Learning and ICT in Universities: from "common" uses of ICT to a variety of learning models?

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***Abstract* - We study uses of ICT (Information and Communication Technologies) by students in particular by observing cases in France. We show that students have developed mainly what we have called "generic" or "common" uses – personal computing, knowledge of Internet… –. However, students do not strongly prefer learning modes using ICT as teaching tools. Uses for educational purposes are diversified, remain limited and need high involvement of teachers. Moreover traditional tools and media coexist with new media. This coexistence questions the simplistic duality between learning with ICT and learning without or between remote learning and traditional learning. Various technologies can be put at the service of different training processes. A very large variety of combinations technologies/uses is offered to teachers. Different learning models with more or less strong uses of ICT are possible, far from a monolithic approach. Blended learning is emerging and the role of the teacher remains fundamental. Every teacher can define the combination of technologies, uses and pedagogical methods adapted to a learning context.**

Index Terms – Information and Communication Technologies, new educational approaches.

GENERALIZATION OF ICT AND EDUCATIONAL USES

The access to Information and Communication Technologies (ICT) in the developed countries is spreading. Indeed the statistics concerning the purchases of computers or the number of people who are connected to Internet are eloquent. Today, more than half of the European households has an access to Internet at home.

Obviously, the educational world does not escape the development of ICT. But if computer materials are developing in all the educational institutions and especially in universities, if broadband networks are expanding, what are the real, concrete uses of these technologies by students and teachers? A first answer consists in stressing new uses. A double assumption is generally made: new uses of ICT

- would follow almost automatically technological investments and,
- would be the vectors of new forms of training.

In other words the supply of technologies and the creativity of the users could lead to a complete revival not only of educational organizations, but even of the training process. Several arguments go in this direction. Thus the development of networks, the ergonomics of materials, the software potentialities (storage capacities, data processing, interactive exchanges - emails, forums… -) favour new communication and training modes. The distance is no more an obstacle to knowledge transmission. The constraints related to traditional teaching, such as the availability of classrooms, the need for learners to be together at the same time, at the same place… disappear.

Table 1 hereafter proposes a typology of different training modes according to the two criteria of places and time.

TABLE I
TRAINING MODES
ACCORDING TO THE CRITERIA OF PLACES AND TIME

	"Real time" (synchronous)	"Time-delayed" (asynchronous)
One place	I = Traditional teaching, Computer-assisted learning	II = Library, electronic data bases…
Different places	III = Videoconference, Teaching platforms Forum…	IV = On line teaching CD-Rom, audio, video... Email...

Moreover, a collaborative or co-operative teaching can be set up in a digital environment. For example today it is possible to carry out remote projects involving different students and groups. Technology can thus play a part in sharing and transmitting knowledge.

But, on the one hand the new uses depend obviously on the capacities and the wills of the users and not only of the technological tools; on the other hand uses do not mean automatic, generalized and easy knowledge transmission. The transmission of knowledge is not a sum of machines or a flow on an electronic network. The double assumption made previously can be reversed: the access to technologies does not induce necessarily the uses and the uses do not mean necessarily a revolution of the training process.

So, it is necessary to observe the reality of the uses beyond the simple access to technologies and to analyse the emergence and the characteristics of new ICT uses. It is also necessary to study how students acquire knowledge beyond the uses, since the acquisition of knowledge is first of all a cognitive process: any student decodes, interprets and

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organizes the information which he receives, or to quote J. Perriault: "With this triple activity of decoding, interpretating and organizing, a person ("l'intéressé") builds knowledge" ([1], p. 16, our translation). In the present communication we analyse especially the uses. **We propose the following intermediate assumption:**

- **new uses are developing with the rise of the access to ICT,**
- **but new educational uses progress slowly, mixed with traditional education.**

We test this assumption in some university cases and propose some tracks to decipher the observed phenomena.

THE ACCESS OF THE STUDENTS TO ICT

We try to learn some lessons from our experience within a university framework which is very favourable to ICT. Indeed, as persons in charge of a Master entitled "Information and Communication Science" we have been able to observe for about sixteen years the uses of ICT by different teachers and students. This Master includes strong contents in ICT. We carried out two surveys in 2005, 2006 on students in the second year of the Master to determine the access of these students to ICT, their uses of ICT and the way in which they perceived, interpreted their uses in particular from the point of view of the acquisition of knowledge[2]. The surveys concerned a significant sample of about 45 students per year among a population of 200 students per year. We chose in particular the students involved in the ICT speciality ("New Technology and Strategic Information") of the Master. Approximately 40% of the interviewed students were long life learners.

Concerning the students, it is clear that they had a generalised access to ICT and widespread uses. Indeed it is a young group of population with very good skills in the ICT field and the intellectual abilities to adapt easily technologies. Of course, the life long learners constitute a population which may differ from the point of view of their age and with regard to their practices of work and their access to technologies.

In the studied cases (investigations in 2005 and 2006) it appears that the access to ICT is very generalized for the interviewed students, whatever their statute (initial training or life long learners), since almost every student had his own computer and an Internet connection (personal or family). In general they had been using computers and Internet for a long time. Let us give some comparative data: an investigation of the CREDOC (Bigot [2]) in France shows that more than one adult out of two (53%) and 71% of the group of the 18-24 years had personal computers at home in June 2005; concerning Internet 39% of the adults and 47% of the 18-24 years were connected at home in June 2005. It is clear that the students we interviewed constitute a group very much interested by ICT.

However the access to ICT is not necessarily an access to ICT within the training framework. For example, concerning France, the investigation of the CREDOC shows that in June 2005 only 50% of the students (18 years old and more) used computers to learn within the training framework, whereas 81% younger people (schoolboys or high-school pupils between 12 and 17 years) used a computers within the school framework (but only 4% of the 12-17 years used a computer every day…). Our sample of students is very far from the average figure of the French students quoted by the CREDOC since all the interviewed students had the possibility of using free access computers with a broadband connection to Internet inside the university buildings. In addition main lectures required the use of the computer (especially in the speciality "New technologies and Strategic Information").

A DEVELOPMENT OF "GENERIC" USES

The evolution towards "ecological" interfaces and the increasing skills of the users in regard to ICT open obviously the way to more intensive uses of ICT. But, simultaneously, on the one hand the technical innovations, subjected mainly to a supply logic (within a dynamic economic framework characterised by obsolescence and short products and software cycles), induce ceaseless transformations of the tools; this causes recurrent difficulties of uses. On another hand, even in the cases of relatively stabilized uses, the users claim higher performances concerning their tools or on the contrary limit consciously their uses. **So the technological evolution and the users behaviour induce a permanent gap between technology and ICT uses. We are faced with a structural instability concerning ICT uses.**

One of the results of our survey relates to the uses which we have called "generic" or "common" uses. The very generalized access to ICT is correlated, for the observed sample, with basic skills concerning traditional software (Word…) and basic Web uses. Our experiment shows that basic uses (for well-known standard software applications: word-processor, presentation software, e-mail, surfing on the Web) are increasingly widespread. This result is true for various Master specialities, whatever the categories of students (even for long life learners). A survey carried out within the framework of an European project into approximately 2000 students of 12 European Universities goes in the same direction [3]: in the SPOT+ project, "In general, the students in our sample reported good skills with different applications. The highest abilities were with e-mail and word processing with which over 80% students reported being able to use without help. A slighter lower ability to use on-line bibliographic databases was reported. Presentation managers were the software with which students had least skill, one third of the respondents indicated that 'they would need some help' to create a short talk with slides using them and the highest percentage of students reporting that they had never used the application" ([3], p. 4). The assumption according to which the extension of the access to ICT induces a development of "generic" uses, especially for young people, seems relevant.

Consequently, from a theoretical point of view, we could expect that the increasing access to ICT and the correlated development of "generic" uses will induce a general and quick diffusion of educational uses. Is this assumption confirmed or refuted by reality?

[2] A third survey was carried out in 2007 but the data are not yet available.

EDUCATIONAL USES?

Of course, students are more likely to use ICT when exercises required by the teachers imply the use of a computer; for example when students have to send by email a written exercise or to search information on the Web or to participate to a forum.

The interviewed students had a privileged access to ICT and intensive "generic" uses. These students had also to intensify their ICT uses within the framework of their curriculum. The training combines traditional classroom lessons with on line training thanks to an Intranet; moreover various exercises need intensive use of ICT (creation of Web sites, etc.).

However, if we look at some indicators of the ICT uses, the results appear more complex than those emerging from the first analysis related to the access or to the "generic" uses. The surveys which we carried out emphasize the ambiguity of the students behaviours and especially of the mental representations with regard to the use of ICT for training. For example, although a very strong majority of the interviewed people declare they are very trustful and very comfortable with regard to their behaviours concerning their ICT use, the percentage of students who adhere without reservation to on line training is weaker: approximately 40% of the sample gave a positive answer without any condition or limit when we asked them whether they would be ready to have a course which would be completely remote via Internet. More than 25% of the interviewed people are cautious and about 35% are completely against on line remote training (they expressed a total refusal without ambiguity). **Questioning and scepticism about e-learning type educational uses remain important, even for students with good skills in the ICT field.**

One might expect that long life learners would be more interested by pedagogical methods based on an intensive ICT use compared to younger students. Indeed, life long learners are adults with important family or personal constraints (they have children…; their home is often far away from the place of teaching…). Moreover, remote training would allow them, or at least some of them, to continue their professional activities during their training period. The surveys which we carried out do not reveal significant quantitative differences between the two populations, i.e. life long learners and young students. Arguments in favour of traditional teaching methods are developed by all the categories of students. Of course, we have to be careful, taking into account the sample, the limited number of our population. Our survey is not representative of all the French universities. However, our results give indications about the diversity of the behaviours and mental representations concerning e-learning and pedagogical methods based on ICT.

We can go further by making the assumption that the students who have good skills in the ICT field do not clearly prefer new modes of training based on ICT, even if they usually use ICT for interpersonal exchanges (email in particular). The general assumption is confirmed by the survey carried out within the framework of the European SPOT+ project already quoted: "students are positive towards the use of ICT in education and learning. However, at the same time, students also report a relatively strong preference for learning with traditional education methods such as printed materials and classroom settings » ([3], p. 13). Some results of our investigations are similar: a very great majority of the interviewed Master students consider that ICT can improve their training, but they also prefer to read a printed text and they consider that a good pedagogy requires a direct, "face to face" contact with the teacher.

TOWARDS BLENDED LEARNING: COMBINATION OF TECHNOLOGIES AND USES

It should be added that students use simultaneously ICT and traditional tools: for example, when documents are available on line, they finally print the documents, even if that eliminates some multimedia qualities (no animation or suppression of the colour…). Going back to paper can be explained because of the easiness of reading, but shows that ICT are far from replacing books. Thus traditional teaching tools (books, paper, blackboard…) coexist with new tools, new "media" (we can consider that ICT are "media" because they are used to inform and communicate). As shown by some experts of media analysis, the media history is that of "more": old media do not disappear but new media develop and coexist durably with old ones (see [4]).

This coexistence questions the simplistic duality between remote learning and classroom learning which has been too often considered in many approaches about ICT in education. More generally any investment in ICT is not an end in itself; it should be realised only in the interest of the concerned populations. In the education field, various technologies can be put at the service of various training methods.

Different interesting studies can be mentioned here in order to complete our analysis. An American study measures the compared efficiency (in terms of the performance of the students measured by tests) of traditionally taught courses with technology-enhanced courses (in various forms). It concludes in the following way: "Our results suggest that it is no longer appropriate to define instructors as either technology-using or non-technology using. The analysis of time costs and technology usage indicates that the issues no longer concern whether to use or not use technology, but what technology to use in what manner" ([5], p. 257)

Our present goal is not to measure different educational performances linked to various uses of ICT, but it should be admitted that the coexistence of traditional tools and new media as well as the multiple ways to use ICT in education (on line courses, on line exercises, remote assistance, forums, collaborative on line projects…) open the way to various learning methods with various combinations of traditional and remote teaching.

S. Mackay and G.J. Stockport [6] study and compare blended learning, classroom and e-learning. They recall different definition of blended learning: "Masie (2002) states that blended learning is the combination of two or more distinct methods of training such as classroom instruction with on-line instruction or simulations with structural courses (…) Blended learning according to Bersin (2004) is

the combination of different training "media" (technologies, activities and types of events) to create an optimum training program for a specific audience" ([6], pp. 85-86; for E. Masie see [7], and for J. Bersin see [8]). We can go further: the question is not to choose *the* ICT solution but the optimal combination (to be defined by the teacher) of technologies and pedagogy adapted to a specific context.

Another study analyse e-learning: the project "was conducted over two semesters utilizing both technical and non technical learning units (…) Among the intriguing findings is that technical e-learning units were evaluated less favorably by users than non-technical units" ([9], p. 49). Their analyse concerns the Information Technology Training Initiative, one of the major programs offered by the Michigan Virtual University (www.mivu.org). They consider also that blended learning is an interesting solution: they complete the precedent definition: "Blended learning emphasizes starting with learning objectives and then selecting the best combination delivery methods to accomplish them ([9], p. 55)".

In the case of the Master that we studied, we have introduced progressively and empirically such an approach: each teacher chooses his methods and tools for teaching (use or not of computer rooms, various uses of the Intranet; exchanges with the students by emails, etc). If we refer to table I above, it is possible to teach partly in a class partly remotely with different tools, so that there is a combination of the four quadrants. There is not an opposition between these various training modes: one can partly learn according to quadrant I, and partly according to quadrant III and so on. The new pedagogical methods will take advantage of the best environment for each precise individual learner situation. It is not a question of frontiers between the four quadrant but a question of continuity.

In fact we are faced to an extreme diversity of technologies which permit to organise many new pedagogical systems: Sarah Guri-Rosenblit underlines the great variety of terms to describe these new learning systems: "web-based learning, computer-mediated instruction, virtual classrooms, on-line education, e-learning, e-education, computer-driven interactive communication, open and distance learning, I-Campus, borderless education, cyberspace learning environments, distributed learning, flexible learning, blended learning, mobile-learning, etc. " [10].

But, in general, the educational uses of ICT need time to develop. We think that an incremental innovation model is relevant to analyse innovations and ICT in education. Far away from the utopia of the massive and immediate diffusion of ICT new technologies are adopted step by step both by teachers and students. ICT will become more and more a natural approach but it will take time. In fact it is not at all the announced rupture with the end of traditional teaching and the rise of a new pedagogical paradigm. The "Edison syndrome" can be mentioned to explain that from time to time in the pedagogical field it is believed that a sudden metamorphosis will change everything. In 1913 T. Edison affirmed (*New York Dramatic Mirror*, 9 July 1913): "Books will soon be obsolete in the schools. Scholars will soon be instructed through the eyes. It is possible to teach every branch of human knowledge with the motion picture. Our school system will be completely changed in ten years". He confirmed his analysis in 1922…

MEDIUM AND TEACHER

In a context characterised by many technological tools and uses, pedagogy is, more than ever, likely to permit the transmission of knowledge to students. One of the lessons not only of the surveys which we carried out, but also of our experience as teachers and of the other studies we quoted in the present contribution relates to the importance of the role of the teacher: the teacher is in the heart of the training process. Even with students better and better familiar with "generic" uses and very open to ICT from the psychological and social point of view, even when some courses are available on line, the requests for explanation on behalf of the students require an important intervention of the teacher. Of course, the attractivity of the medium has not to be underestimated but the teacher has the fundamental role [11]. As G. Prendergast (Training Director Abacus Learning Systems) wrote : "The educator is the trigger to foster or stimulate online learning, not the technology. If used appropriately, technology is just a tool that permits facilitating educators to encourage learning in a flexible and imaginative way" ([12], p. 3).

CONCLUSION

The observation of ICT uses by students leads us to results which consolidate the intermediate assumption made at the beginning of this contribution:

- The increase in the rate of access to ICT and an environment favourable to ICT result in a strong increase of generic uses.
- But educational uses are more complex and their development takes time. New uses, such as co-operative on line exercises or remote courses, can develop but with limits compared to a very optimistic vision, like the vision described through the Edison syndrome.
- A combination of technologies, uses and pedagogical methods, obviously evolutionary during time, is characterizing the new learning system. Blended learning is an interesting approach and has to be more studied.

The teacher remains in the heart of the training process, whatever the technological environment. Its role, within the framework of higher education, is very important:

- to define contents according to recent research, new development of knowledge and changes in the skills required by society,
- to choose the combination of technologies, uses and pedagogical methods which is the most adapted according to a context, a public…

REFERENCES

[1] Perriault, J., *L'accès au savoir en ligne*, Editions Odile Jacob, Paris, 2002.

[2] Bigot, R., *La diffusion des technologies de l'information dans la société française*, CREDOC, Paris, Report n° R237, October 2005.

[3] European Commission, *SPOT+, Survey report: Students' perceptions of the use of ICT in university learning and teaching* (A project partially funded in the framework of the SOCRATES Programme – MINERVA Action of the Directorate General for Education and Culture of the European Commission), 2003. http://www.spotplus.odl.org/downloads/Survey_report_final.pdf

[4] Balle, F., *Médias et sociétés*, Montchrestien, Paris, 12th Edition, 2005.

[5] Sosin, K., Blecha, B. J., Agarwal, R., Bartlett, R. L., and Daniel, J. L., "Efficiency in the Use of Technology in Economic Education: Some Preliminary Results", *The American Economic Revie*w, 94(2), 2004, pp. 253-258.

[6] Mackay S., Stockport G.J., "Blended Learning, Classroom and E-Learning", *The Business Review*, Cambridge, Vol. 5, n° 1, Summer 2006, pp. 82-88.

[7] Masie, E., Hall, B., in A. Rossett (Ed.), *Blended Learning: the Magic is in the Mix*, McGraw-Hill, New York, pp.58-63.

[8] Bersin J., *The Blended Learning Book – Best practices, Proven Methodologies and Lessons Learned*, Pfeiffer, San Francisco, 2004.

[9] Cappel, J.J., Hayen R.L., "Evaluating e-learning : a case study", *The Journal of Computer Information Systems*, Vol. 44, n° 4, Summer 2004, pp. 49-56.

[10] Guri-Rosenblit, S., "Eight paradoxes in the implementation process of e-learning in higher education", *Higher Education Policy*, 18, 2005, pp. 5-29.

[11] Bourgeois, D., Badillo, P.-Y., "The Interactive Knowledge Model: Knowledge Transmission And Cooperative Learning Environment", Chapter 3 in Aug, W. et alii (eds), *Innovations 2004: World Innovation Engineering in Education and Research*, INEER - International Network for Engineering Education and Research -, Arlington, USA, 2004, pp. 17-26.

[12] Prendergast G., "Blended collaborative learning: Online teaching of online educators", *GlobalEducator*, April 2004. http://www.globaled.com/articles/GerardPrendergast2004.pdf