The Introduction of Interactive Whiteboards into Schools in the United Kingdom:

Leaders, Led, and the Management of Pedagogic and Technological Change

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Abstract

There has been a recent, and considerable, investment in the installation of interactive whiteboards in schools in the United Kingdom. In part this has been a response to government pressure for enhanced understanding and use of information and communications technology (ICT), as shown by the National Grid for Learning (NGFL) initiatives and the allocation of ”Standards Fund” money in response to school bids for technological improvement. In part it is also a reflection of more widespread teacher understanding of the value of interactive learning as demonstrated, for example, by McCormick and Scrimshaw (2001) in their analysis of pedagogic change in teaching mathematics, and by Glover and Miller (2002) in charting change within one secondary school. Both articles highlight the need for pedagogic change from the didactic to the interactive, and from the use of multimedia as a visual support for lessons to the integration of the technology and media into lesson planning. Grieffenhagen (2000) has shown that the use of the technology as an adjunct rather than as an integrated element in teaching minimizes interaction and the matching of teaching to learning needs. Joyce, Calhoun, and Hopkins (1997), Touhy (1999), Collins and Cook (2000), and Glover and Law (2002) provide evidence of the need for a match between teaching approaches and the learning style favoured by individuals and groups in schools. Simpson, Payne, Munro, and Lynch (1998), and Colley (1998) demonstrate the use of interactive technology within specific subject areas and stress the need for changed approaches to teaching. The introduction of the new technology and the required change in pedagogic approach have, however, posed challenges for those involved in leadership and administration in three directions: resource allocation, curriculum modification, and the professional development of staff. This article reports on the management of change within 11 schools in the U.K. and considers the interaction of teachers and headteachers in securing change.

Background

Theoretically, the interactive whiteboard is more than a computer, a projector, or a screen–its sum is greater than its parts, and when all the technology is turned off the board surface can be used as a conventional dry-wipe whiteboard should it be required. It can enable the teacher to use high-quality material previously prepared by a teacher or group of teachers using software packages, and to use multimedia material, including electronic microscopes, video-clips, board work, data tables, sketches, CD-ROM, or Internet images; and it facilitates simulation activities incorporating pupil input and reasoned discussion, and immediate recording of the contents of the board at any stage in the development of an argument.

Over the past two years the Department of Education at Keele University in the U.K. has been documenting the introduction of interactive whiteboards within the secondary schools in its initial teacher education partnership through the use of questionnaires filled out by staff and pupils. It has also carried out detailed case studies of the introduction and impact of interactive whiteboards within one secondary school and one Education Action Zone (an area with socio-economic problems offered intensive government investment aimed at securing school improvement). The same questionnaire–a 20-item instrument with a balance of closed and open questions–was used for all teaching staff. Pupils were asked to complete a shorter questionnaire seeking information on the use, management, and impact of interactive whiteboard teaching. A structured interview format was used with staff, headteachers, and administrators to secure a degree of consistency in the investigation. Overall data were obtained from 220 teachers, 46 teachers-in-training, 8 secondary school headteachers, 3 primary school headteachers, 3 local authority

administrators, and 112 pupils. This report is concerned with the introduction of the new technology and relies heavily on the data from structured interviews with the headteachers in each of 11 participating schools.

The Players

This investigation was undertaken in schools where the decision to introduce new technology has already been taken and at least one interactive whiteboard has already been installed. The teachers are therefore aware of the technology and had some access to the interactive whiteboards, with 30% reporting use in most lessons, 18% daily use, 20% weekly, and 20% occasionally. Twelve percent of respondents had no experience of interactive whiteboard use, either because they taught subjects for which the facilities were not available in some schools or because they were not willing to become involved. Over two thirds of respondents reported that more interactive whiteboards were to be installed in their schools in the coming year.

Interview and questionnaire data led to the identification of three attitudes teachers showed to the use of the new technology. This identification was achieved by discussing the criteria for a classification with the headteacher in each of three schools and then applying the agreed criteria to the results from all eleven schools. The descriptors for staff were:

Missioners: those who had come across the technology either through interest or at a training course and who were using it fully in their teaching, developing further skills in its use, and actively encouraging others to use it as a teaching tool. Over half the staff in five secondary schools and one primary school in the sample appeared to have this viewpoint.

I really think that this is the best thing since sliced bread–I have had very few problems with discipline, the youngsters are interested and keen to work with me. There has been an immediate impact on achievement because we use a step by step approach to developing mathematical concepts and because I can make what we do so relevant for them. (Secondary mathematics teacher)

They gave us the training and as soon as it begun I could see that it had potential. I now use the whiteboard as the focus of all our group teaching–it has so many inbuilt gizmos that I can now compete with what the little ones have seen on TV. (Primary teacher, reception year)

Generally, the missioners were more positive in their assessment of every feature of whiteboard use, although they recognized the problems of preparation time arising from intensive use and they were harsh in their self-evaluation of technological aptitude. They were changing their whole approach to the teaching process in order to maximize the potential of interactivity and flexibility. One primary year four teacher (pupils aged 89) commented:
I know that it makes a lot of difference for the children because things are so much brighter, but it is only going to be successful if I ensure that we become more interactive, and that means that I have got to learn how to cope with the use of “slate”s (pupil-held equipment allowing access to the board).
Tentatives: those who had had some introduction to the use of interactive whiteboards and who had access to rooms with the technology, but who were inhibited either by the need for further training or fear of the time needed to become fluent in classroom situations. These predominated in two of the secondary schools and one primary school:
I have had a couple of sessions using the interactive whiteboard but there have been problems of booking the room and moving the youngsters. That said, I was able to give them an interesting lesson. It was basically a PowerPoint presentation but I learnt how to annotate what we were doing, and with the help of the LEA Advisor I included a video-clip to illustrate a point. It took a long while to prepare–seven hours for 35 minutes-but I suppose that I would get quicker, and I do see that once you build up your basic lessons you can amend them without too much extra time. (Secondary, English head of department)

It is something that I am growing into. We use the PowerPoint programme as the basis of all the teaching in English–I think that I will try to develop it for numeracy next year. (Primary teacher year four)

The tentatives were not using the technology as frequently as the missioners – at most for one lesson daily and at least once per week. They were using the equipment at a basic level to extend the normal pattern of teaching, and usually hoping to gain some efficiency in teaching specific topics by developing carefully staged material. One secondary teacher of geography commented:
I was encouraged to set up a video link with a school in Tanzania that we had worked with in the past, but the internet link let us down and we lost 20 minutes trying to get back on line – the problems were too great and I can’t afford to lose the time like that.
Luddites: teachers who, although they had had training opportunities and access to the technology, were opposed to its use partly out of fear of the unknown and partly because it would require some re-thinking of classroom

management and lesson planning. This appeared to be the prevalent attitude in one secondary and one primary school:

I really have enough to do without all the extra training that would be needed. I know that others in the school spend hours on what they are doing and then there are problems when things go wrong. I have heard that the kids can mess around with the pens, and that you get clever clogs who know more about computers than the teacher and then you lose your credibility. Anyway, traditional teaching keeps the class under control. (Secondary, head of Humanities faculty)

Over my dead body! (Primary headteacher)

For the Luddites, making only occasional use of interactive whiteboards, the problems generally assumed greater significance than for other users. They had more pedagogic problems than the other groups of teachers, and were less ready than the other groups to use the equipment to the full with multimedia materials. One primary teacher felt that problems outweighed any possible benefits:

I really can't see how we will have the time to get things ready despite the existence of some pretty good software – in one of the other schools they have had problems with pupils playing about with the pens, and I am not prepared to add to the hassle I have every day.

Attitudes to the use of new technology to enhance learning appear to be affected in different ways by the attitudes of headteachers as leaders and managers of change. In the schools under investigation, the most important objectives were summarized as achieving improvement in pupil attainment by enhancing teacher effectiveness. This was exemplified in the comments from three respondents:

We need to ensure that we were all working towards better SAT (Standard Attainment Test) results with a concentration on effective learning for all children. (Primary headteacher)We have been concentrating on the delivery of effective teaching within the national curriculum framework but recognizing that every teacher will want to do this in the way that suits him or her best. (Secondary headteacher)

It is my job to provide every member of staff with the resources, training, and encouragement to teach more effectively and deliver the enhanced results we so much want for our students. (Secondary headteacher)

Although our sample of schools was small, it was also possible to identify three attitudes to the leadership of change. Similar descriptors could be applied to those used for teachers, but interviews with respondents revealed a greater element of dynamism in making their views known and policy developed or in resisting change. The grouping used follows the analysis of leadership by Levacic et al. (1999) and Morgan and Hopkins (2000), and reflects rational approaches to instructional leadership.

Revolutionaries are convinced of the value of the new technology being made available and have in some instances spearheaded the introduction of pilot schemes so that all staff can be aware of what is intended. They have shown determination in planning for change and undertaken much missioner activity as a prelude to this. Generally they plan for, and achieve, what they want with little collegiality in policy making. Three secondary headteachers and one primary headteacher fitted this description.

There was no point in messing about. I know that the interactive whiteboard can make a difference – it makes for a livelier classroom with better pupil response. My aim has been to get all the staff going my way within a year, and we have got the technology in place for this. (Primary headteacher)

Gradualists are aware of the need for change but fear that financial constraints, the slow pace of staff development, and the hidden problems of the new technology are such that all change has to be made slowly. This group are more pragmatic in their approach but tend to use development planning as a shield against sudden change. This characterizes the attitudes of three secondary and two primary headteachers in our survey.

I know that the teachers want me to have more than eight interactive whiteboards, but I feel that that is as far as we can go. There is one in each main curriculum area, and that ought to enable us to see what a difference it does, or does not, make; to evaluate its impact on learning, and to move all the staff forward at the same time. (Secondary headteacher)

Reactionaries are fearful that the new technology will bring problems for many of the staff and doubt whether the interactive whiteboard can be of other than marginal value in achieving enhanced learning. This group appear to use the need for development planning and extensive consultation as a brake on development. Two secondary headteachers fitted into this category. Their approach, when asked to embrace the new technology, has been one of using current or potential resource problems as a means of deferring change.

I really think that we have enough to cope with at present, and I don't feel that I can ask staff to cope with yet another change. This is especially so where we can only afford limited purchases and I don't want anyone to feel left out. (Secondary headteacher)

Resource Allocation

Overall, each installed system cost about £3,000 per classroom after educational discount at the time of investigation. A cheaper version based upon the use of a projector and a laptop computer but without interactive whiteboards, and costing about £800 per classroom, was developed as a stopgap in one secondary school where the headteacher and governors were keen to ensure that some of the benefits were available in all rooms. Over 85% of the staff in this school were keen to use interactivity as an adjunct to revised pedagogic approaches, depending on current thinking about learning style and differentiation. In the first year of introducing the technology the head, a revolutionary much admired by his staff, with the backing of additional funding as a result of its Technology College status (a bid scheme whereby the government matched locally raised funds for technological change), achieved his target of having interactive whiteboards available for at least 40% of all lessons taught.

The reaction of staff is shown in the progress of the installation of technology. Indeed, the need to plan for total change over a four-year period left some to feel that they were “second-class citizens – how does he decide who will have the boards next?” (humanities teacher). Initially the school purchased 14 sets of equipment, and by staff agreement two had been placed in the two rooms in each of seven faculty-based suites of accommodation. This meant that staff were either

having to book in advance – and that destroyed lesson development and spontaneity in learning, or having to determine which lessons would be interactive and which the pupils would see as ”old ha’”. (Secondary mathematics teacher)

As a result, the mathematics faculty persuaded the headteacher that teaching would be enhanced if all six subject rooms could have the cheaper system for a five-year period, whereas all other subject areas were being fitted with equipment as part of a rolling program. This was agreed, and the reaction of staff was positive because they were sharing programs, tackling learning paths co-operatively, developing materials that can be used as part of differentiated programs and capitalizing on the use of PowerPoint and Excel programs as mathematical tools. (Secondary head of mathematics)

This progress of enhanced gradualism is not mirrored in all schools. In the schools being aided by Education Action Zone funding, there was a determined effort on the part of the local education authority to ensure that half the rooms would be equipped with interactive whiteboards at no cost to the school. Any extension of the technology to other rooms required investment from locally allocated per capita school-based funds. The reaction of the headteachers and governors responsible for ensuring the completion of the program through the use of school-based, rather than central government, funds demonstrated the impact of action according to the views of the headteachers. The gradualists, often with a determination to secure eventual change,

ensure that we equip rooms as part of a rolling program, doing two or three a year until all those who need them have them in their rooms. This will ensure that we don’t waste money on equipment that will stand unused and that we can provide the necessary training support for staff as they come on stream. (Secondary headteacher)

In one secondary school the missioners felt that such a scheme was too slow and that the impetus for the shared development of materials would be lost, whereas the tentatives and Luddite teachers saw it as the postponement of the time when they would need to be involved. The revolutionary headteacher in a school that had considerable additional funding because of its commitment to pupils with special learning needs pursued a policy of forcing staff to use the new technology:

This was the only way in which we felt that we could move all the staff onto a new level of thinking and teaching. They went home for the summer with ordinary classrooms and came back six weeks later with every room fully equipped for interactive teaching. (Deputy head, special primary school)

Of the sixteen staff in this school, five were missioners and were delighted with the facilities and the change it brought to their teaching. A further six tentatives accepted that they were “being forced to make the necessary changes we have talked about for a long while,” and the five Luddites were only using the technology as an adjunct to their normal teaching routines, with very little attempt to integrate the system into their teaching. The reaction of the head in this school was to remove the existing ordinary boards at the end of a further two terms in the belief that

there are some people who will not change unless they are forced to do so, and in the interests of our children, who are meeting the technology in three quarters of their lessons, something has to give! (Headteacher, special primary school)

In two of the schools, reactionary headteachers were not planning to introduce further whiteboards. This was partly because they were fearful that money spent on equipment during a time of generous funding would not be available when replacement became necessary, but also because they were not convinced that there had been significant change in learning where interactive whiteboards were in use. There was evidence that these schools had a high proportion of tentative or Luddite staff and that the attitude of these staff was colouring the headteacher’s response.

It’s all very well having all these boards – we have two in each department but they take a long while to set up, even longer to plan lessons for, and we seem to have had a lot of trouble with pupil interference with things – I tell you it isn’t worth the effort – I am happier with my traditional approaches. (Secondary school head of English faculty

Curriculum Modification

Interactive whiteboards have to be considered as integral to effective teaching rather than as an add-on to the technology available for use. McCormick and Scrimshaw (2001) have shown that where they are used in much the same way as existing blackboards, conventional whiteboards, or computers, they do little to develop the interactivity that is fundamental to enhanced learning. Hinostroza and Mellar (2001) and Ligorio (2001) have shown the need for integration of alternative styles of communication and learning in the software developed for teaching if technology is to offer this enhanced interactivity. Theoretically, the diversity of teaching aids and the flexibility of response should enable the teacher to match learning needs and learning styles within the group being taught. It can enable the teacher to use high-quality materials, including software packages, multimedia, and the Internet to respond to the needs of individuals, subgroups, and whole classes by drawing upon and then developing and annotating a range of saved material in the support of logical and reasoned learning.

Questionnaire responses and observation in the sample schools indicate that curriculum delivery is only improved where three elements are addressed. There has to be sufficient time allocated to the teachers involved so that lesson planning and resource development can be geared to interactivity. Otherwise, as shown by Greiffenhagen (2000), the opportunity for interactivity is lost, and the board, initially an interesting and stimulating novelty, can be ”just another bit of clobber in the classroom” (year eight pupil). During the first year of developing interactive whiteboard use as an integral part of teaching, mathematics teachers were spending up to four hours for each hour of classroom teaching in preparing materials for lead lessons, and English teachers were taking up to seven hours for one hour of literature teaching. If there is not time, there has to be sufficient financial support to allow the use of commercially produced software, but teachers were critical of the content and range of programs available, especially in noncore subjects offering a limited commercial market. They also feel that some material placed limitations on interactivity, and once aware of the potential, they ”feel the need to produce [their] own plans using other material but not being dominated by it” (secondary geography teacher). The intended extent of interactivity has also to be considered. In one of the sample primary schools, all teachers with interactive whiteboards in their rooms were using PowerPoint as the basis of their teaching. It was claimed that this was a good starting point so that the staff can develop their ability to work with one program, can then follow it up with refinements as opportunity presents, and then move on to the integration of other media. (Local education authority advisor)

The teachers found, however, that although responses from the classroom were recorded, and although the presentation was much more stimulating than with simple boardwork, they were becoming frustrated by the limitations imposed.

It was fine until I wanted to develop an idea that went beyond Power Point – until I can cope with alternative programs I feel that the children will suffer despite all the effort that has gone into things – I just am not yet sufficiently flexible in my use of the technology. (Class teacher, year 4, primary school)

The headteachers, according to their views of what was to be achieved, were variously fostering curriculum development. The revolutionary approach was reflected in the planning during 2000 -- 2001 within one primary school to ensure that all numeracy and literacy lessons would be taught around the interactive whiteboard in the succeeding year. Eight class teachers were involved in this work, and each of them took responsibility for the development of materials for the lessons to be taught for four weeks in the year. Shared experience and response were stressed by the headteacher, who felt that

by doing things this way we could be sure that all classes would start from the same technological point and nobody would feel unable to use whole class interactive approaches to teaching, pupil involvement and assessment. (Primary school headteacher.)

Gradualism was more frequently seen in the secondary sector where headteachers delegated curriculum management to faculty heads, and

when one in a subject area gets the bit between his or her teeth, there is a knock-on effect and others start to be interested – especially when they see that topics can be taught more effectively. (Secondary science teacher)

The evidence from those schools led by reactionary headteachers was that there was a tendency for teachers to feel that the potential problems arising from the introduction of interactive approaches outweighed the likely gains. This was expressed in the following comment:

We feel that there are too many problems – just like the old language labs, and that there is no evidence as yet to show that pupils in classes taught by those using interactive whiteboards achieve any more than those without. After all, they will soon see it as a gimmick, and national tests still require a more didactic approach (Secondary school headteacher)

Professional Development

When new technology has been introduced there has been considerable variation in the support and training provided. In the 11 schools in the sample three types of professional development had been available. Whole school

familiarization presentations were made either by representatives of the commercial companies producing the hardware, or by local education authority advisors. When this led to some enthusiasm and the technology was installed, smaller groups of staff were then involved in training in the use of the equipment over a period of time ranging from a half day to three days of intensive training, but ”nobody has paid much attention to the way in which we ought to be using what we have learnt – I suppose they think that we are professional enough to know what the approaches should be” (Secondary school physics teacher).

The alternative, most successful strategy occurred where a technologically and pedagogically competent advisor worked alongside teachers in the development and use of interactive whiteboards within specific subject areas. Three of the secondary schools in the sample had the services of one such advisor for one term over the course of a year.

Having Tim working alongside us rather than directing us made a difference – we spent a lot of time in developing some year 9 English, and I was able to learn so much, especially when he was able to cope with my technical problems – and once he helped me, I was determined not to make the same mistake twice. (Secondary English teacher)

Change leaders appear to exert their control over professional development either through limiting the time available for training and support, or through insistence on the use of freely available commercial familiarization presentations rather than through more expensive specialist advisors. The revolutionary headteachers recognized that training was a necessary part of the initial expenditure, although in all the schools concerned the investment was in expensive training for a small group of staff with the expectation that they would then assist others in the school.

The gradualist headteachers relied more on allowing interested missioners to attend external courses and then “letting the ripples move across the pond.” This was seen most effectively in one of the primary schools where the headteacher appointed a supernumerary member for staff for two terms with a remit to introduce new technology of all kinds into the school. This teacher then offered to provide cover for a colleague absent for a longer period, and developed the use of the technology with the reception and year one class concerned. As a result, other staff became interested, and the headteacher made arrangements to allow them to observe, and share technology and approaches. ”Purposeful interactivity” had been the theme for a whole school in-service session, and the headteacher obtained funding that allowed all staff wishing to have the whiteboards in their room to do so. Within a year the staff agreed that they would all integrate the technology into their core subject teaching.

Both reactionary headteachers acknowledged the technology by allowing whole school presentations, but they then found that it would be too expensive to pay for supply teachers to allow staff to attend external courses, and too limiting to arrange internal support ”where as yet, so few staff have access to the necessary technology”.

Interaction

The headteachers are the ultimate arbiter of expenditure and hence of progress towards the use of new technology. The way in which they have managed the situation is rather more covert. Outwardly they have shown enthusiasm for development, or admitted that they feared giving in to an educational gimmick. Some of the former then tempered their enthusiasm with caution based on the need for rational planning and professional development before making major changes. Those who admitted their opposition were “‘at least seen as honest” (secondary mathematics teacher). The interplay between predominating groups of staff and the prevailing attitudes of the headteachers was examined in detail and is summarized in Table 1.

(click on image to view larger format)

Table 1
The Interaction of Staff and Leadership Attitudes in Managing Change in the Use of Interactive Whiteboards.

School	Predominating Responding staff Attitude > 50%	Critical Mass of Missioners?	Leadership Attitude	Pattern of Change
S1	Missioner	Yes	Revolutionary	Peer persuasion
S2	Missioner	Yes	Revolutionary	Peer persuasion
S3	Missioner	Yes	Revolutionary	Driven
S4	Missioner	Yes – just	Gradualist	Peer persuasion
S5	Missioner	Yes – just	Gradualist	Driven
S6	Tentative	No	Gradualist	Peer persuasion
S7	Tentative	No	Reactionary	Chance
S8	Luddite	No	Reactionary	Inertia
P1	Missioner	Yes – just	Revolutionary	Driven
P2	Tentative	No	Gradualist	Peer persuasion
P3	Luddite	No	Gradualist	Chance

Within this varying context four patterns of change emerged:

1. *Peer persuasion.* In four of the secondary schools and one large primary school, three or four boards had been introduced into a school as part of a development plan, usually stemming from the wish to enhance mathematics or information technology teaching, backed up by adequate training, the availability of on-site pedagogic and technical help, and with a clear remit for informed curriculum development. In each school there was evidence of a critical mass of missioner staff. In quantitative terms, this was usually one teacher within a subject department, and three or more subject departments within a school. The task of this group of teachers was to convince others of the value of changed pedagogy through both example and persuasion. When this occurred, the pace of subsequent change depended upon the support from headteachers. Three of the headteachers were gradualists, keen to introduce change and prepared to plan for the development, but only when convinced that the teachers would use the technology. The other two headteachers were classified as revolutionaries, but because few of their teachers were missioners they were supporting their efforts to convince other colleagues through planning for the proliferation of additional technological resources and school-wide training, whether the interactive whiteboard was actually used or not. One commented:

I have a view of what I want in every classroom and I want to get there as soon as we can but I recognised that for some staff it will be a matter of “make haste slowly,” and so I have to go with that because there are other things I need to push on as well.

2. *Driven.* In two of the secondary schools and one primary school there were examples of power-coercive change. In these schools it had been determined by school leadership, not all revolutionary in their attitude, that provision would be in the best interests of the school. Only 18% of the teachers in this group of schools were missioners, 42% offered tentative comment as they develop enhanced teaching skills, and 40% remained implacably opposed to being coerced into using systems for which they have ”no liking, aptitude or training.” These heads were offered funding for technological change through the Education Action Zones and Colleges of Technology initiatives. These funding schemes require the submission of some form of bid outlining the intended link between capital expenditure and educational improvement. The heads of such schools wanted to use the technology as part of their submission, and the equipment was provided irrespective of any sense of ownership by the staff, and often before the provision of any training. In these schools the spread of missioners has only just reached the critical mass suggested above, and there was a considerable amount of resentment in one secondary and the primary school. In the other secondary

school teachers were making use of the equipment that had been provided, but still in a predominantly tentative manner.

3. *Chance.* In two schools, one primary and one secondary, practice cannot be so easily classified. In one the headteacher, a reactionary, had been totally opposed to the use of whiteboards but had then accepted a ”free” board for installation in a nonteaching room so that staff could experiment. Following the appointment of a supply teacher, who then became a missioner demonstrating the value of the board to her colleagues, the head was convinced of the value of the available software, and all rooms are now equipped with interactive whiteboards in everyday use. In the other large secondary school four boards were being experimentally used by some staff, but there were only two missioners amongst the 68 staff, reactionary management inhibited easy room change arrangements or further training, and of the remaining staff the vast majority were described as ”disinterested observers.” Three teachers in training demonstrated the potential of installed technology in their specific subject areas. Convinced heads of department then became the change agents, persuaded the head of the potential for change, and began pilot work without the support of colleagues as a whole.

4. *Inertia.* In the remaining secondary school the combination of Luddite staff and reactionary leadership inhibited the further development of interactive whiteboard technology, although a small number of missioners have been allowed the use of the facility, and

we soldier on in the belief that something will change – at least we are free to use [the technology] to the full in all our lessons.

Conclusion

At this early stage in the introduction of resources for pedagogic change, it appears that the interplay between leadership and classroom teachers is the force that conditions the pace, extent, and impact of change.

1. Revolutionary heads shared with the teachers in their schools a common awareness of the advantages of pedagogic change connected with the use of interactive whiteboards, planned for the introduction of the change, and supported this with training, technical support, and time for fundamental adaptation. Where missioner teachers predominated, the change was successfully achieved and staff were enthusiastic and keen for there to be further development. Where tentative teachers were in the majority successful change was achieved through the use of peer pressure.

2. The body of teacher opinion influenced gradualist headteachers. Where there was a sprinkling of missioners on the staff, these were aided by a minimum of provision to enable potential to be demonstrated. Their ability to influence tentatives and Luddites then appears to condition the pace of change – but always at a pace determined by the headteacher through control of resources and training. When a gradualist headteacher was persuaded of the value of change, he or she still faced problems because the stated advantages of the technology were not being achieved. This was usually a result of ineptitude or lack of interest by Luddite staff.

3. Reactionary heads appeared slow to move even when faced with pressure from a number of missioners. This was because tentative staff are not given any incentive to make changes, and the resistance of Luddites was reinforced by leadership attitudes to the allocation of necessary resources.

Charting the developments in the sample schools over a period of two years has made clear that the pace of change quickens with the growth of the missioner element, whatever the attitude of the headteachers. Once the majority knows the pedagogic benefits of the technology to the teaching staff, tentatives adopt new practices, the pressure for the allocation of resources becomes stronger, and the Luddite element becomes marginalized. In this respect, the impetus for change is enhanced when the advantages of pupil involvement, motivation, and interactivity and the use of a variety of learning styles appear to bring about enhanced results. All the headteachers except the one leading the school in which inertia was most evident reported that there had been improved results in the previous two years. In seven schools the headteachers believed that the interactive whiteboards had been a contributory factor but were unable to quantify this change. However, all 11 headteachers admitted that interactive whiteboards held considerable potential if properly used. The range of enthusiasm reflected our initial descriptors of leaders. At worst, the technology offered “an interesting new approach” (reactionary secondary head), and at best ”it has been the driving force for change such that we are now aware that whole class interactivity is the key to pupil-oriented learning and a step away from didacticism of the worst kind” (revolutionary secondary head).

References

Colley, A., Comber, C., & Hargreaves, D. (1998). IT and music education: What happens to boys and girls in co-ed and single sex schools. British Journal of Music Education, 10(2), 123 -- 4.

Collins, J., & Cook, D. (2000). Understanding learning: Influences and outcomes. London: Paul Chapman.

Glover, D., & Law, S. (2002). Improving learning: Professional practice in secondary schools. Buckingham: Open University Press.

Glover, D., & Miller, D. (2002). Running with technology: The impact of the large-scale introduction of interactive whiteboards in one secondary school. Journal of Information Technology for Teacher Education, 10(3), 257 -- 276.

Greiffenhagen, C. (2000). A report into whiteboard technologies. Unpublished paper. Computing Laboratory, Oxford University.

Hinostroza, J.E., & Mellar, H. (2001). Pedagogy embedded in educational software design: Report of a case study. Computers and Education, 37(1), 27 -- 40.

Joyce, B., Calhoun, E., & Hopkins, D. (1997). Models of learning – Tools for teaching. Buckingham: Open University Press.

Levacic, R., Glover, D., Bennett, N., & Crawford, M. (1999). Modern headship for the rationally managed school: Combining cerebral and insightful approaches.' In T. Bush, L. Bell, R, Bolam, R. Glatter, & P. Ribbins (Eds.), Educational management: Redefining theory, policy and practice (pp. 15-28). London: Paul Chapman.

Ligorio, M.B. (2001). Integrating communication formats: Synchronous versus asynchronous and text based versus visual. Computers and Education, 37(2), 103 -125.

McCormick, R., & Scrimshaw, P. (2001). Information and communications technology, knowledge and pedagogy. Education, Communication and Information, 1(1) 37 -- 57.

Morgan, W.J., & Hopkins, D. (2000). Do we need a Commonwealth network of colleges of educational leadership? The Round Table, 356(1), 405 -- 418.

Simpson, M., Payne, F., Munro, R., & Lynch, E. (1998). Using information and communication technology as a pedagogical tool: A survey of initial teacher education in Scotland. Journal of Information Technology for Teacher Education, 7(3), 431 -- 446.

Touhy, D. (1999). The inner world of teaching: Exploring assumptions which promote change and development. London: Falmer.

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