Digitalization in European schools

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1 Introduction

2 Current State of Digitalization in European Schools

The European Union produced in 2019 a very complete description of the technology available and used in schools [1]. It divides schools in 3 levels: primary school, middle school and high school.

2.1 Hardware

There are in average 18 students per provided computer in primary schools, 7 for middle and high schools. However, the standard deviation is huge and highly depends on the country, as shown in the figure below.

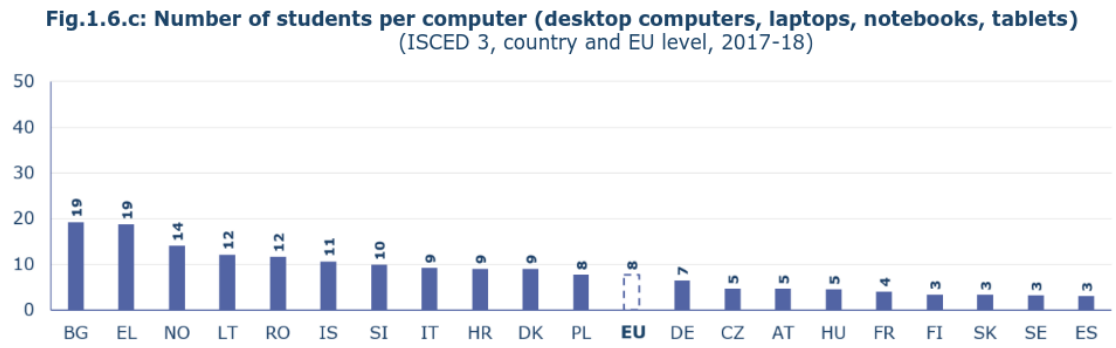

Figure 1: Caption

Teachers considered in 2019 that the number of computers and tablets represented an obstacle for proper teaching in ICT. It is interesting to note that they also considered allotted time and teacher's competences obstacles of identical importance.

2.1.1 Repairability

A very interesting finding is that a lot of hardware is broken in schools. In fact, a bit more than one third of students attend schools with less than 90% of functional equipment. This means that we can significantly improve the state of digitalization in schools, without having to buy new hardware with its social and environmental footprints.

3 Impact of introducing IoT in class and giving personal devices to student

In this section, we will focus on establishing wether introducing computers in class and at home improves the quality of learning and reduces inequalities for students.

In class, the computers are mostly used for text and photo editing as well as Internet searches. The students are getting acquainted with the use of ICT but it does not help much for leaning in the other subjects. About 10% of students also regularly use learning apps for other subjects. [1]

An OECD study from 2015 [7] found that the simple provision of ICT equipment is not sufficient, but that ICT is only linked to better student performance when, amongst others, computer software and Internet connections help to increase students study time and practice. The addition of technology is useless if not paired with some pedagogical improvements [5]. In fact, using computers only improves learning (in domains other than ICT) if they allow collective work and games. An online quizz in teams is the perfect example of a learning improvement via computers in class. Flipped classrooms are also proven more effective. The students read the course at home and practice with exercises in class. This is facilitated by students having a computer or tablet at home with access to an online platform. [3]

Concerning inequalities, the introduction of ICT in class can be helpful in many ways. For example, being introduced to computers already in K12 education with a regular usage diminished the fear for girls to pursue a career in ICT. [2] Of course, other societal factors could and should impact this fear such as better representation. Computers can also allow disability aids. For example, a student with dyslexia will more easily read and write on a computer with regular characters, an automatic corrector can make up for dysorthographia etc.
This reducing of inequalities is however conditioned by the inclusivity of the digital content and hardware themselves.
Moreover, the access should also be as equal as possible for all students. If some student work is to be conducted on computers, a student who has access to a computer at home will be advantaged. Currently, around 80-90% of students have this advantage, which makes it even more difficult for the remaining students.

In conclusion, ICT in class is mainly useful to learn about the ICT domain itself, which is nowadays present in most jobs and important as an educational subject. However, it does not by itself improve the quality of learning in other domains. Some improvements are still seen with ICT usage because it facilitates certain ways of teaching that work best on students: games, collective and active learning etc. ICT can moreover be useful to include students with special needs, by providing personalized content, allowing to study more easily in specific environments, or allowing an interface such as a vocal reader.

If we take change from a continental to a global scale, we must also think of the inequalities caused by the introduction of ICT in European schools to less developed countries. The production and disposal of the ICT hardware currently impacts very negatively the quality of life of countries like Ghana, China, Democratic Republic of Congo and many others. The growing carbon footprint of ICT causes environmental issues. Achieving the SDG Goal of Quality Education in Europe should not hinder

achieving other SDG Goals. Currently, the introduction of new ICT hardware would impact the following goals [8]:
- Clean Water and Sanitation in other parts of the world.
- Life on Land
- Life below water
- Climate action
- Sustainable cities and communities
- Responsible consumption and production
- Reduced inequalities
- Good health and well-being
- Peace,justice and strong institutions

Some compromises have to be made to take into account all of the goals and not only the goal of quality education.

[4] [6]
[9]

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