Information Technology in French Education: implications for teacher education

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ABSTRACT This paper reports a longitudinal study (1992-1996) of the opinions and competencies in informatics of students enrolling at a French University institute for teacher training (IUFM). It showed a substantial increase in computer ownership, better knowledge of computer tools, higher levels of prior training (except in human sciences) and a global increase in students’ expectations of information technology (IT) training. But there are important differences between subject disciplines; apart from technical subjects, there is no evidence that students have much familiarity with IT. Pre-service teacher training institutes still have an important but difficult task to prepare all future teachers to use IT in their subject teaching.

Within the last few years, information technology (IT) has evolved considerably in the French educational system. The front-line of innovation has moved towards communication technologies such as the Internet. The teaching of informatics as a subject, once developed in senior secondary education, has stopped and there is a tendency to consider IT as a global tool whose purpose seems to be to help producing documents rather than solving problems.

Computers have become more commonplace in society, and it is not only affluent homes which have now the privilege of owning one. Department stores sell packages specifically designed for students’ home usage, which may not have a direct relationship to school practice. Has the evolution been too rapid to be followed by the logistics of an educational system that evolves rather slowly?
Regarding the place of technologies in education, authors such as Cuban have described cycles of enjoyment and disillusion linked to the fact that things are always more difficult than was initially announced by enthusiastic innovators; ‘new’ technologies become superseded by newer ones without having expressed all their potential (Cuban, 1986). Similar ideas about the difficulties of integrating IT into education can be found in the form of metaphors like “waiting for Godot” (Johnson et al, 1993) or love between porcupines which must be “slow and cautious”, (Fulton, 1993).

Studies of the place of IT in education show that, on the whole, France is no exception to this model (Baron & Bruillard, 1994 a & b). As time goes on, innovations come and go and are replaced by other innovations using newer technologies. There is no real integration and, although the UK may be an exception, most curricula generally continue to make only general references to IT. In standard classrooms, users often complain that there is a lack of adapted hardware and software, lack of time and insufficient training.

However, the situation varies greatly according to schools, level of teaching and subject matter. In technical subjects (which are integrated in the educational system in France), software instruments do not seem to pose major problems; they are now integrated into the national curricula and taken into account in assessment. In secondary education general subjects, one notices successive phases (research-innovation-development) leading to integration. For example, in the field of natural science teaching, computer assisted experimentation is progressively finding a place in the curriculum and in pedagogical practice. The case of primary education is different; the weight of academic subjects is weaker, the concern about pedagogy and the focus on children’s activities are greater, so the use of educational IT material is easier than in secondary education. No recent global studies are available, but the observations we have been making for several years suggest that great differences exist between schools, depending on factors such as teachers’ involvement and local policies. Furthermore, Information Technology has different meanings and corresponds to different uses and types of integration. We are led to distinguish ‘between:  

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educational technology, which is regaining its youth with the expansion of multimedia software and the Internet,

‘bureautics’, i.e. assistance with personal work (notably document production), and

software instruments used in school work. We prefer to use the word ‘instrument’ instead of ‘tool’ for different reasons, particularly because instruments are not only tools which transform real or virtual objects, but also means to perceive objects, that lead to specific ways to understand them.

In the French context, educational technology is not very popular. It is not prescribed by the authorities and there is no general agreement about the opportunity to use it. Thus, it depends to a large extent on teacher initiative, and can only spread when there is a strong consensus in the profession about its usefulness.

The use of software for producing documents is the most popular application and is likely to spread, without bringing about dramatic changes in the methods of teaching and learning. As in other countries, word processing has become quite commonplace, and its practice is currently recognised as an objective for junior secondary education.

In the past years, many new instruments offering new methods to solve problems, and leading to different ways of conceiving what has to be taught, have appeared. Some have risen and then fallen (like LOGO), because it was difficult to integrate them in a system that changes slowly. Other are now rising, like CABRI in the field of geometry (Laborde & Laborde, 1995) or DERIVE or MAPLE in the field of formal calculus. They offer interesting possibilities, but the development of new activities using these tools is not straightforward. It is easier to integrate devices that simplify the teacher’s professional work without interfering with his/ her control of the class situation than to deal with situations where human competencies are partially replaced by machines. For example, recent studies have been carried out about the use of pocket calculators (instruments that are very commonplace) in secondary education. They show that the main obstacles are related to the fact that a majority of teachers (as well as parents) think that students should not use pocket calculators in mathematics if they have not mastered the technical skills required to operate effectively with paper and pencil (Bruillard, 1995).
Future Teachers and Information Technology: results from a longitudinal study

Teacher Training in France

Since classroom uses of IT are prescribed by teachers, teacher training is universally considered as a key issue regarding IT use in education. In France, in-service training has been the backbone of the public policies carried out between 1970 and 1990. Large investments have been made (several thousand teachers received a one-year training in informatics), allowing the development of IT to be launched. But in-service training also complements pre-service training, which appears thus to be fundamental. It is on this topic that we will focus here.

One should be aware that in France pre-service teacher training is now provided in accredited university institutes (IUFM), to which students apply after completing a bachelor degree. In the first year, students prepare for a national competitive examination. Those who pass it become paid student teachers. They follow a second year of practical training, partly based in schools. After passing a final certification (which more than 90% of trainees succeed in doing), they are appointed teachers and receive tenure. Their duties and level of salary (now equivalent for primary and secondary teachers) are defined at the national level. Primary teachers are multi-disciplinary, but secondary teachers will generally have to teach only the subject matter (or the technical field) they are qualified for (e.g. Mathematics, English, Music, History and Geography). In France, history and geography are considered as a single high school subject. The same pairing applies to biology and geology, and to physics and chemistry. Further information about teacher training in France is provided in the Annex to this paper.

IUFMs are still a recent creation, having replaced the former system where primary and secondary teachers received different kinds of pre-service training (until 1991). It is noteworthy that, probably due to difficult economic conditions, IUFMs are very attractive to students, particularly to prepare for primary teaching, where the duties are reputed to be easier than in secondary education.
The Study

We began to study the role of IT in pre-service teacher training in 1992, focusing on the IUFM of Créteil, a town in the suburbs of Paris. The results, published in Baron & Bruillard, (1994a), concurred with those that were obtained in other countries (Dunn & Ridgway, 1991; Mellar & Jackson, 1992; Downes, 1993). They showed low levels of starting competencies, a rather high level of expectation towards IT as a pedagogical tool and difficulties in integrating IT in studies and in practical work. Furthermore, there was an association between age and opinion. Older students tended to have more positive opinions about IT, particularly about the changes that IT can bring in the teaching of subject matter.

One of the components of our study is a questionnaire, that has been administered to every student enrolling in the IUFM every second year: in July 1992, 1994 and 1996.

We have used almost the same questionnaire every year, during the registration process. However, a few changes had to be made. For example, we added a question in order to discover whether students, whose ages vary widely from around 20 to above 55, had previously worked either as a teacher, or outside school. Concerning students’ training in informatics, we had initially distinguished between training focused on programming or training focused on software tools. We noticed however, that a growing number of students indicated both types of training, so we took this new possibility into account.

Table I shows the rates of response in 1994 and 1996, according to the different subjects. Due to incomplete administrative coding of students’ subjects, those figures could not be computed in 1992.
Each year, about three-quarters of the students were female, with variations related to specific fields. However, in scientific and technical subjects, over half were male.

As time passed, some changes have occurred. One quarter of the students claimed to own a personal computer in 1992, one-third in 1994, one-half in 1996 (only one-third in scientific subjects).

The number of students claiming to have had more than 50 hours training prior to their enrolment at the IUFM has grown significantly (on the average one-fifth in 1992, a quarter in 1994, and about one-third in 1996), with variations according to subjects (technical subjects have always had high scores, literary subjects low ones). Around half of the students claimed to have some experience of computer tools in 1992, this proportion being relatively stable according to the subject matter, except in technical subjects, where it was high. Two years later, figures were around two-thirds, and after a further two years 70%.

There are differences according to the type of tools considered. There is a steady rise in the use of word processors (four out of ten students in 1992 said they had experience of word processing; 60% in 1996). The average figures were lower for spreadsheets (only 14% quoted spreadsheets in 1992, 25% in 1994 and 35% in 1996). But the proportion of those claiming to have some experience of databases remained unchanged at around 10%.

Students' Opinions

We have tested the following students’ opinions of IT in their future job as teachers:

(1) ‘Informatics is an important pedagogical tool’;
(2) ‘Informatics is indispensable for your subject matter’;
(3) ‘Informatics will induce changes in the subject matter’.

Opinion 1 has always obtained high scores (ranging in 1996 from 41% in literary subjects to 85% in technical fields, with an average of two-thirds), followed by Opinion 2. Opinion 3 is less popular: from 32% in arts to 54% in technological fields in 1996.
It is not possible here to present a fully detailed analysis of our results so we only present the evolution of the group answering ‘yes’ to questions (2) and (3), hereafter termed ‘convinced’ (Figure 1).

Overall, there is an increase in the numbers of convinced, except in technical subjects, where it was very high at the start in 1992. By contrast, those answering ‘no’ to both questions, who could be called ‘sceptical’, are few and have tended to decrease.

Students’ Expectations Regarding Training at the IUFM

On the basis of previous research (including interviews of teachers and analysis of training programmes), four types of expectations regarding training at the IUFM have been retained: IT as a personal tool; IT as a pedagogical tool; IT as a tool for the subject matter; IT as a subject. Many students expect to receive training about IT both as a personal tool and IT as a pedagogical tool. Fewer expect training about IT as a tool for the subject matter and only 10% expect training about IT as a subject. Figure 2 shows the percentage of students with these expectations in 1996.
Figure 2. Percentage of students recording their expectations for training about IT at the IUFM in 1996 (n=1237). Primary teachers, PT; Literary, LI; Foreign languages, LA; Human sciences, HS; Sciences, SC; Technical subjects, TE.

Literary subjects, foreign languages and human sciences appear to have similar profiles of expectations. The primary teachers mostly have expectations about the pedagogical aspects. In scientific domains, the expectations may be considered rather low. In technical subjects, they are high, especially about IT in the subject matter. We noticed no gender differences within the school subject, except, in 1996, concerning “IT as a science” for the primary teachers (P=0.001, where males have more positive expectations about training). This might be explained by the fact that the computer is no longer a hobbyist’s tool, nor a scientific subject, but just a practical tool.

It is noteworthy that there has been an increase in the level of students’ expectations of IT training. One interesting result is that the expectations regarding training in IT as a tool for the subject discipline have significantly increased between 1992 and 1996, as shown in Figure 3. One of the reasons explaining this augmentation could be the Internet phenomenon and opinions about its usefulness in education.
Discussion

In this study, we have obtained comparisons over five years. Several facts can be noticed:

- computer ownership is steadily increasing, which is certainly an indicator of changing status for the computer;
- levels of training have increased, except in human sciences, where it remains low;
- there is better knowledge of computer tools, mostly regarding word processing and spreadsheets, but not database management. The problem will be to take into account in the different school subjects this increasing competency in managing personal computer tools; and
- there is a global increase in both the level of interest about IT in education and the level of expectations about training at the IUFM.

An Analysis by Subject Matter

For technical subjects only, we have noticed a high level of expectation regarding IT as a tool for the subject matter. The others did not seem very interested in that aspect. In mathematics, physics and chemistry, one could have reasonably expected more positive opinions and higher expectations than in the other subjects (falling in-between technical subjects and the others). The results we obtained do not concur with this; scientists have rather low expectations – less than one-third are convinced. However, things seem to be changing, and an increase in expectations can be noticed in 1996.

How can these facts be explained? Our results do not allow us to have definitive views, but some hypotheses may be put forward. First, problems may be tied to the proximity between IT and scientific
domains: teachers might want to mark the frontier between their domain and informatics as it exists at university. Secondly, current software tools in scientific domains do not fit the curricula (in France) and pre-service science teachers appear to be aware of that.

Which Perspectives for Teacher Training?

Our results confirm that, apart from in technical fields, there is still a long way to go before IT can be considered as a part of students’ culture. Universities often have difficulties in using new software tools and instruments, because of their organisation and of the increasing population they have to deal with. Pre-service teacher training institutes therefore have an important responsibility in teaching trainees how to use these tools as part of the knowledge of their subject matter.

How can they actually do this? Through recent official notes, the Ministry of Education has asked IUFMs:

- to develop students’ personal use;
- to help advisory teachers integrate IT into their practice (notably by offering them complementary training); and
- to integrate IT into specific training given by the IUFM.

Such concern is doubtless necessary, since official interest has always been a powerful incentive in the development of IT. However, the difficulties of these various objectives differ widely.

The first one seems relatively easy to attain. The different pre-service teacher training institutes take more and more ‘bureautics’ into account and there is increasing access to computers and word processing software, and increasing demands regarding the quality of documents produced by trainers and trainees. But will there be transfers towards more pedagogical uses? This is not certain and seems to depend on many factors tied to actual school organisations and systems (Passey & Ridgway, 1994; Ritchie & Wiburg, 1994).

Integrating IT into specific training given by the IUFM also seems feasible, the problem being to determine which kind of training will be actually offered. Much depends on the ability of faculty members to integrate IT into their own practice. Helping tutors integrate IT implies solving difficult problems concerning not only the IUFM but also school organisation. For example, the difficulty of use in standard classrooms is certainly a very limiting factor; tutors do not use IT very
often and are not convinced that it is important to show IT to trainees during the pre-service period.

Finally, teacher training is but one aspect of the more general problem of integrating IT into education. We are carrying out research on the forms of integration that may be achieved through the convergent involvement of different people working on teacher training. First results suggest that much depends on the awareness and the commitment of those in charge of advising others. One may guess that the growing diffusion of IT in homes, mainly as games and multimedia software but also as tools helping to solve problems, is liable to increase this awareness and to produce some effects. But slowly, since that is the only way for an educational system to change.

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References


APPENDIX

Description of the Studies in an IUFM

In order to make things clearer for people unfamiliar with the French system, the following provides a synthesis about pre-service teacher training in France. Figure 4 provides an overview.

CAPES (certificate for junior and senior secondary school teaching): German, English, Arabic, Spanish, creative arts, music, documentation, history and geography, modern literature, philosophy, economic and social sciences, physics (physics and chemistry).
CAPET (certificate for technical school training): Biotechnologies, business and management, civil engineering, electrical engineering, design and technology.

CAPLP2 (certificate for vocational school teaching): Literature and history, mathematics and sciences, civil engineering, electrical engineering, mechanical engineering.

The following lines are quoted from a document presenting the IUFM of Créteil.

The IUFM of Créteil training builds a coherent course: the first year of training is focused on preparing for the competitive examinations and the second year on preparing the student to be a teacher. Over the two years the course provides a mixture of fundamental lectures, work placements and practical classroom placements.

The first year is devoted to academic matters, but also includes professional training, including placements in school classrooms, or specialised teacher training school classrooms with a qualified advisory teacher.

The second year offers professional training. After success in one of the competitive recruitment examinations, the student teacher is paid. The future primary school teacher undertakes a long placement with effective class management. The future secondary school teacher has to manage one or several different classes for 4 to 6 hours per week. Each has to write a record of achievement based on a real professional situation that he or she has met. For the technical and vocational school teachers, a work placement in a company is added. Finally, the student has to deepen his or her field knowledge which will then be assessed. The training offers individualised flexibility taking account of the field and professional requirements, and responding to the needs which occur during the training, and the student’s own expectations.
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Figure 4. An overview of pre-service teacher training in France.