

# **Information Technology (IT) in secondary schools and its impact on training IT teachers**

**Copyright©Roger Crawford, 2000**

University of Huddersfield	Telephone: 01484-478264
School of Education and Professional Development	Fax: 01484-514784
Holly Bank Campus	Email: R.A.Crawford@hud.ac.uk
Huddersfield	
HD3 3BP	

## **Biographical details:**

Roger Crawford is a Senior Lecturer in Education specialising in IT at the School of Education and Professional Development, the University of Huddersfield. He has taught IT in English secondary schools, and is a Chief Examiner for GCSE IT, an OFSTED inspector, and an author. He has published school textbooks and other resources for teaching and learning, articles in practitioner publications, and a book on the management of IT resources in schools. He is also an experienced and well qualified IT practitioner (Chartered Information Systems Practitioner, C.Eng., MBCS, MSc Computing, MSc Education, PGCE, BSc Mathematics), and worked for several years as a systems analyst/computer programmer in commercial companies in London and New Zealand.

---

# **Information Technology (IT) in secondary schools and its impact on training IT teachers**

Revision of a paper first presented at BERA 1998, Belfast.

## **Abstract**

There are concerns about the teaching and learning of IT in English state secondary schools, and the way IT resources and the curriculum are organised. These circumstances affect students who are training to be IT teachers when they are on teaching placement in secondary schools. They may find that the curriculum model used in one teaching placement school is very different from that used in another; contact with pupils may be too brief causing difficulties with teacher-pupil relationships; different approaches to teaching and learning may be encountered; there may be difficulties with continuity and progression in the IT curriculum; and expected standards may not be consistent. Student teachers may be better qualified, and have more practical experience of IT systems and resources than their subject mentors in schools. However, these may regard students as lacking in basic subject knowledge as the hardware and software in schools does not match students' previous experiences. Few of the above concerns are unique to BEd and PGCE courses in IT, however, they can be relatively more significant. Some helpful strategies are suggested.

---

## Contents

<b>INTRODUCTION .....</b>	<b>3</b>
<b>INFORMATION TECHNOLOGY (IT) IN ENGLISH STATE SECONDARY SCHOOLS.....</b>	<b>4</b>
CURRICULUM MODELS .....	4
STYLES OF TEACHING AND LEARNING .....	5
CONTINUITY, PROGRESSION AND STANDARDS.....	7
RESOURCES .....	9
IT CAPABILITY .....	10
ASSESSMENT, RECORDING AND REPORTING .....	12
QUALIFICATIONS AND EXPERTISE.....	12
<b>IMPACT ON THE INITIAL TEACHER TRAINING OF IT TEACHERS .....</b>	<b>13</b>
THE STUDENT EXPERIENCE.....	14
THE DILEMMAS .....	16
POSSIBLE STRATEGIES FOR INITIAL TEACHER TRAINING.....	17
<b>CONCLUSION AND SUMMARY .....</b>	<b>19</b>
<b>BIBLIOGRAPHY AND REFERENCES .....</b>	<b>21</b>

---

# **Information Technology (IT) in secondary schools and its impact on training IT teachers**

## **Introduction**

Despite many government initiatives and the sustained efforts of many education professionals over two decades there remain concerns about the teaching and learning of IT in English state secondary schools. In comparison with other subjects that are well established in the secondary school curriculum, for example, mathematics, in practice:

- there is uncertainty regarding which curriculum models lead to effective teaching and learning.
- there is confusion over which styles of teaching and learning are most appropriate (Crawford, 1999).
- there is a lack of continuity and progression in the curriculum.
- there are low standards of attainment (Goldstein, 1997).
- there are insufficient modern IT resources.
- understandings of the characteristics of the outcomes required, that is, pupils' IT capability, have and continue to change.
- assessment, recording and reporting, can be unsatisfactory.
- most IT teachers lack qualifications in the subject, and the quality of teaching is poorer than in most other secondary school subjects (Goldstein, 1997).

These circumstances affect students who are training to be IT teachers when they are on teaching placement in secondary schools, and have implications for initial teacher training programmes.

---

## Information Technology (IT) in English state secondary schools

### *Curriculum models*

The revised National Curriculum for England introduced into secondary schools from August 2000 and the previous 1995 revision have separate orders for ICT/IT, rather than subsuming it under the umbrella of Technology as in the earlier 1990 revision. This tends to emphasise IT as a discrete subject although references to it in the English National Curriculum orders for other subjects and supporting advisory documents (SCAA, 1995a&b; NCET, 1995a&b; NCET, 1996, DfEE, 1998b, Annex B) continue to stress its importance throughout the curriculum, and propose a variety of curriculum models:

- IT may be taught entirely as a discrete specialist subject. However, few schools have sufficient IT resources and the time for IT must be found in an already crowded timetable. As a result, either all pupils have a relatively insubstantial curriculum or only some pupils are offered a more substantial course, perhaps leading to external assessment in the General Certificate of Education (GCSE) in their final year of compulsory schooling.
- IT may be taught entirely across the curriculum. This requires detailed curriculum mapping to ensure the programmes of study specified in the English National Curriculum for IT are covered, and in practice this is rarely satisfactory (Goldstein, 1997). Non specialists are required to teach IT; and assessment and reporting are difficult to coordinate.
- IT may be organised as hybrids of the above. For example, the 'skills core' model where IT is taught and assessed as a discrete subject in reduced timetabled time and

---

consolidated throughout the curriculum; and the 'kick start' model where, for example, IT may be taught as a discrete subject in the first year of secondary school, i.e. year 7, and taught across the curriculum in other years (NCET, 1996).

In practice, the organisation of the IT curriculum may not fit neatly into any of the above categories, and is often quite different to that of other secondary school subjects. The range of possible models proposed suggests that almost any arrangement will be acceptable, and a wide variety of practice is evident in secondary schools. For example, pupils might be timetabled for IT each year for only half a term for one hour per week in a carousel with other subjects. Such a pattern of timetabled time would be highly unusual in, for example, mathematics or Modern Foreign Languages, and might be considered insubstantial and therefore unacceptable.

### ***Styles of teaching and learning***

The influence of behaviourism is extensive in secondary schools (Crawford, 1999; Phillips, 1997; Strommen and Lincoln; 1992). As a result of the behaviourist designer centred view of teaching and learning, school teachers are traditionally regarded by their pupils as 'gods of knowledge' (Phillips, 1997) who have total mastery of the subject content they teach, and design and control all the learning that takes place within their classrooms. 'The dominant educational paradigm is didactic instruction where learning is viewed as an information transmission process' (Soloway, 1997), and teaching consists of the transfer of knowledge from teacher to pupil. Teachers are encouraged to develop linear sequences of tightly structured, highly focused learning materials, and assess pupils' learning in relation to the specific learning outcomes built into them (DfEE, 1998a; Fosnot, 1996, p9). OFSTED and the DfEE predominantly recommend such teacher centred, whole class, didactic teaching strategies which teachers of IT can find difficult to put into

---

practice.

There are features of teaching and learning IT that make a constructivist approach the only workable pedagogy (Crawford, 1999; Inge, 1996). IT teachers cannot be 'gods of knowledge' as the content domain and the technology change too rapidly, and pupils may have better knowledge of these than teachers. This obstructs detailed, systematic instructional design and teacher centred, didactic control of the learning process, and undermines traditional relationships between teachers and pupils.

IT teachers who attempt to use didactic, whole class, teacher centred approaches to teaching IT often struggle to retain pupils' attention. Even though pupils may be highly motivated, they can be disinclined to sit and listen to the teacher or to wait for other pupils to complete their work as the teacher takes the whole class step-by-step through precise operational procedures. Where learning materials based on traditional systematic instructional design are used, learners tend to deviate from the given sequence or abandon it entirely, preferring to try and make sense of the situation rather than following a series of rigid steps (Boyle, 1997, p13). Teachers of IT have more difficulty controlling the focus of pupils' work in the classroom because, for example, pupils may have full access to all the features of the software they are using, and to all other installed software. In other secondary school subjects, teachers have much greater control over classroom activities and the texts, worksheets, and other learning resources made available to pupils.

From the constructivist perspective, the role of the teacher and the purpose of learning materials is to facilitate active learning, during which learners construct their own understandings, rather than design tightly specified, linear teaching programmes that impose given knowledge structures on the learner (Strommen & Lincoln, 1992). Teachers cannot transfer meanings or concepts direct

---

to passive learners but can only orientate their learning (von Glaserfeld, 1996, p7). Learners are expected to have ownership of the learning process, experience with construction of their own knowledge, and self-awareness of the knowledge construction process (Boyle, 1997, p76; Wilson, 1997). Learning is seen as the process of ‘assimilation, augmentation and self re-organisation of incomplete mental structures’ (Soloway, 1997), and is considered to be most effective where learners are pro-active in and control the construction of their own explanations (Gergen, 1997; Strommen & Lincoln, 1992, p2). Using IT, learners may create their own knowledge and understanding through active engagement with realistic tasks in authentic contexts using actual tools. There can be an emphasis on process rather than specific learning outcomes, and as a result, these will be less predictable and may vary from learner to learner.

In addition, pupils are likely to investigate and develop not only their own ideas but the ideas of other group members (Phillips, 1997). As a result, learning IT is almost always likely to involve an element of collaborative learning, and IT teachers should expect to learn at the same time as pupils and to take the lead in learning with them.

### ***Continuity, progression and standards***

The organisation of the programmes of study for the English National Curriculum in IT and the level descriptions suggests an hierarchical curriculum with systematic continuity and progression built in whilst their content does not. For example, in the key stage 3 programmes of study of the 2000 revision, pupils should be taught to: ‘reflect critically on their own and others’ uses of ICT to help them develop and improve their ideas and the quality of their work’ and ‘share their views and experiences of ICT, considering the range of its uses and talking about its significance to individuals, communities and societies’ (DfEE/QCA, 1999a, p20); and in the key stage 4 programmes of study, they should be taught to: ‘reflect critically on the impact of ICT on their

---

own and others' lives, considering the social, economic, political, legal, ethical and moral issues' (DfEE/QCA, 1999a, p22). Similarly, in the 1995 revision of the English National Curriculum, pupils were to be given opportunities to 'discuss some of the social, economic, ethical and moral issues raised by IT', and correspondingly, at key stage 4, pupils were to 'recognise the impact of new technologies on methods of working in the outside world, and on social, economic, ethical and moral issues' (DfE, 1995, p4-5). These broad statements do not make it entirely clear exactly what is required, nor is it entirely obvious that key stage 4 subsumes or is a progression from key stage 3 as might be expected.

In addition, the content of the orders is vague compared with other subjects. Note the contrasting specificity between these statements taken from the key stage 3 programmes of study of the 2000 revision of the English National Curriculum for IT and those for Mathematics.

- IT: 'Pupils should be taught to develop and explore information, solve problems and derive new information for particular purposes.' (DfEE, 1999a, p20)
- Mathematics: 'Pupils should be taught to calculate mean, range and median of small data sets with discrete then continuous data...' (DfEE, 1999b, p54).

Similarly, in the 1995 revision, in the key stage 3 programmes of study, a similar lack of specificity was found between IT and Mathematics.

- IT: 'Pupils should be taught to use a range of IT equipment and software...' (DfE, 1995a, p4)
- Mathematics: 'Pupils should be taught to understand and use Pythagoras' theorem..' (DfE, 1995b, p16).

If teachers are not clear exactly what must be taught and when, a lack of systematic continuity and progression can result. 'In only about a half of schools at key stage 3 and two fifths at key stage 4 were the requirements of the programmes of study met' in IT whereas in all subjects taken together the proportion was four fifths (Goldstein, 1997, p11).

---

In practice, IT teachers often find that they teach the same skills to children and adults, and to children of different ages, both within and between institutions. There is a lack of planned, systematic continuity and progression throughout the IT curriculum in English state secondary schools. Published schemes and guidance are scarce, though some work has been and continues to be done to remedy this (ACITT, 1998; DfEE, 2000). This may be a major factor in pupils' achieving lower levels of attainment in IT than in other subjects despite high levels of motivation (Goldstein, 1997; OFSTED, 1995).

### **Resources**

Using IT involves using more expensive resources more frequently than in other curricular activities, however, there is insufficient hardware in many schools for pupils to have access whenever they need it, and pupils may have to share computers even in IT subject studies (Goldstein, 1997).

The hardware and software available in schools is not consistent between and often within schools, with different hardware platforms available (49% IBM compatible; 7% Apple; 32% Acorn - DfEE, 1997a) and a variety of different software in use. In addition, the technology changes rapidly and often unpredictably, with the result that schools must re-equip more frequently than in other subjects and forward planning is more difficult. Many schools re-equip in sporadic bursts due to bid-based funding, and government initiatives, such as the Technical and Vocational Educational Initiative (TVEI), the Technology Schools Initiative (TSI) and the National Grid for Learning (NGfL), have helped some schools but not all. As a result, IT teachers cannot assume that sufficient, modern IT resources will be consistently available, and the provision of these can vary dramatically from school to school.

---

### ***IT capability***

Notions of what constitutes IT capability have changed considerably during the last twenty years, and it is likely that they will continue to do so. Within the English educational community, there is evidence that (Crawford, 1998):

- the perceived purposes of developing pupils' IT capability have moved from vocational to predominantly educational;
- perceptions of the IT skills pupils require have moved from technical skills to those needed by users;
- constructivist approaches to teaching and learning IT are more likely to be adopted;
- there is a tendency to be technologically conservative and deal predominantly with what is known, not with what could or might be possible;
- the relationship between technology and society is often neglected, and where this is not so, only the effects of technology on society are considered.

These trends seem to indicate that, at present, pupils' would be considered to have satisfactory levels of IT capability if they can:

- use IT to support their learning in all subjects;
- use IT software and hardware effectively, and understand its potential and limitations;
- take responsibility for their own learning, developing strategies to help them learn autonomously how to use unfamiliar IT tools, and work collaboratively;
- understand that IT affects social processes.

This definition is not unlike that given in the 1995 English National Curriculum orders for IT and

---

elsewhere (DfE, 1995a; Benzie, 1997). However, there is a greater emphasis here on autonomous and collaborative learning.

IT hardware and software develop rapidly and associated language, meaning and social processes also change. For example, the development of IT related GCSE syllabuses has been accompanied by changes in the name of the subject from Computer Studies (1979 to 1994) to Information Systems (1993 to 1997) to IT (1995 to 2001) and this will change to ICT in 2002. Whilst the subject content has been revised as the name of the subject has changed, there is a clear developmental route that links these syllabuses.

Understandings of what constitutes IT capability can only be snapshots of an evolving process. Alternative conceptualisations of IT capability are continually available as new IT language is created and redefined. These changes may be superficial or may represent genuine knowledge shifts, and as they emerge there may be confusion. For example: network literacy 'may be defined as the capacity to use electronic networks to access resources, to create resources, and to communicate with others. These three elements of network literacy can be seen as complex extensions of the traditional skills of reading, writing, and listening.' (DfEE, 1997b, p7). Pupils who possess 'network literacy' have 'literacy and numeracy; problem solving skills; handle information; social and interpersonal skills and understanding; independent learning; and technical understanding.' The 'new literacies' place more emphasis on the 'skills of handling information' and 'skills of critical thinking' (Tate, in SCAA, 1997, p16).

Similarly, at the time of writing, the meanings of the terms IT and ICT are being re-defined. The 2000 revision of the English National Curriculum names the subject as ICT whereas the 1995 revision names the subject as IT. Prior to the 2000 revision, many practitioners used the term ICT to mean 'the use of IT to support teaching and learning throughout the curriculum' whereas IT

---

was used to mean ‘the subject of IT’. As a result, this re-naming is causing considerable confusion and is likely to lead to shifts in the meanings of the terms IT and ICT.

### ***Assessment, Recording and Reporting***

English schools use a variety of assessment strategies and ways of recording and reporting pupils’ progress. Assessment strategies can differ considerably between schools, and evidence on which assessment is based can be insubstantial. Many secondary schools have only recently become aware of the requirement to report pupils attainment in IT at the end of key stage 3 in terms of the National Curriculum level achieved. There is also confusion regarding requirements at the end of key stage 4: schools may provide no assessment of pupils' IT capability; provide a school report showing progress and/or attainment; enter all or some pupils for either short course or full course GCSE IT; enter pupils for GNVQ; enter pupils for CLAIT; etc. Since each means of assessment has its own syllabus and approach to assessment, this will affect the curriculum at least during key stage 4.

### ***Qualifications and expertise***

Most IT teachers employed in English secondary schools lack qualifications and training in IT or computing, particularly at degree level or above, and very few have been specifically trained to teach IT. The UK Teacher Training Agency (TTA) only approved Post Graduate Certificate of Education (PGCE) and Bachelor of Education (BEd) courses in the subject of IT for the first time beginning in September 1996 (Crawford, 1997a; Selinger, 1997; QCA, 1997, p8). Prior to this there were general requirements that all teachers should have basic IT literacy and there were a

---

very few courses where IT was a subsidiary subject. In general, staff development is far too limited and most teachers have to teach themselves how to use IT (Goldstein, 1997, p11). In contrast, the training of teachers of all other subjects of the National Curriculum is relatively well established.

Teachers of IT must regularly learn new concepts, and re-learn old skills in new contexts, as the technology changes. For example, the recent availability of Internet access in schools has required IT teachers to learn about email and Web browsers; to re-focus their programming skills so that they can build Web sites using HTML; and to be aware of new Web related features in familiar software, such as wordprocessors. Teachers' IT skills may be out of date in comparison with their pupils as they generally use older equipment at school whereas pupils may have access to more modern computer equipment at home (Cuthell et al, 1997). Perhaps it is not surprising that 'Teachers command of the subject was weak and appeared to weaken in comparison with previous years' (Goldstein, 1997, p11).

## **Impact on the Initial Teacher Training of IT teachers**

PGCE and BEd IT students on teaching placement are likely to find that their experiences of teaching IT in English secondary schools are less consistent between schools than that of students training to teach other subjects. This increases their uncertainty when they meet and discuss their work. There are uncertainties regarding curriculum models: students are likely to note that their peers' teaching placement schools deliver the IT curriculum in ways which are different to their own school. In addition, there is confusion over the appropriateness of styles of teaching and

---

learning; a lack of continuity and progression; low attainment; insufficient modern IT resources; different understandings of pupils' IT capability; unsatisfactory assessment, recording and reporting. Most English IT teachers lack qualifications and expertise. However, this profile of unsatisfactory features of students' experiences in schools is not consistent. Many schools have successfully tackled some but not all of the problems, and different schools may confidently assert that their approach is the best but these may be quite dissimilar.

### ***The student experience***

When students who are training to be IT teachers are on teaching placement in English secondary schools, they may find that, to a greater extent than in other subjects:

- a wide variety of very different curriculum models are in use. Students may be expected to teach IT as a discrete subject from the first year of secondary school, i.e. year 7, up to and including post 16 pupils in years 12 and 13. Alternatively, students may only assist other teachers to support teaching and learning in their subjects using IT. These distinct approaches make quite different demands on students' IT knowledge, skills and understanding.
- contact with particular classes may be for only a very short period of time each week, and may not occur every week, causing difficulties with teacher-pupil relationships, discipline, progression and continuity. For example, a student may teach every pupil in the first year of secondary school, i.e. year 7, for one hour each week for six weeks only, which makes it difficult to learn and remember pupils' names, and form good working relationships with them.
- very different approaches to teaching and learning may be encountered. There may be little consistency within or between schools, and quite different styles of relationship between teachers and pupils, and different approaches to constructing learning materials.

---

Students' experiences of models of teaching and learning IT may not be sufficiently well grounded to enable them to consider such a multiplicity of approaches without becoming unsettled.

- they may teach similar levels of skills, knowledge and understanding to pupils in different years, and train colleagues, and may encounter apparently inverse progression, that is, they may find pupils in year 9 more advanced than pupils in year 11. Internalising understandings of continuity, progression and expected standards of attainment is much more difficult in such circumstances.
- they may be instantly de-skilled as the hardware and software they are required to use may be different from or much older than that they have previously experienced. As a result, teachers may regard students with advanced qualifications and experience in IT as lacking in basic IT subject skills.
- they must relearn what they are learning before it is entirely understood because they may use IT in many different contexts and situations. For example, they may use different hardware and software in more than one school, at university or at home.
- strategies for assessing, recording and reporting progress and attainment in IT vary between schools, and may not always be satisfactory, and there is a general lack of models of good practice.
- they are often better qualified, and may have more experience of IT systems and better IT skills than their subject mentors in schools. For example, many mature students will have substantial experience of using a variety of up-to-date computer systems in commerce and industry, and may have post graduate degrees. Observing that they are already more qualified and experienced than IT teachers in schools may lower students' expectations of the standards they should achieve, and cause them to disregard good advice from experienced teachers and teacher educators.

---

### ***The dilemmas***

One consideration when planning a programme of initial teacher training is the need to help students develop an understanding of the demands that will be made of them on teaching placement in secondary schools. Initially, students need models which are simple and well understood so that they can begin to be effective professionals. They need to know what schools' will expect of them initially so that they have a firm foundation for development.

Programmes of study are inevitably sequential, and it would be impractical and undesirable for students to complete all their University based studies before beginning their first teaching placement. Consequently, choices have to be made. At the start of the course, should students be prepared to teach discrete or cross curricular IT? Should they be taught how to design step-by-step worksheets or to set more holistic tasks which develop a range of skills? What expectations should be cultivated regarding resource provision? Which approaches to assessment should they be shown? For the teacher educator, every choice can be the wrong choice. Students may be well prepared for practice in one school but not in another school. A satisfactory programme of initial teacher training is easier to plan and deliver where there is consistency between schools.

By the end of their course, English student teachers must have achieved all the UK Teacher Training Agency's standards. This requirement is very demanding, and is made more difficult by the unresolved issues which are fundamental to the satisfactory teaching of IT in schools. For example, debates about the nature of the curriculum are not frivolous. They affect the day-to-day experience of IT in schools, and adherents of particular approaches are often vehement in their advocacy of them. Students need to be aware of the issues before they begin their teaching placements and discuss them in a sensitive and balanced manner, but how can opportunities be

---

made available in an already full teacher training programme?

### ***Possible strategies for Initial Teacher Training***

Some possible strategies for teacher training are as follows. These have been informally evaluated as a part of professional practice but more rigorous formal research into the effectiveness of them is still required.

- Alert students at the start of the course to the possibility of widely differing experiences and circumstances on teaching placement, preparing them to be flexible and supportive of schools and teachers.
- Discuss learning strategies that may help students deal with unfamiliar circumstances and rapid change, that is, encourage students to be reflective, proactive, autonomous learners, so that they are able to identify and address their own needs, for example, for IT skills training, and direct their own learning.
- Encourage active student participation, preferring seminars and workshops to other methods of delivery, so that individuals' different experiences and concerns can be discussed and placed in a wider context. Many students initially express dissatisfaction with current practice in secondary schools, and appear to perceive their dissatisfaction and their inability to immediately correct what they believe to be schools' deficiencies as personal failings. This can be counteracted and students' confidence increased by sharing the experiences of members of the group when they are on teaching placement in different schools, thus relating individuals' experiences to the wider context.
- Promote and simplify models of good practice but accept that there will be a range of effective alternatives. This is especially so for IT curriculum models; styles of teaching and learning; continuity, progression and standards; and strategies for assessment, recording and reporting.

- 
- Accept current practice in schools but where this is narrow or inappropriate, minimise its impact by tailoring the training programme to meet each individual student's needs. What is suggested is that for IT, individuals' programmes may have to be more deeply profiled than for other subjects, across a wider range of characteristics, and modified more frequently to compensate for a wider range of omissions. This may include arranging complementary teaching placements or providing well targeted support in other ways. For example, if a student is placed in a secondary school that does not have a comprehensive assessment, recording and reporting regime, the training programme can be adjusted to compensate by ensuring that the student has a second placement in a school that can provide a satisfactory and complementary experience. To ensure teacher educators are well informed regarding the characteristics of students' experiences of assessing, recording and reporting, so that they can make appropriate modifications to the training programme, students will need to profile their experiences of different approaches to assessing, recording and reporting. Similarly, students' experiences may need to be profiled to ensure they teach pupils across the entire 11-18 age range, and observe and use a wide variety of teaching styles.
  - Provide individual, informal, easily accessible support for students so that they can keep in contact with teacher educators throughout the training course, but especially while they are on teaching placement. This may help diminish students' concerns by addressing them as soon as possible. Any convenient means of achieving this should be used, for example, traditional face-to-face tutorials and e-mail.
  - Ensure the IT teachers who will act as mentors to students on teaching placement are aware of the above issues and anticipate that students will need to discuss these in the context of the approach taken in their teaching placement schools. However, teachers will almost inevitably take a partisan view because they are likely to have determined and implemented the approach taken in their schools. Consequently, it is important in mentor

---

training to raise issues and encourage open debate. For example, a school's decision to deliver IT as a discrete subject or entirely across the curriculum is often determined by the beliefs of the IT teacher. As the chosen model of the curriculum is then implemented by the IT teacher, he or she may be very committed to the approach taken and have very little experience of the ways other schools deliver the IT curriculum. This can lead to vehement promotion of the chosen approach. As students need to develop their own views by a balanced consideration of the many different approaches, it is necessary that IT teachers move from personal belief to calm consideration of the issues. As a result, it may be useful to include opportunities for discussion and debate in mentor training. Teacher educators may need to act as a catalyst, encouraging IT teachers with different perspectives to engage in debate about current issues both in formal mentor training sessions and on other occasions.

- Ensure students have easy access to the full range of IT resources used in secondary schools throughout the course, at least some of which should be state-of-the-art.

## **Conclusion and Summary**

The difficulties ensuring a satisfactory experience of IT for pupils in English state secondary schools have been reviewed. Few schools have fully resolved these so that it is likely that students on teacher training courses will be affected. They may find that a wide variety of very different curriculum models are in use; contact with pupils may be too brief causing difficulties with teacher-pupil relationships and discipline; very different approaches to teaching and learning may be encountered; and there may be difficulties with continuity, progression and expected standards. Students may be better qualified, and have more practical experience of IT systems

---

than their subject mentors in schools. However, IT teachers may regard students as lacking in basic subject knowledge as the hardware and software in schools does not match their previous experience.

Some possible strategies for teacher training are:

- at the start of the course, raise students' awareness of the widely differing experiences and circumstances on teaching placement, preparing them to be flexible and supportive of schools and teachers.
- encourage students to be reflective, proactive, autonomous learners.
- encourage active student participation, preferring seminars and workshops to other methods of delivery so that individual students' concerns can be discussed and placed in the wider context.
- promote models of good practice but accept that there will be alternatives.
- profile each student's experiences more extensively and modify the training programme to include the full range of approaches.
- provide students with individual, informal, easily accessible support using face-to-face tutorials and e-mail.
- ensure mentor training includes time for discussion of different approaches to delivering IT in secondary schools.

---

## Bibliography and references

ACITT (1998) *Informatics at key stage 3*, The Association for Computing and IT Teachers (ACITT) and Barking and Dagenham LEA, London.

Benzie, D. (1997) IT Capability: is our definition wide of the mark?, in Passey, D and Samways, B (1997) *Information Technology: supporting change through teacher education*, Chapman and Hall, London.

Boyle, T. (1997) *Design for Multimedia Learning*, Prentice Hall Europe, Hemel Hempstead.

Brooks, J. G. and Brooks, M. G. (1993) *In search of understanding: the case for constructivist classrooms*, Association for Supervision and Curriculum Development, Alexandria.

Carroll, J. M. (1992) The Nuremberg funnel: designing Minimalist Instruction for practical computer skill, MIT Press, 1990, in Sneiderman, B., *Designing the User Interface: Strategies for Effective Human-Computer Interaction*, Addison Wesley Publishing Company, USA.

Crawford, R. A. (1997a) *Coming soon: the new specialists*, Times Educational Supplement, Update, p9, 14 March.

Crawford, R. A. (1997b) *Managing IT in secondary schools*, Routledge, London and New York.

Crawford, R. A. (1998) *What is IT Capability? An investigation into notions of what constitutes IT Capability*, on <http://www.hud.ac.uk/ITsec/rac1.htm>.

---

Crawford, R. A. (1999) *Teaching and learning IT in secondary schools: towards a new pedagogy?*, in the Journal of Education and Information Technologies, Official Journal of the International Federation for Information Processing Technical Committee on Education, Vol. 4, No. 1, pp49-63, March.

Cuthell, J., Cullingford, C. and Crawford, R. A. (1997) *Patterns of computer ownership*, in Computer Education, Issue 86, p13, June.

DfE (1995a) *Information Technology in the National Curriculum*, HMSO, London.

DfE (1995a) *Mathematics in the National Curriculum*, HMSO, London.

DfEE (1997a) *Survey of IT in schools 1996*, The Stationery Office, London.

DfEE (1997b) *Preparing for the information age: Synoptic report of the Education Department's Superhighways Initiative*, DfEE.

DfEE (1998a) *What is target setting?* on <http://www.open.gov.uk/dfee/seu/target/index.htm>

DfEE (1998b) *Teaching: High Status, High Standard: requirements for courses of Initial Teacher Training*, DfEE, circular 4/98, London

DfEE (2000) Schemes of work: Secondary Information and Communication Technology, on [http://www.standards.dfee.gov.uk/schemes2/secondary\\_ICT](http://www.standards.dfee.gov.uk/schemes2/secondary_ICT)

DfEE/QCA(1999a) *The National Curriculum for England: Information and Communication Technology*, DfEE/QCA, London

DfEE/QCA(1999b) *The National Curriculum for England: Mathematics*, DfEE/QCA, London.

---

Edge, D. (1995) The Social Shaping of Technology, in Heap H, Thomas R, Einon G, Mason R and Mackay H (ed.), *Information Technology and Society: a reader*, Sage, London.

Fosnot, C. T. (1996) *Constructivism: theory, perspectives and practice*, Teachers' College Press, New York.

Gagne, R. M. (1992) *Principles of instructional design*, Harcourt Brace Jovanovich, 4th edition.

Gergen, K (1997), Constructivist epistemology, on <http://www.stemnet.nf.ca/~emurphy/emurpy/>

Goldstein, G. (1997) *Information Technology in English schools: a commentary on inspection findings 1995-6*, OFSTED/NCET, London.

Inge, C. (1996) *Constructivism and what it means to 'know'*, on <http://mofet.macam98.ac.il/izak/edd/edu/a/0792.html>.

Jonassen, D. (1991) *Objectivism vs. Constructivism*, Educational Technology Research and Development, 39(3), p5-14.

Julyan, C. and Duckworth, E. (1996) A Constructivist Perspective on Teaching and Learning Science in Fosnot, C. T. *Constructivism: theory, perspectives and practice* Teachers' College Press, New York.

Longman, D. (1998) *Meeting with Stevenson*, email from D.J.Longman@sussex.ac.uk to itte@mmu.ac.uk mailing list, 14 July.

Mackay, H. (1995) Theorising the IT/Society relationship, in Heap, N. et al (ed.), *Information Technology and Society: a reader*, Sage, London, p41.

---

Martin, C. (1997) *The Holistic Educators*, Heretics Press, Nottingham.

McKenzie, J. (1997) *Grazing the net: raising a generation of free range students*, on <http://www.ilt.colombia.edu/k12/livetext/docs/graze.html>.

Mead, G. H. (1974) *Mind, Self and Society: from the standpoint of a Social Behaviourist*, 19th impression, University of Chicago.

National Curriculum Council (1990) *Non Statutory Guidance: Information Technology Capability*, HMSO.

NCET (1995a) *Approaches to IT capability: key stage 3*, NCET, Coventry.

NCET (1995b) *Approaches to IT capability: key stage 3: music*, NCET, Coventry.

(also available for English, mathematics, science, D&T, modern foreign languages, etc.)

NCET (1996) *Delivering capability in IT*, NCET, Coventry.

OFSTED (1995) *Information Technology: a review of inspection findings 1993/4*, HMSO.

Perkins, D. N. (1991) *Technology meets Constructivism: do they make a marriage?*, in *Educational Technology*, Issue 31, No. 5, pp. 18-23.

Philips, A. (1997) *Constructivism in the classroom*, on <http://www.dilbert.shawnee.edu/~tmoney/school/cons.html>.

QCA (1997) *Monitoring the School Curriculum: Reporting to Schools*, Qualifications and Curriculum Authority, London.

---

SCAA (1995a) *Key Stage 3 Information Technology: the new requirements*, Schools Curriculum and Assessment Authority (SCAA), London.

---

SCAA (1995b) *Key Stage 3 Information Technology and the National Curriculum*, Schools Curriculum and Assessment Authority (SCAA), London.

SCAA (1997) *International conference report: Information Technology, Communications and the Future Curriculum*, Schools Curriculum and Assessment Authority (SCAA), London.

Scrimshaw, P (ed.) (1997), *Preparing for the information age: Synoptic report of the Education Department's Superhighways Initiative*, DfEE.

Selinger, M. (1997) *New PGCE Secondary Information Technology courses*, ITTE newsletter, Summer.

Soloway, E. (1997) *Learning Theory in Practice: case studies of Learner Centered Design*, on <http://www-personal.umich.edu/~spit/hi-c/DIS.html>.

Somekh, B. (1995) The implications of requiring preservice teachers to 'evaluate the ways in which the use of IT changes the nature of teaching and learning', in the *Journal of Technology in Teacher Education*, Vol.3, No.2/3, p227-250.

Somekh, B. (1996) Value conflicts in the management of innovation: supporting IT innovation in Initial Teacher Training in the UK, in the *Journal of IT for Teacher Education*, Vol. 5, Nos. 1/2.

Somekh, B. and Davies, R. (1991) Towards a pedagogy for IT, in *The Curriculum Journal*, Vol. 2, No. 2, Summer.

Strommen, E. F. and Lincoln, B. (1992) *Constructivism, Technology and the Future of Classroom Learning*, on <http://www.ilt.columbia.edu/k12/livetext/docs/construct.html>.

---

Von Glaserfeld, E. (1996) Introduction: Aspects of Constructivism, in Fosnot, C. T., *Constructivism: theory, perspectives and practice*, Teachers' College Press, New York.

Wilson, B. G. (1997) The postmodern paradigm, in Dills, C. R. et al (eds.), *Instructional development*, Englewood Cliffs, or on <http://www.cudenver.edu/~bwilson>.

Yeomans et al (1995) *From vertical to horizontal? A longitudinal study of Information Technology in ten schools*, in the Journal of IT for Teacher Education, Vol. 4, No. 3, pp329-350