SMART HOME: TEACHING & LEARNING

AUREL ȘTEFAN PICA, ISABELA ELENA BĂNESCU

Politehnica University of Bucharest, Valahia University of Targoviste

stefan.pica@cyberservices.com, banescuisabela81@yahoo.com

Abstract. *In this article we want to highlight the forced digitalization we are dealing with due to the COVID-19 pandemic and the fact that this crisis also brings benefits to the education system. The first steps in this direction were to switch to online courses to protect both teachers and students. For them at home it has become a smart home because they need online platforms, internet, PC/laptop, smartphones, webcam, all this to have access to education and to be able to develop without problems.*

Keywords: smart home, teaching solutions, electronic devices, education, digitization, e-learning, pandemic, internet use

1. INTRODUCTION

The global crisis that appeared at the beginning of 2020 and its consequences made us all understand that we will not be able to be as before, everything has changed and this process continues.

We have all had more or less significant changes, but at this time we have noticed the real problems in the existing education systems in each country.

The inequality produced by the material lack of devices or means of communication, internet, access to the educational platforms provided by educational institutions cannot go unnoticed. A good example could be the result of research that shows the situation that some states have to face, it shows that only 11% of students in sub-Saharan Africa have a personal computer and only 18% have internet at home, compared to 50% of students around the world who own computers and the 57% who have access to the internet [1].

Educational technology refers to the digitization and practice of using technology in order to support teaching and learning from distance in educational institutions.

Table 1. Changes in the education system [2]

Question proposed	Responsible			
	School	Local authorities	School inspectorates	National level

What are the steps to be taken to develop access to the devices and applications needed for online education, especially for marginalized children?		50%		50%
What measures should be taken by the responsible members in order for any student to benefit from quality internet?		50%		50%
What plans will be imposed at local and national level to avoid the digital divide?		50%		50%
What are the methods by which schools will be protected from digital risks and how will the data be protected?	50%			50%
What strategies and investigations will be needed to improve the quality of digital educational environments to become accessible to all students?				100%
What methods of prioritizing and developing online educational	34%		33%	33%

environments will be applied and what would be the strategy for hybrid education?				
What will be the standards applied to ensure that the hardware, software and digital content are fully accessible and understandable to all students?	50%			50%
How will digital technologies be used to improve education and its future mixed approaches?	34%	33%		33%
How is the development of skills according to age, learning cycle and learning skills to support their involvement in distance learning?	50%			50%

2. ANALYSIS OF EDUCATIONAL DEVICES AND APPLICATIONS

In recent years, portable devices have aroused the interest of the population, this being visible in the exponential growth of users.

For distance learning, students and teachers need a hardware part, such as a smartphone, tablet, PC/laptop, but also a software part that includes all the necessary platforms for courses such as Moodle, Microsoft Teams, Google Classroom, etc.

Technology is embedded in everyday life, and it has certainly transformed everyone's way of life, gradually turning us into content consumers.

According to statistics, between 45-50% of children aged between 5 and 15 have their own smartphone or tablet, but nevertheless, the purpose of using the technology is not used for education, this aspect being variable.

There are colleges/universities that use technological benefits, such as:

- The Bolton College uses Ada, a virtual assistant that supports teaching and assessment to reduce workload.
- Ark Multi Academy Trust significantly reduces costs by moving data and services to the cloud.

- The University of Wolverhampton is improving and increasing the flexibility and efficiency of physician training through the use of virtual dissection technology.

- The Blackpool Highfurlong Special School uses a range of assistive technology tools to enable students with many complex needs to communicate and actively participate in their education [3].

Statistics on the ownership of electronic devices by material situation are the result of research showing the following:

1. Families below the poverty line
 - 85% own a mobile device
 - 69% own a computer
 - 91% have home or mobile internet
2. Low and middle income families
 - 91% own a mobile device
 - 81% own a computer
 - 94% have home or mobile internet

Of the families living in the first category mentioned, 33% have only mobile internet access, on smartphone or tablet, and 9% do not have internet access. The second category comprises a sample of 23% of people who connect exclusively to the mobile internet, while 5% do not have access to the internet [4].

Table 2. Study of the average time spent on the internet [5]

Age Group	Sex	In own room	Outside own room	Total of learning based Internet use	Total of actual learning
0 -8 years	Boys	0	0	0	0%
	Girls				
9 -10 years	Boys	4	5	4	44.44%
	Girls	3	2	2	40.00%
11 -12 years	Boys	3,15	2,08	1,77	33.84%
	Girls	2,64	2,18	1,27	26.35%
13 -14 years	Boys	2,74	2,04	1,20	25.10%
	Girls	2,97	1,76	1,52	32.14%
15 -16 years	Boys	2,96	2,35	1,24	23.44%
	Girls	3,05	2,19	1,15	21.95%
17 -18 years	Boys	2,23	2,67	1,80	36.73%
	Girls	1,98	1,65	1,12	30.85%
On average	Boys	2,87	2,01	1,41	28.89%
	Girls	2,60	2,10	1,37	29.15%

The most used devices are laptop, smartphone or tablet. The most common platforms used for education are Microsoft Teams, Google Classroom/Google Meet and Zoom application.

Microsoft Teams is a communication platform developed by Microsoft, which is part of the Microsoft 365 product family, it offers the possibility of chat and video conferencing, file storage and application integration.

Google Classroom is a free web service, developed by Google for schools, which aims to simplify the creation, distribution and classification of tasks in a way that does not involve the physical part that can be done in school, an alternative without pen and paper. The main goal is to streamline the process of sharing files between teachers and students.

Zoom is a communication platform that allows meetings with up to 500 participants.

According to recent statistics, approximately 89% of participants stated that they use Zoom or Google Meet almost daily.

For things to go well, parents need to support their students' academic and financial learning. In this ongoing emergency, children with disabilities need additional support.

Companies that own platforms such as Google Classroom, Zoom, e-learning and social media, as well as various group forums such as Telegram, Messenger and WhatsApp make efforts to periodically test the services they offer to ensure a good evolution of online teaching and learning.

This can be further explored even after the resumption of face-to-face teaching, these platforms can provide students additional resources and training methods.

Even if we are dealing with a global crisis, at this moment there are unparalleled opportunities for collaboration, creative solutions and a desire to learn from others and from the wide range of tool options available.

Many educational organizations offer their tools and solutions free of charge to help and support teaching and learning in a more interactive and engaging environment. Online methods offers opportunities for teaching and learning in more innovative ways than teaching and learning in a normal classroom.

A smartphone is a multifunctional multimedia device connected to a GSM or UMTS network. It also has a real or virtual keyboard, which offers PDA, calendar, GPS navigation, email, computer, camcorder and other functions. However, the most compelling application developed for most smartphone models is connected to the Internet in UMTS/HSDPA networks. In this case, the smartphone needs a special browser application, which offers users a large number of networking possibilities as an intermediary.

A notebook/laptop is a portable personal computer, small and easy to use. It integrates most typical components of a desktop computer, screen, keyboard, touch pad, speakers and battery into one unit.

A personal computer (PC) is a workstation that processes data and information according to a list of instructions called a program. Today's computers are not only information processing machines, but also devices that facilitate communication between two or more users, for example in the form of numbers, text, images, sound or video, even simultaneously.

We applied a questionnaire to a group of students in years 2, 3 and 4 who attend online courses. They had to answer the following questions:

1. What digital platforms did you use during college in online format? (figure 1)
2. By what means was the communication between teacher and student effective? (Figure 2)
3. Based on previous experience, how would you like the courses to be in the next year? (Figure 3)
4. Are you currently employed or do you have time to fully dedicate your courses? (Figure 4)

5. How would you like the examinations to be conducted taking into account past experience and the context of the pandemic? (Figure 5)
6. What devices did you use to attend the online courses? (Figure 6)
7. What devices did you need to do your home projects? (Figure 7)
8. Could you complete all the proposed tasks with a smartphone or did you consider absolutely necessary to use a laptop/computer? (Figure 8)

Figure 1. Online education platforms

Figure 2. Platforms through which the communication was made

Figure 3. The desired form of education for the year 2021-2022

Figure 4. Students situation

Figure 8. Smartphone as the only tool

Figure 5. Desired method for examination

Figure 6. Useful online education devices

Figure 7. Tools used to complete homework

From the diagrams above you can see a trend towards online teaching and learning.. This can have several causes, including the economy of transportation to college, saving time that would have been lost on the road, the flexibility of the program, the opportunity to attend courses, seminars, laboratories at home or at work and a plus of safety, because most people also think about the possibility of contacting the virus in the extended team of which it is part.

Figure 9. Main interests of students in the use of mobile devices [6]

Mobile devices are used by students as a means of communication and applications developed for them, allow students access to courses, viewing notes, loading homeworks, even having space for discussions for good collaboration in a timely manner.

Using the platforms created by the educational institutions, students have access to the school and financial situation, class program, exam schedules and other personal data. All mobile devices keep students connected and informed at all times, especially with an important aspect, such as deadlines, meetings and program changes.

Figure 10. Time spent on the internet [5]

The students participating in this study (Table 2, Figure 10) spend an average of 5 hours a day in the online environment, of which about 30% of the time is dedicated to learning. About 80% of students communicated with teachers on social networks such as Facebook and WhatsApp, these being a faster and more often used by young people. Almost the same percentage of young people own a smartphone to meet their communication-learning needs, while existing computers or tablets in the household are used by other family members too. Even though such a large number of young people prefer a smartphone, they recognize that this device is not enough and they need a computer/laptop because these devices are more efficient in carrying out complex projects.

In a post COVID-19 world, it will be necessary to heal the people separations and the human/interhuman problems that have arisen as a result of quarantines and restrictions on social distancing. We will need to be creative in order to overcome all this obstacles.

In Figure 6 we can see that the vast majority of people prefer the laptop for online courses, being a portable device that meets the needs of users. Next in the students preferences is the smartphone, a device that is in the pocket of an extremely large percentage of the population, easy to use, accessible to anyone and that can meet our needs anywhere, but we can see that there are followers of a classic computer that does not offer the same freedom and reliability for the users. Some students say that they meet the requirements only with the help of a smartphone, but certainly their work is difficult and incomplete because some tasks require programs can not be used from the phone, being versions only for PC.

3. PROPOSED EDUCATIONAL SOLUTIONS

The use of digital technologies has become a big interest in recent years, with portable devices being a great success. The context of the pandemic has only aroused even more the interest in these categories of devices, and the attraction for online learning technologies has grown exponentially.

Any educational solution would be delayed without the active involvement of the population, so we should see education as a common good and treat it in such way to avoid discrimination and inequality. Getting involved in this way, no person is deprived of the right to education, and in this

way people will understand the importance of the need for connectivity and access to information for the acquisition of new knowledge.

The collaborative relationship with the teacher depends on each student, because communication is essential, especially when the interlocutors are at a distance, because in this way the information is more difficult to transmit, can be interpreted or perceived incorrectly.

Students participation in the implementation of new educational methods should be encouraged in order to have the chance to express their point of view, to get actively involved and to become more attracted to the new changes in the educational system.

The school should be transformed into a welcoming environment, with the possibility to offer teachers and students free technologies, because education cannot prosper only with content built outside the human relationships of those who use them or created outside the pedagogical environment. At the same time, education cannot be dependent on or controlled by a digital platform.

The current situation should give us food for thought, especially when we fight against the denial of scientific knowledge and actively fight against misinformation.

Education should be strongly supported because the pandemic and its consequences could undermine several years of progress in this area.

Following a research, eight emerging trends in education were identified:

- Digital responsibility;
- Computational thinking;
- Student-led learning;
- Collaboration rooms;
- Connecting teachers and schools;
- Innovative pedagogy;
- Life skills and workforce training;
- Emerging technologies [7].

It is very important to implement digital tools in the teaching and learning activities. In a digital society it is inconceivable to rule out the possibility of acquiring new knowledge and information from school. These are considered increasingly necessary components of daily life, essential for improving teacher performance and for a good student development.

The digital connection has become extremely important, and our efforts should focus on open licensing and access policies to promote free use, reuse and redistribution. Priority must be given to open educational resources, public education cannot be based on a digital platform with information provided by private companies.

Designing teaching and learning based on authentic content is very important, as it reduces teachers' work and helps students to perceive it more easily. Public education cannot be defined and controlled by the content and methods established outside the teaching space and by the interpersonal relationship between teachers and students.

The fight against online platforms that we saw during the pandemic poses a huge risk to the teaching profession and its autonomy, so it can have serious consequences for the future of education.

We must ensure that any digital transformation is achieved through the good collaboration of technology companies, teachers, students, governments and civil society representatives. [8]

When it comes to online education, we have data presented in Table 1 in which certain problems are exposed, and the population answered who they consider responsible for taking action.

The results obtained in this study clearly reflect the enthusiasm of the younger generation for the use of mobile devices. Students around the world use mobile phones for various purposes, such as video/photo graphics, sending and receiving emails, downloading applications and educational content.

Compared to a computer/laptop, the equipment needed to access the mobile network is relatively inexpensive and easy to use.

A large number of researchers have highlighted some of the main benefits of mobile learning, including:

- No time constraints (Johnson, McHugo & Hall, 2005);
- Available wherever and whenever (Chen & Kinshuk, 2005; Csete, Wong, & Vogel, 2004);
- Content is adaptable to meet individual needs (Trifonova & Ronchetti, 2004; Taylor & Evans, 2005);
- Easier access (Noelting & Tavangarian, 2003; Schreurs, 2006);
- Increases motivation (Duncan-Howell & Lee, 2007);
- Enhances knowledge (Attewell & Gustafsson, 2002);
- More independent (Holzinger, Nischelwitzer & Meisenberger, 2005);
- Improved communication and organisation (Mac Callum & Kinshuk, 2008; Stead et al., 2006) [9].

Most people who use computers use only a small part of their performance and available technology, and frequent use of electronic devices and digital platforms in educational institutions will significantly help both teachers and students to improve their skills in this area.

The mobile phone has been used extensively in recent years without considering its learning potential, as its users did not know much about how it can be used for its true positive and constructive purpose.

4. CONCLUSIONS

Given the pandemic situation, the world is becoming more complex, uncertain and fragile and these things are also reflected in the educational system. With the advent of the virus, the anxious difficulties that arose generated dynamism and multiple possibilities.

In the last months we overcame a lot of challenges, we learned to adapt, to get over the unknown and what was happening to us overnight, forcing us to give up school, holidays and friends.

We have had many overwhelming challenges to which have been added uncertainty, insecurity and fear.

Each of us should be aware that as a result of all that we have encountered, education will change profoundly and at the

moment there are no technological or other solutions that can replace our decisions and actions.

Once all the restrictions are passed, it will certainly not be a complete return to traditional education, and perhaps this aspect is a good thing, so that students will have more digital knowledge, the courses will be more interactive and by introducing new digital learning tools things can be conveyed more easily for everyone to understand. [10]

Technology has the potential to change the educational experience and management of education providers, helping teachers spend more time with things that have a beneficial impact on students.

The global pandemic has caused the largest disruption to the education system in human history, affecting nearly 1.6 billion students in more than 200 countries.

The closure of all educational institutions has profoundly affected approximately 95% of students worldwide and this has brought about significant changes in almost every aspect of our lives.

The totality of the imposed restrictions, together with the measure of keeping the physical distance, directly affected the traditional educational practices and the way of study for both teachers and students.

Reopening schools after the restrictions relax will be a real challenge and this will give us the opportunity to pave the way for the introduction of digital learning and enjoy its benefits.

We hope that the restrictions created by the COVID-19 pandemic will not only have a negative effect on education and that both teachers and students will take advantage of new teaching and learning methods and will constantly use smart devices to enjoy an effective and interactive education system.

5. REFERENCES

- [1] United Nations Educational, Scientific and Cultural Organization, Education in a post-COVID world: Nine ideas for public action, International Commission on the Futures of Education
- [2] UNICEF Regional Office for Europe and Central Asia, Creating resilient education systems in the context of the COVID-19 pandemic: Considerations for decision-makers at national, local and school level
- [3] England Department for Education, Realising the potential of technology in education: A strategy for education providers and the technology industry
- [4] Victoria Rideout and Vikki S. Katz, Opportunity for all? Technology and learning in lower-income families 2016
- [5] Peter Esztelecki and Kőrösi Gábor, The use of smart devices and the internet in education - The Habits of K-12 students about using ICT in education in Northern Serbia, International Conference on Information Technology and Development of Education ITRO 2015

[6] Megan K. Foti, Mobile Learning: How Students Use Mobile Devices to Support Learning, Journal of Literacy and Technology Volume 15, Number 3, December 2014

[7] Google for Education, Future of the Classroom, Emerging Trends in K-12 Education Global Edition

[8] Seibu Mary Jacob and Biju Issac, The Mobile Devices and its Mobile Learning Usage Analysis, International MultiConference of Engineers and Computer Scientists, Volume I, IMECS 2008, 19-21 March, 2008, Hong Kong

[9] Ravi Toteja and Sarita Kumar, Usefulness of M-Devices in Education: A Survey, The 3rd International Conference on e-Learning ICEL 2011, 23-24 November, Bandung, Indonesia

[10] Sumitra Pokhrel and Roshan Chhetri, A Literature Review on Impact of COVID-19 Pandemic on Teaching and Learning, Higher Education for the Future