

*“It is not the strongest that survive,  
nor the most intelligent,  
but those that are most adaptable to change.”*

Charles Darwin

### ***The computer, a learning and teaching tool***

#### ***Advocacy for a computerised education at high school***

It clearly shows that in just three decades, the ways of studying, thinking and acting have changed radically amongst the younger generation. Whilst young people and adults were used to focus exclusively on one task at hand, the 21<sup>st</sup> century teenager learns within the context of performing a multiplicity of tasks, i.e. the famous “multitasking”. They simultaneously write their homework, send text messages, listen to music and chat on social media.

#### **A brief overview**

Forty years ago, doing computer science was mainly about studying programming. We were taught Fortran IV at university, a high-level computer programming language used especially for scientific calculations. We arranged a considerable number of perforated cards one behind the other in a logical sequence, so that the programme could run literally as well as figuratively. Dot matrix printers allowed us to produce paper versions of our work. These printers were, however, forbidden to use for the writing of our dissertations and thesis. Therefore it was necessary to equip oneself simultaneously with a high-performance typewriter which contained several font styles and a correction system with the help of a white ribbon. The micro-computer system back then has given way to the current ubiquitous information and communication technologies.

## **The school's mission**

Recent studies<sup>1</sup> show an increasing number of weekly hours that young people spend on the Internet, mostly on social media, or by playing games or listening to their favourite music. The 12 to 17-year-olds are thus spending about 35 hours per week in front of the television or on the Internet. This excessive consumption even generated a new clinical disease, the *Internet Addiction Disorder*. New forms of technology keep reshaping our behaviour. Due to the advent of smartphones, it is increasingly common to surf the internet, anywhere and anytime.

In the Grand Duchy of Luxembourg, the survey on the use of information and communication technologies, conducted in 2009 by the *National Institute of Statistics and Economic Studies*, reveals that the household equipment rate in computers continues to grow in Luxembourg: 88% in 2009 against 75% in 2005. As for the rate of households connected to the Internet, it reached 87% in 2009. According to the study "Digital Life" conducted in Luxembourg in June - July 2010, 98% of Luxembourgish households today have a computer at home!

Faced with this phenomenon, the opinions of experts diverge. Some, such as Manfred Spitzer, say that computers and television are harmful to the development of children and young people and their learning, while others believe that it leads to more effective learning.

Noting that schools cannot do everything, Spitzer would like to exclude computers from primary school and lower secondary schools and to limit their use for the upper secondary school only. In contrast, a OECD<sup>2</sup> survey indicates that 15-year-old students who regularly use a computer, generally perform better at mathematics and science.

Do we really have a choice? Is it not the duty of the school to take into account the major changes in society? We predict that the ability to sort through information, to take a qualified and critical look at it, as well as the

responsible use of IT tools, will be of utmost importance. Hence, computer education naturally has its place in school. It cannot, however, be confined to only a specific room for one or two hours a week.

The "one computer per pupil" approach makes sense here, even if it may seem costly at first glance. It is true that it is complex and requires a great deal of commitment on the part of the teaching and technical staff.

What are the chances and risks of such an integrated approach of the computer to the student's curriculum?

### **Benefits and risks**

A first advantage of the "one computer per pupil" approach is undoubtedly the increased responsibility of the student in his tasks as a learner: he is the author, the organizer and the manager of his personal computer tool, which is registered to his name. The student must of course be held accountable for any manipulation not authorized by the conventions of the school.

A second major advantage of the laptop is its multifunctionality, e.g., write texts, research information, communicate, do interactive exercises on the Internet etc. These are all new ways of learning, which are instantly available from one single device. Considering the time it used to take to carefully copy a manuscript by hand, the context has changed dramatically, at least for the outside world. The time that is no longer lost due to the rewriting of manuscripts, can now be used for other learning purposes. Amongst the many studies on the integration of communication and information technologies, the one by L. Van Dusen et R.B. Worthen<sup>3</sup> highlights a 20% increase in learning time among students who use the computer to do their homework.

Another advantage is the quality of the layout or the audiovisual presentation, which greatly enhances the work of the student and therefore increases his motivation. At the same time, the integration of technology is in and of itself a

strong motivator, as the school uses the same tools that young people use in their private life.

Technology also allows to better monitor those students who are struggling at school, whilst giving the stronger students the opportunity to progress quicker in their research. It is the pupil who determines his pace of progress and not the teacher who sets the pace for an entire class. Learning can therefore be done in a differentiated way within a class.

The laptop allows information retrieval using a multiplicity of resources, from websites to electronic encyclopaedias, to peer-to-peer networking ...

This access to a variety of resources makes it possible to compare and analyse the quality of the information, but also to vary the learning style and to better consider the different types of learners. In fact, linear education, programmed from textbooks imposed by official programs often confines learning to an incompatible constraint with the cognitive abilities of our 21<sup>st</sup> century students.

The teacher who wants to take advantage of these benefits must show a certain open-mindedness and be ready to give up, to a certain extent, the comforting methods of the regular classroom based on questions and answers. The teacher must prepare himself for the eventual technical hazards. The risk that the young person outpaces the teacher in proficiency and technical know-how is real and requires flexibility from the pedagogue. Rather than seeing this as a threat to his authority, the pedagogue should take the students motivation and invest in it.

But there are also risks and dangers, such as a certain intellectual laziness that could settle in students. The student might start to believe that it is useless to know the grammar of a language, since the automatic corrector corrects all errors, or that it is useless to know how to calculate or make a presentation or sketches if the computer does it instantly.

Another risk is related to the speed in which information can be found or shared. Even though the student knows that not everything that is written on the Internet is correct or true, he may be tempted to take everything at face value for his convenience and to not waste any time. The lack of reassessment and in-depth analysis represents a real threat.

Admittedly, there is also a high risk that no real learning takes place. Did the student really take the time to appropriate and to consciously engage with the information? Or did he simply copy-paste a text from the Internet? It's not enough to surf the Internet to become an expert!

A study by L. Miller and J. Olson, entitled *Putting the computer in its place: a study of teaching with technology*<sup>4</sup>, warns against a blind enthusiasm for computers at school. Among other things, this study indicates that the proper use of the computer is determined by the teacher's ability to plan his or her lessons around the new teaching tool.

Confronted with these dangers and pitfalls, an educational institution must adopt a comprehensive and coherent implementation strategy.

### **What are the strategies and conditions that need to be established ?**

The first requirement for optimal computer learning is, without a doubt, that the school community adopts a common value system and methodological approach. Here are some examples:

- The teaching team needs to agree on the quality criteria for PowerPoint presentations
- Information found on the Internet needs to be referenced correctly with the help of common guidelines

The institution's "complete methodological kit", that every student needs to acquire, cannot become operational without a coherent approach. Taking this into account, our team has developed conventions over the past years for the proper use and codes of conduct in the form of the "Laptop Convention", which is signed by the student and their parents. Methodological skills tables were also added which are acquired each school year. We are currently marking ICT skills as part of the programme, to make them truly an essential part of the student's academic career.

It is also important for the teacher to put the student in a situation where he is responsible for his learning. In addition to the student's "computing background", the acquisition of cross-curricular methodological skills each year makes perfect sense.

This brings us to a more general concept, very present in the reflections of experts, that of literacy. According to the *Organization for Economic Co-operation and Development* (OECD), literacy is "the ability to understand and use written information in everyday life, at home, at work and in the community, in order to achieve personal goals and to expand [one's] knowledge and abilities."<sup>5</sup> The IT tools allow for the development of this skill, as much as the more traditional ways of researching. It is a question of understanding the meaning of the information that was found, to verify its authenticity and to distinguish between affirmation, personal positioning, rigorous analysis or conclusion scientifically established.

Another requirement for the successful use of the computer, is that the teaching staff is offered internal continuing education and that they make use of those courses offered.

In recent years, tablets and smartphone have established themselves as learning tools in the classroom. The "one computer tool per pupil" approach is certainly a big challenge, but there is no alternative. Digital proficency is built only if there is permanent, relevant accessibility, use and evolution.

Pamela Livingston, director of technology at Peck School in Morriston, New Jersey<sup>6</sup>, notes:

*“When we see our students immersed in a sea of technology,  
as they so clearly are in our 21<sup>st</sup> century world,  
it’s our duty as educators to help them  
navigate it smoothly, effectively and purposefully.”*

Nothing to add!

Gaston Ternes, February 2011 and January 2018

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<sup>1</sup> For example :

- Etude du Centre de recherche pour l’étude et l’observation des conditions de vie (Crédoc), juin 2010
- Etude réalisée par le Centre de recherche et d’information des Organisations de Consommateurs (CRIOC) avec le soutien de la Commission Européenne, octobre-décembre 2007
- Etude “Digital Life” menée au Grand-Duché par TNS-ILRES, juin-juillet 2010
- Institute for Public Policy Research, Kaiser Family Foundation, Generation M2, Media in the Lives of 8 to 18 Year Olds, January 2010

<sup>2</sup> OCDE, (2006). *“Are students ready for technology-rich world?, L’Infobourg*

<sup>3</sup> Van Dusen, L.M., Worthen, R. B., (1995). *Can integrated instructional technology transform the classroom?* Educational Leadership, 53 (2), 28–34

<sup>4</sup> Miller, L. ,Olson, J. (1994). *The Journal of Curriculum Studies*, 26, pages 121 à 141

<sup>5</sup> OCDE, Rapport publié le 14 juin 2000 : *“La littératie à l’ère de l’information”*

<sup>6</sup> Livingston, P. (2006), *1 to 1 learning, Laptop Programs that work*, International Science for Technology (ISTE), Washington, p.1