Teaching and Learning RESEARCH BRIEFING

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Interactive Teaching and ICT

The Interactive Teaching and ICT project examined deeply interactive or 'dialogic' teaching in schools, in which pupils have more influence over learning than with more direct, 'authoritative' teaching. The project was designed to probe possible links between deeper interactivity in teaching, the use of ICT, and learning. It also aimed to explore how engaging in reflective dialogue with researchers contributed to changes in teachers' thinking and practice.

- A higher proportion of dialogic teaching is beneficial for learning. Good teachers use ICT to stimulate and support reflective and dialogic interaction → Resources and professional development for teachers to encourage ICT that supports dialogic interaction should help to improve learning
- ICT can help learners to engage with lesson content and influence the course of lessons, but not always in the way intended → Teachers should be aware of the need to intervene during ICT tasks so that pupils achieve learning objectives in addition to task outcomes
- The potential of ICT to support group work is not widely recognised → Research on the role of ICT in supporting forms of talk in group work should be built upon with more resources and professional development
- Reflective dialogue with an observer concerning lesson activities and resource evaluation is valuable for teachers' professional development → Teachers benefit from mentor support to explore resources, gain skills, and reflect on their teaching with ICT.

Further information

An extensive website (www.interactive-teaching.org.uk) has been developed in English and Welsh to provide more detailed information about the project and its findings, including case studies of lessons.

A book in the TLRP/Routledge *Improving Learning* series has been proposed, with the provisional title *Improving learning through interactive teaching with ICT*

Papers in academic journals include:

Kennewell, S. & Beauchamp, G. (2007) The features of interactive whiteboards and their influence on learning, *Learning, Media and Technology* 32(3), 227-241

Tanner, H. & Jones, S. (2007) Using Video-Stimulated Reflective Dialogue to learn from children about their learning with and without ICT *Technology, Pedagogy and Education*, 16(3), 321–335

Kennewell, S., Tanner, H., Jones, S. & Beauchamp, G. (2008) Analysing the use of interactive technology to implement interactive teaching, *Journal of Computer Assisted Learning* 24(1), 61-73.

The warrant

Our research design was built on a theoretical base which was developed specifically to account for the mediating impact of ICT on teaching and learning. This framework characterises learning as a process of change during participation in social activity and subsequent reflection on action, and defines teaching as a dialogic process of setting goals for learners and orchestrating features of the environment to make it feasible to reach them with some effort.

The conduct of the project involved teachers and pupils as participants, joint lesson observation by two researchers, the reflective sharing of perspectives, reflective dialogue with teachers and pupils, and the evaluation of evidence for possible claims across classes, subjects, and the phases of the project.

Furthermore, the results demonstrated coherence across all methods of data collection, which included teacher interviews, pupil interviews, lesson observations, reflective dialogue, and comparison of attainment data.

There was consistent engagement with research users to ensure relevance. This involved heads of the schools, members of the advisory group (from national and local government, teacher education, and teachers from other schools), and engagement with the research community through papers, and presentations at conferences and to networks of colleagues within and beyond TLRP.

Project website:
www.interactive-teaching.org.uk

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Teaching and Learning Research Programme

TLRP involves over 60 research teams with contributions from England, Northern Ireland, Scotland and Wales. Work began in 2000 and will continue to 2011.

Learning: TLRP's overarching aim is to improve outcomes for learners of all ages in teaching and learning contexts across the UK.

Outcomes: TLRP studies a broad range of learning outcomes, including the acquisition of skill, understanding, knowledge and qualifications and the development of attitudes, values and identities relevant to a learning society.

Lifecourse: TLRP supports projects and related activities at many ages and stages in education, training and lifelong learning.

Enrichment: TLRP commits to user engagement at all stages of research. It promotes research across disciplines, methodologies and sectors, and supports national and international co-operation.

Expertise: TLRP works to enhance capacity for all forms of research on teaching and learning, and for research informed policy and practice.

Improvement: TLRP develops the knowledge base on teaching and learning and policy and practice in the UK.

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The research

Project design and data collection

The project involved a total of 41 teachers from 21 primary and secondary schools and involved two one-year phases. The teachers worked in pairs to plan a six-month period of teaching in one subject (mathematics, science or language) with a particular class in each year-long phase of the project. In phase 1, one teacher worked with ICT and one without. In phase 2, all teachers used ICT as a resource when it was considered the most effective way to teach each topic. Five teachers taught through the medium of Welsh. Teachers using ICT worked with the resources that were available to them. All had an interactive whiteboard, but there were many variations in the type of board and in the other items of equipment that were used by pupils.

Teachers were asked initially about their perceptions of interactive teaching and the effects of ICT. The pupils were all given an initial assessment covering the topic or topics being taught. A group of pupils from each class was also asked about how they participated in lessons, how they learned from this, and how ICT helped. After a classroom observation by two researchers (which was recorded by two cameras), the teacher selected a particular section of the lesson to discuss with a member of the research team. The group of pupils were also asked about their perceptions of this episode, using the video as a prompt for recalling the activity. A second pupil assessment, using the same test, was carried out at the end of each phase of teaching.

Interview data was used to determine the common characteristics of interactive teaching and the differences between subjects and between Key Stages. Observation data was explored using a framework for analysing teaching and learning in activity settings (see Figure 1). Where possible, the assessment data was used statistically to compare gains in attainment between ICT and non-ICT groups.

Professional development was a key theme of the project. We expected that teachers would change their beliefs and practices to some extent through the reflective aspect of the data collection, and through the project conferences. We held two conferences: an initial one to induct teachers into the research and one between phases to allow them to share ideas with colleagues in other schools and Key Stages. The effects of this process were studied by means of final interviews and a post-project evaluation conference.

Teachers' developing views of interactive teaching

Most teachers initially spoke clearly about the relationship between their role in generating interactivity and greater pupil responsibility for managing activities, generating ideas, reflecting on learning and assessing what they had achieved. This suggested that their thinking, at least, was predominantly dialogic in nature.

The key factors in encouraging dialogic interactivity were feedback on pupil response and the sustaining of interaction for as long as was necessary for learning. Teachers felt that group work encouraged pupils to initiate interactions, and tasks were often structured to ensure that these interactions took place. Several teachers gave pupils explicit peer-teaching roles. Many of the teachers highlighted the value of making mistakes 'public' and discussing what changes should be made. ICT was seen by some as a means of encouraging learners who would not normally attempt an answer. Teachers devoted considerable time to selecting appropriate resources, because of the difficulty of finding material with an appropriate level of challenge. Welsh-medium teachers identified a shortage of published ICT resources.

It was clear that an interactive approach involved changes in role from traditional pedagogy. In a dialogic lesson, the teacher becomes more of a manager or facilitator of interactions designed to bring about learning, while learners take an active role and engaging in actions traditionally associated with the teacher such as questioning, evaluating and explaining. Problem-solving was encouraged in all subjects, including language learning.

By the end of the project, some teachers were conscious of a shift to more dialogic pedagogy, and most teachers said that ICT had become more integrated into their work. Its main role was to provide additional and replacement material such as images, video clips and quizzes into their practice. Some experienced users recognised that they had become more selective about their use of ICT. Some had changed their ways of working, for instance by letting pupils work on the interactive whiteboard in small groups. They were using the ICT room to enable pupils to find things out for themselves as well as presenting prepared material to them on the board. But teachers felt that ICT could not do everything, and needed to be supplemented with practical work in science and oral work in language teaching.

In reflecting on the project process, teachers valued the collaboration with other teachers, but felt that being able to watch themselves teach, and discussing lesson episodes with the researcher, were the most effective parts of the project. They had become more open to ideas and more confident in making independent judgements and developing their own expertise with ICT.

Pupils' views

Although they were interviewed in groups, pupils expressed a wide variety of individual preferences on each issue we explored. Pupils differed in their preferences for work groupings in the classroom, and for particular modes of communication including songs, conversations, drawing, manipulating equipment, physical movement, pictures, and movies. Many disliked writing, and copying from the board or books was widely felt to be a negative factor in learning. Some recognised that they also learned by watching other pupils performing actions, and making mistakes, at the front of the class.

But there was widespread agreement on the need for active participation and 'fun', characterised by unpredictability, rapid feedback and, for some, competition. Many pupils were clear that 'fun' was a factor which helped them to learn. The value of ICT was clearly seen in terms of how it supported participation and fun, so that games and quizzes were particularly popular. Clarity of the visual display and rapid feedback on their ideas were also seen as valuable in learning.

Classroom practice and participants' reflections upon it

We explored the relationships between the interactivity of teaching and pupil learning by examining features of the classroom including the communications media available there, forms of interaction, the nature of the tasks set for pupils, and the extent to which tasks are managed by teachers and pupils to bring about learning.

Teachers frequently gave pupils the opportunity to work at the front of the class during whole-class teaching. This had an effect on the rest of the class which was often different from when the teacher was doing the work. The pupils generated empathy and spontaneous advice from peers, which maintained engagement and participation from the class.

ICT affected the class in a number of ways. Its speed was valuable where it generated rapid feedback on learning, but could be a drawback when a fast pace was prioritised over strategic thinking or accuracy. Individual or paired activities using computers sometimes allowed pupils to obtain the answer easily with no need to think, or to get the right answer by trial and error with no understanding. This problem was usually overcome during full-class sessions run by the teacher at the whiteboard.

ICT's ability to repeat a sequence of events with slight variation is exploited when learners see a succession of cases of a particular phenomenon. This can help them to learn inductive concepts.

Few teachers used the full features of the interactive whiteboard. Most used only drag-and-drop or even just projection. These methods are good for generating classroom discussion. The large screen was particularly used for sharing ideas with the whole class, mainly in the form of PowerPoint presentations, for displaying pupils' work, and for reviewing earlier work.

Impact on learning and attainment

In Phase 1 we found an overall pattern of 'no significant difference' between classes taught with and without the use of ICT. This corroborated the indications from the qualitative data that although ICT generates attention and interest, few teachers were able to convert it into significant improvements in learning. It seemed that the level of interactivity of teaching is a more important factor for successful learning than whether ICT is used. Indeed, it was found that in all cases where some teachers were observed to use a substantial amount of dialogic interactivity, they achieved a higher gain in attainment during Phase 1 than colleagues using less dialogic interactivity – in some cases, significantly so.

Some teachers who achieved highly during Phase 1 without the use of ICT appeared to be less effective relative to their colleagues when they started using it in Phase 2. This could reflect a temporary dip in effectiveness whilst gaining expertise in using this new technology. Additionally, there was evidence that some ICT-using teachers in Phase 1 had become more effective at using it to support interactive teaching. This could be explained by their reflecting on their experience, discussing their work with other teachers, and acquiring more and better resources.

Major implications

There was a clear balance of evidence, from both observation and assessment data, that more dialogic interactivity, rather than the use of ICT in itself, was the main factor in improving learning and attainment. There was widespread agreement between teachers and pupils that pupils need to participate actively and influence the course of activity, including whole-class teaching episodes, in order to improve learning. Those teachers who recognised a change in their pedagogy shifted more responsibility to pupils, listened to them more, developed a culture whereby pupils could make public mistakes in the expectation of support and explanation rather than fear of ridicule, made their actions contingent on what pupils did, and encouraged pupils to teach each other. They questioned pupils more deeply, set more open, activity-based tasks in groups, allowed more movement and prepared more differentiated activities to cater for pupils with additional needs. This suggests that, when planning the use of ICT, teachers should focus on more dialogic activity which mixes whole-class, small group, pair and individual work and is supported by appropriate resources.

There was evidence that ICT was being used to assist in this approach, but the interactivity supported remained at a relatively low level while teachers gained skills and evaluated resources in ICT. ICT supported dialogic teaching by providing for learner interaction:

- about ICT resources (such as discussion of a video clip or critique of a pupil's writing displayed on the board)
- with ICT resources (such as playing a game or attempting a challenge with immediate feedback)
- through ICT (for example collectively developing a concept map in Science or constructing a sentence in Welsh).

Pupils' ICT skills may need to be developed in order to achieve the potential for learning through ICT.

The ATLAS framework (*see Figure*) was valuable in revealing that learning can be sensitive to small variations in the resources and support provided, and that the use of ICT as a medium to interact through, rather than merely with or about, may be particularly valuable for effective learning.

Our research also suggests that future ICT resource development should be focussed on improving affordances for dialogic interaction. ICT provision in schools should be clearly linked to a professional development strategy for interactive pedagogy, so that teachers gain an understanding of how the use of ICT resources by teachers and pupils can support a more dialogic level of interaction for their pupils.

Whilst some teachers in our sample did not identify any changes in their pedagogical approach, other had decreased the amount of direct teaching in lessons, broadened the range of activities for pupils and increased the independence of pupils. Most teachers who were very effective without ICT did not immediately enhance their teaching when they adopted it. Teachers need to become attuned to the affordances and constraints of ICT so that they can use it effectively in support of task goals and learning goals. This requires investigation and planning time with colleagues outside the classroom, and experimentation in the classroom. Teachers who already used ICT tended to improve their effectiveness and felt that they gained from reflecting on their practice, discussing ideas and sharing resources with colleagues. Good teachers were able to talk clearly about their dialogic strategies and the features they looked for in ICT resources to support this approach. They valued the discussion with expert observers which focussed their thinking on significant events which influenced learning. This suggests that a CPD strategy based on identifying teachers who use ICT to support dialogic approaches, and training them to mentor their colleagues within a school or cluster of schools, may be more effective than external courses or specialist ICT trainers.

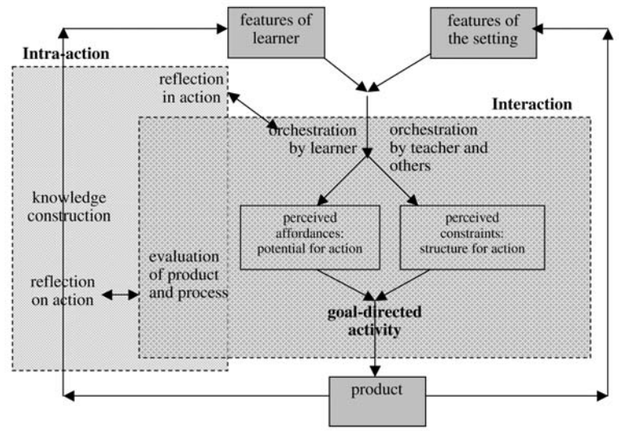

Figure: Analysing Teaching and Learning in Activity Settings (ATLAS) – see Kennewell et al. (2008)