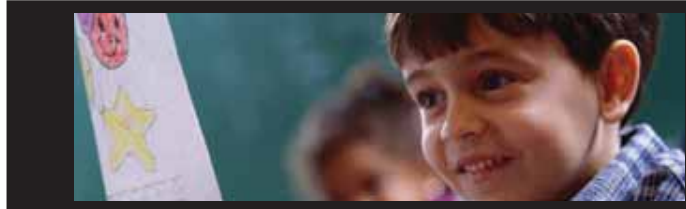
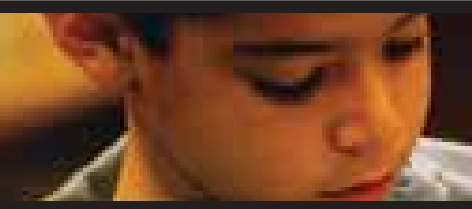
Teachers have consulted pupils about:

School wide issues such as revising school mission statements, school rules and rewards systems or getting the school council to work better

Year-group issues such as planning an induction for next year's group, the qualities needed in a year tutor, seating and grouping procedures, improving target setting, ways of organising homework

Classroom issues such as things that help pupils learn or that get in the way of their learning, what makes a 'good piece of work', how to improve group work, ways of offering feedback that will help pupils improve their work, peer support arrangements





Schools in which pupils are consulted are likely to have a strong sense of inclusive membership, with opportunities for dialogue and discussion for all pupils. They will make sure that the experiences and perspectives of all pupils are heard and responded to – not just ‘the good ones’ or ‘those that do well’ or those that are more confident in expressing a view and ‘talking posh’.

National support for pupil consultation and participation has grown apace and there are more and more schools which can bear witness to the positive power of pupil voice. But it does bring with it the danger of a new orthodoxy. Pupils know when they are genuinely listened to. Being consulted tokenistically can lead to cynicism and disengagement.

Consultation can also fail to make a real difference because of ingrained ways of seeing young people and thinking that they will have nothing worthwhile to say about teaching and learning. Some pupils have learned to expect not to be heard in school; listening only to the strident or articulate risks disenfranchising others. In the same way, it is important to avoid the creation of a pupil voice elite which can become a new school hierarchy. A framework that legitimates comment and provides reassurance that ideas will not simply be accommodated or ignored is essential.

What's in it for pupils?

Being able to talk about your learning helps students:

- Feel more positive about school and more included in its purposes – the organisational dimension
- Have a stronger sense of self worth – the personal dimension
- Have a stronger sense of self-as-learner so that they are better able to manage their own learning – the pedagogic dimension
- Contribute to improvement in teaching and learning and wider school matters – the political dimension

What's in it for teachers?

- A deeper insight into young people's capabilities
- The capacity to see the familiar from a different angle
- A practical agenda for improvement
- A renewed sense of excitement in teaching

What's in it for schools?

- A practical agenda for change that pupils can identify with
- Enhanced engagement with school and school learning
- A more partnership-oriented relationship between pupils and teachers
- A sound basis for developing democratic principles and practices
- A more inclusive approach to self-evaluation
- Support for developing the school as a learning organisation

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www.tlrp.org/proj/phase1/phase1dsept.htmlTeaching

www.consultingpupils.co.uk



Consulting pupils on assessment Project 16

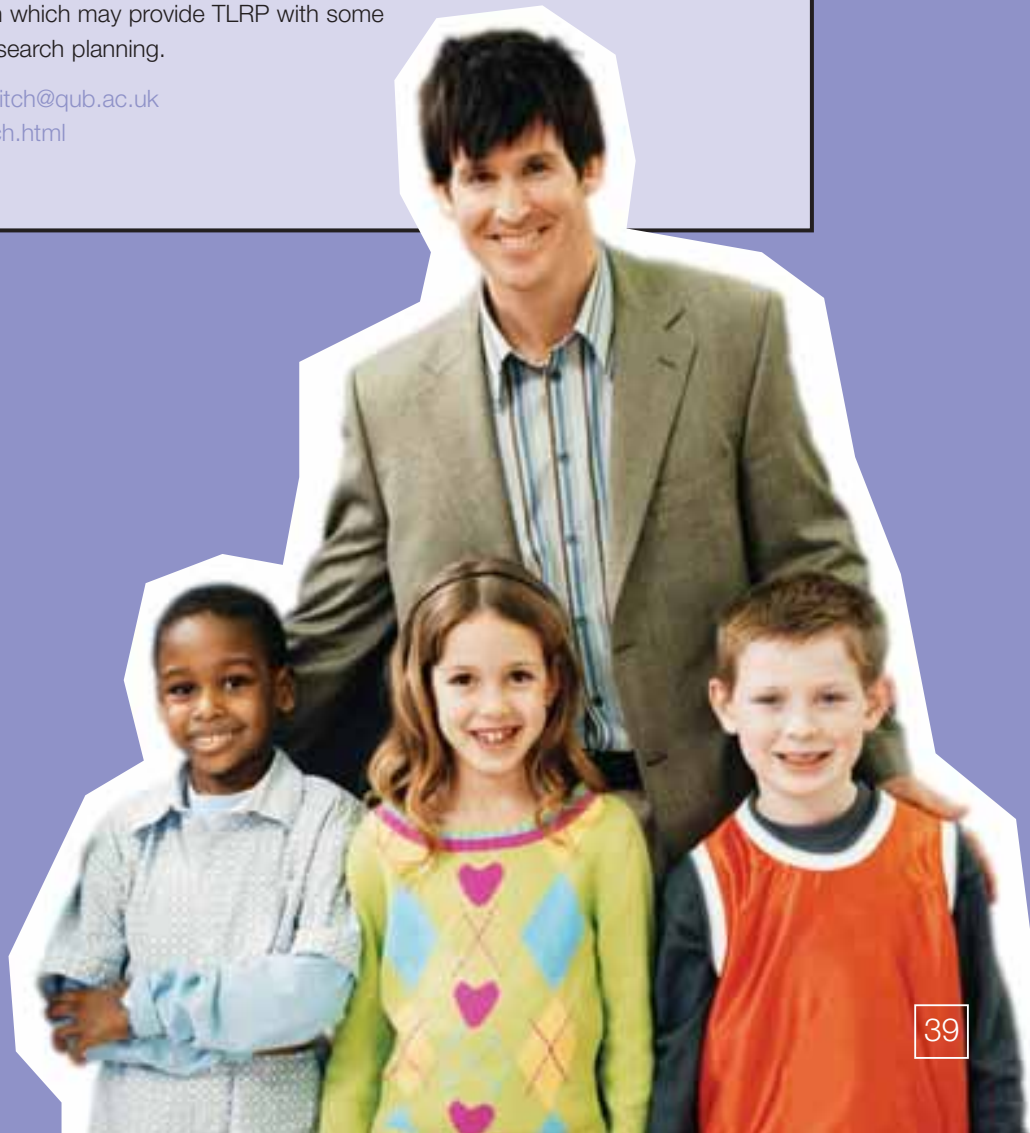
Consulting Pupils on the Assessment of their Learning (CPAL) is a small, 18-month research project and is one of the studies within the TLRP Northern Ireland Extensions programme. It builds on and links to existing TLRP research on consulting pupils.

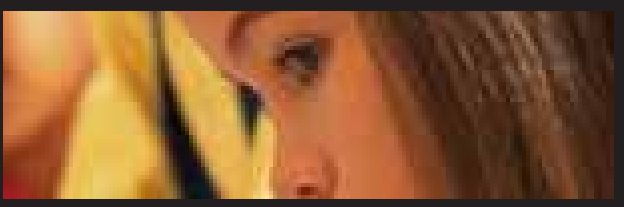
Its focus is on the importance of pupil participation in assessment, especially assessment for learning. There has been little research on this in the past. It is a qualitative, in-depth project which comprises three interrelated studies. Each has a particular focus on pupil rights and pupil participation in assessment.

The CPAL project will produce both theoretical and practical outcomes from each of its three studies. It is looking at pupils' views on the development of the Annual Pupil Profile at key stage 2; at how pupils perceive AfL classroom practices at key stage 3 and how such practices enhance pupil participation; and at teachers' and parents' views on helping children realise their rights in learning and assessment.

CPAL has been developed to tie in with curriculum developments in Northern Ireland. Key stakeholders have been involved in the development of the proposal, and in the design and delivery of the project. The benefits, challenges and tensions to research alongside policy stakeholders is an interesting added dimension which may provide TLRP with some valuable insight for future research planning.

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Learning how to learn – in schools and networks Project 6 continued

The TLRP's project on 'Learning how to learn in classrooms, schools and networks' brought together experts from three different fields – assessment for learning, school improvement and network learning. They tried to find out how insights from each field might be integrated to develop pupils as independent learners. As we saw on page 23, we were interested in whether assessment for learning might help pupils learn how to learn.

Over the four years of the project we explored the relationship between the three levels at which it worked – classrooms, schools and networks. Earlier work on learning had tended to concentrate on each of these levels separately. Two key questions emerged. Could earlier classroom research on Assessment for Learning – AfL – be scaled up and still have the same impact? And what were the connections between teachers' own learning and their classroom practice? We also asked about the organisational conditions that might bring about change and how networks might facilitate it.

We attempted to answer these questions through the use of large-scale questionnaires, interviews, classroom observations and the use of novel research instruments, such as asking teachers and LEA officials to draw maps of their views of networks and their own role within them. We elicited the views of both pupils and teachers in 40 primary and secondary schools and, in some of these schools, administered the questionnaires twice to see whether their views had changed over the course of the project.

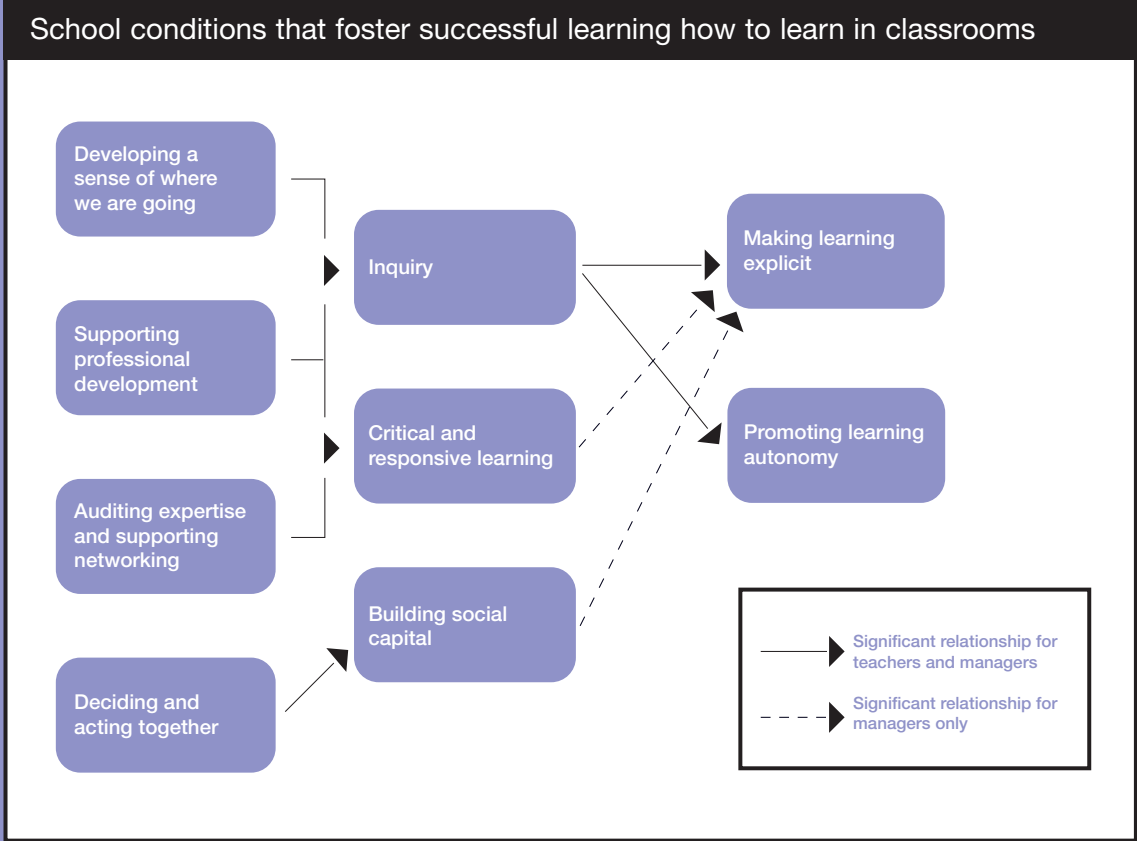
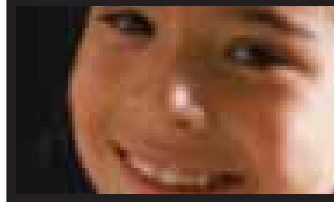
Analysis of the staff questionnaire, involving 1212 responses, revealed that opportunities for teachers to engage in inquiry into their classroom practice, especially with colleagues, are crucial in helping them to promote independent learning in pupils. The support of school leaders for this professional learning is also important.

“

The focus on learning how to learn enabled professional dialogue to flourish, promoted collaborative learning opportunities for children and adults and developed a deeper understanding of some of the elements that contribute to successful learning. It has been one of the most powerful professional development opportunities of my career.

Infants school headteacher

”



Interviews with head teachers and school coordinators showed that schools approach change in very different ways. Structural initiatives such as working groups or policy documents are important, but a cultural dimension is vital for changes to take hold. This might include creating a sense of ownership of change amongst the staff, a culture in which ideas flow two ways, from the bottom up as well as the top down.

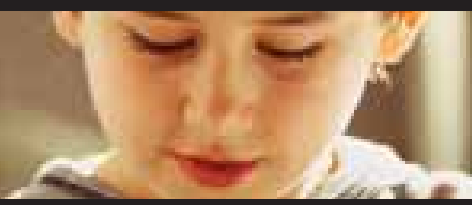
Our findings on how networks support change are also interesting, and confound expectations. Far less electronic networking took place than had been anticipated; and few of the exchanges involved the communication of ideas about professional practice. Moreover, individuals within the same networks viewed the role of these networks, and their own place within them, very differently. Nevertheless, responses to working within a network were almost always positive.

Much of the current rhetoric surrounding assessment for learning, school improvement and network learning, particularly at policy level, has tended to proffer simple solutions and spawned ring-binder 'how to' manuals. Members of this project team have been involved, through conferences, talks and writing for practitioners and academics, in painting a more complex but understandable picture. Our research shows that unless we engage with both individuals and institutions at a level beyond mere exhortation or pressure to adopt procedures, long-lasting, substantive and effective change will not occur.

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<http://www.tlrp.org/proj/phase11/phase2f.html>

<http://www.learntolearn.ac.uk/>



Using Research Lessons to help teachers innovate Project 17

A project linked to the TLRP's research on Learning How to Learn is studying how Japanese 'Lesson Study' may be adapted and used in English schools. It is being run by Pete Dudley, a TLRP research training fellow.

In Lesson Study, Japanese teachers form collaborative inquiry groups and work in each other's classrooms to innovate and transfer new practices. They work together to form hypotheses about what adjustments to lessons may improve learning, based upon data about their pupils' learning, their collective teaching experience and the knowledge available to them from research.

They do this in Research Lessons in which one member of the team teaches and the others observe. They pay close attention to 'focus pupils' who each typify a group of learners in the class – maybe high, middle and lower attaining.

They discuss their observations and formulate further hypotheses, which are tested in subsequent Research Lessons. After several iterations they may reach conclusions about what did or did not work. They will then perform and discuss a public research lesson inviting local teachers, advisers and university colleagues.

In the UK, a pilot study has been carried out into a development project funded by CfBT and NCSL, involving school networks including those involved in the main TLRP project.

It was clear from this project that Research Lesson Study:

- Engages teachers of all levels of experience and sustains their interest over time
- Involves pupils directly in the analysis of the teaching
- Leads to innovations in lesson design and improvements in pupil achievement

The final phase of the research will investigate teacher learning during Research Lesson Study and ask whether it should be developed for mainstream professional development in the UK. It will produce further guidance for practitioners, school and network leaders and policy-makers.

Guidance booklets and a DVD aimed to help teachers and leaders, called 'Getting started with Research Lessons' and published from the pilot study project, are available from NCSL and from CfBT.

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Making schools more inclusive Project 18

How schools can include all children from the communities they serve and enable them to participate to the full and achieve highly is a pressing concern for anyone concerned with issues of equity in contemporary and future society. But we do not understand how schools might be more inclusive. TLRP researchers have collaborated with education practitioners in a project that led to new understandings about how inclusive practice can develop.

This project was carried out between 2000 and 2003 by an action research network that included teachers and LA officers from 25 schools in three urban LAs, and researchers from three neighbouring higher education institutions.

It asked:

- What are the barriers to participation and learning experienced by pupils?
- What practices can help to overcome these barriers?
- How successful are they?
- How can good practice be encouraged and sustained within LAs and schools?

The context

Evidence that many pupils are marginalised includes an increase in the number of young people excluded from schools because of their behaviour. The proportion of pupils placed in segregated special education provision of various forms has changed little over the last 25 years. Too many youngsters leave school without any qualifications.

The schools we worked with included some that had recently faced periods of difficulty such as being placed in special measures.

We began by holding workshops in each LA for teachers from the partner schools. The school teams were invited, in discussion with their LAs and the university teams, to identify barriers to learning and participation, and actions which might be taken to address them. Members of the university teams visited the schools regularly to support these core teams.

Changing ways of thinking

Over the three years of the project, staff in schools recognised that some barriers to participation and learning by pupils stemmed from misplaced assumptions about what pupils could do and how best to teach them. Individuals and groups developed a language of educational outcomes extending beyond national test results. Schools that began to address inclusion effectively shared some common features. Members of staff and school leaders became more committed to inclusion, and more open to engaging collaboratively with evidence about practice. The role of LAs became clearer, supporting schools in working through the tensions between the requirements of inclusion and raising standards.

At the heart of these changes were groups of staff involved in generating and engaging with evidence about their practice, and about outcomes for pupils. Pupil perspectives were particularly effective in this, causing staff to pause and see things from a different point of view. This produced what we term 'interruptions' in staff thinking that allow change to occur. But the key is what happens next. All too easily, the space created by such interruptions can be filled by a pressing concern to achieve results, or to 'drive up standards'. A supportive culture in which staff are able to engage with these interruptions allows them to reappraise their practices and take action together in the light of their rethinking.

Inquiry helped teachers to understand that teaching the curriculum harder and longer would never improve the learning outcomes for many pupils. They began to think again about the factors that underpin learning, such as pupils' pleasure in learning and their self esteem. Teachers realised that they could directly influence these factors.



Implications for national policy

We suggest policy developments to allow schools and teachers to respond to the interruptions they experience:

- Supporting teachers in engaging collaboratively with evidence about their practice, especially underlying factors concerning pupils' experience of schooling
- Increasing the opportunities for teachers to observe each other in action
- Selecting and developing school leaders not only on the basis of their managerial ability, but also on their values and their ability to provide leadership
- Strengthening the role of LAs as the guardians of an external, principled perspective on the work of schools

Policy implications for schools and LAs

Sustainable, inclusive development occurs in schools and LAs when there is a shift from a compliance culture to a commitment to shared inclusive values, and a sustained attempt to resolve the policy tensions inherent in multiple, contradictory education initiatives. It is important to mitigate the standards agenda, pay attention to conditions for teaching and learning as well as their outcomes, and balance long-term planning with short-term and improvised change. Pressures to create a successful image must be matched by deep change.

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www.tlrp.org/proj/phase1/phase1asept.html

www.man.ac.uk/include

Prosiect dysgu cydradd Project 19*

In a Welsh extension to this project, a TLRP team based at Trinity College, Carmarthen and Manchester University is looking at how teachers can be best assisted to develop inclusive practices for the benefit of pupils and of their own professional development.

Collaborative action research is a valuable tool for practitioners which can enable them to reflect upon and evaluate their own practice. But its use for developing inclusive practice can appear threatening or irrelevant for teachers.

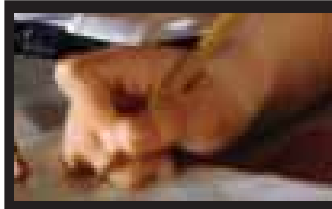
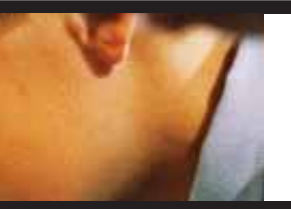
The group is working with teams of teachers in secondary schools, assisted by their educational psychologist, to improve the attitude to learning of disaffected pupils. They are using collaborative action research to do this, and the team is tracking their experiences to develop better ways to help them to use action research to develop inclusion. The researchers are interested in how these changes impact on the classroom experiences of pupils and are gathering the pupils' perceptions of their teachers' changing practices.

The research will reveal teachers' ideas about inclusion, their diffidence about undertaking action research, the practical difficulties associated with it and the challenges of trying to facilitate this type of professional development. As the research continues, the team is working towards a better understanding of ways to support these needs, and in so doing improve the teaching and learning of participating schools. The project concludes in June 2007.

*Prosiect dysgu cydradd, is research that is being conducted in Welsh and English. In Welsh, 'dysgu' means both 'teaching' and 'learning', which expresses their close inter-relationship. 'Cydradd' stands for equality of opportunity.

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Variations in teachers' work, lives, and their effects on pupils Project 20

The VITAE project was commissioned by the Department for Education and Skills to explore variations in teachers' lives and work in different phases of their careers and to identify factors which contributed positively and negatively to these variations over a three year period. It asked:

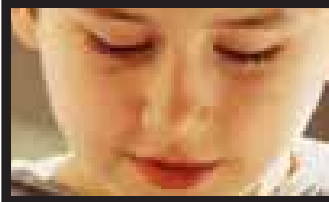
- Does teacher effectiveness vary from one year to another and in terms of different pupil outcomes?
- Do teachers necessarily become more effective over time?
- What are the roles of biography, culture and professional development?
- How do schools and departments influence teachers' practice and effectiveness?
- Are teachers equally effective for different pupil groups or does their effectiveness vary, for example with gender or socio-economic status?
- Do the factors which influence effectiveness vary for teachers working in different contexts, or for different kinds of outcomes?
- Do factors influencing teachers' effectiveness vary across different sectors (primary and secondary) and different age groups (Key Stage 1, 2 and 3)?

The project worked with 100 schools and 300 case study teachers for the study. Half of these were primary teachers (Years 2 and 6) from 75 primary schools. The secondary teachers taught Year 9 pupils either English or mathematics in 25 schools. The schools were representative in terms of Free School Meal (FSM) eligibility, and attainment.

Twice yearly interviews were recorded with the teachers in the study. They monitored their perceptions of effectiveness and the positive and negative influences upon it, and the extent to which these related to pupil progress and attainment. Value-added analyses of pupils' progress and attainment and an annual pupil attitude survey were used to explore pupil outcomes and differences between classes and teaching groups for the teachers in the VITAE study. In addition, an analysis of school documentation allowed a rich and detailed picture of the teachers' lives and work to be recorded.

This research was unique in three ways:

- It investigated variations in teachers' work and lives and sought to explore relationships between them over time and the effects upon pupils
- The data were drawn from an unusually large and nationally representative sample of teachers in different phases of their lives and careers, working in a range of schools of different socio-economic status which were also representative of the national profile
- It combined quantitative modelling (including analyses of large amounts of pupil outcome data), with qualitative case studies to interpret complex data



Conclusion

TLRP findings confirm that pupils, teachers and schools require a sense of purpose and agency, active engagement, an attitude of critical inquiry, and the motivation, will and knowledge to bring about change. But they cannot do this alone. Communication and collaboration are at the heart of learning and change, between pupil and pupil, pupil and teacher, teacher and teacher, teacher and parent, and teacher and researcher. Communication and collaboration between practitioners and policy-makers are also vital, and we believe that researchers can contribute helpfully to this conversation too.

The findings of the projects summarised in these pages hold much promise for the new century but they also highlight challenges. Sustained improvement will require teachers and schools to continue to develop their roles, relationships and practices.

No amount of organisational reform, such as the creation of different categories of schools or within-school setting and streaming, will obviate the need for serious and sustained attention to the nature and quality of relationships and teaching and learning processes. A key, we believe, is support for imaginative new forms of professional development for all those who work in schools, based on evidence-informed educational principles.

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The Commentary is part of TLRP's dissemination strategy. For those who wish to follow up some of the issues raised, the Programme's website, www.tlrp.org, is being developed to provide three levels of access to project findings – 'practitioner applications', 'user summaries' and 'research analyses'. Many resources are downloadable including Research Briefings on completed projects. The first books in our Improving Learning and Improving Practice series are to be published by Routledge in mid-2006.



About this publication

This is the second in a series of TLRP Commentaries designed to make research-informed contributions to contemporary discussion of issues, initiatives or events in UK education. They are under the research programme's editorial control, but their production and distribution may be supported by sponsors. The first commentary, on Personalised Learning, is available from the TLRP office or at our web site.

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