Becta
ICT Research

Project 2b: use of ICT by leading mathematics teachers

This summary is based on research carried out by the Midlands Leadership Centre, University of Wolverhampton.

Background

In 1996, the Department for Education and Skills (DfES) launched the pilot of the National Numeracy Strategy (NNS). The training of advisers, consultants and headteachers in schools followed, and from September 1999 the DfES expected every teacher to deliver the 'daily mathematics lesson'. As a result, 'leading' or 'expert' or 'demonstration' teachers were appointed to assist in the delivery of demonstration lessons and to model effective practice in the teaching of mathematics in primary schools.

LEAs have taken different approaches to the concept of expert or demonstration teachers. These approaches range from authorities in which there are a defined number of leading teachers across the key stages, to those who find examples of good or expert practice in response to individual teacher requests.

Introduction

This project looked at the use and deployment of expert mathematics teachers by LEAs in line with the introduction of the NNS scheme. In particular it looked at the role of ICT in supporting the personal and professional practices of leading mathematics teachers (LMTs) in Key Stages 1 and 2. (In line with the preference expressed by teachers, this report generally uses the term leading mathematics teacher rather than 'expert' or 'demonstration' teacher.)

This small-scale project sought to evaluate:

- the effectiveness of the different LEA models in the deployment of leading mathematics teachers
- the factors influencing success
- the role of ICT in supporting the personal and professional practices of this community of leading teachers.

While this study reviewed practice in only seven LEAs, it is likely that the issues mentioned below will be familiar to all LEAs.

Methodology

The research began with the selection of seven English LEAs. The Midlands Leadership Centre established initial contact with each LEA mathematics team and outlined the types of data that would form part of the project.

Data collection

The research team devised a questionnaire and asked each LEA to provide the names of numeracy advisers, consultants and LMTs to whom it could be sent. The research team collated the response to the questionnaire and used the results to identify areas that required further focus. These areas were:

- appointment of LMTs/description of role/experiences and opportunities

- training and specialist knowledge/support from LEA/national guidance
- demonstration lessons
- communication/networking/dissemination
- use of ICT
- resources
- research and development.

Members of the research team undertook visits of up to five days to four of the seven LEAs during which they:

- interviewed advisers, consultants and members of the mathematics team
- observed mathematics lessons taught by LMTs in their own classroom
- interviewed LMTs
- observed training and in-service training (Inset) sessions for LMTs
- interviewed headteachers
- visited schools that had worked with LMTs
- collected relevant documentation, for example, handbooks, observation pro-formas and materials created by teachers.

LEAs were given responsibility for organising the visits. The schools visited included those in special measures and beacon schools. The LMTs interviewed and observed had a wide range of experience, from those newly appointed and with relatively little experience as a classroom teacher, to those who had been involved since the implementation of the strategy. The teachers interviewed were from across the primary key stages including the foundation stage.
Because of the wide-ranging experiences of the individuals interviewed, the team used semi-structured questions. These allowed the teachers and consultants to make additional or alternative contributions that were relevant to their experience of the work of LMTs.
The research team observed at least four full lessons in each authority – some were demonstration lessons with observing teachers present, others were everyday maths lessons taught by the LMT. During all lesson observations, the pupils responded positively.

Overview of the participating local education authorities

The following gives a brief overview of each LEA:

LEA 1 is in the South of England and supports 48 primary schools. An inspector of mathematics and two consultants lead the mathematics team. Two LMTs are working on a secondment basis to the authority. The authority benefits from an Education Action Zone (EAZ) and three mini EAZs.

LEA 2 is in the North of England and currently supports 130 primary schools. The mathematics team is led by a mathematics adviser, and comprises three full-time numeracy consultants and one leading maths teacher on secondment. There are 34 LMTs in this authority.

LEA 3 is in the South of England and currently has 38 schools within Key Stages 1 and 2. The mathematics team is led by a numeracy adviser, and comprises a numeracy consultant and a job-share secondment for three teachers (each one-day per week). There is a general group of approximately 12 LMTs in this authority, though other teachers provide demonstration lessons on request.

LEA 4 is in central England and currently has 228 primary schools. A numeracy adviser and three consultants make up the mathematics team. One of the consultants was previously a LMT in the authority. There are 12 leading maths teachers providing demonstration lessons.

LEA 5 is in the North of England and has 108 primary schools.

LEA 6 is in the South East of England and has 43 schools within Key Stages 1 and 2.

LEA 7: is in the North East of England and has 65 primary schools.

Key findings

Role of LMTs

The study found that although different authorities used various methods to arrive at the appointment of LMTs, the general expectations placed on LMTs remained the same. It seemed that LMTs had two basic roles:

- to deliver demonstration lessons
- to deliver Inset.

Some authorities placed emphasis on certain areas, but ultimately the description of the role was similar. What differed between LEAs was the organisation of visiting teachers, the professional development opportunities for LMTs and the provision of resources within schools and centrally. What differed between LMTs was that some viewed the role as a career development opportunity, while others undertook the role because of their 'love of maths'.

Responses to the questionnaire indicated that most LMTs had been teaching between six and ten years. Information gleaned during visits showed that advisers tried to appoint teachers from various backgrounds and with varying degrees of teaching experience. One LEA had chosen to appoint consultant teachers and advertised for them jointly with the Literacy Team. The selection criteria included:

- prior evidence of good teaching
- observation of a lesson by the numeracy/literacy adviser
- consultation with the headteacher to ensure the individual was able to take the initiatives forward.

In addition to LMTs, several authorities had employed advisory teachers on secondment. These had been deployed in various capacities, for example, a Year 6 teacher had been seconded for a term to work with other Year 6 teachers on an individual basis. (Because of the end of key stage tests, Year 2 and Year 6 teachers are seen by many headteachers as specialised teachers, thus they are much in demand for demonstration lessons.)

In some authorities the LMTs were also mathematics co-ordinators. The distinction between these two roles was largely undefined and very much dependent on the decisions made at school level about who should be a leading maths teacher. Many of the LMTs interviewed commented upon the need to work closely with the person responsible for mathematics in the school. Only one authority stipulated that LMTs had to be maths co-ordinators.

Methods of operation

In one authority, LMTs had the opportunity to support colleagues in other schools. When this happened, LMTs spent some time visiting the school to plan and teach the lesson, and thereafter to evaluate the lesson and consider an action plan with the class teacher.

LEA numeracy support teams frequently invited LMTs to join network groups, co-ordinator groups or development groups. Activities included creating and evaluating materials with colleagues, attending conferences, and mentoring newly appointed LMTs.

LEAs and schools also recognised that newly qualified or newly appointed teachers often needed further training on arriving in a new school. Findings in this study suggest that this 'mentoring' aspect of a LMTs work had increased in line with the appointment of Graduate Teacher Placements and newly appointed teachers from overseas.

One LEA had a directory allowing teachers to select a LMT based on a specialist area, for example, special educational needs or the teaching of mathematics using drama. The specialisms reflect the LMT's personal confidence. Teachers who wanted to know how to improve a particular area of their teaching organised the visit directly with the specialising LMT.

In another authority, the numeracy team identified 'themes', which all LMTs addressed during the year, and all LMTs taught demonstration lessons on five dates selected by the team. The whole scheme was organised by the numeracy team and visiting teachers had to say what they hoped to achieve from an observation. This method of organisation ensured that publicity was focused around dates and all schools could plan the visits. It also meant that the numeracy team could partner visiting teachers with LMTs in similar circumstances. Furthermore, there was time to plan the dissemination of information to other staff as schools knew the themes at beginning of the year.

Opportunities

Colleagues frequently viewed LMTs as 'exemplary models' of other generic skills including:

- classroom management and organisation
- interpersonal skills
- a reflective attitude to their own practice
- management/leadership skills
- an independent approach to seeking continuing professional development opportunities.

Often, LMTs were encouraged to become advanced skills teachers (ASTs) but found the role required them to be absent from their classroom. (LEAs have responded to the role of ASTs in different ways. Some continue to train the two groups of leading teachers separately and think that because of personal remuneration as an AST, the two groups should be offered different routes to training.) Few of the teachers interviewed had received a personal incentive for undertaking the role LMT. The questionnaire results indicated that many teachers believed that they needed more time to fulfil the LMT role adequately.

Training and specialist knowledge

All LMTs made very positive comments about the training, support and guidance they had received and continued to receive from their LEA. The teachers felt confident in the advice available and acknowledged the expertise and 'voice of experience' found amongst members of mathematics teams.

Generally, LMTs found the training sessions of a high quality and full of useful materials. The National Numeracy Strategy's 'handbook' was recognised as a 'good initial guide', rather than a source of constant reference. LMTs also welcomed the opportunity to watch high-quality videos and valued the time available for discussion with colleagues. The NNS training materials had been

useful, but LMTs welcomed face-to-face training about how to use of the materials to best advantage.

However, the research indicated conflicting views concerning the types of training and specialist knowledge required. Some LMTs are maths specialists and therefore welcome training in areas such as:

- teaching and learning styles
- classroom organisation
- use of ICT
- assessment.

While others recognised a need for continued training in subject knowledge too. (There appeared to be marked differences in the anticipated subject knowledge at Key Stages 1 and 2. Many leading maths teachers at Key Stage 1 did not feel confident enough to deliver maths at Key Stage 2.)

All LMTs talked about the tremendous value of meeting colleagues at the LMT training sessions. The LMTs found it extremely beneficial to have a half-day, or in some cases a full day, away from the classroom in which to consider the latest resources or areas for development. Above all, many valued the time to reflect with colleagues about their demonstration lessons. LMTs also felt that it was important for LEAs to meet with them regularly to ensure that they were up-to-date with regional and national developments – LMTs needed to deliver consistent information during demonstration lessons.

Scheduling lessons, pre-lesson activity, post lesson feedback

The LMT Handbook gives clear guidance about demonstration lessons and most authorities have used this as a guide for their teachers. LEAs have provided pro-formas for lesson observations to ensure that LMTs give visiting teachers consistent information. Most LEA pro-formas included:

- a lesson plan
- an observation form (to help the visiting teacher focus on key elements).

Observations showed that some LMTs had adapted these, either to reflect individual school planning or to emphasise a particular area. The majority of leading maths teachers recognised that using a pro-forma helped teachers to think about the techniques or resources being used to develop the numeracy skills.

LMTs acknowledged that demonstration was still an essential part of their role, although visiting teachers had changed the focus of the demonstration. Observing teachers now rarely focused on the organisation of the mathematics lesson; they wanted to observe specific details, for example, how to make best use of technologies or how to address certain aspects of the numeracy framework.

The study found that often LMTs did not know the teachers who came to their classroom and sometimes the visit was their only meeting. Some LMTs chose to develop contacts with individual teachers after the visit, but this seemed mainly to happen when visiting teachers asked about the possibility of further contact.

It seemed that rather than focusing specifically on the mathematics teaching, observing teachers frequently spent too much time trying to find out general information, for example, where resources had been purchased and how much they had cost. Numeracy consultants in two of the

authorities were trying to improve the focus of visiting teachers by encouraging LMTs to ask them to identify their areas of interest before the arrangements were confirmed.

The study showed that headteachers often expected LMTs to carry out briefing or post-lesson discussions with visiting teachers during breaks or lunchtime. This was largely because headteachers did not want the working day disrupted. (Disruption can be a considerable issue for schools whose LMTs are observed regularly.) However, it seemed that as the work of LMTs developed, so LEAs became clearer about compensatory funding arrangements for schools.

In LEAs where funding was available, schools were usually paid a half-day of supply cover to allow the LMT to teach a lesson and to be available before and after the lesson to talk with the visiting teachers. Most LEAs only paid the school when the LMT delivered a lesson. When LMTs delivered Inset sessions, some LEAs paid a 'preparation fee' directly to teachers. Some advisers questioned whether LMTs should be paid for the additional work as a matter of course and felt that further debate about the issue ought to take place.

Inset sessions, themed demonstrations and consultant seminar sessions

One LEA provided an Inset session for Key Stage 1 teachers to give them more information about how to prepare for the end of key stage tests. A LMT, supported by an adviser, led the session. During the Inset, the LMT used exemplary material that was easily available via the internet. Only a few of the teachers on the course knew that the material existed and none had examined it.

Another Inset session in a different authority was just for LMTs. The whole event was practical and full of lesson ideas for the LMTs to use immediately. In addition, the numeracy consultants had encouraged LMTs to bring along any photocopiable resources that they were prepared to share. Some LMTs demonstrated the resources they contributed and colleagues welcomed the opportunity to see the activities in action and to discuss ways of adapting or extending them. An administrator duplicated the resources so that each LMT left the event with a photocopiable resource pack.

LEA Three offered consultant seminar sessions. Here the numeracy team organised the visit and a consultant attended the session. The numeracy consultant led a seminar session and supported the observed LMT by ensuring that the visiting teachers had a full understanding of the aims of the lesson. The session gave teachers an opportunity to observe a real situation and receive further support directly from the numeracy consultant.

Communication, networking and dissemination

LMTs reacted positively where LEAs had established networking meetings for them. The LMTs had been able to:

- gather practical support
- establish a good rapport
- share ideas/resources
- learn about regional and national initiatives.

This study showed that most LMTs created their own resources or located suitable ideas. There appeared to be far too many teachers creating the same materials in isolation. Most LMTs felt it important to evaluate materials as a group because resources are often adaptable and discussion can lead to important thoughts about continuity, progression and levels of differentiation. While LMTs had been involved in collaborative work, not many were given additional time to disseminate

the materials to other staff in their own school. It seemed that the potential of 'networking time' with other non-LMT colleagues also needed to be evaluated and developed. (The use of ICT is also dependent on core subject co-ordinators working collaboratively.)

Larger schools benefit from working in faculties or teams. For example, one school visited had a numeracy team consisting of one member of staff at Key Stage 1 and two within Key Stage 2, representing the upper and lower years. This group met regularly to discuss issues arising in mathematics lessons and members were responsible for disseminating information back to their year group team. Similar groups operated in this school for the other core subjects of the curriculum. The arrangement was enhanced further when the numeracy team worked with the teachers responsible for Special Educational Needs (SEN) or gifted and talented pupils.

It appeared that LMTs had a valuable contribution to make to their individual school and their 'family of schools' or 'cluster group'. There were examples of cluster groups collaborating effectively. Some of the schools visited benefited from being close to a local secondary school and could share resources or teacher expertise. This kind of collaboration is one that numeracy teams and headteachers could expand or develop. (At least two of the headteachers interviewed criticised local secondary schools for not sharing resources.)

Teachers wanted the opportunity to network and to share resources. Some of the leading teachers were happy to spend time out of the classroom and felt they would benefit from sharing and learning about mathematics teaching beyond their own authority. One of the numeracy teams recognised that finding good practice was a 'constantly evolving process'. Many LMTs believed that their teaching was 'not anything special'. However, the LMTs were completely passionate about their role as teachers and their commitment to the effective teaching of mathematics. The reality of the situation is that most LMTs have had little or no opportunity to observe, or work closely, with expertise from outside the LEA.

Other issues

Large numbers of those interviewed recognised that the issue of the development of mathematics skills at home was an issue. The introduction of the NNS encouraged schools to deliver sessions to parents that explain what their child was learning, but some schools had still not addressed the issue. There appeared to be a need for LMTs to disseminate their work wider than the network of teachers who choose to visit a demonstration lesson.

Many classroom assistants had received training to help them understand the content of the mathematics lesson. Several LMTs referred to the importance of making time to ensure that classroom assistants had an appropriate understanding of their role within the lesson.

Some LMTs gave particular emphasis to displaying information or posters in the classroom. However, there was not much focus on displaying pupils' work or the process and strategies that the children used to complete their work. In some classrooms pupils were dependent on vocabulary displays and tended to look to one part of the room for information. Most of the LMTs observed had flashcards covering the essential vocabulary used within the lesson. The most effective teaching of vocabulary involved the teacher discussing the 'important words of the day', rather than assuming that the pupils would read the information just because it was on display. One teacher made effective use of 'dramatic voice' to encourage the pupils to remember the words. In one authority, the LMTs had created large display boards of effective mathematical

activities and pupils' work. The advisers/consultants had presented the display at various training venues around the LEA thus allowing all teachers in the authority to benefit.

Use of ICT

LMTs appear to have made some progress with the use of ICT within their work. However, at present this seems to centre on creating presentations and making paper-based work more attractive by using a desktop publishing or word-processing program. Where LMTs were observed using ICT for the delivery of lessons, it was rarely used for the whole lesson. Within lessons, some teachers allowed some pupils to use a stand-alone computer or a single computer attached to the school network. Whilst many schools had a computer suite, it was often completely timetabled and access to it for teaching mathematics and literacy or other subjects, aside from ICT skills, was described as 'near impossible'.

Researchers observed the following uses of ICT during this project:

- **Supporting personal practices:** while many LMTs were able to plan using a computer, this was not consistent school policy. Most teachers did not have an internet connection within their classroom. However, most LMTs considered themselves competent at searching on the internet but expressed concern about the time wasted trying to locate appropriate sites to use with pupils. LMTs did use the internet as a source of information to aid their professional development, but they commented upon the lack of non-contact time or professional development time to research national publications or websites. LMTs who were able to make use of the internet did so in their own time. Teachers commented upon the importance of having access to information and computers away from the classroom. Some schools provided access to ICT in the staff room which allowed teachers to work together to look at software and websites. Such provision encouraged teachers to work collaboratively. Overall, it appeared that teachers were developing confidence and competence in their own personal use of ICT.
- **Skill reinforcement:** in the classroom, LMTs used ICT for drill and practice. This tended to be repetition of a paper-based activity.
- **Concept delivery – modelling new information:** some LMTs only had access to an overhead projector or to one computer screen; in these cases they tended to use effective questioning or small activities to involve all of the pupils.
- **Interactive whiteboards**: LMTs had varying levels of experience in use of this equipment. Observations showed that teachers less confident in the use of ICT used the interactive whiteboard simply as a white screen to project lesson content. Teachers that were more confident demonstrated software or played mathematical games with teams of pupils. More use could have been made of the 'flipchart' or 'notebook' features of whiteboards to allow pupils to share their thinking or ideas with the teacher and the rest of the class.

Observations, interviews and responses indicated that some LMTs were not addressing basic issues about classroom and resource management when making decisions to use ICT in a mathematics lesson. Issues such as:

- Whole-class teaching: how to use ICT in the introduction or plenary sessions?
- Sharing equipment: if pupils have to share equipment, what is the most appropriate way to group pupils?

- Technical support: what should the pupils do if they need technical help as opposed to help with their mathematics?
- Learning support and classroom management: can the teacher easily move around the room to observe and to talk to the various groups? How will the teacher record and assess the achievements of individuals?
- Vocabulary: how can pupils find or check useful vocabulary?
- How will the pupils demonstrate their strategies using ICT?
- Software and integrated learning: does the software repeat a specific number of questions or are there different questions when pupils have a second attempt? (Pupils soon memorise the answers or find them from someone who has already completed the task.) If software is differentiated, are more able pupils completing an appropriately challenging task or merely expected to do the same task faster, and repeat it when complete? (Some teachers seemed to buy software and use it without identifying the learning outcomes; therefore, aspects of application remained unexplored and teachers neglected the intended learning objectives.)

For the most part and in each authority, the considerable mathematical expertise of LMTs appeared to need nurturing when it came to the use of ICT in the classroom. LEAs and schools could achieve much simply by resolving problems relating to access to ICT. The project found LMTs who wanted to use ICT within their lessons but who were unable to do so due to:

- lack of equipment
- lack of training
- lack of understanding of, or experience in using, ICT resources appropriately within mathematics.

The questionnaire asked about access problems. One teacher commented:

"I would use an OHP, but my 1930's classroom has very limited access to power!"

There was also evidence of classrooms with limited resources, yet teachers who were enthusiastic and ICT literate. In these circumstances it is difficult for LMTs to demonstrate how to be at the forefront of using technology to improve the teaching of mathematics. A further example of lack of access to appropriate ICT concerned the many teachers who valued the resources available from the NNS, such as the interactive teaching programs, but who were unable to use them fully due to a lack of equipment (data projector).

Use of other resources

The National Numeracy Strategy has made resources such as vocabulary flash cards readily available, but LMTs continue to create resources using pen and paper; for example, large marker pens are often used with card for number lines or target boards. One LEA has paid a school to create a 'box of essential resources' for each year group. The LEA sent a list of the items per year group to each of its schools. Another authority made similar information readily available on its website.

Where LEAs had produced website materials, the maintenance and updating of the content often fell on the numeracy consultancy team. Some authorities maintained physical resource areas where teachers could access mathematics materials. Overall, it seemed that there needed to be more national resources with access for all, rather than different LEAs recreating the same materials.

Teachers need to be able to maximise the use of the resources and encourage pupils to think beyond the immediate context. Additionally, teachers need to look at ways of organising equipment so the pupils can make their own decisions about what will help them to solve mathematical problems. For example, one classroom observed had small baskets of number lines, small wipe-clean whiteboards, counters and other general resources. Thus rather than being told what to use, pupils had access to a range of support equipment.

Teachers need time to make best use of ICT and cannot teach effective mathematics lessons with limited knowledge of software or web-based material. The questionnaires and the interviews illustrated the importance of auditing resources and keeping staff informed about what is available. Several LMTs had addressed the need to remind staff about effective practice by, from time to time, demonstrating the use of resources.

Research and development

During the interviews, researchers asked all LMTs about the research opportunities they explored within their role. None of the teachers had considered the DfES Best Practice Research Scholarship, nor had they explored funding for practitioner research, yet this would have provided vehicle for disseminating their practice.

One LEA had encouraged groups of teachers to work together to develop resources. Consequently, the LEA had sent a CD-ROM of resources to all of its schools.

Conclusions

As LMTs are often seen as exemplars of generic teaching skills, and as many schools have yet to address the issue of how to improve the role of their leaders, an extension of the role of LMT should be investigated. LEAs should consider whether some LMTs might benefit from additional training, for example, formal leadership or mentor training.

Where LMTs are used to support colleagues on a one-to-one basis it is important that they are also trained in lesson observation – what to look for when observing other teachers. It is also important that LEAs meet with their LMTs regularly to ensure that they are up-to-date with regional and national developments – LMTs need to be delivering consistent information during demonstrations. Additionally, LEAs need good knowledge of their LMTs in order to be able to recommend them to support other teachers.

The questionnaire results highlighted that many teachers believe they need more time to fulfil the LMT role adequately. All LMTs talked about the tremendous value of meeting colleagues at LMT training sessions. LMTs find it extremely beneficial to have a half-day, or in some cases a full day away from the classroom to consider the latest resources or areas for development. Above all, many value the time to reflect with colleagues about their demonstration visits.

This study shows that many schools expect LMTs to complete the briefing or discussion time with visiting teachers during break time or lunchtime because headteachers do not want the working day disrupted. Where a LMT is much in demand for demonstration lessons, disruption and loss of teaching time can become an ‘issue’ for the management team of the school. LEAs and numeracy teams should work to ensure that schools prioritise the needs of the pupils alongside the professional development needs of teachers. Thus, if extra funding for supply cover is needed to release the LMT for ‘discussion time’, then LEAs should look at ways of organising this.

LMTs and core subject co-ordinators sharing and networking in school and in clusters of schools is the kind of collaboration that numeracy teams and headteachers could expand or develop to the benefit of pupils, LMTs and other subject staff. Many training strategies could be employed to prevent individuals from researching, creating, and evaluating materials in isolation. These include:

- cross-authority training
- cross-authority development
- wider use of the internet
- creating 'single focus' or 'specific focus' research and development teams at a national level.

It appeared that many leading maths teachers were constantly testing new ideas and reflecting upon their experiences as part of their general classroom practice. Numeracy teams should be working with this group of teachers to capture the most effective ways to improve the teaching of mathematics. All of the advisers discussed how they share ideas within their own authority. Some of them benefit from a close liaison with the literacy team. One adviser asked:

> *"Is it time for literacy and numeracy to have leading teachers covering both core subjects along with more direct delivery on learning styles and the use of technology?"*

It seemed as if these communities of expert teachers needed to be challenged – and thus would benefit from sharing and learning about mathematics teaching beyond their own authority. The reality of the situation is that most LMTs have had little or no opportunity to observe, or work closely with, expertise from outside the LEA. Clearly, LMTs and numeracy consultant teams would benefit from the use of external consultants during regular training or networking days. Structured time to work with external expertise could result in content suitable for regional and national dissemination. This would also encourage the creation and development of new knowledge.

The data from this research reveals that most LMTs do not make use of ICT regularly for teaching of mathematics. (Some LMTs did allow pupils access to computers for the main activity, but this was not a feature of many lessons. There was little evidence to suggest that ICT resources are being used in whole lessons.) Activities involving ICT are generally used by LMTs who have regular access to equipment and because the LMT is confident with a particular program. At present, there is minimal evidence of LMTs using ICT to transform pupils' mathematics learning.

Clearly, the issue of access to ICT needs further exploration. If LMTs are to demonstrate using the technology, then their classrooms need to be equipped appropriately. It seems that LEAs and schools would benefit from guidelines about what constitutes basic ICT provision in the classrooms used by LMTs and, where necessary, funding to achieve the desired outcome.

If, through adequate provision of ICT in the classroom, teachers learn how to use ICT in maths appropriately, then they will need access to ICT outside of the classroom to reinforce their learning and to continue the development of their ICT skills. Therefore, it appears that LEAs and headteachers must recognise that effective use of ICT is not just about initial skills training but about continuing development which considers the use of appropriate resources for teaching specific content. This requires regular evaluation and review and difficult decisions about the prioritisation of scarce resources.

> *"I need time to find out what is out there… and I need time to liaise with the ICT Co-ordinator. I haven't got access to put the software on the network anyway, but I would welcome non-contact time to discuss with the ICT co-ordinator what needs to be done,*

rather than at 3:15 p.m. when you've got a million and one things to do and so have they…I think time is a big wish."

Recommendations

Based on the finding of this study, the project offers the following set of recommendations:

- Professional development should include an element of leadership and/or mentor training to enable LMTs to play a greater part in school improvement.
- LEAs should ensure that LMTs are up-to-date with regional and national developments in mathematics.
- LMTs should be allowed quality time to discuss demonstration lessons with visiting teachers, to explore innovative ideas and to access ICT-based resource banks. If extra funding is necessary to enable the release of LMTs then LEAs should look at ways of providing it.
- The NNS should encourage the development of national and local resource banks to include display materials as well as teaching resources. These materials should be well publicised and freely available to LMTs.
- Where they do not already exist, LEAs should establish networking groups to encourage collaboration within numeracy support teams and between neighbouring schools such as secondary schools and their feeder primaries.
- There should be opportunities for LMTs to network beyond their own LEA.
- LMTs should have access to the necessary resources to integrate ICT fully within mathematics teaching. (Observations in this project (in line with the findings of various national initiatives[1]) indicate that all LMTs would benefit from access to a personal laptop computer and classrooms with interactive whiteboards.)
- The issue of whether teachers ought to receive payment for their work as LMTs should be explored. (The role of LMTs can be difficult to distinguish from that of Advanced Skills Teachers; also, they are subject to constant scrutiny by visiting teachers many of whom expect to see innovative and inspiring ideas.)

[1] For example, Laptops for Teachers. For more information see: http://www.becta.org.uk/research/research.cfm?section=1&id=3183