

LEARNING

Learning to Teach

edited by
Neville Bennett & Clive Carré

ROUTLEDGE

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Learning to teach

Teacher education is currently the subject of widespread political debate and radical reform. There is, however, very little recent empirical evidence about what actually happens on teacher training courses and in the first year of teaching. The Leverhulme Primary Project reported here looks in detail at the experience of all the student teachers on one post-graduate primary teacher training course and of those responsible for them in their university and in schools. It tracks them as they work to acquire the appropriate subject and pedagogical knowledge and as their own attitudes and beliefs about teaching develop through the course. A final section follows some of the students through their first year as qualified teachers. The aim throughout the book is to define the basic teaching competencies and to show how these relate to the knowledge bases with which novice teachers enter the profession. More people than ever before have some responsibility, whether in higher education or in schools, for the training of teachers. None of them can afford to ignore the fresh insights into how teachers are made contained in this book.

Neville Bennett is Professor of Primary Education at the University of Exeter and co-director of the Leverhulme Primary Project. His publications include *Teaching Styles and Pupil Progress* (1976), *The Quality of Pupil Learning Experiences* (with Charles Desforjes, Anne Cockburn and Betty Wilkinson, 1984), *A Good Start? Four Year Olds in Infant School* (with Joy Kell, 1989) and *Talking and Learning in Groups* (with Elisabeth Dunne; Routledge, 1990), part of the Leverhulme Primary Project *Classroom Skills* series of notebooks.

Clive Carré is coordinator of the Leverhulme Primary Project and editor of the Leverhulme Primary Project *Classroom Skills* series. His publications include *Language Teaching and Learning in Science* (1981) and *Visual Communication in Science: Learning through Sharing Images* (with D. Barlex, 1985).

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and Clive Carré



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Foreword

The nature and quality of teacher education is the subject of much concern in many countries around the world. In Britain, and elsewhere, change is being demanded, and generated, by political assertion rather than by careful evaluation highlighting the lack of independent evidence on the processes and outcomes of teacher training.

The three-year study reported here provides independent evidence in relation to the one-year Postgraduate Certificate in Education (PGCE) primary training route. The student-teachers' subject-matter knowledge for teaching and beliefs were assessed on entry to their course, and again at exit. Course processes, including those based in the institution and in schools, were recorded and analysed through the use of multiple methods (including student diaries, interviews and direct observations), and from multiple sources (student-teachers, cooperating teachers, tutors and supervisors). The role of knowledge and beliefs in teaching performances were carefully ascertained before following a group of these same student-teachers through their first year of teaching.

The analyses of these diverse data were designed to identify patterns and trends, not to make grand generalizations. Nevertheless the findings are clear, and supportive of the outcomes of other studies, and provide implications for teacher training in such areas as school-based work, teaching competences and course design.

The chapters of the book have been carefully sequenced to present the findings in a progressive and cohesive manner. Each chapter has been written by the members of the research team who took responsibility for that particular aspect of the study. However as director, and senior research fellow, respectively, of the Leverhulme Primary Project, the overall responsibility for the study, and this book, lies with us.

Neville Bennett and Clive Carré

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Our thanks are also due to the tutors in the training institution studied, and to the schools and cooperating teachers with whom the students spent their teaching practices.

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Finally our thanks are due to the Leverhulme Trust which funded the longer research programme of which this study was part, and to Ted Wragg, who, with the first author, co-directed the whole programme.

Knowledge bases for learning to teach

Neville Bennett

THE QUALITY OF TEACHER EDUCATION

The nature and quality of teacher education is the subject of analysis and debate worldwide. In Britain it is Her Majesty's Inspectorate who, in the absence of independent research evidence, has been influential in mapping the domain (HMI, 1987; 1988; 1991). In making their professional judgements they have tended to emphasize knowledge of subjects, of curriculum, of learners and of assessment.

In their survey of primary B.Ed. courses, HMI claimed that it is essential for primary teachers to acquire both an effective grasp of a broad curriculum repertoire and a deeper knowledge of some specialized aspect of it (HMI, 1987). However, most courses were not achieving this. Most institutions fell considerably short of providing adequate subject study, and the curriculum courses were failing to cover adequately several crucial areas of professional competence. Foremost among these were the ability to assess children's performances, to teach to those assessments, to provide for a wide diversity of pupils' needs and to plan for the progressive growth of pupils' knowledge, concepts and skills. Further, key issues such as multiethnic education and special educational needs were too often only offered as options. Finally, they argued that training courses were not always well managed, lacking strong leadership and clear goals, and were too often taught by those with no primary school experience.

In their recent commentary on inspections of twenty courses for the training of primary teachers, HMI judged the quality of each academic subject as well as aspects of professional skills and competence (HMI, 1991). They considered the English and mathematics courses to be the most satisfactory, although there were weaknesses in assessment and evaluation in English, and in progression and differentiation in mathematics. They complained that science courses were much too short to ensure that student-teachers understood the progressive development of children's scientific knowledge skills and attitudes, or to develop a knowledge base on which to work with confidence.

Time, too, was of the essence in the humanities; time devoted to history and geography generally being insufficient. Consequently student-teachers' knowledge base was poor, the matching of work to children's levels of understanding was inadequate, and the assessment of pupils' learning weak. As such, most of the humanities courses were felt to require considerable review and modification in the light of the demands of the National Curriculum.

In relation to the professional skills and competences needed, HMI emphasized knowledge of children's development, and of evaluation and assessment. In the former they believed there was a need to strengthen the links between the theoretical components of the courses and practical experiences with children. In the latter, they were considerably concerned at the inadequate levels of student knowledge, arguing that they need a more detailed and rigorous conceptual framework and knowledge base on which to examine the purposes, methods and uses of assessment in relation to all aspects of teaching and learning. Many found it difficult to distinguish between observation and inference, and needed considerable help in diagnosing learning difficulties. Not surprisingly, in the light of this, it was unusual for student-teachers to refer to children's learning in the evaluation of their teaching. A related finding was that some had great difficulty in matching work to the different stages of children in the same class, and had similar difficulties formulating questions to probe their pupils' knowledge and understandings.

These same deficiencies in knowledge are cited in HMI surveys of primary teachers in their first year of teaching (HMI, 1988). They judged that effective mastery of the subject was achieved in less than half of the lessons observed, and some insecurity was noted in another quarter. Several other areas were identified where these teachers were experiencing difficulties. These included classroom management and control, identifying and making specific the aims of the lessons, matching work to the varied abilities of the children, skills of questioning, and the use of marking work as an instrument of diagnosis to help pupils to improve their performance. HMI further argued that worrying proportions of new teachers were inadequately prepared to use computers, teach the under-5s, cater for children with special needs, and take on the administrative and pastoral duties which schools expected them to perform.

Finally, these teachers were asked to reflect on, and rate, their satisfaction with their teacher training. Two-thirds were well, or reasonably well, satisfied, but, nevertheless, were unhappy with the balance of the courses. Too much time was allocated to educational studies and too little to practical work, teaching methods and classroom observation. Many primary teachers in particular felt less than adequately prepared for classroom management, the teaching of reading, teaching more able children, the under 5s, and the use of audio-visual equipment.

The importance of subject-matter knowledge is reflected in its inclusion in the criteria to which all teacher education courses in Britain must conform. Primary student-teachers must thus study at least one subject for up to two years at standards appropriate to higher education (DES, 1989b). The assumption is that mastery of a subject and its application facilitate more effective teaching and learning. Indeed the most recent advice argues that newly trained primary teachers should have sufficient subject knowledge in the core subjects of English, mathematics and science to teach and assess pupils across the full range of National Curriculum levels, i.e. to the level which an able 11-year-old, or average 14-year-old, would be expected to reach. In addition they should have sufficient subject knowledge to teach the rest of the curriculum to the same level 'with the support and guidance of colleagues' (NCC, 1991).

Similar concerns about the content and quality of teacher education programmes have been expressed in the United States. Teacher education programmes have been criticized as brief, technologically impoverished, and lacking in conceptual clarity and programmatic consistency (Howey, 1983; Holmes Group, 1986); criticisms recently supported by Goodlad (1991). Goodlad is reported as arguing that 'The research we conducted points rather painfully to incoherent programmes not tied to a mission, with no basic principles of curriculum guiding them, no organizing themes or elements.... Teacher education, no less than the schools, requires reconstruction' (Brandt, 1991). Lanier and Little (1986) were similarly scathing, characterizing teacher educators as largely rigid, shallow, anti-intellectual and conforming, and criticized research on student teaching as desultory in nature, poorly synthesized and weakly criticized.

Subject-matter knowledge is also regarded as important in the United States. One of the propositions of the National Board for Professional Teaching Standards, for example, is that 'teachers know the subjects they teach and how to teach those subjects to students' (Baratz-Snowden, 1990). However, an equally pressing concern appears to be that most teacher education practices reinforce traditional beliefs and methods of teaching through the placement of student-teachers with supervising teachers without considering whether the aims and methods of the supervising teacher are consistent with the goals of the teacher education programme (Ashton, 1991). As Joyce (1975) argued, 'no better method has been devised for preventing change in a social institution than to apprentice the novice to his elder'. Goodlad (1984), with a more colourful analogy, argued similarly, 'if we were to set out to provide the most advanced preparation for future doctors, surely we would not intern them with those whose solution to every illness is bloodletting'.

Although these arguments must be interpreted in the context of a continuing debate about innovation and change from traditional practices in American schools, it is clear, as in Britain, that all is not well with teacher education.

There is a glaring irony here. In an era when teacher educators and researchers have been exhorting teachers to engage in action research on their own practice, and more generally to be inquiring, reflective practitioners, they have signally failed to heed their own prescriptions. Empirical research on teacher education is conspicuous by its very absence. Consequently there is very little evidence on the nature and acquisition of teaching skills and competences, or on what is taught and learned in teacher education courses. There is as yet little understanding of the domains of knowledge on which student-teachers should draw, or of the relationships between knowledge bases and teaching performance. These are the broad questions to be addressed in this study.

THEORETICAL PERSPECTIVES

The theoretical perspectives adopted for these purposes draw on, and integrate, two different traditions of research on teaching and teacher education, i.e. those which Zeichner (1992) identifies as the 'academic' and 'social efficiency' traditions. The latter draws on the empirical study of teaching-learning processes in classrooms, and the former on models of pedagogical knowledge and reasoning.

Teaching-learning processes

Our previous studies of teaching-learning processes in primary classrooms have taken a constructivist view of learning, which perceives children as intellectually active learners holding schemata which they use to make sense of everyday experiences. Learning in classrooms thus involves the extension, elaboration or modification of learners' schema, through a process in which pupils' actively make sense of the world by constructing meanings (Bennett *et al.*, 1984; Bennett and Kell, 1989; Bennett and Dunne, 1992).

The outcomes of such studies bear directly on the teaching skills required for effective practice, and indirectly on the knowledge bases teachers need to draw on and develop. A brief overview of these findings is presented below using a summary model of task processes (see Bennett, 1988; 1992, for full details).

Analyses of data have tended to centre on several indices of appropriateness:

(i) Of task to intention

Of particular interest in this category has been teachers' planning and preparation. Crucial issues in this area are the selection of content and the

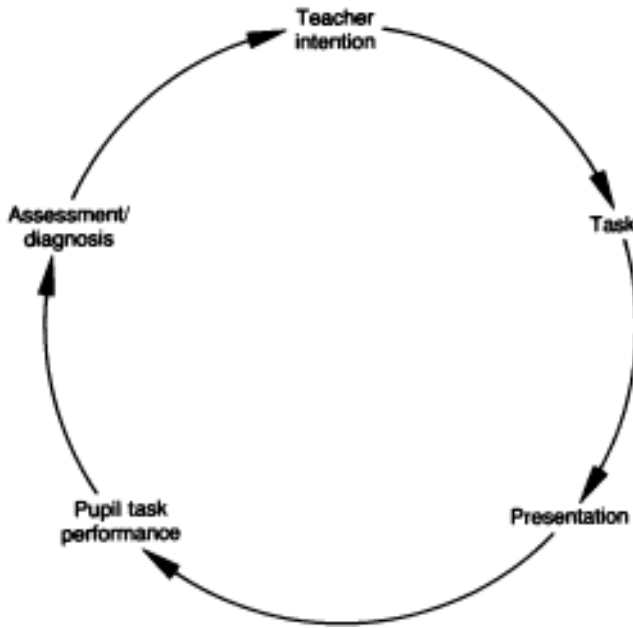


Figure 1.1 A model of task processes

design of tasks appropriate both to teachers' intentions, and to the range of pupils' capabilities. Empirical studies and observations by Her Majesty's Inspectorate have consistently shown that levels of matching tasks to children is generally poor, with high attainers underestimated and low attainers overestimated.

(ii) Of presentation

Lack of appropriateness in presentation can take many forms including lack of clarity, inadequate explanations, poor quality questioning and lack of necessary materials. Poor presentation by either teacher or text is not conducive to the construction of new understandings by learners, and poor task specification can actually undermine teachers' intentions.

(iii) Of implementation

Tasks are undertaken in learning settings largely determined by teachers. In organizing classrooms for optimal learning teachers need to ensure, among other things, that the setting is governed by a set of agreed ground rules, allows for high pupil involvement and incorporates pupil grouping arrangements that reflect task

intentions. As a recent summary of evidence argued, 'The critical notion is that of fitness for purpose. The teacher must be clear about the goals of learning before deciding on methods of organization' (Alexander, Rose and Woodhead, 1992).

(iv) Of assessment and diagnosis

Ausubel (1968) asserted that if he had to reduce all of educational psychology to just one principle, he would say that the most important single factor influencing learning is what the learner already knows. Ascertain this and teach accordingly. In other words, for teachers adequately to take account of learners' schema in task planning then it follows that the diagnosis of those schema are a prerequisite, i.e. to gain a window into the learner's mind. Despite this the evidence is consistent in showing that diagnosis does not generally occur, for whatever reason. This has serious implications for planning and also for matching, since the root of poor matching appears to be inadequate diagnosis.

These findings strongly imply the role of teachers' subject knowledge. For teachers effectively to diagnose children's schema, to plan appropriate tasks, to present quality explanations and demonstrations, and to make curricular choices, all require knowledge and understanding of subject matter. This raises such important questions as 'how can teachers teach well knowledge that they do not fully understand?', 'how can teachers make clear decisions about development or progression in curriculum areas with which they are not thoroughly conversant?', and 'how can teachers accurately and adequately diagnose children's understandings and misconceptions without an adequate knowledge of the subject?'

Questions of this kind are not new of course. John Dewey argued in the 1930s that to recognize opportunities for early mathematical learning one must know mathematics: to recognize opportunities for elementary scientific learning one must know physics, chemistry, biology and geology, and so on down the list of fields of knowledge. In short, he contended that the demand on teachers is two-fold: a thorough knowledge of the disciplines and an awareness of those common experiences of childhood that can be utilized to lead children towards the understandings represented by this knowledge (Cremin, 1961).

Knowledge bases for teaching

Research on teaching has raised useful questions, but has provided few firm answers. As Shulman (1986b) pointed out, 'In their necessary simplification of the complexities of classroom teaching, investigators ignored one central aspect of classroom life: the subject matter'. He characterized this as the 'missing paradigm' problem, arguing that typical studies had treated teaching generically. Missing were questions about the content of the lessons taught, the

nature of the questions asked and the quality of explanations offered. Although arguing that mere content knowledge is as likely to be as useless pedagogically as content-free skill, it is nevertheless important that as much attention be paid to content as has previously been devoted to teaching processes.

Shulman (1987a) delineated seven knowledge bases that identify the teacher understanding needed to promote comprehension among students. These are:

- 1 Content knowledge: referring to the amount and organization of knowledge in the mind of the teacher. This includes both substantive and syntactic structures of a subject, i.e. the variety of ways in which the basic concepts and principles of the discipline are organized, and the ways in which truth or falsehood, validity or invalidity, are established.
- 2 General pedagogical knowledge: with special reference to those broad principles and strategies of classroom management and organization that appear to transcend subject matter.
- 3 Curriculum knowledge: with particular grasp of the materials and programmes that serve as 'tools of the trade' for teachers.
- 4 Pedagogical-content knowledge: that form of content knowledge that embodies the aspect of content most germane to its teachability. It includes, for any given subject area, the most useful forms of representation of those ideas, the most powerful analogies, illustrations, examples, explanations and demonstrations. In other words, the ways of representing and formulating the subject that make it comprehensible to others.
- 5 Knowledge of learners and their characteristics.
- 6 Knowledge of educational contexts: ranging from the workings of the group or classroom, the governance and financing of schools, to the character of communities and cultures.
- 7 Knowledge of educational ends, purposes and values, and the philosophical and historical grounds.

These categories have unknown, and by no means clear, *a priori*, relationships between themselves or to teachers' classroom performances. They undeniably cloak complexities and, according to Leinhardt and Feinberg (1990), artificially split knowledge bases. Nevertheless they provide a useful starting point in conceptualizing students' learning to teach.

Shulman himself views teaching through a model of pedagogical reasoning and action, represented in Figure 1.2, which has many similar features to the task model discussed earlier. 'Given a text, educational purposes, and/or a set of ideas, pedagogical reasoning and action involve a cycle through the activities of comprehension, transformation, instruction, evaluation and reflection. The starting point and terminus for the process is an act of comprehension' (Shulman, 1987a).

Briefly, the argument underpinning the model is that the teacher must first comprehend the ideas to be taught and the purposes to be achieved.

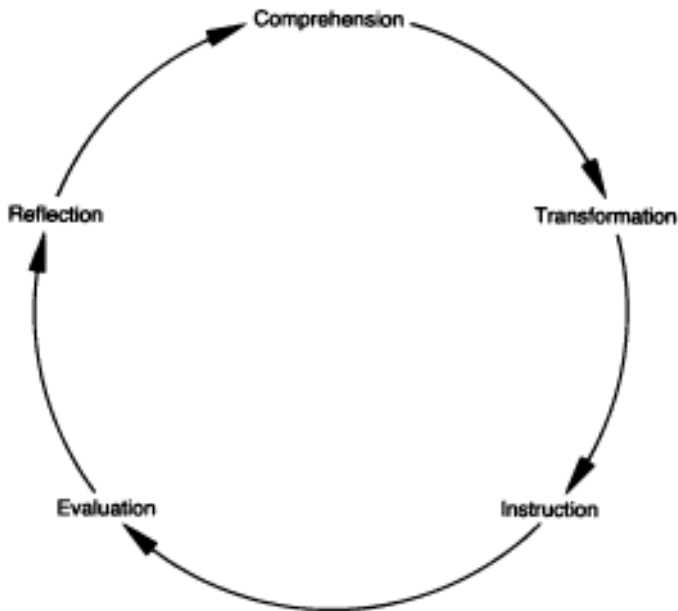


Figure 1.2 A model of pedagogical reasoning

These must then be transformed into forms which are pedagogically powerful, yet adaptive to pupil understandings. Such transformations require a combination of: (a) preparation—critical scrutiny and choice of materials of instruction; (b) representation—a consideration of the key ideas and how they might best be represented, in the form of analogies, examples and the like; (c) instructional selections—choice of teaching approach; and (d) adaptation—often called differentiation, i.e. the tailoring of input, whatever its form, to pupils’ capabilities and characteristics. Instruction, i.e. the teaching act, then takes place within a system of classroom management and organization. The process of evaluation includes in-flight checks for pupil understanding as well as more formal assessments and feedback—a process which, Shulman argues, requires all the forms of teacher comprehension and transformation described above. Reflection requires a reconstruction, re-enactment or recapturing of events and accomplishments, and is the analytic process through which a professional learns from experience. This leads back to comprehension—a new beginning.

Few claims are made for the quality of fit of this model across primary and secondary teaching, or for the invariance of the steps or sequence in the cycle. Shulman does argue, however, that a teacher should demonstrate the capacity to engage in these processes when called upon, and teacher education should

provide student-teachers with the understandings and performance abilities they will need to reason their ways through, and to produce a complete act of pedagogy, as represented in Figure 1.2.

Some tentative evidence on these processes, and their inter-relationships, is emerging from recent research. Grossman, Wilson and Shulman (1989), for example, report from their case studies of secondary student-teachers that content knowledge affects both what teachers teach and how they teach it. Depth of knowledge also appears to influence pedagogical choices. Student-teachers with specialist knowledge were more likely to stress conceptual understanding and syntactic knowledge, whereas non-specialists simply taught the content as it was represented in the text without discussion. Organization of knowledge also emerged as influential. Those who understood the larger map of their subject, and who understood the relationship of individual topics or skills to more general topics in their fields, may also be more effective in teaching their subjects. Knowledge of syntactic structures was also important. Student-teachers who did not understand the role played by inquiry in their disciplines were not capable of adequately representing, and therefore teaching, that subject matter to their pupils.

Borko *et al.* (1988) claim clear support for a relationship between subject knowledge and planning. When student-teachers had strong content area preparation and had confidence in their knowledge, they planned in less detail and were more responsive to pupils in their teaching.

McDiarmid, Ball and Anderson (1989) focus on the role of representation in pedagogical-content knowledge. They take the constructivist view that no matter how clearly teachers present material, pupils' understanding of it will be based on their prior assumptions and understandings. It follows therefore that teachers cannot simply deliver knowledge, and expect pupils to know it. It is the teacher's role, they argue, to connect children to 'the communities of the disciplines'.

Teachers do this by constructing instructional representations of subject matter through the use of activities, analogies, questions, worksheets and textbooks. Through the representations they select, and the ways that they use them, teachers convey messages, sometimes implicit, about the substance and nature of the subjects they teach. The nature of a subject is made known to pupils through the tasks they undertake, the problems they examine, the ways in which answers are sought and validated, what counts for an answer and on what basis. It is through these that pupils come to know what it means to do science, history or mathematics.

Recent research has highlighted the critical influence of teachers' subject-matter knowledge on decisions regarding representation, albeit at secondary school level. McDiarmid *et al.* (1989) report that a teacher's capacity to pose questions, select tasks, evaluate their pupils' understandings and make curriculum choices all depend on their understanding of subject matter. Teachers are better able to help pupils develop flexible understandings of

subject matter if they understand the subject well. Moreover, their understandings enable teachers to develop a variety of ways of representing them to children of varying experiences and knowledge (cf. Leinhardt and Feinberg, 1990).

Evidence of the relationship between teacher knowledge and action is also available from research which has compared the performances of experts and novices. In general it is apparent that the rich and highly interconnected conceptual frameworks employed by experts are markedly different from those of novices. In the specific case of teachers, experts notice different aspects of classrooms from novices, are more selective and efficient in their use of information during planning and interactive teaching, and make greater use of instructional and management routines (cf. Ben-Peretz, Browne and Halkes, 1986; Berliner, 1987; Borko and Livingston, 1989).

Kennedy (1991), in setting out an agenda for research on teaching, defined the teaching task as that of connecting important substantive ideas to diverse learners. Teachers, she argues, cannot teach what they do not know. In choosing a task, for example, teachers need to have enough understanding of the subject to know which ideas are central, which are peripheral, how different ideas relate to one another, and how these ideas can be represented to the uninitiated.

TEACHERS' SUBJECT KNOWLEDGE

Despite the importance currently afforded to subject (and pedagogical subject-matter) knowledge, the evidence available indicates that experienced and student-teachers have only limited understanding of some subjects. For example, in Britain, the Department of Education and Science has asserted that 'the greatest obstacle to the continued improvement of science in primary schools is that many existing teachers lack a working knowledge of elementary science' (DES, 1985), and this has been supported in a set of studies on primary teachers' understanding of science concepts (e.g. Kruger and Summers, 1989). They reported that the majority of teachers' views were based on a 'mixture of intuitive beliefs and half-remembered textbook science from their school days, sometimes with incorrect or imprecise use of scientific language'. Another, smaller, group of teachers seemed not to possess any theoretical understanding of phenomena presented. This group had received little education in science at school and of necessity were able to explain the instances only at a perceptual level, or not at all. They concluded that the scientific thinking of many of the teachers studied resembled that of children, being limited to perceptual and observable entities.

Two recent national surveys reveal clearly that experienced teachers feel

insecure with their subject knowledge in several areas of the curriculum (Wragg, Bennett and Carré, 1989; Bennett *et al.* 1992). When asked to what extent they felt competent to teach the subjects in the National Curriculum, in only English and maths did more than half state that they felt competent with their existing knowledge, without additional help from colleagues or in-service training. In both surveys less than 35 per cent of teachers felt competent to teach science, music or technology without substantial in-service support. In the case of technology only 14 per cent perceived themselves competent.

When questioned about their competences within subject areas they claimed particular difficulty with things electronic or related to information technology. Thus the area in which they felt least competent in mathematics was entering and accessing databases. In science it was the use of power sources and the use of micro-electronic kits. And in information technology itself less than a fifth felt able to add to a database, or use graphics to present work or to develop ideas (Bennett *et al.*, 1992).

Similar findings are represented in the United States. Ball (1990b) and McDiarmid (1990) report that in the areas of writing and mathematics the majority of teachers and student-teachers, including those who had majored in the subjects they would be teaching, had only a limited understanding of the two subjects. Moreover, in following teacher candidates through preservice programmes, and practising teachers through induction and inservice programmes, it was found that despite the diversity of approaches to teacher education that were studied, many of those programmes were unable to alter substantially the ideas teachers held when they arrived. Many teachers perceived school subjects not as bodies of knowledge that might be uncertain or worthy of debate, nor as relating to everyday life. Instead they perceived the two subjects that the research team studied, i.e. writing and mathematics, as 'collections of fixed rules and procedures with few connections among them and even fewer connections to events or purposes outside the classroom' (Kennedy, 1991).

Grossman *et al.* (1989) report that student-teachers' beliefs about teaching and learning are related to how they think about teaching, how they learn from their experiences, and how they conduct themselves in classrooms. They identified two types of beliefs about subjects, one about the nature of the content taught and the other, which they termed an orientation toward subject matter. These beliefs appeared to influence what content was chosen to teach, their goals for instruction, and choices of activities and assignments. They concluded that prospective teachers' beliefs about subject matter are as powerful and influential as their beliefs about teaching and learning. As such, teacher educators should provide opportunities for their students to identify and examine their beliefs, otherwise they are unlikely to be radically changed by professional training (cf. Barnes, 1989).