

# The Marconi ECT Project and the Design of Professional Development

## Abstract

This paper is a summary of a dissertation presented for the degree of MA at Keele University in June 2001 and awarded in November 2001. The dissertation focused on the professional development opportunity called the *Marconi ECT Project* that took place in Staffordshire between 1998 and 2000. The main objectives of this course of study were: to consider the long term effects of an in-depth, long-term period of INSET in the area of electronic systems within design and technology; to record teachers' sense of professionalism as a result of a significant investment of time and resources; to record teachers' confidence and competence levels as a result of this in-depth INSET; and to consider lessons to be learned for the design of future INSET.

The conclusions arising from this study are that any effective teacher professional development needs to be designed around a number of key factors – detailed needs analysis, collaborative and practical course design to meet these needs, monitoring teacher development during and after any INSET and time for colleagues to work through knowledge, skills and understanding in the classroom for the benefit of their pupils. Teachers still act in a professional manner and still have a strong sense of professionalism. Well-designed INSET provision also reinforces teachers' sense of self-worth.

## Introduction

This is a summary of a dissertation which focused on a review and evaluation of a long-term professional development project – the *Marconi ECT Project*. Teachers' sense of confidence and competence was measured and considered during the course of this professional development and also their sense of professionalism. As a means of focusing thoughts, and for points of comparison, a well-established professional development management cycle (Oldroyd and Hall, 1991) was interwoven within this review and evaluation.

The *Marconi ECT Project* provided a high quality INSET opportunity for a group of teachers whose expectations, based on a detailed needs-analysis survey carried out prior to the course, were very high and demanding. The training allowed colleagues to develop their knowledge, skills and understanding at their own pace. Colleagues were encouraged to reflect upon their own school situation and consider how electronics and control systems could form part of the design and technology curriculum. The effects

of the course were monitored over two years both formally and informally and provided a rich source of evidence to gauge the success (or otherwise) of the course.

## At the start

In September 1998, 16 design and technology colleagues began their professional development as part of the *Marconi ECT Project* in Stafford. In July and September 1999, a further three pilot programmes were established in Salford, Coventry and Denbigh. Over the intervening period and up to the present time, a number of similar INSET opportunities have been undertaken in Durham, Liverpool, Sheffield, Colchester and Coventry.

Information and data gathered from the application form responses, needs analysis sheets, self-assessments, evaluations, questionnaires and comments have all been taken into account in the evaluation and analysis of the early pilot project. The *Marconi ECT Project* is seen very much as a long-term initiative and an evaluation of the more recent stages of the project was published in the *DATA Journal* (Branson and Breckon, 2001).

This summary paper describes the impact the *Marconi ECT Project* had on those original 16 teachers and gives considerable weight to the argument for long-term teacher support. English (1995) queried the effects of INSET on changes within schools and asked a series of very pertinent questions:

How long might it take for any changes to manifest themselves?

Over what period of time, therefore, should such observations be made?

Can it be guaranteed that any observed changes are a direct result of the in-service training?

Can it be guaranteed that any observed changes will be permanent or will there be a gradual return to old ways? (English, 1995: 295)

The *Marconi ECT Project* tries to answer some of these questions.

## The data collection

The first part of this paper is an analysis of the findings from the research which was carried out over the past two and a half years. The data came from a variety of sources – needs analysis pro formas, course evaluation forms and questionnaires amongst others at intervals throughout the duration of the training. The data from these sources was both qualitative and quantitative and the analysis reflects these broad categories. The

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data was accumulated to monitor the improvements in colleagues' confidence and competence over the period of the original *Marconi ECT Project*. It was also used to gauge the effectiveness of the professional development management cycle and to monitor improvements in classroom practice in the areas of electronics and control systems.

An initial application form asked colleagues to give background information on the current provision for electronic systems and control pre- and post-16 and to comment on their expectations of the course. Responses in the applications indicated there was a common thread of anticipation and expectation for change. Course applicants saw this INSET as an opportunity to take this area of the design and technology curriculum forward.

Teacher M – 'As a new head of D&T I am keen to restructure our curriculum and develop resources and equipment. This (course) will develop interest and knowledge of electronics.'

Teacher O – 'The department is undergoing a fair degree of change as we work towards delivering a common approach in all material areas. The acquisition of further knowledge outside my own specialism will lead to increased understanding and allow for greater flexibility in teaching, particularly at Key Stage 3.'

These and other comments showed that teacher colleagues within design and technology are only too well aware of their professional development needs and are generally willing to change and welcome the opportunities for change. They are not only interested in their own professional development but more importantly in how that development impacts upon their own classroom practice. Colleagues genuinely want to offer improved experiences for the pupils they see day in and day out. A sense of professionalism comes across which reflects some of Wideen and Andrews' (1987)

comments on the nature of professional development – an improvement in teachers' performance in their present job and a preparation for future development.

**The first needs assessment pro forma**

After colleagues had been accepted onto the course they were asked to complete their first needs analysis pro forma. In the first part of the pro forma, course members were asked to rate themselves against a total of 47 competencies. These competencies were simply brief statements related to four areas of technical development – the understanding and use of:

- (a) electronic systems
- (b) electronic components
- (c) ICT in D&T
- (d) manufacturing ECT systems.

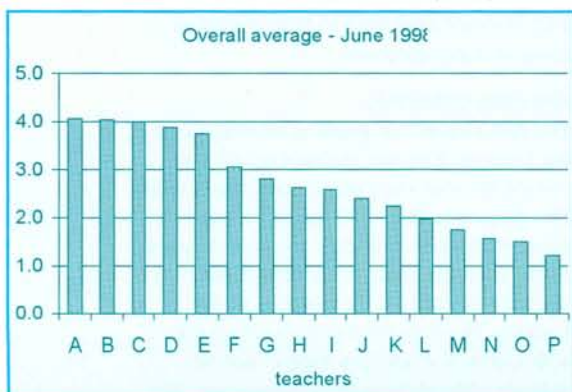
In the second part colleagues were asked a number of questions about their own development in the area of electronic systems and control and their professional development in their role as a member of the design and technology department.

From their responses, colleagues were very much aware of the directions their departments should be taking and a number of comments here pointed to the development of new courses in both Key Stages 3 and 4 and post-16. There was a strong commitment to improvement within the design and technology departments, both in terms of facilities, teaching resources, pupil materials and expertise. There was much reflective comment on needing to review current practice and to plan for future developments and in several cases teachers were already beginning to see the integrative nature of working with electronic systems and control as they commented on how a range of other media – graphics and textiles as well as resistant materials – could be integrated to produce stimulating and imaginative projects for the pupils.

Generally, the teachers were in no doubt that the *Marconi ECT Project* course would lead to increased confidence and competence in teaching electronics and control and broadening their knowledge base in this area of the curriculum. They were also looking forward to sharing time, experiences and expertise with other colleagues.

The analysis of the quantitative data produced the graph below which shows the results of the teacher self-assessment before attending the course. The graph represents the individual teachers' overall average score against all 47 statements, in the four

Figure 1: Overall average teacher competency 'levels' before attending the course.





competency areas, each rated on a 'gut reaction' 1-5 scale. (from '1 - no idea' to '5 - very confident')

Teachers A-E represent a cohort who already had some expertise and felt reasonably confident with much of the material covered on the course. Schools where these teachers taught were already offering either GCSE systems and control or GCSE electronic products at Key Stage 4.

The following graph (Figure 2) represents the perceived confidence of the group of teachers as a whole in the four areas of the competencies – systems thinking, electronic components, designing and making systems and finally the use of ICT.

These two graphs, then, represent the 'baseline assessment' from which progress at different times during the course and also in the different strands of the course competencies were determined.

**After the first part of the course**

One of the major benefits of the Marconi ECT Project was that teachers were away from their schools for 10 days (two blocks of five days) to learn, relax and reflect upon their current practice. After the first five days the course participants were asked to complete an evaluation form seeking comments concerning the various elements covered over this first week. The comments from the teachers taken from these evaluation forms are revealing in that they show a great deal of reflection on their current situation and offer an insight into where they see this professional development opportunity being taken in terms of teaching and learning.

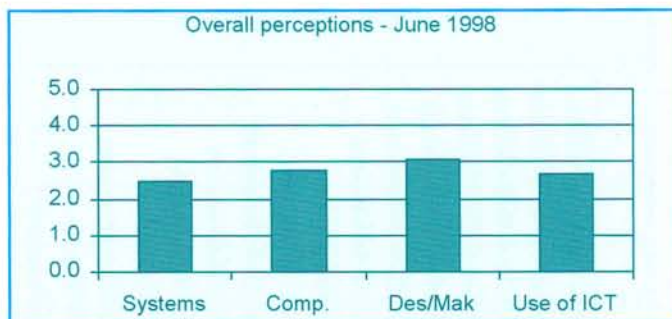
'I came away on Friday feeling much more confident in my ability to support my students and with aspirations to enhance my delivery of electronics through the use of some of the techniques used throughout the week.' (Teacher D)

'An enjoyable week – I learned a great deal and feel much happier in some areas although I still have much to learn.' (Teacher K)

'Inspired by the Smartcards – we can use these with our Y8s!' (Teacher O)

'A fantastic week, allowing time to develop skills further – something we don't have time to do at school. I came back with renewed enthusiasm for electronics and control.' (Teacher B)

'I have gained a great deal from this week. It refreshed my existing understanding and



developed other areas. It is a great idea and is long overdue.' (Teacher I)

'This course has been extremely useful and I feel I have learned a great deal and improved in confidence.' (Teacher P)

'The week was very encouraging, not only due to the personal development which took place, but also due to the opportunities given regarding possible school developments.' (Teacher F)

Figure 2: Overall average teacher competency 'levels' in each of the four competency areas, before attending the course.

In between the two halves of the course, visits to each course participant for half a day took place. This gave enough time for colleagues to reflect on what they had learned and review the department plans for teaching and learning in electronics and control systems. There was a set agenda for the visits. What was clear from these interim school visits was that colleagues were brim-full of enthusiasm for the subject. Many had found a new direction and were so pleased that they had been fortunate in getting such an extensive professional development opportunity. Often colleagues commented upon the time they had to relax and reflect on practice and to 'design and make' and 'try things out' before they did them in the classroom. So often, they commented, the pace of events in schools resulted in them having little time to rehearse processes or make teaching aids or 'get into the software' before they were teaching the pupils.

**After the second part of the course**

After the second five days of the course, the teachers went away to begin to put into practise the techniques and approaches covered on the course. Colleagues were asked again to complete their needs analysis pro formas which asked them to self-assess against the criteria. They were also asked to complete an evaluation form for this second part of the course and to comment on the 10-day course as a whole.

An analysis of the evaluation forms after the second block of five days reveals yet another wholly positive picture. The following are indicative of comments from colleagues:



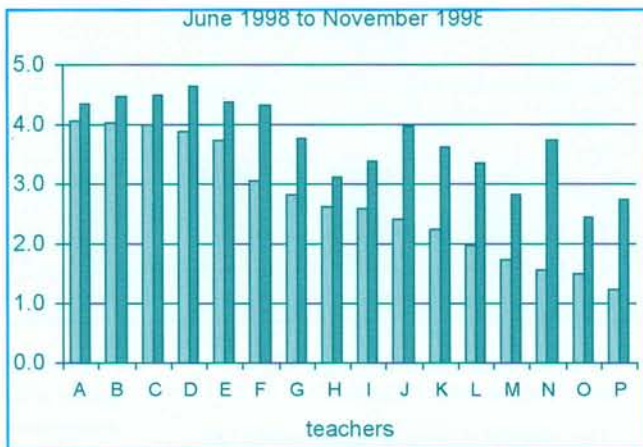


Figure 3: The perceived improvements in the self-perception of the teachers on the course between June and November 1998.

'I have learnt more in a week than I could have in a year at school trying to do it myself. What can I say? – teaching, resources, atmosphere, colleagues, food – everything was really excellent. What I know now, I really know!' (Teacher L)

'I really felt I'd got to grips with SmartCard control. It will be really useful back in school.' (Teacher O)

'The course was brilliant! It gave time to discuss ideas, try out processes and skills. I have renewed enthusiasm for electronics and control again.' (Teacher B)

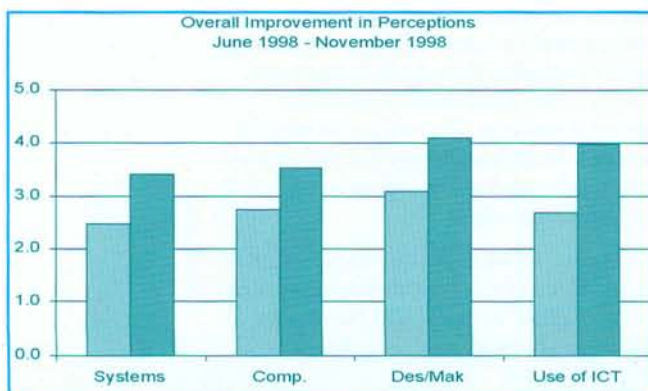
'Follow-up support through visits and network of mutual support should prove invaluable.' (Teacher D)

'Completed the course feeling much more confident and interested in the topic. Looking forward to working in electronics.' (Teacher K)

'I thought this course was excellent. It gave me the time to make inroads into the subject of electronics and time to learn. It would have been impossible to learn as much as I have without this course.' (Teacher P)

Many colleagues felt the course to have been an invigorating experience and one where

Figure 4: The perceived improvements in the self-perception of the teachers in each of the four competency areas, between June and November 1998.



their individual professionalism has been respected and enhanced. There were several comments from colleagues who felt that their enthusiasm and motivation for teaching had been greatly boosted. There was a great deal of reflection within the comments on the evaluation forms with teachers carefully considering their new skills and knowledge and where this would be put to use within the department.

Figure 3 shows the improvements in the self-perception of the teachers on the course between June and November 1998. The self-assessment was carried out within the first two to three weeks after the course ended.

As before, Figure 4 represents the perceived confidence of the group of teachers as a whole in the four competency areas. All four competency areas show significant improvements in perceptions of confidence and competence.

After the second block of five days and during the next two months other visits to course participants' schools were arranged. One of the most valuable aspects of the course was being able to discuss, on an individual basis, how colleagues' professional development was proceeding.

**The follow-up meeting a year later**

One of the most important effects of professional development is that it has to change current practice. If INSET or any form of professional development results in no significant change in practice then it has been a waste of time, effort and money. This year-later meeting was to provide one of the more stringent tests to the success of the *Marconi ECT Project* course. The meeting with all 16 course participants took place in October 1999.

Most of the meeting was spent considering the developments in participants' schools over the past year. It was very encouraging to see the quality of work that had been undertaken since the end of the course, with many course members bringing in examples of pupils' work within both Key Stages 3 and 4. Many course participants commented on the way their pupils had also responded positively to the practical experiences that were being developed in schools. There was a very positive attitude towards the professional development.

After this 'one-year-on' meeting, colleagues were asked again to complete their 'self-assessment' pro formas. The graph below shows the overall average improvement in the self-perception of each teacher on the course between the beginning of the course in June



1998 and October 1999 when we all met again.

From the graphs it is possible to note a sustained level of improvement in colleagues' perceived levels of confidence. There are obviously variations within the graphs, with some colleagues feeling distinctly less confident than they were one year previously.

Figure 5 illustrates the changes in the perceived confidence levels of the group of teachers, as a whole, over the time of the course over the four competency areas.

The results shown in this graph came as a very pleasant surprise. There was an anticipation that any short term gains would be eroded somewhat over the year by the stresses, strains and problems in implementing many of the course ideas. Not only that but the general pace of change in schools and the sheer number of educational initiatives to come into schools during the year would also have worked against there being significant improvements. It was believed that the overall levels of confidence would have dropped back. The results seen were extremely encouraging. Not only did the confidence levels not drop back, but they actually improved slightly over the year in each of the four competency areas.

The reasons for this continued improvement are varied but Figure 6 illustrates the very positive effect of this professional development opportunity and vindicates much of the methodology adopted – a clear focus for the professional development, quality training, time to reflect, long term support, monitoring progress, critical evaluation (at various stages) and sensitive feedback to all involved.

But would it last?

**A survey by questionnaire – January 2001**

Two years after the course started, and one year since the course participants last met, a questionnaire was sent to all course participants. This questionnaire sought course colleagues' views on their sense of motivation, professionalism, whether they felt supported throughout the course, improvements in teaching and learning and the effects upon their long-term professional development.

The results from the teachers who returned the questionnaires were mixed and it is difficult to draw many conclusions from such a small sample of responses. However, a number of comments which illustrate some of the main strands of this paper can be extracted i.e. that lasting change in the classroom is

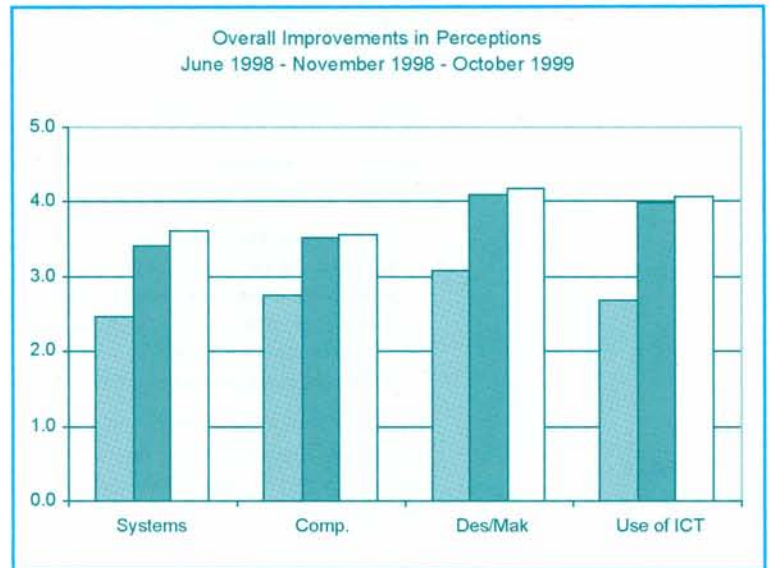


Figure 5: The perceived improvements in the self-perception of the teachers in each of the four competency areas, between June and October 1999.

brought about by ensuring that teachers are supported over a considerable period by agencies both internal and external to the school and that colleagues continue to have access to the resources to ensure that changes in classroom practice have time to become embedded.

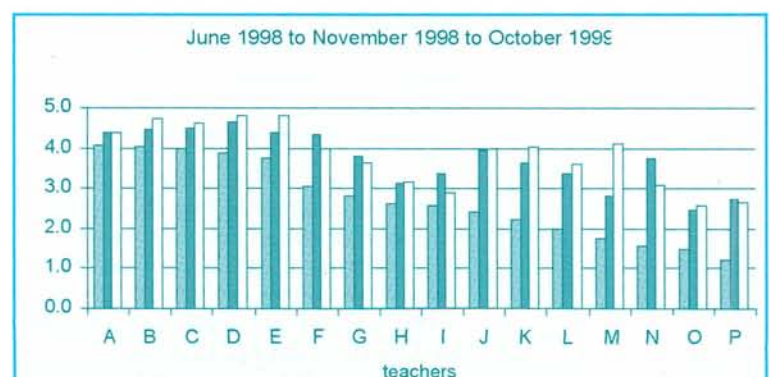
Teacher L has commented on the continued sense of enthusiasm for the new electronics technology within the subject which has been picked up by the students:

'My pupils now get just as enthusiastic when introduced to these (PIC programmers) in the classroom.'

Teacher L goes on to note that many of the lasting changes have been as a direct result of the resources being bought and the enthusiasm with which they have been adopted by other members of the department. There has been minimal further support from senior management and any developments have been generated from within by the personnel in the design and technology department.

Encouragingly, teacher L has developed electronics and control for a wider ability

Figure 6: The perceived improvements in the self-perception of the teachers on the course between June and October 1999.





range and adopted 'more pupil friendly ways' of tackling this area of the curriculum, though L comments that the effect on overall school improvement is hard to quantify. Teacher L also reflects on the gain in confidence to teach in this area of design and technology:

'Before Marconi Days I dreaded taking Key Stage 3 electronics module ... I now do not have these doubts, my confidence in the area is the same as in the other areas of technology – my weak spot has been eliminated.'

Teacher E comments on the improved motivation of the pupils and the confidence that has been developed across the department.

'It (*the Marconi ECT Project*) has enabled other members of staff to become more confident in helping the department deliver the requirements of the national curriculum.'

Similarly, other teachers noted their 'increased sense of worth', how the course had been able to 'improve my motivation for the subject of electronics and computer control' and 'feeling more confident in the classroom'. The benefits of long-term support were also readily apparent in the responses – not only from senior management in schools but also from external agencies – notably the LEA adviser for design and technology!

### Conclusions

The research clearly showed that colleagues were only too well aware of their professional development needs and could articulate these very clearly. The responses from the needs analysis pro formas accurately reflected teachers' starting points and offered guidance in structuring and direction of the course provision. The teachers were aware of the changes needed within design and technology and, given the right opportunity, sought the means to implement such changes. They were interested not only in their own professional development but more importantly in how it would impact upon their own classroom practice. Colleagues genuinely wanted to offer improved experiences for their pupils and the quality of the enthusiasm and commitment on the course and the assignments produced both during and after the course were testaments to this.

Three issues arising from this study, and for the implementation of any professional development management cycle, stand out as worthy of significant comment, for they have an impact upon the design of any professional development. These issues are:

- a comprehensive needs analysis
- action research as part of the INSET provision
- the allocation of in-school support over sufficient time for initiatives to become well established.

### Needs analysis

The use of the needs analysis pro forma proved to be of immense value in determining the starting points for the development of both the technical competencies and also the managerial skills of colleagues. As has been demonstrated, the 16 teachers were very much a 'mixed ability' group and the results from the initial data collected allowed aspects of the course to be tailored to particular individual needs. Obviously there were structured/taught inputs during the course but colleagues took opportunities after these to develop the material covered at their own pace and for their own situation. Evidently, throughout the course, teachers were fulfilling one of Tomlinson's (1997) key points related to professionalism where he comments that teachers 'are committed to the core business which is quality of pupil learning'.

The careful identification of INSET needs is one of the fundamental aspects of good professional development practice. As Oldroyd and Hall (1991) comment, 'recognising your own needs is much more acceptable than someone else defining them for you'. The data generated by the needs analysis pro formas was used to perform a number of tasks. It established a baseline from which developments could be measured, it acted as a reminder to colleagues when used for the second and third time to consider their needs very carefully, it provided a wealth of information about design and technology department curriculum developments over the period of the course but more importantly it provided information on how to structure and deliver the professional development course to meet colleagues' needs. Once colleagues have clearly identified and generated their needs, course provision becomes a partnership between provider and participant

The clear identification of teacher needs has become one of the cornerstones of the Marconi ECT Project. In the new delivery model, after an initial face-to-face period, colleagues in schools now work through INSET material of their own choosing, via the Internet, and at their own pace. There are assignments set within the INSET materials and it is expected that teacher colleagues complete a number of assignments to meet both the requirements of a sub-set of the competencies and also, in doing so, fulfil



some of their identified needs. The hope is that a more stringent application of this 'needs analysis driven' approach will alleviate much of Fullan's (1991) criticism of the futility of so much INSET.

#### **Long-term support for change**

Any changes in classroom practice which have flowed from the *Marconi ECT Project* have been of the course participants' own design and choosing, fitting well with Fullan's (1991) forceful comment that 'the starting point for change is not system change or change in others around us, but change in ourselves'. But the teachers, in returning to their own schools, may not be returning to a culture or structure that is conducive to, or at the very least, supportive of lasting change. The responses from the course members relating to continued support from senior management were varied on this point. The culture within a school to which course participants are returning must be taken into account as this has a significant effect upon whatever changes can be successfully implemented. Stoll and Fink (1996) forcefully remark that:

'Those who introduce educational reforms or restructure educational systems pay scant attention to the social organisation and contexts in which these changes are introduced. Any attempt to improve a school, however, that does not address the underlying organisational conditions can be viewed as 'doomed to tinkering'.' (80-81)

The role of the professional development co-ordinator (PDC) in schools is vital. Oldroyd and Hall (1991) in their final chapter illustrate the many tasks incumbent upon any professional development co-ordinator to ensure that all elements of the professional development management cycle are complete. In the hurly-burly of school life it is often easy to forget to follow through and monitor the effects on classroom practice of any INSET undertaken by staff. Unfortunately, the budget for the *Marconi ECT Project* only allowed a very limited amount of follow-up work in participants' schools – effectively two half days over the year. It fell, therefore, to the school PDC to monitor and evaluate the effects of the training.

In terms of generic monitoring and support, the schools' PDC would be the ideal person to keep a watching brief on the effects of colleagues' INSET. In terms of the more subject specific aspects of professional development, advisors and inspectors external to the school would be better placed to monitor such effects. Sadly, with the demise of many LEA advisory services, and with it

the more specialised advice and support available, colleagues in schools find it difficult to gauge the quality and effectiveness of any changes arising from their INSET programmes.

The project has also shown, through both the quantitative data and the qualitative comments, that on-going and long-term support is crucial to the success of any INSET initiative. Insufficient time to implement change is one of the major contributors to preventing change taking place. One of the other major contributors, of course, is the fact that there are so many changes taking place at any one time – cf Fullan's (1991) 'multiple innovations'. By building in support time over the year of the course, colleagues were reminded of their commitment to the project and support was on offer whilst other innovations and pressures of school life continued to have their impact.

By adhering to a well-developed policy framework of a professional development management a number of lasting improvements in teacher confidence and competence have been demonstrated over the past two years which has been very encouraging.

#### **Action research as part of the INSET provision**

Definitions of action research vary but its essential nature is summed up in the cycle: planning, implementing, reviewing and re-doing better. Action research may start with an intellectual question or with a desire to make a practical contribution. It often involves the practitioner in a self-study of their own attempts to improve professional practice. Its essence is to undertake a critique of current practice with a view to improvement both of the practice and the practitioner. Teachers engaging in action research projects are embarking upon their own reprofessionalising through reflective action.

Much INSET lends itself to being conducted through action research projects and where this is so it will allow teachers a means of re-establishing the links between theory and practice – where reflection on practice by the teacher leads to further action within the classroom or school. One of the developments with the *Marconi ECT Project* is to engage colleagues in small-scale action research projects. These are couched in terms of fulfilling the conditions of one of the assignments as part of the new INSET framework. The assignment is designed round a 'plan, teach, evaluate and reflect' activity carried out within the classroom situation.



Action research is practical professional development. INSET providers then become facilitators of the process enabling teachers to develop the skills to undertake this approach. Listen to Stenhouse (1984):

'Good teachers are necessarily autonomous in professional judgement. They do not need to be told what to do. They are not professionally the dependants of researchers ... This does not mean that they do not welcome access to ideas created by other people at other places or in other times. Nor do they reject advice, consultancy or support. But they do know that ideas and people are not of much real use until they are digested to the point where they are subject to the teacher's own judgement. In short, it is the task of all educationalists outside the classroom to serve the teachers; for only teachers are in the position to create good teaching. (69-70)

Action research can be the means of returning to the 'teacher as reflective practitioner' rather than 'teacher as technician'. In a similar vein, Dadds (1997), in commenting on approaches to continuing professional development, makes the point that teachers have 'learnt to seek the 'expert' outside but deny that there may be a potential 'expert' within'. Action research is then a means of 'nurturing the expert within'.

#### Recommendations

This paper then suggests the following recommendations which INSET providers should take into consideration. These are that effective teacher professional development needs to be designed around a number of key factors – detailed needs analysis; a collaborative and practical course designed to meet these needs; time for colleagues to work together both during and after the course (networking) and monitoring teacher development again both during and after any INSET to gauge the impact of the professional development. Well-designed INSET provision also has the effect of reinforcing teachers' sense of self-worth and will provide opportunities for teachers to act in a professional manner to regain that strong sense of professionalism.

The recommendations completing this paper are applicable, not only to the continued delivery of the *Marconi ECT Project* in its current phase, but also to anyone designing long-term INSET opportunities for teachers. Professional development opportunities should be designed around a well conceived professional development management cycle; take into account the professionalism of

teachers; the professional needs of teachers, as identified by them; ensure that INSET provision starts where teachers are in their own developmental stage; ensure that teachers are supported over a reasonable period to ensure lasting changes in the classroom and that the effects of such INSET are closely monitored and evaluated. Recent moves towards distance learning opportunities which require teacher colleagues to learn via the Internet will require an even more rigorous application of any professional development management cycle used.

#### References

- Branson, P. and Breckon, A. (2001) 'Marconi ECT Project: Phase 1 evaluation', *DATA Journal*, 6 (3)
- Dadds, M. (1997) 'Continuing Professional Development: Nurturing the expert within', *British Journal of Inservice Education*, 23 (1)
- English, R. (1995) 'INSET: Initiating change or merely supporting it?', *British Journal of In-service Education*, 21 (3)
- Fullan, M. (1991) *The New Meaning of Educational Change*, London: Cassell
- Oldroyd, D. and Hall, V. (1991) *Managing Staff Development – A handbook for secondary schools*, London: Paul Chapman
- Stenhouse, L. (1975) *An Introduction to Curriculum Research and Development*, London: Heinemann
- Stenhouse, L. (1984) 'Artistry and teaching: the teacher as a focus of research and development', in Hopkins, D. and Widen, M. (Eds), *Alternative Perspectives on School Improvement*, Lewes: Falmer Press
- Stoll, L. and Fink, D. (1995) *Changing our Schools*, Buckingham: OUP
- Tomlinson, H. (Ed) (1997) *Managing Professional Development in Schools*, London: Paul Chapman
- Wideen, M. and Andrews, I. (Eds) (1987) *Staff Development for School Improvement: A focus on the teacher*, Lewes: Falmer Press