

# Security Threats and Risk in Education

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**Abstract**— With covid-19, the way the schools work has drastically changed. The old-school methods are being suppressed, and things such as distant learning and online courses are becoming more and more popular as the main gateways for teaching. This drastic change, which was by no means bad, has fulfilled its duty. But has it really filled all the gaps that it created. In the short time that it was really highlighted, all seemed well, and people went forward. But was it all well. As expected, when you force changes, things might go initially well, but some things go wrong. That's why you're not meant to force things into somebody but to slowly make an effort to implement them. Therefore, it should be acknowledged that there are some bad things behind the curtains of greatness. Portugal is a country where educational system before COVID was simple and not so online, so when the changes came, teachers were lacking skills and students were given rushed material. Why rushed. It felt like they just gave material out without having a proper protection. And even now it kind of feels like it. So, this paper aims to explain how safe the educational system is for the students in Portugal. How secure is it. Is the liberty given by the educational system good.

**Keywords**— Cybersecurity in education, Data breaches in education, Network security in educational institutions, Risk assessment in education, Student data privacy, Threats to educational institutions.

## I. INTRODUCTION

As the year 2020 began, new challenges awaited humanity. At an unprecedented pace, the world turned upside down. From a lively social life to a confined one. As quoted by Silvia Guallar, Martin Humburg and Nihan Koseleci Blanchy from the European Investment Bank, about 1.6 million children's education was abruptly interrupted [1]. This interruption was so brutal that the whole educational system had to be changed. The traditional methods had to be replaced with newer and more up-to-date methods, such as online learning. Even with all the effort, 40% of the students in the world lost contact with their teachers. To really understand the effects of the pandemic on the educational system, there would have to be an ongoing study until it could be identified with all the students for whom we're affected.

The problem that will be studied in this paper will be the integrity of the implementation of the online in the educational system as well as the possible aftereffects of its implementation, more specifically the system in Portugal. And the psychological consequences on the students.

This paper will try to represent the issues that the pandemic created in the Portuguese education system, mainly focusing on the affects that it may have had on the students and about the security of the network of schools. The quick rise of online learning and the challenges that came with it.

To understand and outline all the objectives, the paper was made doing a literature review, where I had some topics identified. Afterwards reading many papers, I was able to fulfill each topic. And then I wrote this paper based on the topics. That's why it only views this problem in my perspective. The topics, that also represent my perspective in the problem were effects of covid to the world's education, threats during covid, effects of the covid to the Portuguese education, possible threats to the Portuguese educational institutes and solutions.

## II. EFFECTS OF THE PANDEMIC TO EDUCATION

While many people received resources, such as laptops and the internet, others didn't have the same fate right away. The students with less financial power had issues, as they were probably in schools where there isn't much material. These factors may have increased inequality in the educational system. According to the European Investment Bank's report, the percentage of schools that don't have resources isn't limited to less developed countries [1]. An inquiry made with the teachers of Germany has indicated that one-third of the secondary schools and almost half of the primary schools had contact with a small number of students during the initial period of the pandemic [1]. This inequality may or may not, affect the performance of the students, specially in the psychological way. A report written by the ILO (International Labour Organization) reported that in a survey where 61% of the participants were young people involved in education, they believed that the pandemic left a heavy toll through disrupting learning, diminished educational and learning outcomes, and lost earnings [2]. As said in the report, 73% of the youth were affected by the closure of schools, universities, and training centers [2].



Fig. 1. Type of interruption to youth by the effects since the onset of the pandemic [2]

This graph shows the type of interruption to youth by the effects since the onset of the pandemic. It focuses on many variables such as income, sex and type of education attained. This graph was used from the report [2]. Looking at the transition to online and distance learning, it is more widespread in high-income countries, highlighting the large “digital divides” between regions. The following figure shows how the transition affected each group.

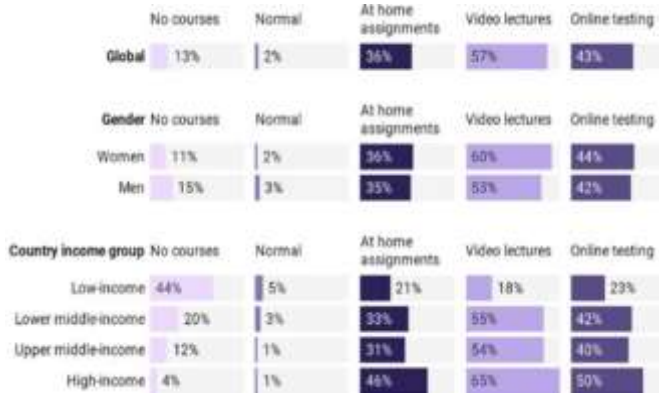


Fig. 2. The learning methods offered to different groups [2]

According to the survey, despite all the efforts to ensure that education maintains its order, 65% of young people reported having learned less since the onset of the pandemic [2]. And these statistics clearly show the challenges involved in moving learning out of the classroom into the home [2]. The following graph shows the learning changes and the effect that they might have on their future.

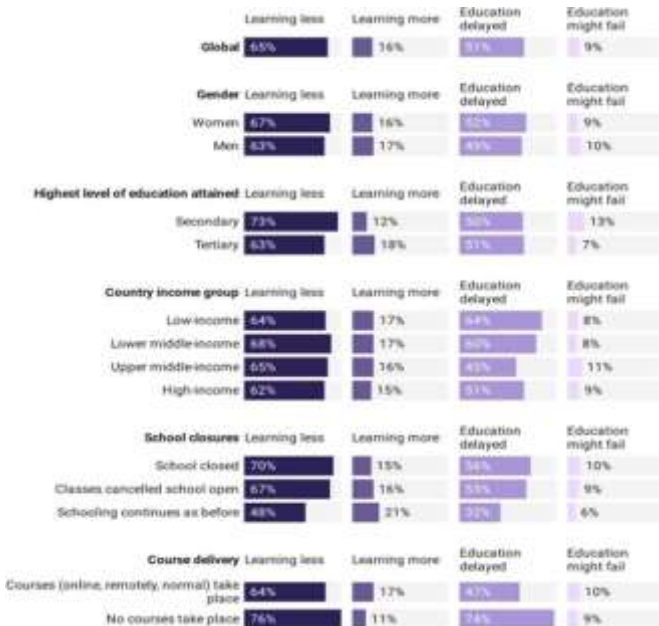


Fig. 3. Perception of the changes by the different groups [2]

As peaceful as the online platforms looked, there were some big things going on behind the scenes. From January to June 2019, the number of users that encountered threats on some specified platforms was 820. These platforms were Blackboard,

Moodle, Zoom, Google Classroom, Coursera, edX, and Google Meet [4].

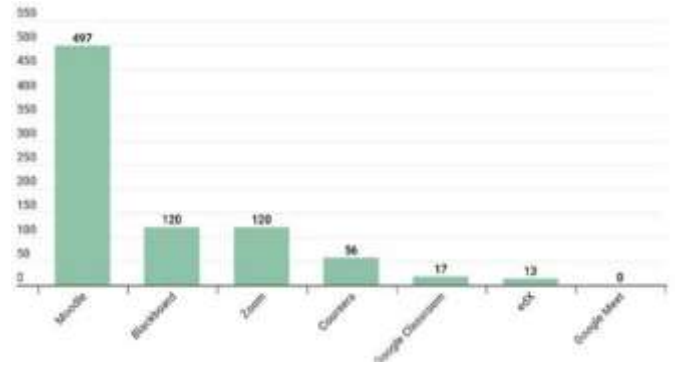


Fig. 4. The number of unique characters that encountered various threats disguised as popular learning/conferencing platforms, January – June 2019 [4]

In 2020, the total number of users that encountered threats disguised as popular websites was 168,550. [4]

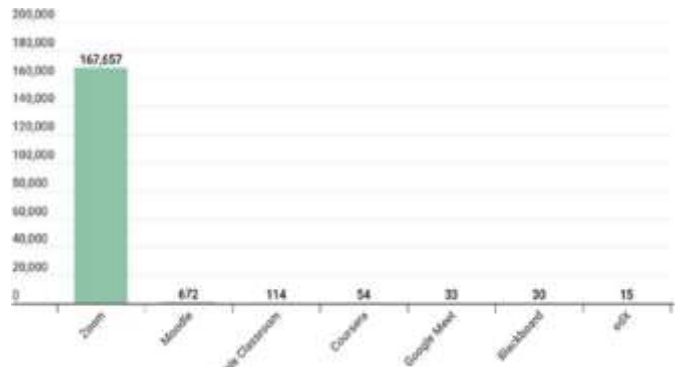


Fig. 5. Number of threats encountered by unique users during year 2020 [4]

According to Alexei Arina, who wrote the paper Network Security Threats to Higher Education Institutions, in June 2020, Microsoft Security Intelligence reported that 61% of the 7.7 million malwares recorded were related to the education domain [5] and university networks are open to provide students with services, and this could be exploited by attackers, attacking an authorized user and gaining access to the network [5]. Another way to get access to a university network could be via adware and downloaders, because many students have the need to download several applications [5]. It is written in the paper Large Scale Analysis of Malware Downloaders by Christian Rossow, Christian Dietrich, and Herbert Bos that downloaders are malicious programs with the goal of subversively downloading and installing malware (eggs) on a victim’s machine [6]. According to a paper written by Seyhmus Yilmaz and Sultan Zavrak, adware is software that generally makes pop-ups, banners, etc. advertisements appear on the user’s computer [7].

Now talking about Portugal, according to a study made by the Conselho Nacional de Educação (CNE), Portugal had some indicators of inequality in the Portuguese. In 2020, we’re getting better numbers: less than 10% of Portuguese students are abandoning school early, and more than 95% of children with

about 4 years are frequenting preschool education programs [3]. Even with these positive numbers, Portugal had other not-so-good ones. There was not enough increase in the percentage of students that had minimum knowledge in literature, mathematics, and science [3]. The issue in Portugal had built up when the pandemic came. The pandemic made the socioeconomic difference very clear, and in Portugal it was very clear that it broke many people's income during the crisis. Examples of this were the families that already had an existing economic problem and were confined to the following conditions: their homes would have more people living than their supposed number, making the students space unpeaceful [3]. There were also many without technological equipment or the internet, making it impossible to even interact with the teacher [3]. In other situations, such as the immigrants who had low Portuguese language knowledge or the families with one parent or many children and children that had special needs, they had a bigger risk of poverty [3]. The socioeconomic conditions and access to digital equipment, age, emotional conditions and welfare, and other factors contributed to the increase in inequality in education between students in the pandemic [3]. During the pandemic, as said in the study, there was an increase in the levels of anxiety and a change in the humor of the children and teens. The children, who are the most vulnerable, have manifested changes in behavior and disturbances in their sleep [3]. Teens aged around 16 and 24 have reported that some suffered from anxiety, some had depression and irritability, and in other cases, feelings of loneliness [3]. Some reported that they were having more problems at home, clearly demonstrating that the conditions at home weren't good [3]. The conditions in the home and the lack of space are associated with negative psychological effects. Even with the effort to make all the students connected to the teachers, more than three-quarters of students were fulfilling daily tasks. There were some students who couldn't be connected during the first confinement [3]. Statistically speaking, 70% of the students felt difficulty learning, especially in the first to fourth grades. That's because not all students fulfilled all the objectives given and took the risk of abandoning them. That's because the closure of the schools made half of the teachers and directors think that the number of students abandoning the school would increase [3]. Looking at the impact of the pandemic in the universities, the first big concern was the implementation of the educational system in an online format and granting the conditions necessary to do all classes using a laptop and network [3]. And, looking at this concern being accomplished, some negative points come out, such as many students having bad conditions to access this type of learning. This was aggravated because many students weren't even living near the universities [3]. There were also some students who didn't have a computer [3]. During the 2020-2021 academic year, there was an increase in the number of students who were getting student loans. The students also benefited from other types of support, such as the emergency fund, medical support, merit scholarships, discounts, and many more [3].

Goals 2020	Portugal	Average EU28
Until 2020, at least 95% of the children between 4 years and the age to start school frequented pre-school.	98,6%	95,5%
Until 2020, the percentage of students that are 15 years old with low level of literature skills should be inferior to 15%.	20,2%	21,7%
Until 2020, the percentage of students that are 15 years old with low level of mathematics skills should be inferior to 15%.	23,3%	22,4%
Until 2020, the percentage of students that are 15 years old with low level of science skills should be inferior to 15%.	19,6%	21,6%
Until 2020, the percentage of population between 18 and 24 years that abandoned their education should be less than 10%.	8,9%	10,3%
Until 2020, at least 40% of the adults with the age between 30 and 34 years old should have concluded their higher education.	39,6%	41,6%
Until 2020, at least 82% of the population with the age between 20 and 34 years old should have found a job between 1 and 3 years after completion.	75,7%	81,5%
Until 2020, At least 15% of the adults should participate on learning during their life.	10,0%	11,3%

Fig. 6. Statistics of Portugal, in education terms, comparing it to the average of the European Union [3]

The following figure shows how happy were the students in Portugal with online learning. Shows the percentage of students who were happy with online learning. Red means very bad, orange bad, green is without opinion, light blue means good and dark blue means very good. 2718 students participated in this survey.

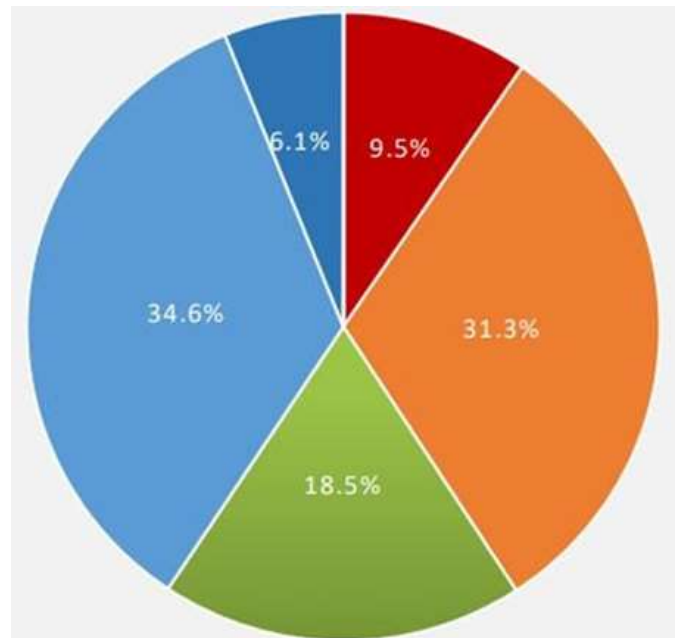


Fig. 7. Percentage of students who were happy with online learning. [8]

Why does everything that was said before matter? Simply put, everything was made online, and students were given equipment so that they could get access to their classes. If all students did what was meant, would there be any threats attacking? If all students didn't use the web much, wouldn't it be impossible for them to click on ad ware.

As a student, it is normal to get some sort of stress relief, especially in times when COVID is around. In a paper written by Anne Marie Porter and Paula Goolkasian, they concluded that playing games had an effect on stress outcomes and that it could even raise the level of positive emotions [9]. In stressful times, that's what they want—a relief of some sort. And many

games aren't free, especially the good ones. And there are many applications out there that aren't free. What is the best way to get them for free? Piracy! According to research made by the website dataprot.net, most countries still have unlicensed software rates of 50% or higher [10]. Even in a country like the USA, 16% of software usage is without permission, and globally, 2 in 5 copies of software products are unpaid [10]. These are quite the numbers, and that's because many of the people who received free equipment didn't have money to buy software, taking piracy as the way to obtain it. Also, the 30-44 age category was most likely pirating books, according to DataProt [10].

Another way that we teens use to relieve ourselves is music. And according to DataProt, 44,44% of male college students and 14,62% of female students see online music piracy as positive [10]. Maybe people could say that the Portuguese education system wasn't attacked, but is there really anything important to attack? If there was an expensive structure or an important data structure, then maybe it would be an ideal place to attack. But even if the risk looks like it's low, it's still something to be considered. That's why I will present some possible solutions to avoid any of the previous possible issues. A solution would be to make access to the university's or school's network possible with a VPN. That's because it encrypts the connection, helps to ensure that sensitive data is transmitted safely, and prevents people from eavesdropping [11]. Another solution would be to filter the websites that a student can access. That will make sure that only the "good" websites will be accessible. Also, the institution should do courses, volunteer, or hold seminars to ensure that the students know what to do and what not to do on the internet. The school itself should have somebody to control the administrative access. This monitoring could identify illegal actions [5]. The account itself should be linked to a person who will solely use the account for management and monitoring of the system [5].

### III. CONCLUSION

In conclusion, the security of network systems in schools in Portugal is like a random egg from which any animal could come out. That's because the effects of the pandemics were not nice, but there were some good points from them. A lot of good and bad happened during and after it. Believing that online is the future, even so, schools should provide solutions for an uncertain future. A hybrid learning model would be perfect, assuming that both in-person and online learning are well developed for an oncoming problem. Portugal should be attempting. There should be continuous student analysis because of the long-term effects of the pandemic. The scars that

it left might not be visible now, but later they could be some thing bad. Looking at what was mentioned in this paper, it was mentioned pretty much that the effects of the pandemic were good and bad, but looking in terms of the educational system it has been more negative. Even if the changes were positive, the consequences that they came and could come with are just a lot more overwhelming. That's why it is important to focus on the security and the integrity of the network systems. Mentally the pandemic made the hole a trench, as many students felt the negative effects of being confined between walls for many days. Concluding, the school networks in Portugal might not be attacked much, but the risk is there. There is a potential problem that may come as many mentally affected students as possible, or the network being corrupted. That's why there should be a focus on the continuous evaluation and enhancement of the school network and the mental assessment for the students. A key approach would be to build a secure and resilient network infrastructure that can fight the uncertainties of the digital age and effectively support the evolving needs of students and educators.

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