This international handbook offers an in-depth study of the development of primary Technology (or Design and Technology) education worldwide. It is unique in that it focuses on the way in which the building blocks for this subject have been established—providing much needed research and information for those involved with secondary education and beyond to draw on. The inclusion of Technology education into primary curricula has gathered momentum for the last two decades as its importance and relevance to children’s lives has been realised by educators. This handbook offers a detailed insight into the many and varied ways in which countries have incorporated the subject into children’s primary school experiences, and issues that have arisen during its implementation. The authors all work in the field of primary technology education and have been actively involved in curriculum development and research in their own countries.

The first part of the book is devoted to the introduction, the development and implementation of Technology education into the primary curricula of countries worldwide. Reasons for this movement, successes and barriers to development are discussed and speculation about the future of Technology education is reflected upon.

The second part of the book relates to issues that have arisen as the subject has grown over the last twenty years, and consideration needs to be given to these if future successes are to be achieved. Classroom practice including designing and ICT, teacher education, enterprise, sustainability and indigenous technology are all reflected upon and support the notion of technology as a valued and valuable part of the primary curriculum.

This book should be of interest to undergraduate and graduate students, practitioners, researchers, curriculum developers, policy makers and professional development providers who are involved with, and have an interest in, primary technology education worldwide.
International Handbook of Primary Technology Education
INTERNATIONAL TECHNOLOGY EDUCATION STUDIES

Volume 7

Series Editors
Rod Custer, Illinois State University, Normal USA
Marc J. de Vries, Eindhoven University of Technology, The Netherlands

Editorial Board
Piet Ankiewicz, University of Johannesburg, South Africa
Dov Kipperman, ORT Israel, Israel
Steven Lee, Taiwan National Normal University Taipei, Taiwan
Gene Martin, Technical Foundation of America, USA
Howard Middleton, Griffith University, Brisbane, Australia
Chitra Natarajan, Homi Bhabha Centre for Science Education, Mumbai, India
John R. Dakers, University of Glasgow, UK

Scope
Technology Education has gone through a lot of changes in the past decades. It has
developed from a craft oriented school subject to a learning area in which the
meaning of technology as an important part of our contemporary culture is
explored, both by the learning of theoretical concepts and through practical
activities. This development has been accompanied by educational research. The
output of research studies is published mostly as articles in scholarly Technology
Education and Science Education journals. There is a need, however, for more than
that. The field still lacks an international book series that is entirely dedicated to
Technology Education. The International Technology Education Studies aim at
providing the opportunity to publish more extensive texts than in journal articles,
or to publish coherent collections of articles/chapters that focus on a certain theme.
In this book series monographs and edited volumes will be published. The books
will be peer reviewed in order to assure the quality of the texts.
International Handbook of Primary Technology Education

*Reviewing the Past Twenty Years*

Edited by

Clare Benson and Julie Lunt

*Birmingham City University, UK*
# TABLE OF CONTENTS

Preface ........................................................................................................................................... ix

**Part A: Country Studies**

1. Twenty Years of Primary Design and Technology in England: Winners and Losers ........................................................................................................... 3  
   *Clare Benson*

2. Primary Technological Education for All in France: A Study of the Role of Technology in the Primary School System and Teacher Training over the last Twenty Years ................................................................. 13  
   *Marjolaine Chatoney and Jacques Ginestié*

3. Technology in the Primary Sector in New Zealand: The Journey this Far and Where to Next ........................................................................................................... 29  
   *Vicki Compton*

4. Technology in the Scottish Primary School: A Twenty-Year Retrospective Study ................................................................................................................ 39  
   *Wendy J Dow*

5. Technology in Malaysian Primary Schools .............................................................................. 51  
   *Gill Hope, Zanariah Mahyun Yusef and Ramachandran Vengrasalam*

6. Caught in the Currents - the Shaping of Primary Technology Education in Australia ............................................................................................................. 61  
   *Steve Keirl*

7. The Growth of Primary Design and Technology Teacher Education in South Australia: More Head, Less Hands, Always with Heart ........................................ 77  
   *Steve Keirl and Denise MacGregor*

8. Primary Technology Education in New Zealand: A Scenic Twenty Year Journey .............................................................................................................. 89  
   *Gary O’Sullivan*

9. Technology Education in Finnish Comprehensive Schools ................................................ 97  
   *Aki Rasinen, Pasi Ikonen and Timo Rissanen*

10. The Implementation of Primary Technology Education in South Africa .............................. 107  
    *Andrew Stevens and Kate Ter Morshuizen*
# TABLE OF CONTENTS

**Part B: Issues within Design and Technology Education**

11. Nuffield Primary Design & Technology – A Brief History ........................ 119  
    *David Barlex*

12. Designerly Thinking in the Foundation Stage ............................................. 137  
    *Clare Benson and Tara Treleven*

13. Technological Education: The Issue of Information Retrieval Via the Internet ................................................................. 151  
    *Pascale Brandt-Pomares*

14. In Search of a Pedagogy for Primary Design and Technology ................. 167  
    *Alan Cross*

15. The Rise of Technological Literacy in Primary Education .......................... 181  
    *John R Dakers*

    *Wendy Fox-Turnbull*

17. Exciting Electrics – the Starting Point Approach to Design and Technology in Action ................................................................. 211  
    *Keith Good and Esa-Matti Järvinen*

18. Taking Ideas on a Journey: Researching Designing in a Kent Primary School ..................................................................................... 221  
    *Gill Hope*

19. Primary Design and Technology Education and Ethical Technological Literacy ................................................................. 235  
    *Steve Keirl*

    *Julie Lunt*

21. Technology Education and Education for Enterprise (E4E) ....................... 261  
    *Gary O’Sullivan*

22. Embedding Education for Sustainable Development in Primary Design and Technology Education: Reflections on a Journey ................................. 275  
    *Maggie Rogers*
TABLE OF CONTENTS

23. Perceptions of Primary Design and Technology: Initial Teacher Education
   Students’ Experiences ................................................................. 285
   Marion Rutland, Sally Aston, Debbie Haffenden, Gill Hope, Dot Jackson,
   Bhav Prajapat, Maggie Rogers and Martin Seidel

24. Indigenous Technology and Culture ............................................. 305
   Sonja Vandeleur and Marc Schäfer

List of Authors ................................................................................. 319
The International Handbook for Primary Technology Education has its roots in the biennial international primary Design and Technology conference initiated in 1997 and hosted by the Centre for Research in Primary Technology (CRIPT) at Birmingham City University, England. The first conference was held seven years after the subject was introduced into the National Curriculum for all primary schools in England and Wales in 1990 and it was at this time that other countries worldwide were also introducing and developing the subject. It became, therefore, more urgent for a forum to be created through which research and curriculum development could be shared and disseminated, discussed and evaluated. The Proceedings from the Conferences have become one of the main publications that focus on primary developments (children aged 3–13 years) and this Handbook is based mainly on papers that have been delivered over the past 13 years. During this time, the subject has gathered pace around the world and it is now a compulsory subject in many countries in all continents. It has been interesting to watch its development, sometimes cyclical in nature; there have been periods of time when the subject has been high on the agenda of Governments and then declined as changing political power has affected educational issues. The development of the subject in different countries is outlined in Part A of the book; whilst in Part B many of the issues that arise from learning and teaching in Design and Technology are highlighted.

It is clearly evident from a study of different countries that the subject can be called Technology or Design and Technology. In some countries Technology is more aligned with the use of computers; although in others this would be Information and Communication Technology (ICT). In addition, Technology can be more focused on technical knowledge such as in Germany. However in this Handbook, it is usually the case that the underlying principles are the same whichever word is used. The common concepts relate to the designing and making of a product. These include consideration of user and purpose; functionality; and values and technical issues which need to be taken into account as the product is being created. The use of the word ‘Technology’ in the title reflects the fact that this term is the one most commonly used worldwide.

It is interesting that the growth of the subject has been worldwide and it is worth considering reasons for this. Apart from the political pressures, it is a subject that provides young people with unique opportunities to develop a range of process skills such as critical and creative thinking skills in addition to their practical skills, through undertaking authentic tasks, in which they can see a real purpose. The subject offers opportunities to link learning in a number of different disciplines. Through a variety of activities, the young people are able to take risks and develop skills that will be important to them both in their work and everyday lives.

We would like to give our thanks to all those who have contributed to this Handbook and for those children, teachers, teacher educators, and researchers who have supported the authors in countries worldwide. We hope that it will prove a valuable
PREFACE

resource for all who use it and make a significant contribution to the on-going research in Primary Technology. Our final thanks go to Netta Pickett whose eagle eye and tenacity have proved invaluable in the formatting and final checks of the manuscript.

Clare Benson and Julie Lunt
Editors
PART A:
COUNTRY STUDIES
INTRODUCTION

It hardly seems possible that twenty years has passed since the first National Curriculum for primary schools in England (DES/WO, 1990) was introduced. It was felt that all children had an entitlement to experience a similar curriculum, although schools were free to expand the skills and content and to deliver the curriculum in ways that they felt were most appropriate for their children.

Included in this document was a new subject – that of Design and Technology. It appeared that it might be a ‘loser’ almost immediately from the way in which it was introduced to schools. Despite this inauspicious start, there has been so much to commend it - a vehicle through which children can enjoy and value education, develop lifelong skills, and engage with the designed and made world around them. Teachers who understand, and have confidence, to deliver the subject have certainly identified themselves as winners and have developed their teaching skills in so many ways.

This chapter provides a commentary on the development and implementation of Design and Technology in primary schools since 1990. Evidence has been gathered from the many documents, articles and books that have been published, from Inspection reports – Office for Standards in Education (OFSTED), from data gathered from primary teachers undertaking one day and extended primary continuing professional development (CPD) courses and from personal observations working in schools throughout England. ‘Winners’ and ‘losers’ during the implementation and development of this subject will be identified, and ways forward offered, as England waits once again on the brink of a possible radical change to primary education.

THE NEW NATIONAL CURRICULUM FOR DESIGN AND TECHNOLOGY

In the years before the National Curriculum was introduced, pupils in primary education (aged 3–11 years) had opportunities to do craft, woodwork, sewing and cooking. In science they mainly studied the natural world relating to flora and fauna, and areas such as mechanisms, forces, structures, and energy were largely ignored. Implementation of Design and Technology was to start from September 1990 in all state schools in England and Wales for children aged 5–16 years. (Wales and
England shared the same curriculum until 1995 when Wales developed its own curriculum. Scotland and Northern Ireland had different curricula and have continued their own development of the subject. Scotland had until recently National Guidance rather than a National Curriculum, and both countries incorporate Technology within broader areas of experience).

The content of Design and Technology was developed by a working group (the Parkes Review, 1988), composed mainly from business and industry and those with secondary or higher education backgrounds. Primary views were certainly not strongly represented. Had primary educators been involved, the final document would almost certainly have been one, that when planning, primary teachers could relate to, and have used successfully. Instead it was overloaded with content and used vocabulary that was unfamiliar to primary teachers. For example, children were to be given experiences related to artefacts, systems, and environments – words that were used with little explanation. In addition, Design and Technology was joined with Information Technology in one document entitled Technology in the National Curriculum (DES/WO, 1990). It was in two parts: Design and Technology capability and Information Technology capability. If there had been confusion and misconceptions before, this only served to add to the problem. Primary teachers, who mostly had little knowledge and expertise in the area, immediately thought that the subject focused on computers (data gathered from teacher courses in 1990/91/92).

As implementation got underway, perhaps one of the most disappointing developments was the way in which the subject was delivered. Primary teachers saw the process as linear - to be worked through, rather than areas that could be covered in innovative and flexible ways. Children were given a design and make brief such as design and make a bag; they then might look at some bags; choose fabric that was given to them, make it, and evaluate the product. This often resulted in 30 identical bags. There was very little opportunity to design, to investigate a range of fabrics and fasteners, and to identify a user and purpose. This was hardly surprising. With little previous knowledge, and little continuing professional development (CPD), teachers looked for strategies that would help them; working through the four Attainment Targets in the National Curriculum (1990) gave them a structure, albeit a rigid one. Little, if any, support for implementation was organised nationally; few resources were available, partly due to the short time scale between publication of the National Curriculum and its implementation; CPD was almost non-existent in Design and Technology, partly due to the very small number of people who could provide relevant courses; and, perhaps most importantly, there was confusion as to the nature of the subject. It would be fair to say that many primary teachers concentrated on implementing the core subjects (English, Maths and Science) as the pressure of testing and target-setting grew (Ive, 1997, 1999; HMI, 1991).

Certainly this period could have been one of ‘winners’. Design and Technology can offer children so many exciting, relevant opportunities for learning in a range of contexts. Through Design and Technology children can develop their process skills such as critical evaluation and creative thinking, as well as practical skills. Teachers were able to put the interests of the children at the centre of learning and to make appropriate cross curricular links. However, whilst it can be argued that there were
no absolute ‘losers’ during this period, clearer documentation and teacher support would have resulted in greater success during this initial implementation period (Ive, 1997).

‘GROWING’ THE SUBJECT

1990–1995

It might be imagined that after such a confusing and pressured start, teachers would be given time to gain an understanding of the new Order, to plan appropriate schemes of work, find suitable resources, trial activities, and evaluate and change practice as they grew in confidence. This was not to be. Almost immediately, concerns were raised about the way in which the subject was developing and the document Technology in the National Curriculum - Getting it Right (Smithers & Robinson, 1992), prepared for the Engineering Council, talked about ‘Mickey Mouse’ activities with egg boxes and suggested that the subject had become generalised problem solving without a specific knowledge base. There was much debate as to the specific knowledge base that was part of the subject, some arguing that it needed to be very limited, whilst others promoted the notion that it should draw on a range of subjects, including Science, Art, Mathematics, IT (now ICT), Home Economics, and Business Studies.

Primary teachers started to create some exciting projects, but as more subjects came on stream in 1991, pressures of time and lack of understanding hindered these developments. New draft orders were published in 1992, and again in 1994 before the new final Order was published (SCCA, 1995). Thus, it seems hardly surprising that progress was slow during 1990–1995, and that teachers began to lose sight of the nature and importance of the subject. However, the Schools’ Inspectors report ‘Subject and Standards 1994–5’ (HMI, 1996) indicated that pupils were almost always enthusiastic about the subject and found the work enjoyable and interesting. Primary standards and standards in teaching (satisfactory and above) in English, Mathematics, Science, and Design and Technology were all graded at 80% with the exception of Key Stage 2 (7–11 years) teaching; this was graded at 75%. The format of reports changed after this, thus making comparisons in future years impossible.

1995–2000

The new National Curriculum in 1995 (DFE, 1995) clarified the nature of the subject through the statement:

Pupils should be taught to develop their Design and Technology capability through combining designing and making skills with knowledge and understanding in order to design and make products. (p. 58)

The content of the 1995 document was slimmer than previous ones; the language of the document was more easily accessible for primary teachers; the attainment
targets were reduced to two: designing and making; and the holistic nature of Design and Technology was emphasised through the level descriptions.

One of the major positive changes for primary teachers was the introduction of the section relating to opportunities through which pupils could develop their capability. Three opportunities were identified: assignments in which pupils design and make products (DMAs); focused practical tasks in which they develop and practise particular skills and knowledge (FPTs); and activities in which they investigate, disassemble, and evaluate simple products (IDEAs). This offered a clear structure for teaching, and whilst it did lead to linear teaching programmes, it promoted the idea that teaching pupils skills and knowledge was essential for good quality Design and Technology. Ive (1997) confirmed that HMI identified that this structure had been responsible for raising standards, certainly in primary Design and Technology.

Primary teachers were faced with major changes in 1998. The government, faced with poor standards in literacy and numeracy, introduced two new initiatives – one for literacy (Department for Education and Employment (DfEE), 1998) and one for numeracy (DfEE, 1999) – and whilst these Strategies were not mandatory, head teachers felt pressured into implementing them. There were time implications now as schools tried to cover the new, suggested content in the Strategies, and foundation subjects such as Design and Technology were once again under threat of being marginalised. The government, through the document Maintaining breadth and balance (QCA, 1998a), did suggest that schools should keep a balance in their curricula, but the threat of poor inspection results did much to negate the content of this document.

The publication of the national exemplar Schemes of Work (QCA, 1998b) for Key Stage 1 (5–7 years) and Key Stage 2 (7–11 years) did go some way, particularly at primary level, to offset the damage to the development of Design and Technology. The schemes of work were created to give schools possible ways of delivering the curriculum. They were only guidance and they were for schools to use as a tool against which they could evaluate, monitor, and plan new units of work. It was never the intention that these schemes should be followed in a step by step approach. However, problems arose when teachers kept rigidly to the suggested activities and did not develop the units to meet the needs of their own pupils and to fit in with the school’s individual curriculum. Initially the Schemes therefore did much to help raise standards and, if used appropriately, continued to do so. However, where schools made no adaptation to the national Scheme, it could be seen to constrain the development of creativity and thinking skills.

The five year moratorium on National Curriculum change drew to an end and during 1998–9 fresh debates took place with regard to proposals for the new 2000 Curriculum (DfEE/QCA, 1999b). Perhaps the most significant change in Design and Technology was the inclusion of an importance statement at the beginning of the programmes of study. There was still some confusion as to the nature and importance of the subject and it was felt to be crucial to have a clear statement that set out the rationale for the subject, together with key elements relating to the nature of the subject. The user, purpose, and function of a product were emphasised and this is
something that needs to be focused on throughout all phases of education, but particularly in the primary school. The content of the new document was slimmed down again and the two Attainment Targets became one to emphasise the holistic nature of Design and Technology and the importance of assessing Design and Technology as a whole, not as a series of ‘can do’ statements.

At the same time, a new National Curriculum for children in the Foundation Stage (3–5 years) was published (DfEE/QCA, 1999a). This curriculum was divided into six areas of experience, and whilst Design and Technology capability can be developed through all the areas, the main focus is within Knowledge and Understanding of the World. Through a Department for Education and Skills (DfES) funded project, ‘Developing Designerly Thinking in the Foundation Stage’, Benson (2003, 2007) identified the lack of opportunities that 3–5 year olds were offered in developing their Design and Technology capability through the activities they experienced. There was still much emphasis on the natural world, and little on the designed and made world. Children were given many activities in relation to making, but few that would develop design skills. If pupils are to develop their capability, then it is vital that they have appropriate experiences from the start of their education.

Throughout this period, Initial Teacher Education (ITE) was developing specialist Design and Technology courses for primary trainees, thus providing new entrants to the profession who were well equipped to lead the subject area throughout the primary phase. Schools who employed these new entrants were certainly ‘winners’ as they had teachers who were confident in their subject knowledge and understanding and were able to support whole school planning in the subject.

2000–2010

Since 2000, primary OFSTED inspection reports (e.g. OFSTED, 2001, 2002) indicate that whilst there is much good practice in Design and Technology, much remains to be done at all levels, particularly in the areas of designing and developing teacher knowledge and understanding. However, schools have not been given much time to implement the new curriculum. Primary schools had yet another initiative to contend with in 2003 when the government started a review of the whole curriculum, starting with the publication of ‘Excellence and enjoyment – a primary strategy’ (DfES, 2003a) and the subsequent creation of the Primary Strategy (DfES, 2003b). Literacy and numeracy were still emphasised, but the inclusion of the importance of the development of thinking skills, questioning, and problem solving did link with Design and Technology. In addition, misconceptions about the content of the Primary Strategy arose. Schools started to plan using a topic, or thematic, approach based on the perception that the Strategy promoted cross-curricular links. This has led to a growth in making, or craft, activities rather than Design and Technology and the user, purpose, and functionality of the product is often lost. Topics linked to history often provide the worst examples, with children making Viking boats from card templates and Tudor houses using straw and card boxes. The latest OFSTED Inspection report (OFSTED, 2007) covering the three years 2003–6, provides a clear
overview of the state of Design and Technology, and suggests key areas that need to be addressed. These do not surprise those working to develop primary Design and Technology and include teachers’ limited expertise and confidence; schools’ reluctance to allow teachers to attend staff development courses due mainly to funding; and the need to improve assessment, recording, and reporting of pupils’ progress.

Unfortunately the specialist courses for ITE that were so successful before 2000, started to be withdrawn for a number of reasons and only a very few remain in 2010. Firstly the Teacher Training Agency (TTA) took away the requirement for primary teachers to have a specialism; the students can be given a choice in their course between Art or Design and Technology, and History or Geography; inspections do not cover foundation subjects including Design and Technology; and costs can be reduced by cutting specialisms. Both schools and trainees are definitely losers as there are so few trainees starting their careers with the confidence to teach and lead Design and Technology in schools.

By contrast, winners during this period have been primary teachers that have attended extended Design and Technology CPD, part funded through the Teacher Development Agency (TDA), formerly the TTA, and all have to be at MA Ed level. Courses have been available throughout England and include practical as well as theoretical content. Quality of the course has been rated at the highest level by OFSTED and identified as bringing about positive impact on standards through school inspections.

It was during 2000–2010 that research in Design and Technology grew. In 1997, as primary Design and Technology became more established, the Centre for Research in Primary Technology (CRIPT) was created at University of Central England (now Birmingham City University). Its first international biennial conference was held in the same year, and conference proceedings have provided an excellent resource for research findings covering current key issues. Almost the only large scale project for primary work has been funded by the DfES and was undertaken by the Centre for Research in Primary Technology (CRIPT) from 2003–2006 (Benson 2003; 2005; 2008). The project – Designerly thinking in the Foundation Stage – supported the development of designerly thinking through the engagement of young children with the designed and made world around them, and involved 400 Foundation Stage teachers. More recently in 2008 the National Endowment For Science, Technology and the Arts (NESTA) has funded a curriculum development project entitled Butterflies in my Tummy. The focus for this project was the links between Social and Emotional Aspects of Learning (SEAL), risk taking and designing. A range of support materials from this project are now available at www.data.org.uk and an evaluation of the project was undertaken by Benson and Lunt (2009). One of the main findings from the evidence gathered was that there are a number of advantages for bringing together designing activities and SEAL strategies to support innovation and risk-taking. These include broadening children’s repertoire of techniques for designing; developing children’s awareness of how their feelings can impact upon their learning and their designing activity; and developing a supportive ethos for innovation and risk-taking. However, it is important that children are clear how these activities
support the particular designing and making focus of their project. An appropriate balance between paper-based tasks and three-dimensional designing is also important in maintaining children’s interest and motivation.

With regard to setting a research agenda, Baynes and Johnsey (1997) set out a platform on which to build research in primary education. This was followed in 2003 by a report from Harris and Wilson (2003), funded by the DfES to review, comment on, and offer recommendations for areas that should be funded and systematically researched. Their report provides an excellent, if not complete, picture of research relating to both primary and secondary Design and Technology. They concluded, as many suspected, that there were few large scale projects; most were small scale and case studies that often made generalisation difficult, if not impossible. However, a positive development in recent years has been the growth of action research undertaken by primary teachers involved in MA courses (e.g. Benson, Lawson & Till, 2005; Benson, Lawson, Lunt & Till, 2007) and funded through the TDA.

CONCLUSIONS - WINNERS AND LOSERS

It can be argued that it is a great tribute to teachers that Design and Technology, within the primary school curriculum, has become an established and well-liked subject (Benson & Lunt, 2007) at least amongst children. Without the teachers’ resilience, hard work, and commitment to the subject, and their belief in its value to the children they teach, the subject could have disappeared after one of the numerous, major changes over the years. However, there are already some indications of changes that will affect the subject. A primary review was undertaken of the whole curriculum, led by Sir Jim Rose, but the resulting curriculum proposals failed to get through Parliament before the May 2010 General election. Therefore the 2000 National Curriculum is still the legal document that schools should use. There is divided opinion as to whether this would have been a ‘winner’ or ‘loser’. Design and Technology was included in the area of learning ‘scientific and technological understanding’. Would the subject have been weakened by further misconceptions relating to the nature of the subject or would it have been strengthened as appropriate links were made with science?

During the past twenty years it can be argued that winners and losers have balanced each other, tipping the scales up and down. Certainly there is evidence that some documentation, lack of resources and CPD tipped the scales down, whilst elements of documentation, support materials, creative teaching, and children’s enthusiasm for the subject tipped the scales in a positive direction.

Whatever changes take place, it is vital that the nature of the subject is always clear for those who have to implement the curriculum. In no National Curriculum document to date is there a statement of its philosophy or underlying ideals (Kelly, 2004); however the notion of subjects, knowledge and skills can be found, together with general statements such as a desire to raise standards. Any new curriculum should be based on previous research findings and have a clear philosophical standpoint. One thing is certain: it will be crucial for Design and Technology to keep
abreast of technologies in the rapidly changing world, enabling the pupils who experience the subject to become:

...responsible citizens who make a positive contribution to society. (DfEE/ QCA, 1999b, p. 51)

The new curriculum is awaited with interest.

NOTES

1 This is based on a paper given at the Technology Education Research Conference, Gold Coast, Australia, December 2010. Proceedings of the Sixth Biennial International Conference on Technology Education Research.

REFERENCES


TWENTY YEARS OF PRIMARY DESIGN AND TECHNOLOGY


Clare Benson
Director, CRIPT
Birmingham City University
England
2. PRIMARY TECHNOLOGICAL EDUCATION FOR ALL IN FRANCE

A Study of the Role of Technology in the Primary School System and Teacher Training over the last Twenty Years

INTRODUCTION

Understanding the contemporary technical environment and the socio-technical investment accompanying it is essential to the development of a country and of its citizens. Technological education contributes to this in different ways and at different levels within the education system. Its integration into general education in France is recent. This chapter is organised into two parts. The first part discusses technology in the education system and takes into account, through the specificity of different structures in the French system, the place allocated to technological education and the forms it takes according to the structure within which it is taught. The second part is dedicated to teacher training in the technological domain. Training which until recently used a degree as its starting point is now part of the Degree-Masters-Doctorate study sequence, more commonly known as LMD. LMD opens up new possibilities for organising teacher training which can be started in the different phases of L and M.

THE EDUCATION SYSTEM

The Main Principles of the French Education System

The education system is linked to the history of the republic. The principles of compulsory schooling, secularism, equality and its being free of charge are at the heart of the aims of schooling.

Schooling is compulsory for children between 5–16 years of age and from all families, both French and foreign nationals. In practice, schooling actually begins at the age of 3 until the age of 18, for a variety of reasons such as higher qualification requirements or the job market. Parents may choose to teach their children themselves, or to place them either in a public or private school. The first option is rare. It requires parental agreement, as well as approval for the given teaching. Ideological impartiality and equal opportunities are compulsory.

The principle of secularism is unique. It affirms the separation of power between the church and the state. All children are welcomed irrespective of their faith and beliefs, even in confessional private establishments. Teaching is given with total respect for freedom of thought. Curricula and school books are neutral. The personnel
are secular. Proselytising and propaganda are forbidden. To the notion of secularism is added that of political neutrality and impartiality. The last of which, in the same way as secularism, applies to staff, syllabuses and books.

The principle of equality prohibits discrimination of any kind. The education system has to guarantee equal opportunities for both sexes, as well as social and cultural equality.

Historically, the notion of schooling being free of charge preceded its being obligatory. School equipment is provided by communes or departments for public (state) schools. School manuals are provided in both public and private schools. In secondary school, costs are paid by the families.

**Organisation of the Education System**

The education system is organised into levels and cycles. Primary school constitutes the first level or grade. It is split into two schools, nursery school (optional) and lower primary/elementary school (compulsory). Middle school and high school comprise the second level or grade. Two courses of study are available in secondary school: a general technical diploma and a professional (practical) one. In this chapter, we will only look at the general technical option.

The first level is organised into 3 cycles, starting at nursery school and continuing in elementary school. Cycle one corresponds to the first two years of nursery school. The children are aged between three and five years. The second cycle starts in the final year of nursery school, and ends after the first two years of elementary school. Children are aged from 5–8 years old. Cycle 3 refers to the last three years of elementary school, for children aged 8–11. Primary school education is organised using a national programme (syllabus) established by the Ministry for National Education. No diploma is awarded at the end of this period. Pupils are assessed throughout the whole of primary school. First degree education is funded by municipalities (city councils) which provide the buildings and equipment needed for the school to function. Teachers are paid by the education ministry. Administrative staff are managed and paid for by the city council.

Second level education begins in an establishment known as a ‘college’ (middle school) and ends in another one called a ‘lycée’ (secondary school). Middle school lasts for four years, pupils are aged 11–15. Secondary/high school lasts for three years. Pupils are aged 15–18, sometimes 19. Approximately 83% go to a school of this kind. Middle schools adhere to a national curriculum. It is structured in three cycles - the adaptation cycle, the central cycle and the orientation cycle. These cycles last for one year, two years and one year respectively. Pupils are evaluated by means of continuous assessment to gauge their knowledge and a final exam, with a view to obtaining the diploma known as the ‘Brevet des colleges’. The budget for middle schools is allocated by the Ministry for National Education for staff costs and salaries, whereas investment and equipment are funded by departments (France is split into 96 administrative departments). At the end of middle school, pupils have two choices over which course of study to take. They can either continue their learning at a general technological secondary school, or at a general one. All these choices make
a wide range of qualifications available to young people, such as the ‘certificat d’aptitude professionnel’ (CAP), ‘le brevet d’études professionnelles’ (BEP) or a ‘baccalauréat general or professionnel’ (Bac, BP). Study for the ‘baccalauréat général’ is in a ‘lycée général’, and the ‘baccalauréat professionnel’ in a ‘lycée professionnel’.

General and technological high schools are structured in two cycles: the determination cycle and the terminal (final) cycle. The determination cycle allows pupils to choose either a literary, scientific or technological (industrial, tertiary or biotechnological) route at the end of the determination cycle. It lasts for one year. The final/terminal cycle lasts for two years, culminating in the baccalauréat diploma. This qualification is the recognition given for completed secondary school studies. Each study choice has a national syllabus. The budget for secondary schools’ staff salaries and operations is managed by the Ministry for National Education, whereas investment and equipment is dealt with by regional authorities.

TECHNOLOGICAL EDUCATION IN GENERAL TEACHING

A Generalist Technological Education from Nursery to Secondary School

Technology has been taught in France from nursery to secondary school since 1985. The different structures (primary, middle and secondary school) give it varying forms. In primary school (pupils aged 3–11 years old) technology education is linked to scientific learning (physics-chemistry, biology, geology). In middle school (11–15 years), technology is a compulsory subject linked to sciences. In secondary school (15–17 years) technological education takes the form of an option or study choice called ‘Sciences for Engineers’ chosen along with others (e.g. sciences, arts, economic and social sciences). Besides the specific formats and progressive organisation of subject areas and specialities (options), all the different levels are interested in situations that allow for the production of technical objects (objects or systems).

Technological Education for Science and Technology-Based Teaching in Primary Schools

In cycle 1 (known as the ‘cycle des apprentissages premiers’ or early learning cycle) a subject area called ‘Découvrir le monde’ (Discovering the world) aims to teach pupils about the richness of the world surrounding them (objects and living things). Besides experiences already known to young children, nursery school allows a child to be curious about things by discovering some of the phenomena of life, matter and man-made objects (Bulletin Officiel de l’Education Nationale (BOEN), 2002a). The teacher makes the pupil aware of the fact that (s)he can handle and transform the objects around them; that they can be put in order and classified; and that their qualities can be distinguished in doing so.

In cycle 2 (‘cycle des apprentissages fondamentaux’ or fundamental learning cycle) the Discovering the World module continues. Pupils learn how to use technical objects correctly. They learn to ask themselves questions and to think about their actions. They alter, handle, observe, compare, classify and experiment with things. They go beyond their initial ideas by learning to apply them to real situations. Hence,
they learn about materials that are available to them. They question themselves and develop their practical know-how. The teacher allows pupils to structure their thinking and actions through basic construction or building projects, heightening their sense of innovation and inventiveness (BOEN, 2002a). The weekly time dedicated to this domain switches between three and three and a half hours.

In cycle 3 (known as ‘cycle des approfondissements’ or in-depth learning) a discipline called ‘Experimental Sciences and Technology’ targets a more rational way of thinking about materials/matter and living things, through careful observation and analysis of phenomena which pupils are interested in. The aim is to prepare pupils for living in a society where technical objects play a major part, as well as teaching them about the benefits of science. The science and technology curriculum is heavily centred on the experimental approach. The knowledge offered is much more aptly put together, as it is the result of questions being asked when activities involving observations and changes are conducted (MEN, 2002a). Such teaching leads to discussions about major ethical problems of our times to which children are particularly sensitive (economic development, environment or health). Weekly time dedicated to this field can vary from two and a half to three hours.

In primary school, the teacher is versatile. S/he has to teach all subjects. But due to the reality of institutional demands and practices, teachers focus more upon French and mathematics. As a result, scientific and technological education is not taught much. In order to aid the development of sciences and technology, the ministry put a plan in place to revamp the teaching of science and technology call PRESTE. This project was preceded by ‘la main à la pâte’ operation, initiated by Georges Charpak of the ‘Académie des Sciences’ and ‘Prix Nobel de Science’. The results are favourable: science and technology teaching rose from 3% to 25% in three years.

The Plan to Reform Science and Technology

A plan to reform science and technology was put in place by the ministry in 2002 with the aim of making primary school science and technology teaching more effective and giving it an experimental dimension (Ministère Éducation Nationale (MEN), 2002b). The idea behind this was to increase pupils’ ability to discuss and reason, as well as to progressively implement scientific concepts.

The pedagogical approach is based on questioning and investigation, through the use of concrete processes for experimenting, complemented by documentary research if necessary. The pedagogical approach therefore creates the conditions for a genuine intellectual activity for pupils. On the one hand, it allows pupils to build their knowledge by being involved in scientific activities, whilst on the other hand encouraging pupils to discuss and express their ideas together with observations, hypotheses and conclusions. This leads them to share ideas, throw their points of view together and formulate provisional or final results, orally or by writing. Listening to and respecting other pupils’ input and taking their opinions into account allows pupils to develop the ability to reason and to critique something constructively. Finally, the activity is part of a coherent process which places the emphasis on common sense and helps to create inter-disciplinary links, notably a general grasp of language and citizenship.
These learning paths target the acquisition of knowledge, and the use of analytical methods and reasoning. The advantage of the defined framework is that it clearly explains the situation and gets away from any institutional blurring of boundaries. It also reassures the people involved.

This plan to reform the teaching of science and technology does not ask teachers to find and create everything. It requires them to refer to existing documents and to define precise and realistic objectives. Teachers will be in a position to create conditions for a real learning scenario, in which pupils will be able to build lasting knowledge.

With the science reform plan, access to knowledge of technology in primary schools forms part of an investigation process, as is the case for science. This process adheres to a principle of unity and diversity in the choice of learning methods, materials and objectives. Technological exposure within this structure is difficult to find, because the transition between science and technology cannot be taken for granted (Agassi, 1997; Chatoney, 2003, Rowell, 2004). It requires effort to be made to identify knowledge, which is not easy to do (Chatoney, 2006) due to limited training time being dedicated to the teaching of science and technology for primary school teachers in their early and subsequent training.

THE TRAINING OF PRIMARY SCHOOL TEACHERS

The objectives and demands of teacher training are defined by ministerial decrees and must be adhered to by everyone with regard to the organisation of competitive entrance exams within the public sector. Teachers employed in the public sector by the state represent approximately 80% of all teachers in France. Around 18% have private teaching contracts. The state helps to run these kinds of establishments by dealing with teachers’ salaries. In return, such teachers have to meet the same demands as public state teachers; primary, middle or secondary schools are at the very least, obliged to follow national curricula. For practically all teachers working in France, training carries with it the same requirements set by the Ministry for Education. Such a training course is overseen by the Instituts Universitaires de Formation des Maîtres (IUFM) (National Teacher Training Institutes) set up in 1991 with a new law for teacher training being passed1. These institutes are in charge of training all teachers in 1st and 2nd degree education for all disciplines, including technology.

Teacher training in France is sequential. Firstly, students wishing to become teachers go to university to obtain a degree. Once they have this, the students attend the IUFM for a 2-year training course.

In keeping with the Bologna protocol/agreement, French universities, like their European counterparts, are changing university courses to make them the same as studies in Europe and on an international level (Chatoney & Ginesté, 2006). The Licence (Degree), Master, (Masters), Doctorat (Doctorate) (LMD) system is adopted in three cycles. Each qualification now corresponds to the same period of study, that is to say three years for the degree, five years for the masters and eight years for the doctorate. The stakes are high for Europe, for universities and for students. Europe is aiming for the free movement of people in the European space. Universities are
targeting a strengthening of their training and research policies in the European space. Students want their qualifications and university education to be recognised on a European level.

The IUFM, which were previously independent from universities, are like many other institutes and specialised schools in France, progressively integrated into universities. (The IUFM for Aix - Marseille was the first to be integrated, in January 2007). Teacher training in France in its current form is quite difficult to integrate into the LMD system for several reasons: the first being that prospective teachers are recruited after gaining a degree and passing national entrance exams. These exams are difficult; it is competitive and institutional demands are high. The second reason is that it is difficult to socially place the job of teacher. Certain people think that training is not needed to become a teacher, and that some socially acquired skills and good academic knowledge are sufficient to be able to teach. Professional (practical) skills in teaching are given no credence. They are believed to be innate or gained by trial and error when working with children. Others think socially acquired skills coupled with good academic knowledge are insufficient in doing the job. For them, knowing how to teach requires having working knowledge that is specific to the job. There are actions, techniques, ways of organising things, and epistemological tools that one has to know about (Ginestié et al., 2006). In this context, integrating teacher training into the LMD format hints at moving from the idea of a professional training course which is supervised by the employer (the entrance exam), to professional university training (skills).

The putting into place of the LMD structure has brought with it openings for teaching jobs prior to the two years of training at the IUFM, leading to a new idea for such training. In this chapter, we will first of all present the LMD idea, and the problem it poses for finding opportunities in teaching jobs. We will then move on to discuss using the LMD plan in the teaching of science and technology, and the new format for training primary school science and technology teachers.

The LMD Idea

The LMD system is the result of the actions of four education ministers in 1998 (French, Italian, English, German) at the Sorbonne. This declaration started the process of constructing the current European space, and led to a conference on the harmonisation of studies in European universities (MEN, 1998). A year later, European education ministers in Bologna (Italy) drew up the main reference points for European study courses and diplomas, and expanded the process to incorporate all European countries (MEN, 1999). Since then, the idea of a European teaching space has made progress and begun to take shape. All these efforts have allowed an agreement to be reached about the quality of training, equivalent diplomas and the free movement of students in Europe. This last point is strongly backed by a whole array of European programmes, such as Socrates, Comenius, and Leonardo. Work on this harmonising process is still ongoing.

The LMD system has been set up to facilitate the understanding of university training and research policies, whilst also respecting the wide range of offers.
This harmonisation process is not however a standardisation process for higher education; it has to allow universities to offer their own courses and diplomas, as is the case with all major universities worldwide.

The LMD has two objectives: to reassert the value of national diplomas to give students the certainty of having a qualification that is recognised in all European countries, and to construct a European higher education teaching space based on an understanding and trust between the range of national systems in Europe. This trust is founded on methods for the evaluation of the quality of training courses and diplomas (MEN, 2002c).

On a European level, the LMD system clarifies the organisation of training schemes, making them workable and understandable in the European space. It involves:

– decompartmentalisation of curricula, allowing specialist subject areas in establishments to be more clearly identified;
– more flexibility in training schemes, in order to favour progressive orientation processes and the teaching of a wide range of students;
– the putting in place of a modular teaching and European credits system (ECTS) to improve moving from training programmes to working, and also between countries and establishments.

In terms of universities and students, the LMD scheme links training and research. It also heightens competitiveness within establishments, which leads to the following structural changes:

– the putting in place of main areas of training together with research;
– availability of a wide range of study choices to cater for student diversity and developing demand for professional training;
– promoting innovation and experimentation in teaching in order to move away from the classic lecture (cours) - seminar (TD) - practical class (TP) structure;
– supporting innovative choices of multi-subject type, incorporating general knowledge and culture, modern languages, technology and professional training in an attempt to gain more subject flexibility;
– scientific involvement for training teams by conducting research to provide coherence between scientific powers;
– recognition of professional Masters’ programmes to comply with local economic, social and cultural needs.

**Availability of Teaching Jobs in the LMD Structure**

The LMD system progressing towards masters and doctorate poses no real problem to a university within typical university courses. However, the putting in place of professional paths towards teaching jobs is more problematic. The Ministry for National Education has reservations about the IUFM’s ability to train teachers from the point when teacher training will be integrated into Masters’ programmes:

It is important … to express concerns about certain projects planning to create a Masters in teaching jobs... A university – IUFM partnership risks putting the IUFM in the midst of a university diploma process, even though it should be
focusing on professional teacher training for those having passed the entrance exam. (MEN, 2002c)

To facilitate IUFM integration, universities have agreed to contribute fully to preparing the teachers of the future in terms of degree courses offered and entrance exam preparation, explaining that:

The integration of the IUFM preparation will be more thorough, involving degree courses... The question of a Masters being awarded to teachers at some point during their professional training will lead to new answers with the IUFM pedagogically integrated into universities. (MEN, 2002c)

With these plans, the availability of teaching jobs is not limited to the final two years of training at the IUFM.

Like others, the universities in Marseilles have integrated modules linked to teaching into their degree courses. How does the professional element of teaching appear in technological subjects in the first LMD at the University of Provence (started in 2003)? What position can IUFM take in the university integration process and with regard to Masters’ courses in teaching?

To look at this question, we will present an LMD system put in place for scientific degrees as of 2003, leading to teaching jobs for life and earth sciences, physics and chemistry students.

Multiple Subject Degree Course – Training and Scientific Knowledge

The science department of the University of Provence (Aix-Marseille 1) offers students a new choice of course corresponding to the LMD system called Multiple subject degree course – training and scientific knowledge. This degree leads to jobs in teaching, notably primary school teachers and in the technological sector of secondary education. Where and how does this degree course fit into the LMD structure? The illustration below shows the possible career choices available to students in the science sector at the University of Provence.

Figure 1 allows us to understand the whole structure and general format of the LMD system, which in turn allows a student to plan their choices throughout their studies. When starting a degree course, a student has several possible choices of what to study. In the general degree structure there are three possible choices: Mathematics, Information Technology and Physics and Chemistry (MI-SPC), Life Sciences and Universe and Environmental Sciences (SV-SUE) and Sciences for Engineers – mechanical and electronic engineering and automatism (SPI). The scientific multiple subject degree is a third year course. It leads (as indicated by two arrows in the illustration) either to IUFM teacher training programmes, or to a professional or research masters. It is different from professional (manual) masters courses, which lead directly to jobs as technicians.

The multiple subject degree course is done by a small number of university students who are young and highly motivated by the availability of courses which fit in with the LMD philosophy. The aim is to give students a good chance of passing the primary school teaching exams and other entrance exams for state jobs which
are offered. This provides the opportunity to take exams to become either a primary school teacher or a national education advisor. It takes place prior to exam preparation given by the IUFM - preparation that is accessible via an exam which 90% to 95% of students on this course pass. With options being carefully chosen, it also allows students to go on to take socio-educational exams for state jobs at degree level.

In order to reach its multiple subject and cultural objective, this degree course includes an important scientific unit (Physics and Chemistry or Biology and Earth Sciences) which involves completing a scientific multiple subject dissertation which is presented as an exposé, lessons in Mathematics, Technology, Information & Communication Technologies (ICT), a modern foreign language, an introduction to methods of literary analysis and the writing of a story. The course also includes an introduction to the epistemology of sciences and techniques, and the possibility of doing an internship or basic constitutional law and social and political sciences.

Two modules (technology and internship organisation) are intentionally geared towards becoming a primary school teacher. These modules are formed in a partnership with the IUFM in Aix – Marseille. The technology module targets the acquisition of knowledge needed to produce technical objects/tools, and how such objects work or exist. It also aims to cover the basics of different technological approaches (structural, functional, systemic etc.) and the language or jargon relating to them. The aim is to acquire the skills required to conduct a technical project, notably in terms of anticipation, planning and organisation (dependence systems, causal chains, schemes of interaction, value analysis, etc.). It is a subject-based module. Teaching is centred upon the history of inventions and techniques, the study of social organisations for the production of objects, processes in technical projects and industrial
conception, interdependence between operation, functions, structures and forms of
technical objects and systems, graphs and jargon, relationships between man-object,
man-machine, man-tools.... Students also receive an initiation to 3D modelling
software. This teaching corresponds to what is taught in primary schools as an
introduction to technology, with the help of videos, school documents, and even
documents produced by pupils. Hence, students have to study in settings that are
limited by pupils’ understanding and the conditions or equipment. For example,
students must produce a technical project outside the classroom. From this file, they
produce the technical object in a practical class. In this project, the technical aid or
object can only be produced using tools and materials used in primary schools. This
raises students’ awareness of the restrictions in primary school equipment and the
importance of preparation in this kind of activity. They learn for example the majority
of techniques that can be used at school, feasibility, and technical jargon. The technical
dossier is limited by precise specifications. Managing the dossier complies with
common reference procedures for technology teaching in France. It is a thorough
process: investigation-research, operational approach, research and choice of technical
solutions, technical object drawings, organising its production, and conformity. The
dossier and creating the object are evaluated by means of a written statement. As
far as teaching is concerned, the problem linked to graphic jargon is supported by
examples from primary school (for example drawings, key, and coding). Systems
for the transformation and transmission of movement are begun in a practical class
about automatism adapted to primary school level. The invention history class is a
practical application session adapted for 10 year-old pupils.

Such a conception of technological training naturally goes beyond the subject area
for which it is intended. The module allows students to gain awareness of what
technology is from a general point of view, in what ways it can be used and find
viable conditions for teaching it to young pupils. This approach complements the
training given by the IUFM which, due to a lack of time, is unable to develop these
different aspects and especially contextualise them in academic practices. Spontane-
ously, students tend to consider that the technological initiation comes from
manual education, despite the fact that such teaching disappeared in the 1980s. This
more thorough teaching allows students to get away from the naive perception of
the expectations of primary school technological education teaching. It also allows
them to become aware of the relationships between technology and other subject
areas. There is of course an important epistemological element in terms of academic
references and ideas regarding multiple subject courses and flexibility. These relation-
ships are examined further in the IUFM training.

The option of doing a teaching practice in a primary school involves a preparation
class for the work placement, a teaching practice in a primary or nursery school
with a mid-term report, and a report at the end, concluding with a written account.
The teaching practice includes approaches to a primary school and teaching through
observing what the teacher does in the classroom and the school generally.

The ongoing aim is to develop the ability to analyse the teacher’s actions and
teaching-learning situations. Lessons about the role of the school, the teacher, the
education system, syllabuses, and teaching-learning scenarios precede the work
placement in the school. The system of class-internship-class-internship-dissertation progressively prepares students to observe carefully. It will be easier for them to understand the teacher’s teaching choices, and to see how pupils react in a given situation. Observing how the teacher operates is also an important part of preparing a class (for example teaching preparation, thinking about teaching materials, risk prevention, and multiple subject structure) and a teacher’s subsequent analysis of their own choices (for example strategy, activity accompaniments, and organisation).

Of course, during the work placement, students experience school life on a daily basis. They also find out about parts of the job which are not talked about enough, such as team work, relationships with parents, lesson supervision, lunch time and other breaks, sick pupils, and school trips. This option does not have a professional (practical working) aim. It is a discovery of the working environment and the work of a teacher in general terms. Training teachers professionally is the job of the IUFM at a later date.

As we can see, both these modules created in the university and IUFM partnership help to develop student knowledge of what being a primary teacher entails. Notably, it is a question of highlighting the importance of the introduction to science and technology in the primary school, to ensure that these subjects are well taught and hopefully to encourage more pupils and students to choose studies of this kind. It is also a matter of developing the contribution made by scientific and technical culture to pupils’ general knowledge.

The introduction and placing of the multiple-subject degree course in the LMD setup has been a well-documented source of controversy in academic quarters. Some people think that the decision to opt for jobs in teaching means that the degree course in question becomes a kind of cul de sac option. They go on to say that it takes the weakest students who are not good enough to do scientific studies at a higher level. In other words, being a teacher does not require exceptional academic prowess or completion of high-level university studies. This idea fits in with the one which claims that everyone is capable of teaching. Others think that general knowledge and orientation have no place among scientists. Such resistance embedded in an academic model of scientific knowledge is proof of differing opinions with regard to the role of a teacher, what the job is said to entail, and hence upon what knowledge the job is founded. People are still debating the fact that it may suffice to merely have good knowledge of a discipline in order to be capable of teaching it. Such a notion is disparaging to the work of a teacher, notably the mastery of knowledge and the skills necessary to teach a subject. The main reason for this knowledge and skills debate is that it means that teachers must perform their educational duties within the framework of a school system which forms part of a socio-cultural, socio-professional and socio-economic environment. This was in line with earlier comments in the chapter, about time being necessary to bring an end to generalisations regarding degree courses geared towards teaching jobs.

Hence, since 2002/2003, modules dedicated to knowledge of teaching and teaching jobs have been offered to students who later wish to become teachers. IUFM integration is ongoing. The IUFM in Aix-Marseille was the first one to be integrated, in January 2007. In order to do this, and purely in view of the training, the IUFM had
to specify the training content, give it a university level, organise the training into modules, consider evaluations based on the European System of Transfer of Accumulation and Credits (ECTS) credits, establish a link with research, and offer new study options in line with the LMD idea.

The IUFM Masters

The IUFM has redesigned its two years of training into a Masters. This was not easy, due to confusion between recruitment by means of exams to teach in the public sector, and professional teacher training. This contradiction is clearly seen in the first year of IUFM training, the sole aim of which being to prepare students for the exams, whilst taking the format of a first year Masters. Passing the entrance exams cannot be a viable means of evaluating the elimination of a first year Masters, because it depends on the ratio of the number of positions offered and the number of candidates. IUFM training couples Masters 1 with passing the competitive entrance exams.

First year training is subject and culture based, and also involves teaching such as training for success. The school subjects’ part is vast, given that primary school teachers are required to teach many subjects. They have to study for exams in French, mathematics, one of history and geography or science and technology, but also languages, sport, art and music. As well as all of this, there is also the work placement in a primary school. Such placements allow students to get an idea of the working environment. This is something which they are obliged to talk about as part of the entrance exam.

The 2nd year of training forms part of a more typical university training and working structure, the validation of which is entirely in the hands of the training institute. There are three parts to be completed in order to validate this section: work placement, teaching modules and a dissertation. The system in place satisfies the university requirement of awarding ECTS and that of an academic jury charged with awarding candidates their state school teacher status. Second year training is made up of three components, one of which is pedagogical and professional teaching. It allows teachers to learn, to link practice and theory, to analyse practical elements and to introduce common themes for all teachers. The second component regards the work placements. It is used to apply knowledge, experiment, observe, and become familiar with institutions and other educational systems. Interns do a placement where they take charge of a class at a middle school, an observatory placement in a primary or secondary school, or a supervised practical placement and a placement in a company, or a placement abroad. The third component is the completion of a dissertation about the work placement. It is used to analyse, write up, and ask a question about a specific area of teaching linked to educational research. Its aim is methodological.

Training for Technology Teaching at Primary School

In the first year, students study for the Concours de Recrutement des Professeurs des Ecoles (CRPE) teaching exam. With this in mind, students must choose to take
the exam in either history and geography, or science and technology. But whichever choice they make, all students will have to answer a question to assess their knowledge of history, geography, science and technology. The remainder of the exam is dedicated to science and technology or history and geography. Due to the flexible nature of the exam, first year training has two components: a major component of 36 hours, and a minor one of 28 hours. Both target expertise in key scientific and technological concepts and their links to living things, matter, or man-made objects.

The objective of the training course is first and foremost to increase students’ knowledge and skills for all subjects taught at primary school, to help them pass the exam. In order to achieve this, the chosen training structure has opted to introduce students to the process of transposing scientific and technological ideas to allow them to build their own basic knowledge of a scientific and technological nature.

Candidates are examined on the content taught at the IUFM. This content is detailed in the entrance exam syllabus (BO no 21 du 26/05/05). The content touches upon extremely varied subject areas such as measurement, matter, energy, electricity, life forms, the earth, astronomy.

Students use a dossier to procure the main concepts of different disciplines. For the minor component, these files group together various documents (for example descriptive experimental, object drawings, processes for building, summarising, and production options) and serve as a study and analysis aid. For the major component, students compile dossiers which allow them to bring together essential scientific and technological notions and develop learning sequences with an emphasis on the investigative aspect. Students are twice put into an exam situation as a means of training.

In second year, training is centred exclusively on the teaching and professional (working) aspects. Students learn about teaching systems using existing resources, conduct evaluations, organise study, manage materials, and think about tools to help knowledge transposition such as posters, flowcharts - all of this in 15 hours. A collaborative working platform joins the link between students’ private study and training.

CONCLUSION

Teacher training at the IUFM today is split into four distinct sections, the importance of which all have to be appreciated. The first time scale is that which precedes starting at the IUFM, a time to build subject knowledge and the first steps on a path leading to jobs in the field. The second part concerns preparation for the IUFM M1 exam. The third is hands-on practical or professional training, which comprises teaching, practical experience in schools and thinking about the job. This corresponds to the second year of IUFM, M2 IUFM. The fourth section is the duration of a teacher’s career, a form of continual training from start to finish. Diplomas are awarded for these sections; degree, masters and doctorates for some.
Teacher training is not limited to knowing about a subject. Of course this is necessary, but it is not sufficient to be able to train a professional teacher able to transmit knowledge in different academic setups with highly heterogeneous groups of pupils. Training also requires being able to teach this knowledge and having a thorough knowledge of the educational system. This knowledge must be used in practice when the teacher is doing his/her job. The IUFM M1 and M2 training schemes attempt to find a balance between that which is practical, teaching, training time and training components. Such a balance is struck in the passing from M1 to M2 to allow every student involved in such studies to build their own professional working identity. This is a long road to take in the LMD system.

Training to teach science and technology can no longer be considered in terms of the juxtaposition between earth and life science teaching, physics, chemistry and technology, as was previously the case. The idea of a training course with integrated teaching is difficult to contemplate. It relies upon the teacher’s ability to adopt different points of view about the subject they are dealing with. This raises several questions: that of the theme and its multiple subject nature, but also the handling of points of view and the notions and concepts to be constructed through these viewpoints, in other words, the question of what knowledge and epistemology is required in the training of teachers.

NOTES

1 The orientation law of 1989 led to the disappearance of normal schools which trained primary school teachers and regional teaching centres which trained secondary teachers.

2 The Sorbonne is a major Parisian university.

3 Colloque de la Sorbonne, « vers l’harmonisation Européenne des cursus universitaire », Paris, 1999

4 Total training time for science and technology is approximately 30 hours at the IUFM.

REFERENCES


*Marjolaine Chatoney and Jacques Ginestié*

*UP-IUFM d’Aix-Marseille*

*UMR ADEF – GESTEPRO*

*France*