Teaching with Information and Communication Technologies: Preliminary Results of a Large Scale Survey

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ABSTRACT

On behalf of the Ministry of Education in Luxembourg (Europe), 821 teachers – from primary school to higher education – were questioned in an online survey at the beginning of 2009 about their use of information and communication technologies (ICT) in education. In this paper, we briefly present the context of the questionnaire and will then focus on its outcomes. The preliminary analysis of the results will mainly focus on the closed questions of the survey and try to answer several fundamental questions related to the availability, as well as to the current and the future usage of ICT in schools. Most of the teachers use ICT in some way in education, but printed documents remain the most popular source of information during class. The main argument listed to use ICT is the increase of students' motivation, while the major concern is the technical hardware dependency or unavailability. Also, an important number of teachers is concerned about the increased preparation time that is in most cases not rewarded. Finally, a vast majority of the teachers is willing to take part in an e-learning training program, probably because they feel unqualified or do not (yet) see the advantage of ICT for their classes.

Categories and Subject Descriptors

K.3.1 [**Computers and Education**]: Computer Uses in Education—*Computer-Assisted Instruction.*

General Terms

documentation, human factors, measurement, standardization.

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Keywords

survey, communication technologies, information technologies, teaching, e-learning, assessment.

1. INTRODUCTION

As Carl Sagan said, "we live in a society exquisitely dependent on science and technology, in which hardly anyone knows anything about science and technology". Today, young people are *digital natives* [7] which means that they have an expectation that information and communication technologies (ICT) will have an underpinning role in their work and learning for work. But, learning and teaching is not about technologies. Learning is first about the learner and his/her will to learn, and second about purpose, i.e., aims, objectives and applications to real life.

More and more teachers rely on electronic teaching tools and concepts because they believe in their advantages, to better present information or to foster an autonomous and exploratory learning approach. But, it is difficult for *digital immigrants* to find suitable teaching tools (e.g., platforms, eVideos, software, etc.) among all the promising products that are available on the market. Although e-learning continues to grow in popularity and now accounts for more than 10% of all training, many people are missing its full potential and are failing to understand the benefits it can yield [4]. In part, this confusion has swelled as a result of dozens of e-learning technologies confronting those in education (e.g., electronic books, simulations, text messaging, podcasting, wikis, and blogs) with new ones seeming to emerge each week [5]. And such technologies confront instructors and administrators at a time of continued budget retrenchments and rethinking.

Given the many unknowns about the use of ICT in education, there is a lack of clear direction on where e-learning is headed and how teachers and administration can plan for its effective implementation in their schools. Clearly, a study to examine the current state and future trends is warranted. This paper presents preliminary results of a representative survey study about the use of ICT in education in Luxembourg.

The remaining part of this paper is organized as follows.

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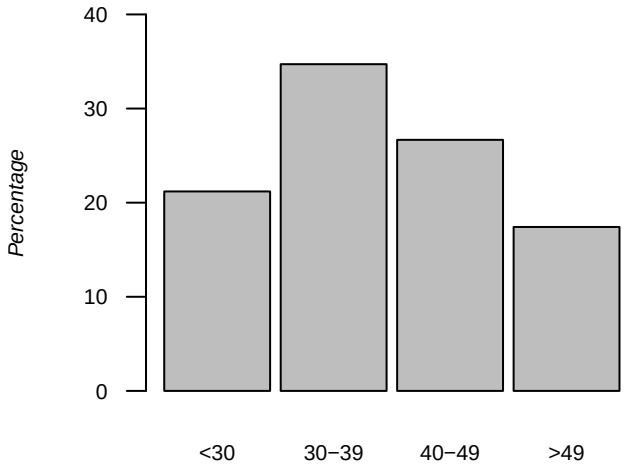

Figure 1: Age categories.

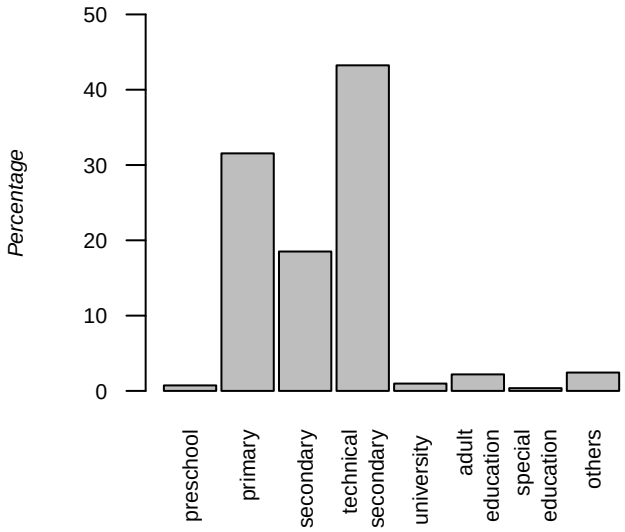

Figure 2: Types of schools.

In section 2, we briefly present the context of the survey. The results of the responding teachers are given in section 3 and discussed in section 4. We conclude the paper in section 5 with some critical thoughts.

2. CONTEXT OF THE SURVEY

2.1 Motivation and Objectives

The Grand-Duchy of Luxembourg (Europe) is one of the smallest countries with a population less than 500 000 people, but possesses the highest gross domestic product (GDP) per capita in the world. The annual education budget is high, allowing all schools an excellent infrastructure.

In terms of ICT in education, the Luxembourgish Ministry of Education initiated the project *mySchool!* in 2001 to provide a central multilingual educational working environment for teachers, principals, students, office staff, and parents[1]. The expected results are better communication, efficient collaboration, lifelong learning and fostering an understanding of the learning and knowledge society of the future. The portal provides access to educational resources such as multimedia e-learning facilities, virtual learning communities, and web-based administrative applications. Students can submit homework and participate in community discussions via collaboration tools. They can create database-driven applications (*portlets*) and actively participate in the construction of *mySchool!*'s learning environment. Moreover, communities can develop their own web content and quickly design their own web sites.

[1]Project *mySchool!*, `http://www.myschool.lu/`

However, and despite all the investments in learning technologies and infrastructures, the OECD PISA studies[2] show that Luxembourg performs below average on a European and international scale.

On behalf of the Luxembourgish Ministry of Education, a nation-wide exploratory survey about the use of ICT in education in Luxembourg was initiated in 2009, in order to address the following questions:

- What kind of ICT equipment (hardware and software) is available to teachers in Luxembourgish schools?
- To what extent do they use the available technologies?
- What purposes do they use these technologies for?
- What are their pedagogical perspectives on teaching with ICT, namely, what effects on teaching and learning do they expect from the use of ICT?
- What are their concerns and criticisms about the use of ICT in their school?
- To what extent are they willing/ready to increase their use of ICT in education?
- Under what conditions would they extend the use of ICT in education, mainly in terms of infrastructures and educational technology-related training programs?

[2]OECD PISA (Programme for International Student Assessment) Studies, `http://www.pisa.oecd.org/`

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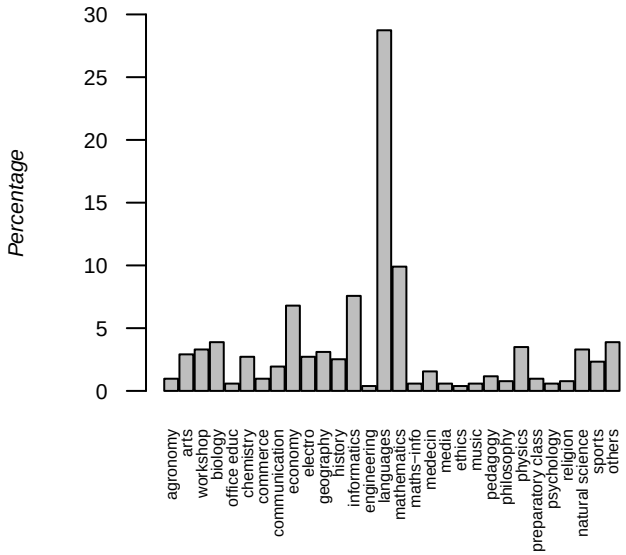

Figure 3: Disciplines.

2.2 Survey Details

The survey was prepared and executed in a joint cooperation of the "Centre de Technologies de l'Éducation" (CTE)[3], the Hasso-Plattner-Institute (HPI) at the University of Potsdam, and the University of Luxembourg. The survey contained a mixture of open and closed questions on various topics related to:

- the demographics of respondents,
- the kind of school they work at,
- their use of ICT in education,
- the equipment that is available in schools,
- their needs in terms of ICT equipment for teaching,
- their pedagogical views on using ICT in education,
- their fears, concerns, and difficulties with technologies,
- the software, applications and online tools they know and would recommend to their colleagues,
- the educational portal *mySchool!*, and
- an outlook into the future of teaching with ICT in Luxembourgish schools.

The survey was addressed online to all teachers in Luxembourg from primary school to higher education *via* e-mails to the domain "education.lu". The respective

[3]The CTE is the department at the Luxembourgish Ministry of Education in charge of the technical educational infrastructure of the schools, `http://www.cte.lu/`

Table 1: Teachers in Luxembourg (2007/2008).

primary	2434
secondary	3859
higher	173

numbers of teachers in the different school settings are depicted in table 1. In the Luxembourgish school system, "primary school" is 6 years (enrolled pupils are aged from 6 to 12 years), and "secondary school" is 7 years (enrolled students are aged from 13 to 19 years).

The survey was accessible online from March 1, 2009 till March 31, 2009 and was answered by 821 teachers. Figure 1 shows the groups of ages of the 821 teachers, figure 2 depicts the type of schools where they teach, and figure 3 gives an overview of their disciplines. A majority of responding teachers were from primary and secondary education, and only few were from higher education.

3. RESULTS

The preliminary analysis of the results presented in this paper will be solely based on the answers to the closed questions of the survey, and will focus on the following issues:

- What kind of ICT equipment (hardware and software) is available to teachers in Luxembourg's schools?
- What purposes do they use ICT equipment for?
- What are their pedagogical reasons to use ICT tools in education?
- What kind of difficulties and concerns do they have when using such tools?
- What purposes would they (more often) use ICT for in the near future?
- Under what conditions would they (more often) use ICT for teaching purposes?

3.1 Available ICT Equipment

Table 2: ICT Equipment in the usual classroom.

blackboard	92.0%
Internet access	67.6%
computer for the teacher	63.5%
overhead projector	62.4%
video projector	53.8%
possibility to connect to network/Internet	44.8%
computer(s) for students	35.0%
sound system	32.9%
whiteboard	23.8%
TV	21.3%
laptop(s) for students	14.7%
activeboard	3.0%
other	4.4%

Table 2 shows the responses to the question about the technical equipment that teachers have in their usual classroom, i.e., the classroom they use most often. The traditional blackboard is present in nearly all classrooms

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(indicated by 92% of the respondents). When it comes to new technological equipment, more than half of the teachers indicated that they have access to hardware that very well fits into a more teacher-centered approach, like a video projector, an overhead projector, a computer for the teacher, and wired Internet access (respectively 53.8%, 62.4%, 63.5%, 67.6%). Only about a third of the teachers reported having computers for students in their normal classroom (35%), and less than 1 out of 6 reported having laptops for students (14.7%).

When asked whether they are satisfied with the technological equipment in their classroom, more than half of the respondents indicated that they were (58.8%). About a third of them would like to have more equipment (37.5%). Interestingly, very few teachers indicated that they do not require all the available equipment (3.7%).

More than half of the respondents (59.5%) indicated that they wished to have software, hardware, or online tools that are more appropriate for their domain or discipline, while about a third of them (40.5%) were satisfied with what they have.

Teachers were also asked if their school gave them access to a file-sharing platform, e.g., to share syllabuses with colleagues. About two third (63.9%) reported having access to such a platform, while 1 out of 5 (20.6%) reported not having such a platform, and about 1 out of 6 (15.5%) did not know whether their school had such an online service or not.

3.2 Purposes of ICT Use in Education

Table 3: Purposes of ICT use in education.

to prepare courses	94.1%
for private use	92.2%
to prepare tests	87.6%
during courses	65.4%
to correct tests	23.9%
in no way	1.6%
other	23.9%

Teachers were asked what purposes they currently use ICT tools for (see table 3). Nearly all of them indicated that they use ICT to prepare their courses (94.1%) and in private life (92.2%). A vast majority (87.6%) also uses ICT to prepare tests and examinations. About two third of the responding teachers reported using ICT during their classes (65.4%). Less than a fourth of them uses computer tools to correct their tests and exams (23.9%) or for other unspecified purposes (23.9%).

While a very large majority of teachers said they used ICT (at least sometimes) to prepare their courses, paper-based supports like books, textbooks and photocopies are still more widely used than electronic documents, resources available on the Internet, educational software or video material (see table 4 for details).

During courses, paper-based supports, blackboard and whiteboard are also more frequently used compared to electronic documents, video, Internet resources and discipline specific software. Table 5 shows the frequencies of usage during courses for these different teaching tools.

Table 4: Frequency of use of content types.

	often		...		never
paper-based supports	67.0%	20.0%	7.6%	3.7%	1.7%
Internet, search engine	39.3%	31.2%	17.7%	7.9%	3.9%
electronic documents	35.8%	29.7%	19.1%	10.0%	5.4%
discipline specific software	17.2%	17.1%	22.2%	17.7%	25.8%
mySchool!	7.8%	16.0%	25.3%	27.6%	23.3%
video content	5.7%	11.8%	22.9%	35.7%	23.9%

Table 5: Frequency of use of ICT tools.

	often		...		never
paper-based supports	69.7%	20.2%	6.2%	2.2%	1.7%
blackboard, whiteboard	62.0%	17.4%	11.7%	5.4%	3.5%
video/overhead projector	25.1%	24.7%	23.8%	16.3%	10.1%
electronic documents	10.8%	20.2%	21.0%	23.0%	25.0%
Internet, search engine	6.6%	17.7%	22.2%	27.5%	26.0%
discipline specific software	11.7%	10.7%	18.5%	23.3%	35.8%
video content	3.3%	8.9%	24.1%	40.1%	23.6%
mySchool!	2.1%	6.1%	13.5%	22.0%	56.3%

3.3 Pedagogical Reasons for Using ICT

Table 6: Pedagogical effect of ICT.

	positive		...		negative
motivation	35.3%	41.2%	20.1%	2.7%	0.7%
communication	25.0%	30.1%	32.0%	6.9%	6.0%
comprehension	16.3%	39.8%	37.9%	5.0%	1.0%
responsibility	10.1%	27.2%	44.9%	12.8%	5.0%
homework	11.3%	24.1%	44.6%	13.4%	6.6%

Increased students' motivation seems to be the main pedagogical reason for which teachers are willing to use ICT in education, followed by students' comprehension and communication between the different actors within the school system. Using ICT to increase students' responsibility in their own learning process and to foster autonomous learning outside the school setting are not seen as primary options. See table 6 for the average ratings attributed to these different outcomes of using ICT in education.

3.4 Difficulties and Concerns About ICT in Education

In terms of difficulties and concerns, teachers most frequently indicated that they feel dependent on hardware and software (53.8%), that hardware and software are not

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Table 7: Difficulties and concerns about ICT.

dependence on hardware and software	53.8%
hardware and software not available/suitable	45.4%
difficulty to get access to a computer room	29.5%
preparation of the courses takes too much time	24.6%
not enough training of the teacher	19.6%
no real advantage for the pupils	15.5%
not suited to my course/discipline	11.0%
no personal interest of the teacher	4.9%
no interest on behalf of the pupils	3.9%

available or do not suit their needs (45.4%), that it is difficult to get access to a computer room (29.5%), that it takes too much time to prepare their courses using ICT (24.6%), and that they are not really trained to do so (19.6%) (see table 7 for more details).

Many of the responding teachers feel that using ICT for preparing their courses takes them more time than the traditional supports (54.5%).

3.5 Changes in ICT Use in the Near Future

Table 8: Changes in ICT use in the near future.

	a lot		...		not at all
to prepare courses	78.3%	13.3%	4.9%	1.7%	1.8%
for private reasons	71.9%	16.6%	7.6%	2.1%	1.8%
to set up tests and exams	72.4%	11.6%	8.9%	2.3%	4.8%
during their classes	35.6%	31.2%	22.4%	6.7%	4.1%

There were two questions in the survey about potential changes in the near future about teachers' use of ICT. Overall, teachers stated that they will use ICT more often in the next 5 years, mostly for preparing their courses and for private reasons, but also to set up their tests and exams, and even during their classes (see table 8). More than half of the respondents declared that they would participate in dedicated training programs on e-learning in the near future (58.7%) and only very few were unwilling to do so (9.5%) while the rest are still undecided about this issue (31.8%).

3.6 Conditions for Extended ICT Use in Education

Table 9: Conditions for extended ICT use.

classroom better equipped	49.1%
hardware and software more reliable	34.0%
better access to a computer room	32.2%
adequate training in using ICT	28.3%
real advantages of ICT for my students	27.8%
supplementary workload taken into account	23.3%
less overtime	14.1%
other	3.8%
no, I will not use ICT	1.6%

When asked under what conditions teachers would use (more often) ICT for teaching, respondents indicated that they wished their classroom to be better equipped (49.1%), hardware and software to be more reliable (34.0%), to have better access to a computer room (32.2%), and to be adequately trained in educational technology (28.3%) (see table 9). Interestingly, about a quarter of the teachers indicated that they would use ICT in education if it had real advantages for their students (27.8%), or if the supplementary workload was taken into account in their job descriptions (23.3%).

4. DISCUSSION

The preliminary results presented in this paper show that teachers in Luxembourgish schools have excellent access to educational technologies that can support them in their teaching activities (e.g., a computer connected to a video projector), and that they do use computers and the Internet to some extent while preparing their courses. Overall, it seems that teachers make a more or less substitutive use of ICT, i.e., the computer helps them to do the things that they would normally do without a computer [9]. This seems to be in line with the results of a case study done by Cartwright and Hammond [2] in the UK, showing that teachers use of ICT can be described as "fitting it in" rather than as "effective use of ICT". According to Mitchel Resnik [10], "[i]n many cases, new technologies are simply reinforcing old ways of teaching and learning". Given these premises, it may seem only natural for teachers to perceive new technologies as a somewhat unnecessary supplementary burden, especially when software and hardware seem to be unreliable and difficult to handle. Butler and Sellbom [1] have also stressed out this factor as one of the main factors inhibiting the adoption of new technology by teachers, as well as the fact that many teachers find it hard to learn how to use such tools.

It should be noted here, that teachers in Luxembourg do not seem to be unwilling to use ICT in their classrooms, if they had better access to decent equipment, technical support and training offers. When it comes to the pedagogical perspectives of using ICT in education, they largely see the computer as a helpful tool to enhance students' motivation, without really perceiving the more transformative effects of ICT on the whole teaching/learning process.

Further analysis of the collected data is required – namely the responses to the open questions – to better grasp how teachers in Luxembourg currently use ICT in education, what concerns they have about its use, how they see the future of teaching/learning with digital technologies, and what types of teaching/learning tools they already know and use today. This analysis may shed better light onto our preliminary conclusions, mainly by giving us a better view on the kind of ICT-enriched learning situations that they currently try to create in their classrooms.

5. CONCLUSIONS

In this paper we presented the preliminary results of a survey about the use of ICT in Luxembourgish schools, from primary schools to higher education. Overall, these results suggest that ICT equipment, when available, is predominantly used and conceived as tools to support teaching, rather than as tools for (autonomous) student

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learning. These tools very well fit into the traditional way of teaching, where the teacher speaks in front of the class and uses the blackboard or a projected computer screen to illustrate – with or without multimedia – what (s)he is explaining. Clearly, there is a need for training programs that help teachers to envision advanced and transformative uses of ICT in education.

Several studies have indeed shown that the adoption of ICT by teachers heavily depends upon perceived usefulness [3, 6, 8, 12]. According to Peter Scrimshaw [11], there seems to be a strong link between teachers' views of the use of ICT in education and their views of teaching and learning in general. A teacher with a learner-centered approach to teaching will more easily adopt new technologies than a teacher with a teacher-centered approach, or at least their uses will be quite different in terms of learning/teaching activities that can be supported or enhanced by ICT tools.

Teachers will also need to have better technical support and to develop better skills in ICT so that they feel less at the mercy of failing hardware and software.

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7. REFERENCES

[1] Butler, D. L., and Sellbom, M. Barriers to adopting technology for teaching and learning. *Educause Quarterly 25*, 2 (2002), 22–28.

[2] Cartwright, V., and Hammond, M. 'Fitting it in': a study exploring ICT use in a UK primary school. *Australasian Journal of Educational Technology (Online Edition) 23*, 3 (2007), 390–407.

[3] Cox, M., Preston, C., and Cox, C. What factors support or prevent teachers from using ICT in the primary classroom. In *British Educational Research Association Annual Conference. University of Sussex at Brighton.(September 2-5 1999). http://www.leeds.ac.uk/educol/documents/00001304.htm* (1999).

[4] Fee, K. *Delivering E-Learning*. Kogan Page, 2009.

[5] Kim, K.-J., and Bonk, C. J. The future of online teaching and learning in higher education: The survey says... *Educause Quarterly 29*, 4 (2006), 22–30.

[6] Lam, Y. Technophilia vs. technophobia: A preliminary look at why second-language teachers do or do not use technology in their classrooms. *Canadian Modern Language Review/La Revue canadienne des langues vivantes 56*, 3 (2000), 389–420.

[7] Prensky, M. Digital natives, digital immigrants. *On the Horizon 9*, 5 (2001), 1–6.

[8] Preston, C., Cox, M., and Cox, K. *Teachers as innovators An evaluation of the motivation of teachers to use information and communications technology*. MirandaNet, South Croydon, 2000.

[9] Puentedura, R. TPCK and SAMR – models for enhancing technology integration. `http://www.msad54.org/sahs/TechInteg/mlti/SAMR.pdf`, 2008.

[10] Resnick, M. Sowing the seeds for a more creative society. *Learning and Leading with Technology 35*, 4 (2007), 18.

[11] Scrimshaw, P. Enabling teachers to make successful use of ICT. *Coventry: British Educational Communications and Technology Agency* (2004).

[12] Yuen, A. H., and Ma, W. W. Gender differences in teacher computer acceptance. *Journal of Technology and Teacher Education 10*, 3 (2002), 365–383.

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