

DCSF, National Strategies and TLRP Workshop

WHAT HAVE WE LEARNED ABOUT PEDAGOGY FROM TLRP AND WHAT DO WE NEED IN THE FUTURE?

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Learning and teaching in schools: A commentary and audit from TLRP

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Overview

This document comprises a Commentary and Audit of the findings of TLRP's school-focused projects as published by the Summer of 2007.

The foundation of the document is a substantive Audit (pages 8 – 30). In it, the focus, designs, findings and implications of TLRP's twenty-two school-focused projects are summarised. Ten principles for effective teaching and learning are each discussed. This paper acts as a resource for the Commentary.

In the Commentary (pages 2 – 6), the implications of the Audit are teased out in respect of the first specific objective of the workshop:

- To review what we've learned from TLRP to date about effective pedagogy and how to implement it

This section concludes with two specific proposals.

Some thoughts on the second objective are then offered (page 7):

- To identify future research priorities, combining perspectives from policy, field staff and researchers

We look forward to workshop discussions around the third objective:

- To identify what next steps should be for different stakeholder groups.

A COMMENTARY ON TLRP'S SCHOOL PROJECTS

To review what we've learned from TLRP about effective pedagogy and how to implement it

What do we mean by 'effective pedagogy'?

Within contemporary Western democracies, three major strands of philosophical and political thinking on educational purposes are well established. The first concerns teaching and learning linked to economic productivity – and has taken various forms historically as labour market needs have evolved. The second concerns social cohesion and the inclusion (or control) of different groups within society – and this remains important within our unequal and diverse societies today. The third concerns personal development, fulfilment and expression – with a contemporary manifestation perhaps in the term 'wellbeing'.

The three are, of course, deeply interconnected. Indeed, the view taken here conceptualises 'effectiveness' as a mutually beneficial synergy between the three. This stance appears to be closely aligned with stated principles of government thinking - though of course implementation is always challenging. As one would expect, effectiveness is the all-pervasive theme of the 'Broad Strategic Questions for Schools Directorate 2007-08'.

So what then of 'pedagogy'? Many years ago, Brian Simon published a paper entitled: 'Why no pedagogy in England?' (1981). He compared the multi-disciplinary and scientific tradition of pedagogic thought and practice in Europe with the more instrumental approach to teaching which he found in England. Here, he argued, the development of teaching was dominated by a concern with the individual differences between learners and groups of learners, and how to respond to them. In contrast, as Simon put it:

To develop effective pedagogy means starting from the opposite standpoint, from what children have in common as members of the human species; to establish the general principles of teaching and, in the light of these, to determine what modifications of practice are necessary to meet specific individual needs.'

This argument can be chased through at two main levels. It has implications for forms of institutional provision, and Simon was a strong supporter of the comprehensive principle. It also has implications for teaching and learning practices and the way we seek to understand 'what works'.

TLRP has focused on teaching and learning in authentic settings both inside and outside schools and other institutions through the life course. The specific findings of its projects are described in Research Briefings, papers, books and in the Audit document.

A major ambition of the Programme, for both analytic and impact purposes, has been to try to produce an evidence-informed statement of 'general principles' of teaching and learning, just as Simon advocated. Indeed, the basic view that we take is that a great deal is actually known about pedagogy, both in the UK and internationally, but that the synthesis, communication and implementation of such knowledge is far weaker than it should be. In this respect, there is work to be done by practitioners, researchers, civil-servants and policy-makers working together – and this workshop is most welcome for this reason.

The concept of 'evidence-informed principles' engages diverse forms of evidence whilst calling for the necessary application of contextualised judgement by teachers, practitioners, policy-makers, etc. In our view, it enables the accumulation and organisation of knowledge in resilient, realistic and practically useful ways, and has the potential to progressively generate

understanding and language for use within public debates. However, it is important to be clear that it does not make unequivocal claims about categoric knowledge or cause-effect relationships.

We turn now to TLRP's attempt to specify such principles.

TLRP's evidence-informed pedagogic principles

TLRP's evidence-informed principles are the product of an iterative process of consultation and debate between researchers, practitioners, policy-makers and the TLRP Directors' Team. It should be noted that these are in a continuous process of development. In their present form, reflecting the conclusion of TLRP's school-focused portfolio, these principles are stated as follows:

1. 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 means adopting a broad conception of worthwhile learning outcomes and taking seriously issues of equity and social justice for all.
2. 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. 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. 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. 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. 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.
7. Learners should be encouraged and helped to build relationships and communication with others for learning purposes, in order 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.
8. Informal learning, such as learning out of school, should be recognised as at least as significant as formal learning and should therefore be valued and appropriately utilised in formal processes.
9. 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.

10. 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.

The ways in which the three major educational purposes are inter-woven within these principles will be apparent. They are explicit within Principle 1 and permeate thereafter.

The principles then address curriculum, pedagogy and assessment (Principles 2, 3, 4 and 5) focusing each on the meaningfulness, authenticity and explicitness of the content and process of teaching and learning. This reflects the major thrust of understanding, post-Vygotsky, that learner development requires both appropriate support from more knowledgeable others and the provision of conditions for self-regulation and progressive, independent thinking.

The goal of independent, lifelong learning is made explicit in Principle 6, and the focus moves to recognise the social dimension of learning and the power of informal processes (Principles 7 and 8). The latter are particularly important in settings beyond formal educational institutions – in family, community, workplaces and, indeed, in phases of life, such as retirement, which call for more independent learning.

There is a permeating juxtaposition between learning which is meaningful to the learner and the presentation of curricular or training requirements of uncertain perceived relevance or appropriateness. The challenge of matching learning challenge to learner need is an enduring issue. In formal educational settings it depends on the expertise of teachers, trainers and delivery systems. In informal settings, the match may be achieved through self-regulation and socially embedded and contextually authentic support. However, whilst the latter has potential for deeper forms of learning, it does not systematically provide for challenge and the progressive improvement of standards of performance. The importance of both formal *and* informal learning is thus affirmed, though recognition of informal learning tends to be weak.

Principles 9 and 10 affirm the enormous importance of teachers' own learning in support of learners, and of institutional and government policy in providing the conditions which enable or constrain learning.

TLRP's work has been presented and debated at conferences around the world (eg: in 2006/7, in Norway, Sweden, Netherlands, Chile, Australia, New Zealand, Hong Kong, USA) and similar analyses of key issues in lifelong teaching and learning are being found. For example, Finland's 'Life as Learning' (LEARN) programme has established strong links with TLRP on the basis of complementary findings, as has New Zealand's Teaching and Learning Research Initiative (TLRI) (see BERJ, October 2007, for review contributions from Germany, USA, Israel, Hong Kong, Finland, Switzerland and New Zealand).

An important theme of much of this work internationally is that enduring issues in learning, teaching and education are becoming understood in more holistic ways. There is thus the potential for more cumulative policy formation and development of practice.

TLRP's findings and DCSF Broad Strategic Questions

The priorities of government necessarily reflect a very wide range of influences - and syntheses of 'what we think we know' scientifically is only one of them. On the other hand, policy which fails to engage with such knowledge might be challenged in terms of public responsibility. In this context, whilst there are some important misalignments, it is important to acknowledge and affirm the broadly consonant trend of development of both educational understanding and UK policy when seen historically.

However, from the research perspective, take up of specific initiatives, though sometimes welcome, often seems fragmented, as if the search for ‘what works’, media panics, political events, contestation by competing stakeholder groups or even ministerial biographies are exerting significant influence on decision making processes. From a TLRP perspective, we do not expect quick fixes, for we believe that learning is a long-term process which requires consistency over time and consonance in provision for curriculum, pedagogy and assessment and in teacher and institutional development.

Seen from this perspective, whilst many of the broad strategic questions of the Schools Directorate are clearly worthwhile in themselves, the existence of a coherent, holistic, evidence-informed approach to teaching and learning underpinning them is not immediately apparent. It is also important to ask whether, when one considers policies of the various educational agencies, consonant principles about teaching and learning can be discerned.

As the Audit paper and TLRP’s Research Briefings, etc, show, the Programme has offered specific findings on various important topics – pupil voice, learning how to learn, science education, teacher roles in ICT, etc – but it’s most distinctive and important contribution is arguably to challenge at this level of principle.

The example of lifelong learning

Many educationalists would probably take the view that the demands of economic effectiveness appear to have taken priority in recent national policies as global economic competition has increased – thus leading to the pervasive use of target setting. Evidence suggests that this may, in retrospect, have been a short-sighted emphasis both because of the plateau of improved performance being reached and in terms of offering the types of teaching and learning experiences which are most likely to produce the workers and citizens most likely to succeed in contemporary and future world societies and economies. Indeed, the Gilbert Review, ‘2020 Vision’ (DfES, 2006) begins to recognise this as does the general thrust towards the personalisation of teaching and learning and public services generally.

Looking more broadly, the aspiration for ‘learning through the life course’ and the capacity to respond to change and new challenges requires more attention to learning disposition, learning how to learn and to the learner identities which are formed in childhood and through successive learning experiences. These concepts occur at the interface of psychology (eg: Dweck, 1999) and sociology (eg: Pollard, 2007). Dweck has located the origin of a ‘mastery orientation’ within a person’s intrinsic self-belief whilst Pollard traced social influences on the development of ‘learning identities’ over time. TLRP’s accumulated evidence suggests three very general conclusions which might hold across the life course.

- People have considerable potential as learners, in the right circumstances, though-out their lives.
- Potential tends to be realised when people are able to exercise meaningful agency – a sense of purpose.
- Circumstances may be enabling or constraining, and opportunities are unevenly distributed between different social groups.

Formal educational organisations find it difficult to recognise and respond to individual uniqueness and potential. Informal settings and social networks can be more responsive, but are more serendipitous and less accountable. The recent introduction of personalisation into education at all levels can be seen as a worthwhile attempt to resolve this dilemma and

harness motivation. However, if personalisation is restrictively focused on performance and national standards (as, for instance, is made explicit in TDA's Professional Standards), then the initiative is unlikely to solve the motivational dilemma.

Scaling up

This discussion of personalisation highlights another key challenge faced by decision makers on future educational policy. Although we know a great deal about effective teaching and learning, can authentic forms of provision be developed which can be reliably and cost-effectively scaled up?

School practitioners provide many examples of achievement which endorse the validity of the principles of teaching and learning reviewed above. And yet, these cases tend to be characterised by relatively high levels of skill and understanding by those implementing them. In challenging circumstances, exceptional levels of commitment are also needed. The intervening variables, at school institution and local authority levels, are also hugely influential.

In summary then, what works for some (in appropriate circumstances) will often not work for others. This may be a major part of the explanation for the difficulty in overcoming the tail of underachievement which most education systems face. Interrupting this reproductive process, to improve the quality of education and performance for all, is likely to need interventions at many levels.

Towards solutions?

We offer two specific thoughts.

1. TLRP experience suggests that the most amenable point of entry probably lies in enhancing the expertise of teachers, other staff and schools as learning environments. The emphasis here would need to be on their understanding and on the quality of their contextualised professional judgement, rather than on conformity to external standards per se. Were this to be taken forward, we recognise that it could have significant implications for the GTC E, TDA and teacher associations.

2. As argued above, we believe that there is a compelling argument for progressive, cumulative and sequenced policies based on coherent pedagogic knowledge. TLRP's statement of ten evidence-informed principles is intended as a contribution towards a new scientific foundation for policy and practice. Were this to be taken forward, it would need to be refined, developed and applied in systematic ways.

We warmly welcome the opportunity to discuss these ideas with colleagues from DCSF and the National Strategies.

REFERENCES

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- James, M. and Pollard, A. (2006) *Teaching and Learning in Schools: A TLRP Commentary*. London: TLRP.
- Pollard, A. (2007) *Education, Schooling and Learning for Life*. TLRP Research Briefing No 23. London: TLRP.
- Simon, B. (1981) 'Why no pedagogy in England?' in B. Simon and W. Taylor (eds) *Education in the Eighties: the central issues*. London: Batsford.

Identifying future research priorities

Some thoughts are offered below as a contribution to discussion in the workshop.

Teacher learning: if the proposal in the Commentary were accepted, there would be a need for new thinking about and a radical increase in provision to support teacher learning. The Strategy teams may have a very significant role in this.

Evidence informed principles: if the proposal in the Commentary were accepted, there would need to be a process of review and consultation on pedagogic principles to act as a foundation for policy and practice. TLRP's work might be a starting point, but engagement of other stakeholders and experts would be important.

Scaling up of successful small scale innovations in teaching and learning so that they can be effectively rolled out across schools and across the system is a major constraint on improvement and merits far more analysis. Again, the focus is likely to come back to teacher learning and how best to manage and support it.

Valid assessment of educationally significant learning outcomes remains conceptually and technically difficult. Public attention on basic skills alone constrains development of measures or indicators of, for example, motivational or dispositional attributes.

Technology enhanced learning (TEL) is attracting considerable research investment. The extent to which technology can provide appropriately differentiated and social support to learners remains to be seen but it is undoubtedly going to complement face to face interaction extremely powerfully.

Neuroscience has generated public excitement as a productive source of knowledge about learning, but the scientific community is being very responsible in moderating expectations. The application of neuroscientific insights, as they accumulate, is likely to be most effective in partnership with psychological and educational expertise.

Psychology and education, as contemporary UK academic fields, do not interact as much as they have historically. There is considerable potential for further advances in scientific understanding developing from a new synergy between these fields.

Socio-cultural studies have been popular in education in recent years. They have much to offer in respect of understanding social process of teaching, learning and identity but arguably have not yet penetrated public policy in a significant way.

Sociology continues to offer important analyses of educational issues, some of which appear to have slipped into the background of contemporary thinking. Among the most important is the role of social class – which underpins many public debates on the quality of schools and schooling.

AN AUDIT OF TLRP'S SCHOOL PROJECTS

Scope and coverage

The Teaching and Learning Research Programme is funded from a number of UK government sources and managed by the Economic and Social Research Council (ESRC). Costing about £40 million spread over 12 years (2000-2012), it is the biggest programme of coordinated research in teaching and learning that the UK has ever known. The total number of projects within the TLRP is likely to exceed 70, and these are complemented by almost 20 cross-Programme thematic analyses of various sorts. Projects cover issues ranging across the entire lifecourse, from early years to old age, and involve research teams from all parts of the UK.

22 projects and fellowships within the TLRP's portfolio were based in schools or pre-school settings: two of these focused on early years, six on primary education, three on secondary education, and eleven across all school phases. The list below notes that three of these are 'associate projects'. These were funded from other sources but invited to become part of TLRP because of the significance of their work for teaching and learning. Many of these projects were established towards the beginning of the life of the Programme and most are now complete and publishing their individual results. This is an appropriate time to take stock of what has been learned as a result of this work, although it holds some challenges because TLRP projects were not set up to investigate topics according to some map of the theoretical and substantive territory. They were selected, by a Steering Committee, from a very large number of bids, on the strength of their scientific quality and the extent to which they engaged with the core aims of TLRP. These are:

- To work to achieve improvements in learning outcomes for identified groups of learners;
- To work in authentic settings of teaching and learning;
- To bring multi-disciplinary or interdisciplinary approaches to research;
- To enhance the capacity for a research-based approach to education and training practices;
- To work in partnership with practitioners, learners, policy makers and others in the research community, to achieve maximum impact through transformation of the research results into actionable strategies and practices;
- To make research-based contributions to the fundamental understanding of teaching and learning.

Each of these expectations was itself a response to concerns about the quality and impact of educational research which had been articulated in recent years, in the UK and elsewhere (see Pollard, 2005, for more detail).

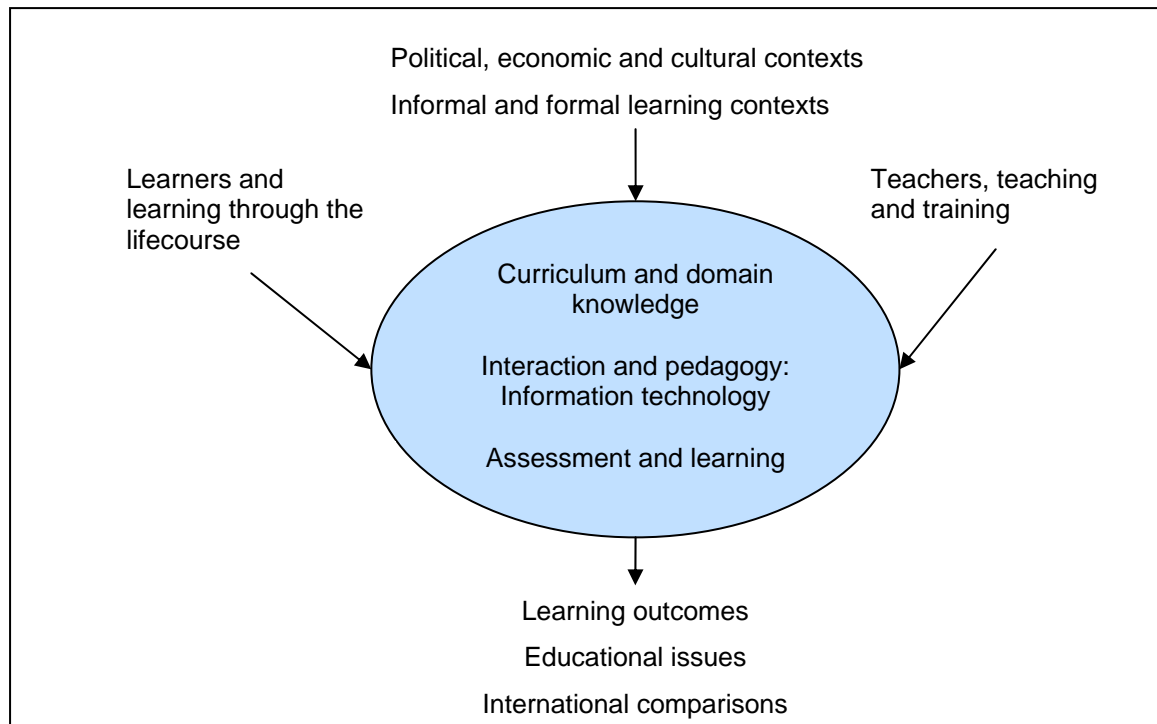
Thus, a diverse group of projects was funded: some dealing with learning in specific areas of the curriculum, some on learning across the curriculum, and others investigating environments for learning or school conditions for improvement. The projects have been classified in the following way (see James and Pollard, 2006):

1. Learning in specific areas of the curriculum, notably English, mathematics and science.
 - a. The role of awareness in the teaching and learning of literacy and numeracy in Key Stage 2 (Director: Professor Terezinha Nunes, Oxford University)
 - b. 5-14 mathematics in Scotland: the relevance of intensive quantities (Director: Professor Christine Howe, University of Cambridge)
 - c. EPSE: Evidence-based practice in science education (Director: Professor Robin Millar, University of York)

- d. Learning scientific concepts in classrooms at Key Stage 1 (Research Training Fellow: Stephen Hodgkinson, University of Brighton)
2. Learning across the curriculum
 - a. ACTS II: Sustainable thinking classrooms (Director: Professor Carol McGuinness, Queen's University Belfast)
 - b. LHTL: Learning how to learn in classrooms, schools and networks (Director: Professor Mary James, Institute of Education London)
3. The use of ICT to enhance learning
 - a. INTERPLAY: play, learning and ICT in pre-school education (Professor Lydia Plowman, Stirling University)
 - b. InterActive Education: teaching and learning in the information age (Director: Professor Rosamund Sutherland, University of Bristol)
 - c. The use of ICT to improve learning and attainment through interactive teaching (Director: Dr Steve Kennewell, Swansea School of Education)
 - d. From black boxes to glass boxes: computerised concept mapping in schools (Research Training Fellow: Robin Bevan, Deputy Head teacher King Edward VI Grammar School for Boys, Chelmsford)
4. Environments for better learning
 - a. SPRinG: Social Pedagogic Research into Group work (Directors: Professor Peter Blatchford, Institute of Education London (for KS2) and Professor Peter Kutnick, King's College London (for KS1))
 - b. ScotSPRinG: Supporting group work in Scottish schools: age and the urban/rural divide (Director: Professor Donald Christie, University of Strathclyde)
 - c. HSKE: Home-school knowledge exchange in primary education (Director: Professor Martin Hughes, University of Bristol)
 - d. Provision for gifted and talented pupils at secondary transfer (Research Training Fellow: Jenny Brookes)
 - e. Identity and Learning (Associate project) (Director: Professor Andrew Pollard, Institute of Education London)
 - f. EPPE: Effectiveness of pre-school primary education (Associate project) (Director: Professor Iram Siraj-Blatchford, Institute of Education London)
5. School conditions for the improvement of teaching and learning
 - a. Consulting Pupils about Teaching and Learning (Director: the late Professor Jean Rudduck, University of Cambridge)
 - b. CPAL: Consulting Pupils on the Assessment of their Learning (Director: Dr Ruth Leitch, Queen's University Belfast)
 - c. Understanding and developing inclusive practices in schools (Director: Professor Mel Ainscow, University of Manchester)
 - d. Facilitating teacher engagement in more inclusive practice (Director: Dr Sue Davies, Trinity College, Carmarthen)
 - e. LHTL: Learning how to learn in classrooms, schools and networks (Director: Professor Mary James, Institute of Education London) (This project fell equally in two categories)
 - f. Lessons for learning: using research study lessons to innovate and transfer metapedagogy (Research Training Fellow: Pete Dudley, Capita/ Director of Primary National Strategy)
 - g. VITAE: Variations in teachers' work and lives and their effects on pupils (Associate project) (Director: Professor Christopher Day, University of Nottingham)

The discussion of research findings, which follows, will be organised under these topics and, for brevity, the projects will be referred to mainly by the relevant director's surname or the project's acronym.

Each of these headings, and hence the foci of the projects, maps on to a simple conceptual framework that has been used to review the coverage of TLRP work and to develop cross-Programme thematic analysis.



In recognition that value could be added to project work by review and synthesis across projects, drawing in research and scholarship from beyond TLRP where relevant, the conceptual framework was also used as a device for identifying areas where useful cross-Programme thematic work might be done. Thus, over time, a series of thematic initiatives were commissioned and have produced, or are producing, research outputs in the form of commentaries, journal articles and special issues, annotated bibliographies etc. Some of these thematic initiatives are relevant to this audit and will also be drawn upon, especially in the final section of this survey which synthesises findings. Of particular relevance is TLRP thematic work on:

1. Neuroscience, human development and teaching (Convenor: Dr Paul Howard-Jones, University of Bristol)
2. Personalised learning (Convenors: Professors Andrew Pollard and Mary James, Institute of Education London)
3. Teacher learning (Convenor: Professor Mary James, Institute of Education London)
4. Changing teacher roles, identities and professionalism (Director: Professor Sharon Gewirtz, King's College London)
5. Curriculum and domain knowledge (Director: Professor Robert McCormick, Open University)
6. Science education in schools (Convenor: Professor Emeritus John Gilbert, University of Reading)
7. Identifying learning outcomes (Convenor: Professor Mary James, Institute of Education London)
8. Assessment and indicators of learning outcomes (Director: Professor Richard Daugherty, University of Cardiff)
9. Social diversity and difference: researching inequalities in teaching and learning (Convenor: Professor Miriam David, Institute of Education London)

During 2008, there are plans for synoptic publications of relevance on:

10. Learning and identity through the life course
11. Pedagogy and learning
12. Social diversity and learning
13. Learning for the contemporary economy

Methodological approaches

The methodological approaches adopted by TLRP projects were diverse: including classroom experiments evaluating 'interventions' through pre and post tests compared with control groups; large-scale quantitative surveys; in-depth qualitative case studies of individuals, groups or schools; and combined approaches. Most projects combined approaches in some way, either by having separate survey and case study strands, for example, or by integrating quantitative and qualitative elements more formally.

The majority of projects funded through TLRP were a form of 'development and research' (D&R). In other words, they set out to stimulate some activity, innovation and change and to research the consequences. In some instances an action research approach, working collaboratively with teachers as researchers, was specifically adopted. Some such approach was regarded as necessary if projects were to fulfil the TLRP aim to 'work to achieve improvements in learning outcomes for identified groups of learners', which implied a developmental dimension. However, the further Programme aim to 'work in authentic settings of teaching and learning' made the attribution of measured change to specific interventions technically challenging, except in those studies that were closely focused on very specific innovations in controlled settings. Even here the constraints of working in schools with whole classes of children precluded the use of fully randomised experiments. For this reason, TLRP researchers are cautious about claiming to have found unequivocal evidence of cause and effect relationships although they all examine, in some detail, the various and complex associations between teaching, learning and context.

In project research briefings, as elsewhere, TLRP researchers have been expected to make explicit the 'warrant' for the knowledge claims they make (see James et al., 2005). In most cases they make reference to the way their research builds on previous work, its theoretical underpinnings and justification, the extent to which it has fulfilled the empirical standards of the social scientific approach adopted, and the ways in which the work has been received by the user community.

Some TLRP project teams are composed of researchers working with a single, coherent theoretical position or framework: there are examples of cognitive constructivist psychological perspectives, symbolic interactionist sociological perspectives, and cultural historical activity theory perspectives. However, many teams attempted to view the subjects of their study through multiple lenses in order to 'bring multi-disciplinary or interdisciplinary approaches to research'. (See James, 2006, for a discussion of the challenges of trying to meet TLRP's ambitious aims.)

The cross programme thematic work also adopted a range of analytic approaches. Much of this work was carried out by a dialogic process involving a series of meetings or seminars, with contributions from researchers within and beyond TLRP, and subsequent deliberation and synthesis by a core team or task group.

The production of 'evidence-informed principles' about teaching and learning represents yet another level of analysis, designed to present key TLRP insights in accessible ways for practitioners and others. Use of the concept of 'principles' made it possible to draw on diverse

forms of evidence whilst calling for the necessary application of contextualised judgement by teachers, practitioners, policy-makers, etc. It enabled the accumulation and organisation of knowledge in more resilient, realistic and practically useful ways, and has, we believe, the potential to progressively generate understanding for use within public debates.

Outputs from projects and thematic work have also taken various forms. In addition to books and journal articles, each project has produced (or will produce) a research briefing, for policymakers and practitioners, which summarises the research and findings (downloadable from the TLRP website at: <http://www.tlrp.org/pub/research.html>). These summaries explain the focus of the research, identify key findings and their implications for policy and practice, and provide brief accounts of how the research was conducted and why we should have confidence in the conclusions. These research briefings are the main basis of the accounts in the next section of this survey. Cross-project thematic work has also produced a range of outputs, often in the form of journal special issues but, perhaps most importantly, in a series of TLRP Commentaries (also downloadable from the website).

Selected studies

This section provides a very brief summary of some major findings from each of the TLRP school focused projects. They are grouped according to the classification outlined earlier.

Learning in specific areas of the curriculum.

Three TLRP projects and one research training fellowship have investigated specific areas of the curriculum. These involve the core areas of literacy, numeracy and science although, as mentioned earlier, this was what was funded, rather than deliberately planned. The project on 'The role of awareness in the teaching and learning of literacy and numeracy in Key Stage 2' (Nunes) focused upon aspects of learning to spell and learning fractions. The project directed by Howe was an extension of this, based in Scotland, but researching aspects of mathematics only. The 'Evidence based practice in science' project worked mainly in secondary schools to investigate how learning in science can be enhanced. The project conducted by Hodgkinson, as the focus of his research training fellowship, was linked to the SPRinG project on group work, summarised below. However, it is included in this section because its focus on primary science was particularly strong.

The two different subject foci of Nunes' project are summarised separately here although they were unified by similar experimental approaches to their investigations.

The teaching of literacy in primary and infants schools is a 'hot topic' and much current attention has been given to the role of phonics. Much less attention has been given to the potential value to junior age children of learning about the role of morphemes in spelling. The English language, with roots in many other languages, uses units of meaning called morphemes to form words. An understanding that spelling represents morphemes can help. For example, the correct spellings of 'magician' and 'infection' are not predictable from the way they sound. The ending of both sound the same. However, knowing that the suffix 'ian' is added to a noun denoting a person, but the suffix 'ion' is added to a noun denoting a concept, can help children make sense of the spelling of these kinds of words. Nunes' project on morphemes showed that literacy can be improved by increased awareness of how morphemes make words and are represented in spelling. Specifically they found that: i) primary school children of all ages have difficulties with spelling words when the spelling cannot be predicted from the way the word sounds; ii) children's difficulties with spelling of many words can be reduced by making them aware of the morphemes that compose words; iii) making children aware of morphemes has a positive effect on their vocabulary growth. The implications of this study are that teachers should be made aware of the role of

morphemes in spelling and that systematic teaching about morphemes school be introduced into primary schools.

Fractions were the other focus of Nunes' project. In this she and her team tackled the problem of teaching rational numbers. Quantities represented by natural numbers are easily understood: we can count and say how many oranges are in a bag. However, fractions cause difficulty to most people because they involve relations between quantities. For example, if two girls spend half of their pocket money on snacks, they may not each spend the same amount of money. As with the morphemes work, the project developed a teaching programme which boosted pupils' understanding of the relative nature of fractions. The team found that: i) most pupils in Years 4 and 5 have not grasped the relative nature of fractions as numbers, and their difficulty is primarily conceptual; ii) pupils have some intuitive understanding of the relative nature of fractions from their experiences with division; iii) teaching programmes that start from pupils' intuitions about sharing, and which establish connections to fractions as numbers, can have a positive impact on pupils' learning. The implications are that teaching pupils about fractions should include a focus on logical relations, but this should build on pupils' intuitions. Teacher education needs to help teachers become aware of pupils' intuitive understanding of the logic of fractions and the situations in which they are most easily understood.

The project conducted by Howe in Scotland, in collaboration with Nunes and her team, again studied the relations between quantities in mathematics. On this occasion the project was built on the observation that most mathematics teaching in the UK focuses on 'extensive quantities' involving one variable, such as distance or time, whilst 'intensive quantities' involving relationships between more than one variable (e.g. speed which involves distance in relation to time) tend to be ignored or treated in piecemeal fashion. A survey of primary school children showed that this neglect leads to enduring difficulties and undermines children's mastery of fractions. A teaching programme was developed to remedy this and was found to boost understanding of intensive quantities as well as fraction usage. Moreover, the approach was compatible with current curricular demands and extended them in valuable ways. Specifically the project found that: i) primary school children of all ages have difficulties with intensive quantities, showing that mastery does not develop without teaching; ii) these difficulties are primarily conceptual; iii) primary school children of all ages have difficulties using fractions to name intensive quantities, but iv) a mere two or three hours of teaching can boost children's understanding and their use of fractions in these contexts. The implications are that intensive quantities, and the use of fractions to name them should be explicitly taught in schools because children cannot be expected to generalise their knowledge from extensive contexts to intensive ones. However, this does not require major changes in the school curriculum because short teaching programmes have been found to be effective.

The EPSE (evidence based practice in science education) project, co-ordinated by Millar, covered four distinct topics, each the focus of work at a different university. For this reason, they are summarised separately here. Millar's own work, at York University, focused on the use of diagnostic assessment to enhance learning in science. Much research has been carried out on pupils' understanding of key science ideas but this has not led to marked improvement in teaching and learning. As a means of improving practice, banks of diagnostic questions, based on research, were developed for several core topics. These were used to monitor pupils' understanding of key ideas and to explore how materials of this sort can influence teaching and learning. The researchers found that: i) teaching and learning can be improved by providing materials that embody research findings; ii) carefully designed probes can provide quality information on pupils' understanding of key concepts, and inform action; iii) the level of pupils' understanding of many fundamental science ideas is low, and increases only slowly with age. The implications are that the impact of research findings on practice is greatly increased if they are 'translated' into specific practical applications or teaching materials; that tools for quickly assessing understanding of key ideas can help focus learning activity; but

that levels of understanding should be monitored systematically over time to inform curriculum decisions, given the difficulties that many pupils experience in grasping core ideas.

A second, but related, focus of the EPSE project was the development and evaluation of evidence-informed teaching sequences. This was carried out by Leach and colleagues at the University of Leeds. They designed three short teaching sequences (4-6 lessons) based on content that secondary pupils find difficult to learn – plant nutrition, modelling changes in matter in terms of particles, and the behaviour of simple electric circuits. When these teaching sequences were implemented, the researchers found: i) that pupils' learning was measurably better, in terms of important aspects of conceptual understanding, than other pupils following the schools' normal approach to the same content, although they were no better than others at questions requiring factual recall; ii) teachers not involved in the development of the teaching materials could use them with good results and responded to them positively providing they were perceived as workable. The implications are that carefully designed teaching sequences, linked to systematic CPD, has the potential to lead to significant improvement in pupils' understanding of key science concepts. However, testing regimes that focus heavily on factual recall may hide the very need for such development because they can overestimate pupils' understanding of key ideas.

The third element of EPSE work, carried out at King's College London by Osborne, focused on teaching pupils 'ideas about science' because much recent international debate has suggested that the primary aim of school science should be 'scientific literacy' although there is little academic consensus about what this might mean. A Delphi study was therefore used to explore the extent of agreement amongst a diverse group of expert stakeholders. This led to an investigation of the nature of the challenge that teaching these ideas poses for teachers. The researchers found that experts agreed on nine key themes: about the nature of scientific knowledge (science and certainty; historical development of scientific knowledge), the methods of science (scientific methods and critical testing; analysis and interpretation of data; hypothesis and prediction; diversity of scientific thinking; creativity; science and questioning), and institutions and social practices in science (scientific work as communal and competitive activity). The implications are that these themes should be included in the school curriculum but this will require significant investment in the professional training of science teachers, particularly how to manage a more discursive approach to teaching.

The final focus of the EPSE project, led by Ratcliffe at the University of Southampton, investigated users' perception of what counts as evidence for the development of educational policy and classroom practice in science education. This enquiry, drawing on interviews and focus groups, identified some factors promoting and inhibiting the use of educational research. It found that: i) professional networks are crucial; ii) science teachers have a positive view of research but tend to evaluate educational research using 'natural science' criteria and are relatively uninformed about other approaches; iii) weight of evidence is rarely sufficient to change practice- claims only convince if they resonate with prior beliefs and experience; iv) teachers rarely use the rigorous methods they expect of research to evaluate their own practice. The implications are that professional networks need to be strengthened to foster a culture which values research, but the professional training of science teachers needs to develop a better understanding of social science approaches. As with the other elements of EPSE, the 'transformation' of research findings into practical strategies emerged as important; this includes the development of diagnostic tools to assess the achievement of significant learning outcomes.

The study undertaken by Hodgkinson, as a fellowship towards a PhD, was also concerned with science teaching but, in this case, in the primary school. It adopted an ethnographic approach to the investigation of how young children come to understand the world as they interact in groups whilst undertaking science tasks. (This project is linked to the Key Stage 1

SPRinG project on group work which is summarised below.) The results of this project are yet to be evaluated or published, however the narratives developed from contrasting ethnographic studies of classroom practice in England and Germany indicate two forms of classroom ritual – hegemonic and identity rituals – which shape the way children find meaning in classroom activities, or are excluded from doing so.

Learning across the curriculum

The two TLRP projects which we have classified under this heading focus on the development of skills and practices associated with analytical, critical and creative thinking, assessment for learning and learning how to learn. In both projects the approach to development was based on providing teachers with practical strategies that could be ‘infused’ across the curriculum. The project teams took the view that skills learned in separate lessons or courses would not easily transfer to different subject contexts without explicit attempts to integrate them across the curriculum. Previous research and scholarship has demonstrated that thinking skills and learning to learn are not separate psychological abilities but learnable practices that are used for learning different subject matter. Thus thinking skills and thinking something are inextricable, as are learning how to learn and learning something.

In the ACTS II project, McGuinness developed frameworks and classroom strategies with teachers, involving a curriculum topic and specific pattern of thinking being taught together. These methods were evaluated in a three-year study with Key Stage 2 pupils in Northern Ireland schools. A particular focus was on the development and analysis of classroom talk that helped children to think about their thinking (metacognition). The findings indicated that: i) teachers were able to design and teach lessons using the ‘infusion’ approach; ii) children’s thinking strategies were helped by such things as modelling thinking and using visual tools; iii) 94 teachers involved in the CPD programme reported changes in their classroom practices, in their perceptions of children’s thinking and in their images of themselves as teachers; iv) on self-rating measures, children participating in ACTS reported positive changes in their learning, particularly their use of metacognitive strategies, which were related to effort. However these changes took time to build: those children who had participated for three years benefited most; and gains were not even across all learners. The 80 per cent of children with moderate to high developed abilities, as measured by verbal and non-verbal reasoning tests, benefited most. When the bottom 20 per cent were given problems to solve they showed positive changes in their strategies compared to control children, but these specific achievements did not translate into how the children rated themselves more generally. Children’s self-evaluations were positively correlated with measures of attainment in reading and mathematics but effects were small compared to the impact of background factors such as social-economic circumstances, gender, prior attainment and age in class. This shows how powerful these background factors are. Nevertheless, the study showed that thinking skills and strategies are amenable to change and they can be a lever for improvement. As with the Nunes and Howe studies (above) the key seems to be to help children become aware of these strategies and how to use them. The implications are that developing children’s capacity to learn takes time and special attention needs to be paid to children with poorer cognitive and social resources. This in turn requires teachers to develop both their practices and their beliefs about learners.

Making learning practices explicit was also a key theme in the Learning How to Learn project led by James. This project built on existing research which has demonstrated that assessment for learning (formative assessment) practices can lead to improved learning and achievement. This project was primarily concerned with the conditions in schools and networks that would allow such practices to become embedded and spread within and between schools. For this reason it is also included in the relevant section below. The strand of the project that focused on classrooms showed that assessment for learning helps teachers promote learning how to learn by providing ideas for practical strategies that enable pupils to become more autonomous learners. This enables classroom practice to be better aligned with the dominant

values that 600+ teachers expressed in a questionnaire, and less driven by the culture of performativity. However, analysis of video evidence showed how difficult it is to shift from reliance on specific techniques e.g. writing learning objectives on the board (the letter of AfL) to practices based on deep principles integrated into the flow of lessons (the spirit of AfL). Again, this project demonstrated that although advice on techniques is useful and important to teachers, longer term development and sustainability depends on professional development that encourages teachers to re-evaluate their fundamental beliefs about learning, the way they structure tasks, the nature of their classroom roles and their relationships with pupils.

The use of ICT to enhance learning

The use of ICT in teaching and learning warrants a separate heading because four projects had this as a central focus, and a whole new set of projects on technology-enhanced learning (TEL) is being established within TLRP. TEL work is likely to continue until 2011/12.

The INTERPLAY project, led by Plowman in Scotland, investigated the challenges of introducing ICTs into play settings involving very young children, and how practitioners can respond to changes to create opportunities for learning with ICT. Practitioners and researchers worked together to address these questions using the concept of 'guided interaction' to initiate small projects using different approaches. They found that: i) children's encounters with ICT are enhanced when practitioners use guided interaction (questioning, modelling, praising, supporting) and balance child-initiated and adult-led activities; ii) encounters with ICT accompanied by guided interaction can enhance dispositions to learn, knowledge of the world and operational skills, as well as hand-eye coordination; iii) providing a broad range of ICTs, including digital still and video cameras, mobile phones and electronic keyboards and toys, as well as computers, promotes more opportunities for learning. The implications are that professional development of practitioners is needed to develop a responsive, reflective pedagogy, and nurseries should broaden their focus beyond computers to other forms of ICT and be aware that children develop competence with ICTs at home.

The InterActive Education project (Sutherland) worked in partnership with primary and secondary school teachers to investigate ways in which ICT can be used to enhance learning in subject domains, particularly its value in helping children to enter new knowledge worlds. The approach was holistic and socio-cultural. The project found that: i) schools have interpreted enthusiasm for ICT in education as being largely about the acquisition of equipment; ii) effective teaching and learning with ICT involves building bridges between 'idiosyncratic' learning, arising from extended periods of individual engagement, and 'intended' learning that often needs to be supported by the teacher; for example, pupils are unlikely to develop knowledge of science from game-like simulation software; iii) there is a two-way exchange of knowledge between home and school use of ICT and this impacts on school learning; iv) the teacher remains key to the successful use of ICT for learning. The implications are that professional development is crucial so that teachers can put ICTs to good pedagogical use in the classroom, encouraging pupils to build on their out-of-school learning but helping them to construct 'common' knowledge which has currency in wider communities, as well as in the classroom.

The project led by Kennewell, in Wales, on the use of ICT to improve learning and attainment through interactive teaching is an extension of the InterActive Education project. Kennewell's project has focused particularly on the use of interactive whiteboards. The recent proliferation of interactive whiteboard (IWB) technology in classrooms, particularly in the UK, suggests that teachers and educational policymakers see this as a very powerful teaching tool. Although the project will not complete until the summer of 2007, the indications are that Kennewell's results will be much like Sutherland's. The features of IWBs have the potential to support new forms of interactivity in teaching and to support a more participatory pedagogy. However, they are still tools that need to be well used. If IWB's are to achieve the

claims made for them, there may need to be a new wave of professional development which takes account of the particular affordances of IWBs and the need to embed them in teachers' pedagogical reasoning.

Robin Bevan, a TLRP Research Training Fellow, carried out a PhD project, linked to the Learning How to Learn project (see above and below). In this he investigated on-screen learning in secondary schools using a concept mapping software program developed in the United States. Previous studies have demonstrated the potential effectiveness for learning and achievement of computerised concept mapping. However, Bevan's study shows how effectiveness of on-screen activity depends significantly on the strategy adopted by the teacher. Working with teachers from history departments in two schools, he used an experimental design with pre- and post-testing, three experimental groups each with a different 'treatment condition', and controls. He found that: i) pupils who used the on-screen concept-mapping tool alone, with no collaboration with other students, achieved no significant sustained learning gains; ii) when the class collaborated in developing their concept maps, pupils demonstrated sustained and improved learning in a subsequent essay task; but iii) providing automated scoring for the concept maps demotivated the weakest pupils and did not lead to any additional learning gains. The implications are that despite the promise of new technologies, an unmediated switch to on-screen learning is unlikely to lead to improvements in learning. Teachers looking for improved learning with on-screen activities need to explore the powerful potential of peer collaboration. Indeed the adoption of new classroom strategies involving such collaboration can be more significant than the impact of the software itself.

Coming through all these projects is a strong message that it is not the ICT tools per se that bring about improvements but the way that they are mediated and used.

Environments for better learning

A group of TLRP projects investigated features of classroom settings and the wider environment that promote or inhibit learning. Two linked projects researched the effects of pupils working in groups in classrooms, and another three projects studied the interactions between learning in home and school. A further major 'associate' project has compared the learning benefits of different structures for provision in the early years.

The SPRinG (Social Pedagogic Research into Group work) project sought to develop a new approach to increasing engagement and learning in everyday classroom settings at Key Stage 1 (led by Kutnick), Key Stage 2 (led by Blatchford) and Key Stage 3 (led by Galton). The project team was aware of a wide gap between the potential of group work to enhance learning and their previous evidence of only limited use in schools. The problems that they identified were a lack of a strategic view of the purpose of groups and practical problems of formation and process. In response, the team embarked on a project to work with teachers to develop a programme of group work that could be successfully integrated into school life (the development stage) followed by a year-long intervention study to evaluate the success of the programme in terms of attainment, motivation and within-group interactions, compared to control groups (the evaluation stage). An applications stage was designed to apply group work to contexts known to be particularly problematic. The project found that: i) in contrast to views that group work may interfere with learning in mainstream curriculum areas, teachers successfully implemented effective group work in both primary and secondary and across the curriculum; ii) this had a positive effect on pupil's academic progress and higher conceptual learning (at KS1 effect sizes from 0.22 to 0.62 were recorded in reading and mathematics; at KS2, where science was a special focus of the project; effect sizes from 0.21 to 0.58 were recorded for conceptual understanding and inferential thinking); iii) there were positive effects on pupil behaviour, through increased on-task interactions, more equal participation, sustained interactions and higher level discussions; iv) there were improvements in personal relations between teachers and pupils and among pupils, provided

that teachers took the time to train pupils in the skills of group working. The implications were that group work can be made to work with benefits to attainment, motivation and behaviour. However, this requires preparation and support. Group work skills need to be approached developmentally: social skills first, then communication skills, then problem-solving. Providing teachers with practical 'relational' strategies, based on principles, provides a successful approach to raising standards and improving behaviour.

The linked 'extension' project in Scotland (ScotSPRinG), led by Christie, had similar results. This project worked only in primary schools but investigated, especially, the effects of class composition in urban and rural school contexts where classes may be single age or a mix of year groups. As with the KS2 work in England, the team worked with upper primary school age pupils and focused upon the development of conceptual understanding in science, although a range of cognitive, affective and social measures were used to assess impact of innovations. Project findings showed: i) significant gains across a number of measures, attributable to the group work intervention; ii) cognitive gains were related to the quality of collaborative dialogue during group work; iii) there were no consistent differences between single age or mixed age classes, nor between urban and rural schools; iv) group work yielded significant gains in social relations with collaborative engagement with tasks contributing most, however, socio-emotional gains were independent of the cognitive gains. The practical 'relational' strategies offered to teachers were highly valued and reported to benefit both teachers' professional practice and pupils' learning which implies that the SPRinG approach is effective and sustainable.

The Home-school knowledge exchange (HSKE) project, led by Hughes, investigated how the home and school environments for learning might complement each other. Focusing upon literacy and numeracy in these two worlds, the team helped teachers, parents and children to find new ways of exchanging knowledge between home and primary school, using videos, photographs, shoeboxes of artefacts etc. They then investigated how this process of knowledge exchange could enhance learning and ease the transition to secondary school. The project found that: i) there are substantial 'funds of knowledge', embedded in national, ethnic and popular cultures of homes and communities, that can be used to support learning in schools; ii) simple knowledge-exchange activities can make teachers more knowledgeable about children's out of school lives, and parents more knowledgeable about what happens in school; iii) HSKE can have a positive impact on teachers, parents and children and on attainment although gains were not statistically significant in mathematics, and not uniform across the project in literacy (they were significantly better in Cardiff schools but not in Bristol). However, the implications are that policy-makers and school leaders should pay more attention to HSKE as a means of improving relationships and raising standards.

A research training fellowship, held by Brookes, is linked to the HSKE project but focuses particularly on provision for gifted and talented pupils at secondary transfer. Findings from this ethnographic study tracking 15 Year 5 children into Year 8 are yet to be evaluated and published. However, there are indications that school selection by parents, and the process of transfer, are experienced as multi-faceted, iterative, stressful and prolonged. Evidence from the HSKE project, and this linked fellowship, focusing particularly on the social and emotional dimension of secondary transfer, has been the focus of an innovative dramatic representation of research findings which is now available on a DVD (see http://www.tlrp-archive.org/cgi-bin/tlrp/news/news_log.pl?display=1181220375 for details).

Both of the home-school projects outlined above drew to some extent on the methodological (longitudinal ethnography) and theoretical (symbolic interactionist) antecedents of work by Pollard. The interactions between pupils' experiences of schools, homes and communities in the formation of learner identities has been a focus of his longitudinal ethnography of two cohorts of children (ten in each of two primary schools contrasted by different social class settings). They were studied from 4 to 16 and tracked into secondary school. This series of

studies has been drawn into TLRP as an associate project, partly because Pollard's thinking, derived from this work, has informed the way the scope of the Programme has been conceptualised (see the framework above). Comparison and analysis of detailed case studies from this project revealed that: i) relationships between teachers and pupils remain the basis of the moral order of the classroom and underpin discipline and behaviour; ii) children develop their identities as learners through successive experiences as they move through schooling; iii) pupils actively negotiate their way through schooling, which, over time, can be conceptualised as a 'pupil career'; iv) the extent to which school provision matches learners' identities, social relationships and cultural resources strongly influences the outcomes of education. The implications are that attention needs to be given to the creation of positive classroom climates characterised by respect, trust and mutual exchange of dignity; the most fundamental form of education – the process of becoming a person – requires as much careful consideration; authentic personalised provision in schools should build on an understanding of the development of strategic biographies.

Another 'associate' project, funded by the DfES, is EPPE (Effectiveness of pre-school primary education), the most significant European study to date on the impact of pre-school and the contribution of family background to children's development (3-11 years old). The findings from the pre-school study (3000 children and 141 pre-school settings) are that: i) high quality pre-school experience benefits children and these benefits remain evident at age 10; ii) children made more gains in settings combining education and care and in nursery schools where there were more highly qualified staff; iii) good early years staff provided direct teaching, instructive learning environments and 'sustained shared thinking' to extend children's learning; iv) a high quality early years home environment is associated with gains for children but what parents do is more important than who they are. The implications of this project have already had a substantial impact on national early years policy including establishing free entitlement to pre-school for all children; pilot projects on an early (2-3yrs) start for disadvantaged children with a greater emphasis on quality; expansion of Children's Centres under Sure Start and a funding framework to enhance staff qualifications; greater emphasis on adult/child interactions in the English Primary National Strategy and the Foundation Stage; initiatives to increase parental involvement through joined up services, especially to disadvantaged families.

School conditions for the improvement of teaching and learning

A final cluster of TLRP projects focuses upon the conditions within schools, and across networks of schools, that support improvements in teaching and learning.

Consulting Pupils about Teaching and Learning, a network of six projects coordinated by the late Jean Rudduck, built on growing recognition that young people have a right to be heard and have something worthwhile to say about their school experiences. The UN Convention on the Rights of the Child (1989) included children's right to be heard as one of its four basic principles. Pupil consultation is also regarded as integral to the citizenship curriculum and lifelong learning. However, listening to and learning from pupils is a challenge to teachers and schools. The findings of the projects, drawn primarily from the testimony of pupils and teachers in 48 schools, provided evidence of benefits for: i) pupils, by enhancing engagement with learning, sense of agency and of self as learner; ii) teachers, by deepening insights into children's abilities and learning preferences, leading to more responsive teaching and willingness to give pupils more responsibility; iii) schools, by strengthening school policy in substantive rather than marginal or tokenistic ways; and iv) national policy, by providing new insights and practical tools for school self-evaluation and development planning. Importantly, however, given the increasing status of 'pupil voice' as a 'movement', this research also cautioned that ingrained habits can prevent pupils being heard. Conditions for new ways of listening include: hearing the quiet voice in the acoustic of the school; avoiding the creation of a pupil voice elite; maintaining authenticity; sharing data and/or offering feedback to pupils; trust and openness as a pre-condition of dialogue and action.

This project has been extended by a subsequent project carried in Northern Ireland with a particular focus on children's rights to be consulted on the assessment of their learning. This has particular relevance in Northern Ireland as policy makers introduce a Pupil Profile to record pupils' development and encourage the adoption of Assessment for Learning in classroom practice. Led by Leitch, the CPAL project comprises three independent but interrelated studies in primary and post-primary schools. One of these asked (through focus groups, creative approaches and e-consultation) 80 Key Stage 2 pupils what they thought of the concept of the Pupil Profile, and another study investigated teachers' and parents' awareness of children's rights and their responses to key aspects of AfL pedagogy. Findings were that: i) KS2 pupils viewed Pupil Profiles as personal documents, useful for helping them improve their learning and helping them with decision-making about future schooling; ii) to fulfil these expectations, children thought that Profiles should provide feedback from teachers on how to improve, be attractive and readable, include a section contributed by pupils, have input from parents/carers, be inclusive of wider abilities and achievements, and enhance a pupils' views of themselves; iii) teachers advocated children's rights, expressed by Article 12 of UNCRC and embodied in AfL practices, but viewed time, class size, curriculum coverage, need for control and school culture as constraining implementation. CPAL demonstrates that pupils can be consulted directly on significant matters of educational policy, and that where principles of AfL are embedded in practice, pupils can experience high levels of participation. However there is a need to promote greater consistency among teachers of what consultation means from a rights-based perspective.

The issue of children's rights was also implicit in the work of the project on inclusion, led by Ainscow. This collaborative action-research project in three local authorities addressed the question of how schools can include all children from the communities they serve and enable them both to participate fully and achieve highly. The findings were that: i) many barriers to participation and learning stem from teachers' misplaced assumptions about what pupils can do and how best to teach them; ii) 'interruptions' to established understandings and practices can be fostered when groups of staff engage with evidence about pupils' experience of school and their own practice; iii) it is not possible to improve outcomes for pupils simply by teaching the curriculum harder and longer; teachers have to strengthen pupils' pleasure in learning and their self-esteem. The implications are that teachers need to question their accepted ways of working; focusing on a specific issue for school enquiry is more productive than imposing whole school change; and, the national focus on highly measurable outcomes needs to be broadened in addressing underachievement and inclusion.

This project has given rise to an 'extension' project in Wales, led by Davies at Trinity College Carmarthen. Called 'Prosiect dysgu cydradd' (or 'Facilitating teacher engagement in more inclusive practice'), this project was built on evidence that many teachers remain unconvinced of the principle of inclusion. It set out therefore to draw more secondary teachers, through action research, into the challenge of engaging all of their pupils in their learning. A major innovation was the involvement of educational psychologists acting as facilitators to support and challenge. The project team found that: i) many secondary school teachers are unfamiliar with action research and, unless they develop a sense of ownership, they see this approach to development as just another imposition; ii) however, energy and creativity are released when teachers allow or invite their assumptions about pupils and learning to be challenged; iii) both school leaders and external facilitators (such as educational psychologists) have a role in providing support and challenge. The implications are that there is a need for a simple model of action research for teachers to engage with, and that this process of reflection and action needs to be protected from external agenda. Seeing pupils differently is a crucial step towards changed classroom relationships and discourse.

The Learning how to learn in classrooms, schools and networks (LHTL) project has already been mentioned, above. Its findings are also relevant to this section because it was principally

concerned with the conditions in schools and networks that would enable the positive effects of assessment for learning to be scaled up and sustained without intensive and expensive support. Combining both quantitative and qualitative methods, this project worked with 40 infants, primary and secondary schools to investigate a 'logic model for a causal argument' that linked classroom practice to teachers' own learning practices and school management practices. It found that: i) classroom-focused inquiry by teachers is a key condition of promoting autonomous learning by pupils and that schools that embed AfL and LHTL make support for professional learning a priority; ii) educational networks are much talked about but little understood, and electronic tools for professional development purposes are not well used, however, the intellectual capital of schools can be built on the social capital developed through teachers' personal networking practices. The implications are that school leaders need to create the structures and cultures that support collaborative classroom enquiry and the sharing of innovations in classroom practice, within and beyond the school, because a key aspect of teacher learning is 'knowledge creation' (i.e. a third metaphor to add to the more familiar 'learning as acquisition of knowledge and skill' or 'learning as participation in communities of practice').

Linked to this project is another TLRP research training fellowship, awarded to Dudley to undertake an investigation of ways in which Japanese 'Lesson Study' might be adapted and used in UK schools. This provides a formal approach to collaborative classroom enquiry that emerged as a crucial factor in the LHTL project. Teachers work in groups to formulate hypotheses about adjustments to lessons to improve learning. These are tested in Research Lessons which colleagues observe and discuss subsequently. New hypotheses and adjustments are tested in further iterations until the teachers feel ready to perform a public research lesson. This fellowship project has yet to be evaluated although there are early indications that: i) Research Lesson Study engages teachers at all levels of experience and sustains their interest over time; ii) it involves pupils directly in the analysis of teaching; and iii) leads to innovation in lesson design and improvements in pupil achievements.

Finally, the importance of teacher learning emerges again in the VITAE 'associate' project. This study of 300 teachers provides a new perspective on teachers' quality, retention and effectiveness over the whole of their careers. The findings are that: i) pupils of teachers who are committed and resilient are likely to attain more than pupils whose teachers are not; ii) teachers' sense of positive professional identity is associated with well-being and job satisfaction and this is a key factor in their effectiveness; iii) the commitment and resilience of teachers in schools serving more disadvantaged communities are more persistently challenged than others; iv) teachers do not necessarily become more effective over time – a minority risk becoming less effective in later years; v) sustaining and enhancing commitment and resilience is a key quality and retention issue. The implications are that head teachers, national associations and policy makers need to consider the connections between commitment, resilience and effectiveness and develop strategies for meeting the needs of teachers in different phases in their professional lives, and in different communities.

Main areas of divergence, disagreement and consensus

TLRP projects all share a concern with teaching and learning but they do not completely overlap in terms of focus, context, scale, methods or perspective. Therefore they cannot be compared directly and areas of both divergence and agreement can be identified and evaluated. As the synthesis below indicates, we have attempted to elicit some common themes and distilled these into principles for practice. However, they are at a very general level and some might say that they are self-evident statements representing contemporary evidence-informed educational thinking. Nevertheless, TLRP evidence suggests that many are still some way from being operationalised, implemented and sustained in policy and practice. So the principles are worth serious consideration.

Some differences appear significant. For example, projects that focus on cognitive dimensions of learning (e.g. Nunes) might seem to contrast with those that emphasise emotional engagement, dispositions and motivation (e.g. Hughes and Pollard), or those that investigate learning as socio-cultural activity (e.g. Sutherland). However, surface differences usually disappear on further scrutiny because different projects ask different research questions. They do not necessarily refute the value of other questions or perspectives. All might be considered important and complementary in investigating the holistic experience of learning by children and young people, in and out of school.

If there is one notable area of agreement in general, but divergence in detail, it concerns teacher learning. Most projects produced strong evidence that a key to improved learning and achievement by pupils is the learning of teachers. However, there are some differences implied by the evidence about how this learning is best achieved. Some projects (e.g. Nunes, Howe and Millar) argued strongly that research findings need to be translated into practical strategies and materials that teachers can use directly in classrooms, whilst others were more inclined to support classroom based enquiry in which teachers have a greater say in identifying problems to work upon. However, even here, the differences are more of degree than substance. Those projects, such as Ainscow's and Davies', which adopted an action research approach, still saw an important role for evidence from research in challenging the taken-for-granted assumptions that stand in the way of improvement in learning. As John Elliott pointed out in his contribution to the C-TRIP thematic seminar series (see <http://www.tlrp.org/themes/seminar/gewirtz/papers/seminar8/paper-elliott.pdf>), Lawrence Stenhouse, who is often regarded as the father of teacher research in the UK, saw the transformation of schools as most likely to arise from a productive relationship between university researchers and classroom practitioners, who each have different but complementary roles in generating and testing new knowledge for practice.

3 Synthesis of key findings and insights

In 2006, the TLRP directors' team began work on looking across project findings to see whether any overarching messages were emerging. The TLRP Commentary, *Improving Teaching and Learning in Schools* (James and Pollard, 2006), was the first statement of our tentative conclusions, including the ten principles for effective teaching and learning. We subsequently 'tested' their validity in discussion with various audiences. One such 'audience' was researchers working on TLRP post-school projects, who were interested in the extent to which such principles might generalise to their work. Discussions with them alerted us to some particular emphases and gaps in the school based work. For example, although the schools projects were interested in learning outcomes, and were underpinned by coherent conceptions of learning, they probably contributed more 'new' knowledge to our understanding of effective *teaching*, than learning per se. This is perhaps understandable given the nature of schools, which contrasts with post-compulsory settings where 'teachers', as such, do not always exist. Furthermore, whereas psychological, social-psychological or sociological approaches were drawn upon, biological and neuroscientific aspects of learning were not investigated in TLRP schools projects. As one respondent expressed it, 'Where is the brain in TLRP's model of learning?' TLRP has sought to redress this imbalance by funding a seminar series which has published a commentary on *Neuroscience in Education* (Howard-Jones, 2007). The object of this publication was to engender a formal dialogue between neuroscience and education as a platform for future development. Meanwhile, caution is advised in respect of popular programmes that claim to be 'brain-based'. As the TLRP Commentary makes clear, 'these programmes have usually been produced without the involvement of neuroscientific expertise, are rarely evaluated in their effectiveness and are often unscientific in their approach' (p. 4).

Other criticisms of our attempt to synthesise findings from school-based projects highlight the limited attention given to issues of equity and transitions, including a need for greater clarity about the relationship of informal to formal learning. It is not the case that schools projects have nothing to say on these issues, as the summaries above make clear, but some of their data on these issues have yet to be fully analysed or written up. For this reason a further thematic group, led by Miriam David, is mining evidence across TLRP on *Social diversity and difference*.

In autumn 2007, TLRP's Principles for Learning and Teaching will be published in a new format as a poster inside a magazine called, *Principles into Practice: a teacher's guide*. This will be sent out, with a DVD, to every school in the UK.

Each of the ten principles is first expressed as a simple statement beginning with the stem: 'Effective teaching and learning....' It is then expanded in a description of the practices that are seen as important. In the original version (in James and Pollard, 2006) each principle was also mapped against the evidence that supported it. Such evidence comes from across school sectors. We have not reiterated all that evidence here because we have summarised project findings in the section above. However, we have added critical commentary with respect to some of these principles.

Principle 1. Effective teaching and learning equip 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 worthwhile learning outcomes and taking seriously issues of equity and social justice for all.

As the first and most important aim of TLRP, all projects were expected to work to improve outcomes for learners. In the early days it was mostly assumed that this meant increasing attainment on tests and examinations. As the work progressed, researchers sought to broaden the concept of outcomes beyond those defined by the current standards agenda. The need to do this was emphasised by the work of the Inclusion projects, which saw engagement with learning as crucial. The projects on group work (SPRinG and ScotSPRinG), researched the affective dimension as an outcome of learning as well as a precondition for academic success. ACTS II found a positive relationship between attainment, effort and the development of metacognitive strategies and the Learning How to Learn (LHTL) project concluded that a capacity for autonomous learning is possibly the most important outcome for students who will live and work in the fast moving world of the 21st century. The longitudinal studies carried out by Pollard emphasised the importance of the development of learner identities for effectiveness and fulfilment across the life course.

It is possible to argue that attempts to broaden the 'standards' debate were driven by a desire to promote educational values beyond those that focus narrowly on benefits to the economy. Education is driven by moral purposes (Pollard, 2002) and educational research reflects this. Such values are contested and the way in which this principle is worded possibly understates the extent of the debate about the aims of education.

Within TLRP, this debate was acknowledged in the work of the cross-phase Learning Outcomes Thematic Group. Using the distinction made by Sfard (1998) concerning two metaphors of learning – learning as acquisition (of knowledge, skills and understanding) and learning as participation (in communities of practice) – and speculating on the need for a third 'knowledge creation' metaphor (Paavola, et al., 2002), it became clear that there was a difference between the outcomes that were promoted in post-compulsory settings and those that are most obviously pursued in schools. As James and Brown (2005, p.17) observed:

- The acquisition metaphor was used, and attainment/understanding/concepts and other cognitive outcomes were pursued, in all sectors of education, but especially in schools and HE.
- The participation metaphor was more characteristic of post-compulsory education (FE, HE, workplace learning, CPD, and lifelong learning) with strong emphasis on outcomes associated with social practice, dispositions, membership, access and inclusion.
- Only early years (pre-school and early primary) and HE appeared in the creative category to suggest a possible need for a ‘knowledge creation’ metaphor.

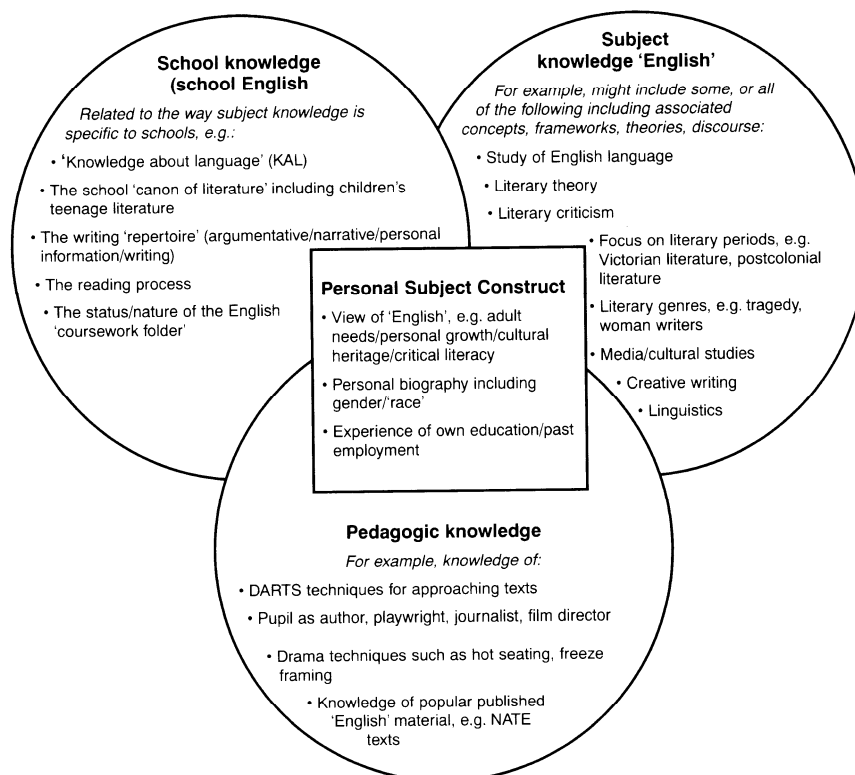
One implication of this analysis of the first 30 TLRP projects was that more focused attention needs to be given to the nature of the outcomes that are valued, promoted and assessed at every phase, and the degree of consistency and coherence that may, or may not, be needed in education across the lifecourse and across diverse groups of learners.

Principle 2. Effective teaching and learning engage 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.

TLRP projects that focused on particular subjects showed that teachers need to possess both a good understanding of the subjects they teach and of the best ways to teach them. The literacy and numeracy projects carried out by Nunes and Howe emphasised the role of ‘awareness’ of this kind by teachers. These projects, and particularly the EPSE projects in secondary schools, also showed that insights from research were readily used by teachers when they were transformed into worked examples.

Further cross-programme thematic work on curriculum, domain knowledge and pedagogy, led by Professors McCormick and Moon, is currently underway and will report in a special issue of *The Curriculum Journal* at the end of 2007. This group is exploring a heuristic model (see <http://www.tlrp.org/themes/seminar/moon/papers.html>) which examines the relationships between four perspectives: the subject knowledge perspective; the curriculum perspective; the learner perspective; and the pedagogical perspective. Leach and Moon (1999) illustrate this with respect to secondary English teaching.



Principle 3. Effective teaching and learning recognise 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.

Pressures for 'delivery' and 'coverage' can work against the promotion of deep and secure learning, and enhanced motivation. Teachers need time to diagnose learning difficulties and help pupils to improve. This was a foundation principle of the LHTL project, which built on assessment for learning practice. The two Inclusion projects, the HSKE project and the EPPE project also encouraged teachers to challenge their taken-for-granted assumptions about the prior knowledge and experience of certain groups of children.

Principle 4. Effective teaching and learning require 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.

The way that teachers plan and structure activities in the classroom, and the role of classroom dialogue in scaffolding, was a theme in a number of projects. It was a foundation principle of the EPSE projects' development, implementation and evaluation of teaching sequences and diagnostic questions. The InterActive project found scaffolding learning, by teachers, to be crucial across ages and across the whole range of school subjects because it promoted sustained, mindful engagement. It was also found to be crucial in early years learning with ICT (Plowman's INTERPLAY project).

Principle 5. Effective teaching and learning need 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.

Complex learning behaviours and outcomes (see Principle 1 above) need subtle measures which often require observation, by teachers, over time and across different contexts. However, the way in which the initial TLRP projects were commissioned did not easily permit new measures of wider learning outcomes to be developed and tested prior to the introduction of pedagogical innovations (see James and Brown, 2005, for a discussion of this). In other words, most projects were ‘development and research’ rather than ‘research and development’, and assessments of outcome tended to be based on existing measures, such as national tests, rather than novel instruments. The problems raised were recognised as individual project teams sought to find adequate ways to assess the outcomes they wanted to promote, i.e. beyond conventional academic attainment.

These issues, identified by the Learning Outcomes Thematic Group (James and Brown, 2005), have subsequently been revisited by another TLRP thematic seminar series, led by Daugherty, with support from the Assessment Reform Group (see: <http://www.assessment-reform-group.org/>). This ‘Assessment of Significant Learning Outcomes’ (ASLO) thematic series is exploring the ways in which the relationships between assessment and curriculum are conceptualised. It has become evident that the problems inherent in specifying a curriculum and in designing valid assessments have been compounded, even within one country (UK), by the use of different terminology in different sectors. The ASLO team has been investigating examples of work undertaken on maximising the extent of congruence of assessment practices with the full range of learning outcomes, as specified in five contexts: national curriculum mathematics; the ‘Learning to Learn Indicators Project’ in Europe; workplace learning; higher education; vocational education.

Through the course of the seminar series the thematic group has been developing a conceptual framework with a view to developing a more constructive critique of the extent of congruence in existing curriculum and assessment systems. It is hoped that the framework will eventually support the design of systems in which the alignment of assessment to curriculum is closer than is often found in current systems.

Principle 6. Effective teaching and learning promote 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 learners having the will and confidence to become agents in their own learning.

Most TLRP schools projects emphasised the importance of developing learning awareness, explicit learning practices, positive learning dispositions, and learning autonomy. However, the LHTL Project found that, whilst teachers want to promote learning autonomy in their pupils, they find it difficult. Those who were most successful were those who took responsibility for what happened in their classrooms, and reflected on what they could do to improve matters, rather than blame external pressures or pupil characteristics.

Principle 7. Effective teaching and learning foster both individual and social processes and outcomes.

Learners should be encouraged and helped to build relationships and communication with others for learning purposes, in order 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.

The TLRP group work projects demonstrated the benefits of efforts to improve the quality of group work and student's mastery of cooperation and collaboration. Pupils involved in these developments made significant academic gains, which were stable across schools in different social contexts. Bevan's study of on-screen learning using concept-mapping software also found that significant sustained learning gains were only associated with opportunities for collaborative peer discussion. These projects confirm the vital importance of classroom dialogue. Other projects examined the benefits of making space for teachers to consult students about their learning.

The Consulting Pupils Project found that taking students' views seriously enhances self esteem and agency and improves learning opportunities. However, these researchers also found that in the 'acoustic of the classroom' some pupils have more communicative competence, and are 'heard', more than others. Teachers need to be alert to social class and gender differences. The CPAL Project, which extended these themes, used the concepts of space, voice, audience and influence, from the UN Convention on the Rights of the Child (Article 12), as a framework for understanding the possibilities and challenges of encouraging student participation and consultation.

Principle 8. Effective teaching and learning recognise the significance of informal learning

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

At classroom level, teachers can be encouraged and helped to value and build on informal learning. For example, projects investigating ICT in schools found that schools sometimes underestimate the extent of computer expertise derived out of school.

Explicit home-school knowledge exchange activities produced impact on outcomes but this was mediated by social class, gender and attainment factors, which underlines the importance of handling informal learning with sensitivity in order to avoid negative consequences for particular groups of pupils.

Principle 9. Effective teaching and learning depend 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.

TLRP has produced very substantial evidence on the needs and character of teachers' professional development and learning, both through individual projects and through two cross-Programme thematic initiatives (see <http://www.tlrp.org/themes/seminar/gewirtz/> and a special issue of *Research Papers in Education* 20(2), 2005). That pupils' learning depends substantially on teachers' learning is perhaps the overriding finding from TLRP schools projects. 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, as well as their practical skills. Teachers need to possess frameworks of concepts and principles to guide the decisions they make in the unpredictable situations they often encounter in

classrooms. Without this there is a danger of practice becoming ritualised and mechanistic. TLRP evidence suggests that this development is best achieved through teachers' critical inquiry, with colleagues, in classrooms contexts. The Research Lesson Study Project (Dudley) researched a model for CPD that is school-based, longer term, collaborative and inquiry-based. The Inclusive projects, noted that visits from teachers in other schools, and interactions with external facilitators, was valued for questioning assumptions. Schools with cultures of participation and inquiry, and professional networks, are in a good position to support this but they benefit from help from local and national providers.

Specific, targeted professional development materials and courses were also valued. All TLRP development and research projects found that offering teachers practical strategies, based on principles and evidence, provided much needed support for setting up, managing and improving the effectiveness of innovations in everyday classroom settings.

Principle 10. Effective teaching and learning demand 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.

A number of TLRP projects investigated the impact of policy on teaching and learning. Most noted that when senior managers support innovation it becomes sustainable. However, LHTL Project head teachers revealed their concerns about leading learning in their schools within the context of prescriptive government policy. The greater the external pressure, the greater was the desire for flexibility, diversification and agency.

4. Implications for national policy, national agencies, LAs, schools, others

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 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, and crucially, provision for professional development of teachers and leadership for learning.

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 Department for Children, Schools and Families seeks to maintain this priority through the National Strategies and other initiatives. 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 through the *Every Child Matters* agenda. 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 Education and Inspections Act, 2006, indicated that the government had reverted to structural change as a lever for raising standards.

Policies have ultimately to be turned into practices which bring about improvements in learning and achievement for individuals and groups. 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 humility. They are the result of an analysis of key findings across TLRP's projects, some of which continue to be active whilst the overall review has been conducted. 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, all need to learn better if children are to succeed.

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