Research for Teachers
Curriculum

published: Fri Aug 14 10:41:35 GMT 2009

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What should children and young people learn?

The Qualifications and Curriculum Development Agency (QCDA) described the curriculum as 'the entire planned learning experience of a young person', which includes skills, values and personal development in addition to what is to be taught and learnt. But what does this mean in practice? The key factor is the design of the curriculum at school level. It is the point at which the curriculum meets the learner that is crucial and it is what teachers do that really matters.

Evidence from research featured in this research summary suggests that learning and achievement flourished when it involved some or all of the following:

- planning for learning that is 'context based'
- connecting the curriculum with young people's experiences of home and community
- planning for learning experiences that structure dialogue in group work and encourage collaborative learning
- designing content and experiences that identify and build on pupils' existing understandings
- flexible learning across different areas of the curriculum, and
- ensuring teachers have excellent professional development in subject knowledge to enable them to create learning experiences of this kind.

This summary shows just how wide-ranging the curriculum can be. Drawing on research findings from eleven robust studies* we give examples of effective curriculum planning and delivery that not only covers subject material, but helps to challenge the most able and talented, close gaps in attainment, promote working together and, by motivating pupils, encourage lifelong learning. We also present six case studies which illustrate ways in which teachers have successfully incorporated the six key features into curriculum design in different contexts. *The studies were selected from an international review of individual studies from systematic research reviews published by QCDA in 2008 (see further reading).

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Overview

This RfT summary drew on research findings from a number of robust studies that gave examples of how teachers have effectively planned and delivered the curriculum to enhance student learning.

Why is the issue important?

In many local authorities and schools there are significant numbers of children who find it difficult to access the curriculum and who are attaining at a level below their abilities.

What did the studies find out?

The studies found that when teachers brought the curriculum to life for their students by embracing skills, values, background and personal development in addition to what was taught and learnt it helped them to:

- motivate students
- challenge the most able and talented, and
- close the gap in attainment.

How was this achieved?

The studies found evidence for the effectiveness of curriculum planning and delivery that included some or all of the six key features:

- learning that is 'context based'
- connecting the curriculum with young people's experiences of home and community
- structured dialogue in group work and collaborative learning
- building on pupils' existing understandings
- flexible learning across different areas of the curriculum, and
- teachers' excellence and professional development in subject knowledge

How was the research designed to be trustworthy?

The summary draws together findings from 11 studies selected from a 'review of individual studies from systematic research reviews' published by QCA in 2008. Most of the studies (9) were evaluations; one of which was a randomised controlled trial (in which intervention strategies are randomly allocated to pupils).

What are the implications?

The research showed the importance of teachers:

- using a range of contexts for learning that go beyond the classroom to include the outside world and community
- engaging students in their learning through dialogue and group-working, based on what they know and can do already
- building strategies for teaching and learning that are cross-curricular, and
- engaging in CPD that complements their work in developing the curriculum.

What do the case studies illustrate?

The case studies show, for example, how:

- students developed their writing skills in the real-life context of local restaurants
- students participated in group work that enhanced their mathematics learning
- teachers identified and built on students' existing scientific understanding, and
- members of a mathematics department worked collaboratively to develop their mathematics teaching and learning in ways that met the needs of their students, increased challenge and created motivating learning contexts.

How did teachers broaden and extend the curriculum to engage learners more effectively?
In compiling this RfT summary we looked at a range of studies from the United States and the UK which focused on teachers' planning and implementation of the curriculum. In doing so we found evidence in the studies of a number of aspects of teachers' planning and practice that were effective in engaging pupils and raising achievement. These examples demonstrated:

- context based teaching that explored phenomena in real or simulated situations
- inclusive teaching and learning and citizenship education that connected with the students' community beyond the school
- collaborative learning and structured challenge in group work which were effective learning strategies
- structured learning that focused and built on students' existing concepts and understandings, rather than 'teaching to the test', as an important foundation for progression
- removing rigidity in the approach to the curriculum, which allowed time and space for conceptual development and encouraged integration of cross-curricular learning, and
- that teachers need to have a deep knowledge and understanding of the subject matter in order to be able to support children's learning through the use of appropriate teaching and learning strategies.

We explore these key features in the following sections using our chosen studies to illustrate curriculum planning and delivery in a wide range of contexts. Some of the studies appear more than once as they are relevant to more than one of the six key features.

How did real-life contexts lend variety and interest to the curriculum?
The studies highlighted a wide range of examples of context-based teaching that linked to students' knowledge and experience of everyday life. These approaches were helpful for making the curriculum more relevant, benefiting all students, particularly those from ethnic minority backgrounds and those feeling demotivated by the conventional curriculum. Examples illustrating context-based approaches to the curriculum included:

- using conflict between the characters in a play as a way of bringing key features of human genetics to life as well as its implications for society
- setting physics learning in the context of technology in daily life and society
- providing students with 'Fat and the Slim' - a modular programme that covered topics such as digestion, structure of fats and sugars in the contexts of anorexia and obesity
- organising a flower show to provide a context for developing group problem-solving skills, and
- second- language learners listening to one familiar (a well known rock band) and one unfamiliar (a gold rush) topic of equal length - they produced more correct responses about the familiar topic.

For example, one study (Black & Goldowsky) showed how students in a US high school found the use of drama, with characters using everyday language, helped to bring key points of human genetics to life. The proportion of students who could effectively describe and explain genetic mapping and its implications, and present reasoned argument rose significantly as a result.

In another study (Wierstra) Dutch teachers used an enquiry approach to physics teaching and learning for secondary students set in the context of technology in daily life and society. They constructed study units around themes such as, 'traffic and safety' and 'energy at home'. Being able to draw on a range of contexts for learning physics ideas provided the teachers with considerable flexibility in meeting the varying needs of their students, thereby promoting inclusion. Questionnaire evidence and test data suggested that the approach was effective in promoting higher levels of cognitive achievement and in enhancing students' enjoyment and

attitudes towards the subject.

You may like to read a case study which describes embedding learning about literacy and writing in a real-life context, a local restaurant. For details of the other examples mentioned above and in other sections of this summary, you may like to look at the 'review of individual studies from systematic reviews' on the QCDA website (see further reading).

What effect did linking to young people's experiences of home and community have on pupils' learning?
Inclusive teaching and learning and citizenship education that connected with the students' community beyond the school made a difference to student learning. There were many ways in which this was done including relating the curriculum to students' personal experiences, and involving parents in their children's learning.

Examples of learning experiences linked to the wider community included:

- helping young people develop as responsible citizens, gain a sense of the ethic of service, and feel a sense of accomplishment
- learning at home that encouraged interactions between parent and child, such as supporting reading activities, so helping to improve pupils' self-esteem and achievement, and
- using money at home to learn mathematics.

'Community Connection', a programme from the US helped young people develop as responsible citizens, gain a sense of the ethics of serving others, and feel a sense of accomplishment (Garcia-Obregon et al). The programme aimed at keeping students in schools and provided opportunities for students to form ties with the community through service. The key point about the service learning was that it was carefully worked out so that curriculum learning aims were threaded into the community activities. The results revealed that students made gains in areas of reading and mathematics and developed greater self-confidence as well as learning how communities work.

Another study (Tizard et al) described how parents in a London borough shared reading activities with their primary aged children. Parents were encouraged to listen to their child reading several times a week and researchers visited them at home several times during the year. The researchers worked hard at developing relationships with the parents. They met them at parents' evenings, at home and at the school gate and occasionally helped parents where necessary. Those pupils who were in the 'home collaboration' group, showed a clear improvement in their ability to read and understand what they had read. The study also showed that home collaboration made a greater contribution to children's reading skills than extra support from teachers. For more details see Tizard's study.

Other Research for Teachers summaries have explored ways of involving parents, such as through setting interactive homework activities specifically designed to promote conversations between children and their parents at home in summaries about parental involvement and **home school knowledge exchange.**

You may like to read a case study that shows another way of connecting with pupils' community beyond school - primary pupils worked with their teachers and outside partners to produce a film about citizenship.

What was the impact on pupils of a curriculum based on structured dialogue and group work?
The studies showed that collaborative learning and structured challenge through group work were effective curriculum experiences that involve learning strategies. However, they also showed that effectiveness depended on teachers providing clear guidance for group working, and designing tasks and activities that helped students develop the skills they needed to work collaboratively in a productive way.

The impact of structured group work was in contrast to less effective curriculum experiences where learning was not collaborative and where there was no specific requirement that students worked together. In such

contexts, even though they were organised into groups, the students tended to work individually, albeit side by side, on tasks for their own ends. We explored effective ways of structuring group work in our earlier summary [Raising achievement through group work](#).

Some studies described how teachers made group work collaborative by structuring activities that encouraged learner voice, promoted learning interactions and generated effective patterns of discussion. These included:

- the TRAC (Talk, Reasoning and Computers) programme which promoted ground rules and awareness of language use to develop pupils' reasoning and collaboration skills
- a 'Physics Curriculum Development Project' which promoted inquiry learning, and
- a programme that involved training students to be peer tutors in mathematics.

In the TRAC programme (Mercer et al) the teachers took the children through a series of lessons to show how the rules worked. The rules were based on evidence about building exploratory talk, in which partners engage critically, but constructively with each other's ideas. In exploratory talk, statements and suggestions are offered for joint consideration. These may be challenged and counter challenged but challenges are justified and alternatives are offered. Children's use of language and problem solving scores increased when compared with control groups. Our earlier RfT [Raising achievement through group work](#) explores how teachers promoted exploratory talk through establishing ground rules in more detail.

Wiejstra's study of the Dutch Physics Curriculum Development project described a programme of lessons that were inquiry-based and actively involved students. They worked in small groups, choosing their own topic of enquiry, including planning and carrying out experiments. The study showed that the more inquiry-based the classroom environment, the more favourable the pupils' attitude to physics, and the greater the cognitive achievement.

In another study (Fantuzzo et al) pupils showing poor performance in maths were randomly split into three groups: one with home-based parental involvement plus reciprocal peer tutoring; one with parental involvement without the peer tutoring and one group with neither. Pupils involved in peer tutoring were put into pairs and trained to take on alternating roles as teacher and student for tackling mathematical problems. Pupils who took on the role of the teacher had to keep their students on task, give prompts and provide praise and encouragement. They had to observe their peers working and coach them to try better strategies. The group with both home-based parental involvement and peer tutoring achieved higher assessment scores in mathematics although both the parental involvement groups showed higher self esteem.

You may like to read a [case study](#) that illustrates the effective use of dialogue and group work in a mathematics context.

How important was building on pupils' existing understandings?
In line with other research, particularly in science and mathematics, the studies showed how pupils bring their own everyday understandings to school with them. (See for example our earlier RfT about [learning science](#)). These 'alternative' conceptions can provide helpful starting-points from which to build new, more complete and accurate understandings. Starting from what pupils know and can do already is explicit or implicit in many approaches to learning highlighted as effective, including, for example, structuring group discussions, which we described in the previous section.

Interventions that helped teachers build incrementally on pupils' existing beliefs included:

- engaging students in thinking about their learning in ecology, by asking students to consider whether and how the ideas fitted their existing beliefs
- teachers finding out what their students already know about chemical reactions and then building on it in order to help students go from concrete to abstract understanding
- using Chinese students' pre-existing knowledge to interpret the text and to create expectations of what they are about

to hear/read in learning English, and

- using pupils' existing experience and knowledge to help them gain greater understanding of what learning is all about, through tackling questions such as 'How is the writing they do inside of school like the writing they do for other reasons?'

One study (Blank) explored the effect of building in structured opportunities for students to reflect on their thinking in their learning about how living things gained energy in food webs. Teachers probed their students' prior knowledge and beliefs through prompting them to ask themselves a number of questions, such as whether what they were learning:

- made sense to them
- gave them ideas for investigations, and
- helped them to solve new, challenging problems about living communities.

The study showed that the beliefs students brought in from everyday life were initially difficult to shake off even when they were presented with scientifically accurate data. But tests held later on showed significant gains for the students who had taken part in the thinking skills approach. They were observed to be much more critical of their own and others' views, and discussion was livelier. Recordings of their dialogue showed that it was extended, and that students listened to each other and gave reasons for their suggestions.

Another study (Strang & Shayer) looked at the application of thinking skills to the teaching of chemical reactions and equations to 14 year olds. Teachers identified any conceptual difficulties students had with the work during initial discussions with individual students. These difficulties included not understanding that the overall mass does not change during a chemical reaction or that gases have mass. They then specifically designed lessons in ways that supported the students in dealing with these difficulties, particularly going from what they observed to the underlying theory. The lessons involved experimental work and discussion, during which the teacher asked questions directed at the conceptual difficulties the students had shown earlier, but did not provide answers. By the end of the study the students' test scores were around 20% higher than the scores of a comparison group which did not receive the intervention.

You may like to read a case study that shows how teachers built on pupils' existing knowledge and understanding to develop their thinking about science concepts.

How did flexibility in curriculum design help to encourage learning across the curriculum?
There were many examples in the studies of effective curriculum design that showed subject teachers developing flexible, inclusive and appropriate learning experiences. Whilst the content was related to particular subject matter, the core learning experiences were, in many cases, transferable across the curriculum. Examples of such cross-curricular strategies included:

- the use of drama to help students understand the issues involved in human genetics and its implications
- a cross-curricular approach to understanding personal relationships in a history project that involved a number of subjects, and
- a study of nature led by a science and an art teacher.

Black and Goldowsky's study showed how drama was used to convey science content about genetics and ethical questions. A play was used to make the complex issue of mapping human genes more real and effectively linked ethical and scientific issues. Such key issues included do we want to know our genetic make-up, and if it points to serious disease, how should our knowledge be used in an ethical society? Having characters students could recognise helped them relate more easily to the debate. The study showed that drama helped to bring key points of learning to life thus lending itself to cross-curricular approaches.

'Facing History and Ourselves' (Beyer & Presseisen), was an interdisciplinary programme involving a study of persecution during World War II, which helped to develop middle and high school students' critical

thinking abilities. The programme involved teachers from literacy, history, French, mathematics, science and art/music working together with support from a consultant. Each department gave students the chance to experience how minorities were treated during World War II through the medium of their particular subjects. Students not only gained in historical knowledge of the period, but showed an improved ability to reason about human relationships and the implications of one's actions.

Another programme (Williams et al), which was run by a science and art teacher, involved 16-18 year olds in learning outside the classroom. Activities included hiking, animal studies, and real world science. Sometimes students worked in teams. This enabled them to tackle challenges and tasks that were greater than the ones individual students could achieve by themselves. For example, on a survival activity students worked in groups, using a map and compass to find their way. For another survival assignment, students were given the task of collecting 100 different plants, labelling them and presenting them in an aesthetically pleasing way. Virtually all the students on the programme said that it made learning and school more enjoyable.

You may like to read a case study in which art and ICT were brought together to create an effective teaching and learning approach to the study of paintings in an art gallery.

How important was subject knowledge and CPD for wide-ranging curriculum design?
The studies showed that teachers needed deep knowledge and understanding of the subject matter to help them to support students' learning through appropriately matched teaching and learning strategies. Teachers needed to draw on both their subject knowledge and their experience and knowledge of learning in order to make their planning and delivery of the curriculum more effective. Professional development was central to this process.

Programmes which showed the importance of teachers' professional knowledge and understanding of children's thinking in the subject included programmes which developed teachers' knowledge and understanding of:

- the different kinds of talk that children use and how to develop more productive forms of talk
- thinking skills and cognitive acceleration
- interactive whole class teaching, and
- children's thinking in mathematics.

The Talk, Reasoning and Computers (TRAC) programme (Mercer et al) helped teachers to support their pupils in moving towards exploratory talk - a way of interacting which emphasises reasoning, the sharing of relevant knowledge and working collaboratively. It was important that teachers modelled such talk for learning too. Teachers also needed the confidence to focus the class on the quality of their talk, and to intervene to support groups during discussion.

Another teacher development programme - Cognitively Guided Instruction (CGI) (Fennema et al) linked how teachers designed and taught mathematics with their students' thinking as they tackled mathematics problems. Teachers found out how their students were thinking by questioning them, reading what they had written and listening to their explanations. They then used what they learned to decide on the students' next steps in learning: '*She [a teacher] kept extensive notes about each child's thinking and used her notes to write problems to fit what she knew'*.

The teachers made children's thinking central to how they taught: '*They came to believe that their role was not to tell children how to think, but to provide an environment in which children's knowledge could develop as the children engaged in problem-solving experiences and reported on solution strategies.*' In one example from the study, children were expected to solve problems such as 24 + 46 in any way they could and to understand how they solved the problem so they could tell their teacher and other pupils about it.

In both these programmes the students made gains in their learning when compared with control groups that

did not take part in the programmes.

The key role of teachers' professional development in designing effective curriculum experiences

Professional development was a crucial component in the design of many programmes. It was also linked to the effectiveness of a wide range of programmes aimed at developing particular pedagogic strategies that ran across subjects, such as thinking skills. CPD supported by external specialists - usually from HEIs - enabled teachers to understand and rehearse children's thinking and strategies prior to the learning experiences themselves.

In the TRAC programme, the CPD took teachers through the professional learning they needed so that they could then guide their pupils through a series of lessons that built up their skills in using dialogue effectively for learning. The CGI programme involved mathematics specialists supporting teachers in exploring and refining their beliefs and attitudes in ways that enabled them to place their students' thinking at the centre of the curriculum experiences they designed and facilitated. Teachers gained an understanding of their students' mathematical thinking and planned how to use it as the basis for the development of more advanced mathematical ideas.

You may like to read a case study that highlights the importance of teachers' professional development in the context of in-house CPD for a mathematics department.

How was the research designed?

This summary draws together findings from 11 studies which were selected from a review of individual studies that had been highlighted in a number of systematic research reviews published by QCA in 2008 (see further reading). These studies were selected because they offered classroom-based examples of the six key findings highlighted by the review.

Nine of the 11 studies were evaluations; one of them was a randomised controlled trial (in which intervention strategies are randomly allocated to pupils). There were also two case studies.

Seven of the studies used pre- and post tests or assessments and two employed post-tests. One used a mixture of surveys and school data, including students' performance on state tests. One study used post intervention interviews and questionnaires. Seven studies involved the construction of intervention groups and control or comparison groups that were not subject to the interventions.

The research reviews which disclosed the individual studies followed the methodology used in systematic reviewing and included:

- identifying potential reviews, published from 2000 onwards
- developing search terms based upon definitions taken from international databases, thesauri and search engines
- filtering the results of the inclusive searches to create a map of existing research, and
- recording data from the studies in a custom-built database to enable read-across of patterns and trends in the data

The methodology also included searching the following relevant websites and databases:

- the EPPI-Centre Evidence Library;
- the Evidence Based Policy and Practice website;
- National Foundation for Educational Research website;
- the Campbell Collaboration website from the US;
- the What Works Clearinghouse from the US;
- the Education Works website from New Zealand; and
- ERIC, BEI, the UK Educational Evidence Portal, IngentaConnect, Education-Line, CERUK, and Regard (ESRC).

What are the implications?
Teachers may like to consider the following implications of the findings of this research:

- Real life contexts were found to be effective in promoting student motivation and achievement. How can you create contexts based in real life, such as transport, the local environment, local institutions, which cover all the necessary elements of the content?

- Dialogue helped students tackle open-ended activities that involved them in identifying what they knew and understood already so they could build on it effectively. How can you increase such opportunities? Could you, for example, turn more content into challenging open-ended activities that require pupils to think together in a structured way to solve a problem?

- Cross-curricular teaching and learning provided teachers with extra flexibility for developing the curriculum and opportunities to help pupils connect ideas together at a deeper level. How can you work with colleagues from other subject areas to identify opportunities where cross-curricular approaches could be effective, e.g. drama and science, mathematics and design, literacy and science, ICT and art?

School leaders might like to consider the following implications:

- Evidence in the summary suggests that deep subject knowledge combined with knowledge of effective teaching and learning strategies are essential for effective curriculum development. How do your school CPD strategies approach combining the development of knowledge and understanding of teaching and learning strategies and subject knowledge? How best might you use curriculum design as a form of professional learning for teachers?

- Curriculum linked to home and community helped students' learning and motivation. Are there ways in which you could enhance this process through the services of e.g. governors, parents or other members of the local community who may be involved in early learning centres, volunteer or other community organisations?

- Can you create opportunities for teachers to plan work with parents that requires students and their parents to actively work together? Examples could include sharing literacy activities that involve parents, asking pupils to make predictions and answer questions about what they are reading?

Gaps in the research
Gaps that are uncovered in a piece of research have a useful role in making sure that future research builds cumulatively on what is known. But research also needs to inform practice, so practitioners' interpretation of the gaps and follow-up questions are crucial. We think the following kinds of studies would usefully supplement the findings presented in this summary:

- more research into how to 'diagnose' or identify students' existing conceptions and build on them

- more studies, particularly longitudinal ones, of the impact of family and community-based learning and its interrelation with school-based learning studies, and

- more English research into mathematics teaching and learning practices and how these are influenced by both the culture of English schooling and teachers' beliefs.

What is your experience?
Do you have any evidence regarding strategies for developing the curriculum in ways that are particularly effective in meeting the needs of your pupils? Do you have action research or enquiry based school strategies/experiences or programmes that are designed to explore new ways of presenting the curriculum? We would be interested to hear about examples of effective approaches, which we could perhaps feature in our case study section.

The studies
We used the following 11 studies for this RfT summary:

Beyer, F. S., & Presseisen, B. Z. (1995) *Facing History and Ourselves: Initial Evaluation of an Inner-City Middle School Implementation*. Philadelphia, PA: Research for Better Schools, Inc.

Black, D. R., & Goldowsky, A. (1999) Science theater as an interpretive technique in a science museum. *Paper presented at the Annual Meeting of the National Association for Research in Science Teaching*. Boston, MA: March 28-31.

Blank, L. (2000) A Metacognitive Learning Cycle: A Better Warranty for Student Understanding. *Science Education*, 84 (4), pp. 486-506.

Fantuzzo, J. W., Davis, G. Y., & Ginsburg, M. D. (1995) Effects of parent involvement in isolation or in combination with peer tutoring on student self-concept and mathematics achievement. *Journal of Educational Psychology*, 87, pp. 272-281.

Fennema, E., Carpenter, T., Franke, M., Levi, L., Jacobs, V., & Empson, S. (1996) A longitudinal study of learning to use children's thinking in mathematics instruction. *Journal for Research in Mathematics Education*, 27, pp. 403-434.

Garcia-Obregon, Z., Trevino, J., Uribe-Moreno, S., & Zuniga, S. (2000) *The Effectiveness of a School Based Service-Learning Program 'Community Connection' at a South Texas Middle School* . Texas: South Texas Research and Development Center

Mercer, N., Wegerif, R., & Dawes, L. (1999) Children's talk and the development of reasoning in the classroom. *British Educational Research Journal*, 25, pp. 95-111.

Strang, J., & Shayer, M. (1993) Enhancing high school students' achievement in chemistry through a thinking skills approach. *International Journal of Science Education*, 15, pp.319-337.

Tizard, J., Schofield, W.N., & Hewison, J. (1982). Collaboration between teachers and parents in assisting children's reading. *British Journal of Educational Psychology*, 52, pp. 1-15.

Wierstra, R. F. A. (1984) A study on classroom environment and on cognitive and affective outcomes of the PLON-curriculum. *Studies in Educational Evaluation*, 10, pp. 273-282.

Williams, D., Yanchar, S., Jensen, L., & Lewis, C. (2003) Character education in a public high school: a multi-year enquiry into unified studies. *Journal of Moral Education*, 32, pp. 4-30.

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Case studies

We have chosen six teacher case studies - one to illustrate each of the six key findings explored in the summary.

- Case study one focuses on literacy and writing in a local restaurant as an illustration of learning in a real-life context.
- Case study two shows how two teachers connected their students' learning experiences with the community. The teachers and their pupils worked with outside partners to make a film about citizenship.
- Case study three illustrates how a group of teachers promoted effective dialogue and group work in mathematics.
- Case study four shows how teachers set about building on students' existing knowledge and understanding in science.
- Case study five is an example of flexible learning across the curriculum. It describes how ICT and art were combined to help students study paintings in an art gallery.
- Case study six illustrates the importance of effective CPD in providing teachers with the skills they need to develop the curriculum in ways that meet the needs of their students, increase challenge and create motivating learning contexts.

Context-based learning

We chose this case study because it focused on embedding learning in a real-life context, a local restaurant. The teacher leading the project believed a restaurant context would offer opportunities for non fiction writing of all types and also inspire the pupils. The aims of the project were to:

- expose the children to real life writing and to create enjoyment of writing
- revise text types for non fiction writing in a lively and inspiring way that would engage children in the build up to national tests, and
- enable the children to write any type of text with confidence.

What did the children do?
The children undertook a number of activities, including:

- researching Rick Stein's Seafood Restaurant in Padstow, Cornwall and creating menus and advertising material for the restaurant
- writing letters about the food and service at another local restaurant which their teacher posted on a weblog that charted the whole project
- writing applications for jobs based on real vacancies on the Rick Stein restaurant website
- being interviewed for a job at the restaurant, and
- writing restaurant reviews for local newspapers and magazines.

What learning experiences did the teacher organise and present to her pupils?
The teacher used drama and role play before the pupils started writing as well as showing them what bad writing looked like. The pupils found it particularly helpful to see their teacher's bad writing and then have a chance at improving it in a shared writing exercise. The teacher engaged pupils in 'reading the text type' and getting them to understand and identify language and organisational features of writing. The pupils were encouraged to use both formal and emotive language, identifying 'wow' words and phrases to use in their own writing. Using the weblog enabled the teacher to publish the children's work online and gave other teachers and parents the opportunity to read what the pupils had written and provide feedback.

How did the pupils benefit?
The project helped make the pupils enjoy learning and the quality of the children's writing improved. For example: '*As I walked through the entrance the aroma-therapy awoke my senses. The restaurant has a big, orange sparkly glow and staff that are fast on their feet. Music plays softly in the background and is very calm and relaxing which makes the room fill with happy smiles'* (Extract from a restaurant review)

Karen Garner, Year 6 Class Teacher & Literacy Coordinator
Shirley Warren Primary and Nursery, Cornwall
Write out to lunch!

Connecting with the community

We chose this case study because it describes a project in which connections were made between the school curriculum and wider community. It involved a class of 11 to 12-year-old pupils from a Glasgow primary school and their two job-share teachers in making a film about citizenship in a partnership with a theatre and film production company. The teachers aimed to create a real context for developing their pupils' citizenship skills, while also giving them a sense of achievement. The project took six months from the initial proposal to the premiere in a Glasgow Cinema.

What activities did the pupils engage in?
The teachers prepared the pupils for making the film by working on their group work skills. They set up a

number of group tasks in different areas of the curriculum. In their feedback to the class they emphasised group performance and pupils' individual contributions to the overall work of the group. According to the teachers: '*the class very quickly got the message that they rose or fell by collaboration and group outcomes'*.

While working on the film the pupils also explored citizenship through studying units such as: Our Community, Rights and Responsibility, Government and Law, UN Convention on the Rights of the Child and Effecting Change. The units were flexible and lessons evolved in response to the children's level of interest and needs. Invited guest speakers included representatives from a variety of organisations, such as Amnesty International. The pupils' responses to the units showed how their awareness of citizenship and inclusion were growing. The class made lists, without prompting, of excluded groups and constructive ways of making society more inclusive.

How did the pupils work with professionals to make the film and what skills did they learn?
Making the film involved designing a number of key learning/activity stages, including:

- a local actress helping the children develop their drama and improvisation skills. She explored citizenship with them, developed their confidence in story telling, and taught them acting skills
- involving a theatre company and film production company in helping the class with scripting. The children were soon using film and television vocabulary effectively
- designing the work so that pupils worked in small groups and took responsibility for their own small scene such as, a panel discussion, supported by the media professionals, class teachers and other staff, and
- casting parts and organising the filming schedule. The external professionals took the children's scripts, made them practical, explaining each step to the children and ensuring that each child was involved in the acting and filming processes.

During the week-long filming pupils took on the roles of sound engineer, production assistant, assistant director - '*some of them displaying the qualities, creativity and bossiness of true professionals'*. Some additional film was taken in class, teachers and children were interviewed, and a documentary was put together to inform other teachers about the project. Pupils wrote a booklet with support from the local authority's advisor in social subjects.

How did the pupils benefit from the project?
The teachers reported pupils becoming much more confident in their approaches to each other and to their schooling. Some of them displayed a high level of knowledge and understanding of rights and responsibilities. In the words of one pupil: '*Everybody had a lot of fun filming. I learned we should care for the community and not to be selfish and help elderly people to cross a road. I really enjoyed making the film'*.

Pupil consultation and involvement became the norm and seemed to work well. Pupils met and in most cases exceeded their attainment and attendance targets. Teachers noted that their creative writing and oral communication skills had improved significantly.

The film was launched at the Glasgow Film Theatre before an audience of parents, friends, family, colleagues and invited guests. One of the teachers commented: '*Hearing the applause from their guests was magical for them. They had achieved something that had seemed impossible...'*

This sentiment was clearly echoed by the pupil who said:
'*Mrs. Harker spoke (at the premiere of the film) and said how proud she is of us and things. Then they played the film and it was brilliant. It was funny. At first it was embarrassing seeing ourselves on the big screen but then we got used to it. It is my favourite film in the whole universe...'*

Reference
Clare Harker and Geraldine Smith, Holmlea Primary School, Glasgow
Developing citizenship and increasing pupils participation

Enhancing pupil dialogue in collaborative group work

We chose this case study to illustrate a way of promoting effective dialogue and group work. A whole school focus on literacy skills in one of the two secondary schools involved in the study helped the mathematics departments to explore the difficulty many students found when communicating their thinking and reasoning in extended investigative tasks and GCSE coursework and in the mathematics curriculum generally. The aims of the study were:

- to investigate how different pupil groupings affected pupil dialogue, and
- to develop and evaluate strategies and resources to support collaborative group work and pupil dialogue.

How did teachers set about developing their students' group discussion skills?
The teachers undertook a number of 'research lessons' that provided a baseline and opportunities for intervention. The teachers selected 'case pupils' to represent different sections of the class, then planned a lesson, or lessons, with these pupils in mind. One member of the research team taught the lessons, whilst other members made observations and recordings of the case pupils' behaviour and responses to the lessons. After each lesson the research team met to analyse the data they had collected and use it for planning the subsequent lesson. For example, the Year 8 series of research lessons included:

- **lesson 1 - observing unstructured group work**
  Pupils were asked to work together on a mathematical investigation with no guidelines for group work. Teachers made and analysed audio recordings to find out how far pupils engaged in talk for learning.

- **lesson 2 - structured group work**
  Teachers held a class discussion aimed at producing 'ground rules for working in groups', such as, 'give reasons to back up anything you say'. They also restructured some of the groups so that pupils were working with others of the same gender and of closer ability to their own.

- **lesson 3 - structured group work (higher ability set) and 'Blip-Blop' activity**
  Teachers provided ground rules and arranged pupils in single-sex, similar ability friendship groups. The task - Blip-Blop problems - encouraged pupils to discuss processes they would use to solve problems. (All values had been replaced by nonsense words, for example 'Sam has baba packets of sweets. Each packet has gaga sweets in it. Sam gives away nana sweets from each pack, etc. How many sweets does he have left?') One member of staff taught the lesson and two colleagues observed and recorded pupil discussions.

What did the teachers learn about designing the curriculum?
Overall, the teachers found that group work was an effective way of promoting talk for learning, particularly when they took steps to make it structured. Without the ground rules, most of their students' talk was cumulative (repetitions, confirmations and elaborations), with some disputational talk (disagreements and individual decision-making) but little evidence of exploratory talk, where students explained and justified their decisions. The teachers also found that homogeneous groupings (based on gender, ability or level of communication skill) led to more frequent constructive dialogue, particularly where the groups were composed of girls.

Reference
Corina Seal, Sweyne Park - Secondary School, Essex.
How can we encourage pupil dialogue in collaborative group work?
National Teacher Research Panel Conference (2006) summary

Building on students' existing understandings

This case study shows how teachers built on KS3 pupils' existing knowledge and understanding to develop their thinking in relation to science concepts - in particular their misconceptions of particle theory. The study involved Year 6 and 7 teachers and their classes.

The teacher-researcher (who was also KS3 co-ordinator) focused on particle theory because it is an abstract concept; pupils have common misconceptions about particles because they cannot see them. She believed that

if pupils are to understand the abstract concept of particle theory at KS3 their ideas about states of matter and dissolving must be more concrete at KS2, and they must be using keywords appropriately in order to build up a more complex vocabulary.

How did the teachers find out what the pupils knew already?
The teacher-researcher collected a variety of data to find out what the Year 6 pupils had already learned and understood, including:

- a questionnaire that asked them to comment on their feelings and opinions of science. Comparing their results to those of a group of Year 7 pupils suggested their enthusiasm for science tailed off during Year 7
- a test that measured their understanding of particle behaviour in phenomena they were likely to meet in Year 7, and
- interviews with the pupils to determine their use of keywords in describing what happens to particles during melting, evaporating, freezing and dissolving.

The primary school teachers observed secondary science lessons about particles in order to find out how pupils' ideas developed as they met more complex phenomena. They noticed that pupils struggled to use keywords which were taught at KS2 and concluded that they needed to focus more deeply on keywords at KS2. Secondary school teachers also visited the primary school for half a day of lesson observations to find out more about teaching and learning strategies used there.

What ideas did pupils come up with?
The Year 6 pupils' ability to explain phenomena using the particle idea varied:

- Pupils thought particles had popped, melted or disappeared when a solid melted (this accounted for 70% of the pupils interviewed).
- When a metal ball was heated, pupils thought the particles moved to the sides of the ball as the ball expanded or the particles themselves expand.
- Most correctly drew and attempted to explain what happened to particles as sugar or salt dissolved.

Unlike the pupils in Year 6, the Year 7 pupils incorrectly drew sugar dissolving or used the wrong terminology in their explanations, suggesting a weak link between concept and keywords.

What activity did the teachers organise to help develop the pupils' understanding?
The teachers planned an investigation for Year 6 pupils that aimed to find the melting point of chocolate and to explain the melting using the particle idea. (Explanations using the particle idea are a key part of KS3 science and represent a continuous and logical development from KS2).

Working with talk partners, pupils were encouraged to use a number of strategies including:

- a 'washing line' of terms
- card organising to make an explanation
- trump cards based on terminology, and
- modelling.

The activity took place over a number of lessons in both the primary and secondary schools (the latter gave pupils access to more sophisticated apparatus), covering:

- pupils' recall of the properties of solids and liquids, modelling predictions and planning their investigation
- pupils carrying out the practical work, evaluating it and learning about accuracy and reliability
- pupils attempting to describe melting in terms of particles arrangement, and reviewing their initial ideas, and
- pupils presenting what they had learned, ensuring correct use of keywords.

How did pupils benefit?

The teachers reported how the pupils made excellent presentations to explain what happens to chocolate at its melting point. Pupils used their bodies to model particles vibrating and moving apart and used accurate terminology to describe the process. Some pupils made physical models out of paper and card. The teachers also reported an improvement in the scientific accuracy of pupils' explanations although heating a metal ball and the effect of heat on an aerosol can were not so well understood.

Most pupils' ideas about particles had changed, for example ' *I can explain melting and freezing better*' or ' *I know that particles vibrate more when heated in a solid'*. Pupils learned new keywords, such as, 'accuracy', 'reliability', 'vibrate' and 'collide' and around half felt confident to explain these words or use them in a sentence. When presented with a concept cartoon in which the four pupils in the sheet had their own ideas of what happens to chocolate as it melts nearly all the pupils were able to identify the misconceptions and correct the statements.

What did the teachers learn about curriculum planning from working with each other?
The secondary teachers found the primary school strategies for discussion helpful and planned to use them in their Year 7 lessons. These strategies included: talk partners, discussion starters, sentence starters for speaking and the differentiated card sorting activities. They also felt more aware of pupil misconceptions as they entered Year 7 and proposed questioning pupils' understanding of a topic beforehand to elicit misconceptions. The primary teachers planned to spend more time on developing abstract concepts and challenging pupils more, especially with regard to applying terminology about a concept.

Reference
Leyla Di-Bellonia
Eliciting children's misconceptions of particle theory to support their literacy development in science
Gatsby Teacher Fellowship report

Flexible learning across curriculum areas

This case study describes a flexible and effective use of ICT in the study of paintings in an art gallery, a technology application which could be applied in many other curriculum areas. The project involved facilitating A level and GCSE students' analysis and understanding of works of art and relating this knowledge and understanding to their own art work at school by using handheld wireless technology.

What learning experiences did the students undertake?
Learning took place through questioning and dialogue. Using the Internet and wireless technology students accessed material called a 'trail' based around three to four paintings in the gallery. A trail consisted of a series of structured, simple questions that invited the students to construct an understanding of the paintings for themselves. For example:

Ignore the main characters and concentrate on the atmospheric effects of light in the background. How would you describe the atmosphere of the landscape? Select from

- peaceful
- stormy
- hazy
- sunny
- gloomy

The students examined the paintings, recorded their answers on the handheld computer and downloaded their notes when back at school to use in their coursework.

What impact did the new approach have on the students?

The project was met with a very positive response from the students. They felt that the trail questions made them more curious about the paintings rather than just seeing them as pieces of art. They were curious to know why and how an artist had chosen to paint in a particular way and they liked recording their own thoughts and information about the paintings.

The learning experience though private and personal, also made the students want to share their views with each other - quite a different experience to gallery talks where students felt passive and 'talked at'. The students appreciated not being overtly directed as to how to view the paintings. They began to value their own opinions and increasingly engaged in constructive dialogue with peers, teachers and gallery staff. The approach also encouraged less able students to participate in group discussion because they knew their opinions were valid.

The richness of the experience also enabled the students to make meaningful connections between the work they had seen and their own practice. Many of the students paid greater consideration to the vital elements of paintings - the use of colour, line, light and drama etc - in their own work. One student felt encouraged and inspired to create her own paints in the way the 'Old Masters' had. She used a variety of organic sources, such as egg, stone and shells to create her own paints.

What did the teacher learn from the new approach?
The project helped the teacher focus on *how* students learn rather than *what* they learn. Reflecting on practice was a significant feature for both the students and the teacher and played a crucial part in developing a vibrant learning community and changing students' perceptions of themselves as learners.

Reference:
Ellie Burkett
'A new way of looking?' Reflections upon one teacher's experience of supporting learners using handheld computers
National Teacher Research Panel Conference (2008) summary:

Effective CPD in mathematics

We chose this case study because it shows the importance of professional development for enabling teachers to make their planning and delivery of the curriculum more effective. The CPD in this example focused on enquiry-based teaching and learning of mathematics in Year 7.

Previously, the mathematics department had taught in a traditional way with textbooks featuring prominently. The CPD was led by the second in charge of the department in response to a perception that the highest attaining pupils were not being sufficiently stretched or interested by the maths curriculum as offered. The teachers used a lesson study approach which involved an in-depth look at a specific subject area - in this case factorising quadratic equations - and an analysis of how it was being taught and how pupils were learning. A second aim was to use the CPD opportunity to engage all members of the department in professional learning in terms of changing their beliefs and attitudes, as well as their practice.

What did the CPD involve?
The teachers worked together through a number of stages, including:

- designing a plan for an introductory lesson on the topic of factorising quadratics for a Year 9 class (this is earlier than the topic is normally introduced but the teachers felt it appropriate for the students involved)

- an introductory lesson taught by the CPD leader and videoed by another department member

- collaborative discussion of the video by the whole department who used it to revise their initial lesson plan in the light of the students' responses, and

- trying out new approaches in the classroom.

Based on their analysis of the students' responses, the teachers looked at their set of examples and questions

and revised them. They discussed the responses the students had made in the videoed lesson and made suggestions about how the difficulties and misconceptions that had arisen might be addressed. Some time was devoted to predicting the students' likely responses to the new suggestions.

A key aspect of the CPD was the use of video recording as a means of observing and critically reflecting on a particular lesson. Using video gave the teachers an opportunity to scrutinise closely the responses of the students. The role of the leader within the school-based CPD was important, particularly in relation to bringing in new ideas from research and development activities in mathematics from elsewhere. The involvement of the whole department was critical in supporting individuals in reflecting on, and changing their practice.

How did the CPD affect learning and teaching?
The teachers were successful in establishing a classroom culture that involved collaboration between the students. They gave the students open-ended tasks that offered students the opportunity of independently following different lines of enquiry and then explaining their investigations to each other.

There was evidence of students actively engaging in learning mathematics and being interested in and committed to the process. Students moved around the classroom to support each other and there was extensive talk about mathematics.

Teachers found asking more open questions and promoting discussion between students gave them much more insight into the students' knowledge than a traditional approach would have done: ' *You wouldn't know that your pupils had this level of understanding without working like this'* . Teachers commented on the shift in their focus, from their own teaching onto a focus on the students' learning.

Reference:
Researching effective CPD in mathematics education

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Further reading

The research reviews

QCDA website, Building the Evidence Base project, Strand 3, Literature Reviews.

Summaries of related research

Research Informed Practice digest: *Reasoning as a scientist: ways of helping children to use language to learn science*

Research Informed Practice digest: *The effects of interactive reading homework and parent involvement on children's inference responses*

Research Informed Practice digest: *The impact of a thinking skills approach (CAME) on students' mathematical ability*

Research Informed Practice digest: *What role does communication play in co-operative learning?*

Resources

Context-based maths resources
[Bowland Maths](#)

Group work
[Improving Effectiveness of Pupil Groups in Classrooms](#)

Talk
[Guidance materials for supporting pupil learning through talk](#)

Teaching through drama
[Breathing life into science through drama](#)

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Appraisal

Robustness
The studies selected for this RfT summary report on school-level strategies that developed and implemented the curriculum in ways that engaged the more difficult to motivate students and those who were achieving significantly below their peers.The evidence was based on data from 11 studies selected from a 'review of individual studies from systematic research reviews' published by QCA in 2008, which used rigorous inclusion criteria. The studies were selected for their robustness and relevance in relation to curriculum development, planning and implementation. They included:

- nine evaluations; one of which was a randomised controlled trial (in which intervention strategies are randomly allocated to pupils)
- the use of pre- and/or post tests or assessments in 7 studies, and
- the construction of intervention groups and control or comparison groups that were not subject to the interventions in 7 studies.

Relevance
In many local authorities and schools there are significant numbers of children who are not engaged by the current curriculum and who are attaining at a level below their abilities. Teachers of these children are looking for approaches which help them enhance their learning. The studies found that when teachers brought the curriculum to life for their students by embracing skills, values and personal development in addition to what was taught and learnt it helped them to:

- motivate students
- challenge the most able and talented, and
- close the gap in attainment.

Applicability
The studies found evidence for the effectiveness of curriculum planning and delivery that included the six key features:

- learning that is 'context based'
- connecting the curriculum with young people's experiences of home and community
- structured dialogue in group work and collaborative learning
- building on pupils' existing understandings

- flexible learning across different areas of the curriculum, and
- teachers' excellence and professional development in subject knowledge.

Writing

The studies are accessible to teachers and all have a focus on the implementation of the strategies and programmes in the schools concerned. Where appropriate they provide detailed descriptions of professional development undertaken by the teachers concerned. Overviews of the main features and findings of the study are presented, which are particularly helpful where the study authors have used statistical methods.

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