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Higher Education Policies for Developing Digital Skills to Respond to the Covid-19 Crisis: European and Global Perspectives

Edited by
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CHAPTERS

THE DIGITAL SKILLS IN THE HUNGARIAN HIGHER EDUCATION DURING THE FIRST WAVE OF COVID-19

Kornélia Lazányi, Alexandra Vincze, Péter Szikora

1.1 Introduction

The coronavirus pandemic is the defining global health crisis of our time. The virus has spread to every continent, except Antarctica. The number of cases is growing rapidly around the world, with countries competing over the virus' spread – slowing it down is a global priority. Efforts have been made to manage the virus by testing and treating patients, contact tracing, restricting travel, quarantining citizens, and cancelling large gatherings like sport events, concerts and schools. By affecting almost every part of the world, the pandemic has caused not only a health crisis but an economic, political and social crisis. The closure of shops, restaurants and entertainment facilities all over the world might leave deep wounds, socially as well as economically. Every day, more and more people are losing their jobs and their income. The International Labour Organisation estimates that 195 million jobs could be lost as a result of the Covid crisis (United Nation Development Programme, 2019).

Society faces unprecedented challenges due to the emergence and pandemic spread of the coronavirus. Significant economic, social and environmental changes may be seen, making digital preparedness and access to IT infrastructure for teleworking increasingly important.

The day-to-day lives of higher educational institutions (HEIs) have also been altered radically (Aristovnik et al., 2020b). HEIs had to switch over to contactless education (e-learning) within days. The aim of the present study is to describe the situation of Hungarian higher education relative to the pandemic situation and to offer recommendations about digital competencies in connection to the long-term integration of the competencies – whose importance has been underlined during Covid – acquired during the pandemic into education.

1.2 The Covid-19 situation in Hungary: The first wave

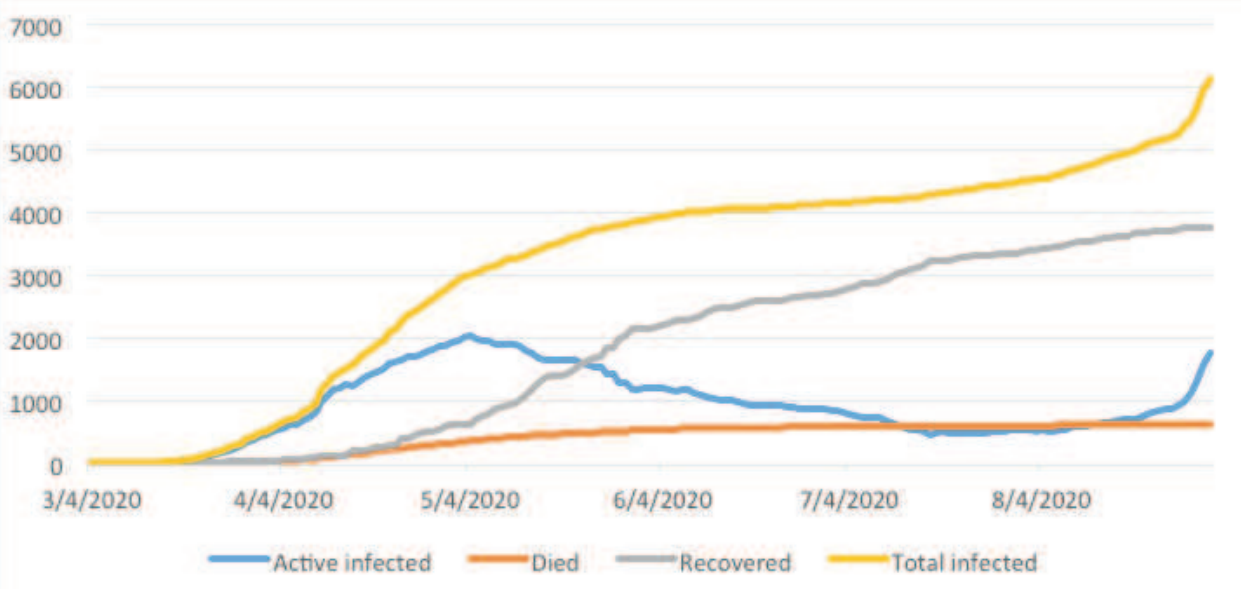
The Covid-19 pandemic is an epidemic caused by the SARS-CoV-2 virus, a disease called Covid-19. The first cases were discovered in December 2019 in Wuhan, China. As early as on 31 January 2020, the Hungarian government established an operational body with the main task of managing the Covid-19 pandemic in

Hungary and to analyse and evaluate its spread abroad. The first registered case of the Covid-19 virus in Hungary was announced on 4 March 2020 by Prime Minister Viktor Orbán. The operational body has met on a daily basis since 5 March. It has become responsible for the localization and screening of infections and for epidemiological and health measures by coordinating the activities of public bodies, where applicable. The first patients in Hungary were two students of Iranian descent who arrived in Hungary on 26 and 28 February, respectively.

The outbreak was declared a pandemic by the World Health Organization (WHO) on 11 March 2020. On the same day, a national emergency situation was declared in Hungary, whereby a special legal order came into force in Hungary: a period different from peace and the general rules of normal state operation. Like in most countries around the world, measures restricting people's daily lives were introduced in Hungary. The curfew restriction law was enforced on Friday, 27 March, when already 256 active infected patients could be found in Hungary – then mainly in the capital (Budapest). The curfew applied to the whole country, with people only able to leave home for a good reason. Examples of such good reasons were: employment, professional duty, economic, agricultural activity, marriage and funeral in the close family, shopping in a grocery store, market, pharmacy, tobacco shop, gas station etc. These restrictions most likely did slow the infection's spread, yet the number of active infections rose by 1,342 within 25 days, meaning an average of 53 new cases per day. A Financial Action Group also started working on crisis scenarios, on restarting the economy, reconstructing economic processes, budgets and the possible damage and outcomes created by the virus.

The pandemic has so far arrived in Hungary in three waves. During the first wave, which began in March 2020, the number of active cases increased until early May, exceeding 2,000, and then began to decline steadily. This decline lasted until the second half of July, but after then the number of new cases grew slowly at first and then started to rise rapidly after August, upon the onset of the second wave. The third wave started in February 2021. Epidemiological data for the first wave are shown in Graph 1.

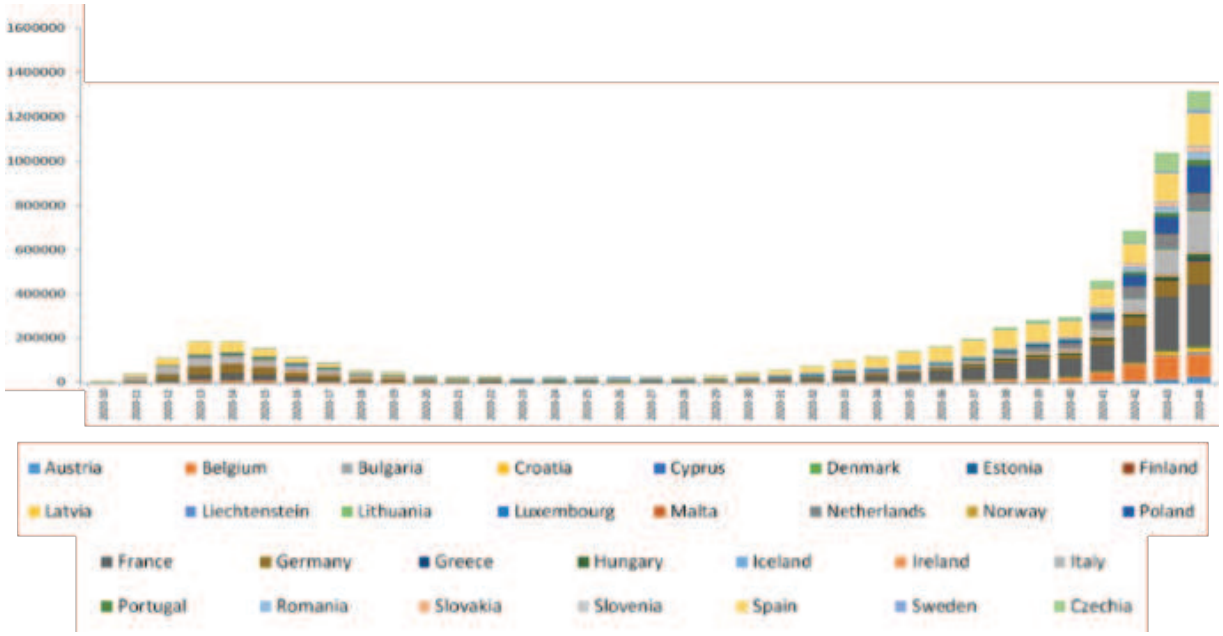
Graph 1: Epidemiological data of the Covid-19 cases in Hungary during the 1st wave



Source: Own compilation on the basis of data provided by koronavirus.gov.hu

During the epidemic's first wave, which lasted from March until mid-July, 595 victims of the pandemic were registered, with the worst daily figure of 17 people dying on 19 April. Mortality began to rise more sharply in the second wave after September 2020. The Hungarian data are even more interesting in the light of the European data. A European comparison is shown in Graph 2.

Graph 2: Epidemiological data of the Covid-19 cases in the European Union during the 1st wave



Source: Eurostat, 2020

"The Covid-19 epidemic is hitting strong shocks on the already weak and fragile world economy", stated a UN report published in March 2020, indicating the Covid-19 epidemic was likely to have a profound and negative impact on a global scale. The report added the long-term global economic slowdown could adversely affect Agenda 2030. According to the report, the groups most affected by the pandemic would be women, children, the elderly, and informal workers. It was already anticipated in March 2020 that most countries did not have a healthcare system able to adapt to such a large-scale, unexpected health crisis. Unfortunately, these forecasts were mostly proven correct.

1.3 The situation of Hungarian higher education: The first wave

In Hungary, on 11 March 2020 an 'extraordinary rector's break' was ordered in higher educational institutions (HEIs), while the spring break was brought forward in order to prepare for the digital agenda. At the request of the Secretary of State for Higher Education, by 16 March 2020 HEIs had developed an institutional action plan to ensure the continuation of education in the form of distance learning. Teaching carried on after 23 March, in an extraordinary work schedule, using distance learning methods.

In view of the emergency, the spring semester was extended until 31 August by which time students should have been able to complete their laboratory exercises, exams, and final exams. In the period when normal educational activities were suspended, beginning on 12 March no student could enter university campuses.

Student administration could only be performed online. University students with Hungarian citizenship or a permanent residence in Hungary had to leave the student hostels by 15 March and return home to their place of permanent residence. Foreigners could still stay in their dormitory if their repatriation could not be resolved, however, their places of residence were changed compared to the period of normal full-contact education.

The government temporarily amended some higher educational laws, including those on reclassification. University faculty staff continued to go to work (staff could still enter the premises when students could no longer), but had to comply with epidemiological control restrictions.

During the epidemic, an "out-of-classroom digital agenda" (EMMI Decision 3/2020) came into force where it was recommended the main role of the educator was to help students learn independently, obtain and process information (OH, 2020). Hence, the traditional, 20th-century education system suddenly switched over to a 21st-century version. The Prussian frontal classroom teaching that clearly suited the needs of the industrial society, where the teacher was the sole custodian of knowledge and the learner was responsible for sitting in a disciplined manner and attending the lesson, was changed and transformed in the information society era where the emphasis is on the creation of knowledge, and the acquisition, processing and sharing of knowledge, and the use of symbolic communication (Castells, 2000).

Based on a summary by Hajdu (2020), HEIs have adapted well to this forced transition to distance learning. It is true that universities and colleges already had some routine in distance learning as they have been holding correspondence courses and mixed-method courses for a long time. The leaders of six universities and several lecturers working in HEIs who responded to the survey's questions also noted the software conditions for distance education had been in place in higher education for a long time, even if not used by all lecturers. E-learning systems for sharing materials online and taking online exams (such as CooSpace and Moodle) were introduced in most institutions back in the 2000s, and a free version of Office 365 has been used for years for educational purposes. This meant meetings and lectures could be held with the help of the Microsoft Teams app. Accordingly, as a first step, institutions sought to encourage their instructors to use software uniformly. This was important since they were able to provide the right support for the pre-selected software and it was also easier for the students if they did not have to become used to using different programs from class to class. This practice worked, even though the centrally selected software often did not fully meet the different expectations of the teachers.

In contrast, the availability of hardware has in many cases been a problem. Teachers were generally equipped by the universities with laptops, headsets and cameras, and could even go into the university buildings and use the indoor equipment. Still, students did not always have the proper tool to follow the lessons. Although video conferencing can also be arranged on smartphones and tablets, it was not really easy, even if possible, to interact through them, proving especially difficult to actively participate in seminars previously held in a computer room without a proper PC, which – since Covid-19 has affected children of all ages and many office workers equally – have often needed to be shared among household members.

During the transition, teachers were not allowed to change the main content of their courses. Instead, they had to create and enrich the course materials in a way that conforms with the new teaching method, for which they had roughly 1.5 weeks available during the early spring break. Distance learning methods varied quite widely: there were institutions where teachers could choose from several options, from supporting students through a self-directed learning process with pre-loaded curricula and online consultations to teaching lessons via videoconferencing. The biggest problem concerned practice-oriented courses. Experiments that require special equipment, materials, infrastructure, and security measures obviously could not be performed by students at home. Some instructors recorded their presentations and tried to get them to their students, yet this was not equivalent to having the students do the task themselves in person (Hajdu, 2020b). Several universities made similar decisions regarding practical classes. Their schedule was postponed to later semesters or until the summer one by extending the spring semester of 2020. Moreover, graduate medical students could even substitute some of their practical subjects with voluntary clinical work.

Still, in many cases, online education caused a great deal of extra work for both students and teachers because the curricula and supporting materials for distance learning needed to be prepared in a short time and continuously thereafter. The knowledge to be imparted during personal tutor–student meetings (lectures, exercises, consultations) now had to be recorded in writing or in the form of videos, which took significantly more time than the traditional, full-contact teaching.

Class assignments were often replaced by home assignments, which are time-consuming to both prepare and correct. On top of that, in addition to holding lessons via the Internet, instructors often provided students with handouts, case studies, and articles — which also took longer to prepare and process than usual. Teachers also faced a difficulty in that the timeframe of the lessons was loosened, with much greater pressure to answer student questions outside of working hours.

Based on experience reported by HEIs (Hajdu, 2020b), online education did not work as well in the case of seminars as in a traditional classroom. Many teachers did not even seek to undertake an online presence, preferring to publish the curriculum through materials to be read, and those who did keep the lessons often expected the students to prepare in advance. As a result, the workload of students rose significantly. Although students have been able to attend classes more during the pandemic (since all alternative forms of leisure time were limited) and it also became easier for them to connect to classes from home, negative changes in their classroom activity were observed (Hajdu, 2020).

However, in the case of the lectures the experiences were mostly favourable (Hajdu, 2020b). According to the feedback provided by research participants, many students did not consider 1.5-hour-long lectures worthy of giving up all other activities before the pandemic, but since in the meantime during their online education they can also do something else and no one has commented on their computer use, despite being directly expected to do so, has seen their participation increase. Many of those who attended before pointed out that there is no background noise around them, making it easier to listen and take notes. In addition, the activity rate has become much higher than before. While no one dared to ask in front of dozens or even hundreds of their peers in a lecturer, students have been much more courageous to ask questions in writing during the online education. Live lectures were recorded by the majority of instructors and made available later so as to enable class revision.

Education has thus shifted to digital platforms in various forms, depending on the institutions and their teaching staff. According to Vincze's research among Hungarian higher education students, the transition was not only smooth from the point of view of the institutions, but the distance learning started better than average for the students as well. Most students adapted to the new conditions easily.

Although the research cannot be considered representative, it brings the answers of 543 higher education students coming from several different Hungarian – Budapest-located and rural – universities. The respondents' average age was 23.950, with a standard deviation of 6.132 years. The youngest was aged 18 years, while the oldest research participant was 56 years, which may be explained by the fact that the proportion of full-time students in the sample was 77.71%.

In line with the research results, 84.71% of the respondents had already used some kind of e-learning interface before the pandemic. The use of e-learning was also generally not seen as complicated. This is since most universities use the Moodle system that includes many curricula, meaning that students are familiar with use of the site. Taking a long time to learn how to use the online interface was not typical because in most universities the students have already encountered online interfaces and used, e.g. Moodle, Zoom, Skype, Teams, Google Classroom, Facebook. However, user habits have been radically transformed by the pandemic situation. Use of the Teams application increased the most, by 384%, while use of the Zoom application rose by 291%, and Skype by 255%.

Table 1: Use of various educational platforms before and during the Covid-19 pandemic in Hungary

Platform	Before Covid-19	After Covid-19
Moodle	**431**	**474**
Zoom	**51**	**148**
Skype	**71**	**181**
Teams	**88**	**338**
Classroom	**37**	**58**
Facebook	**69**	**82**

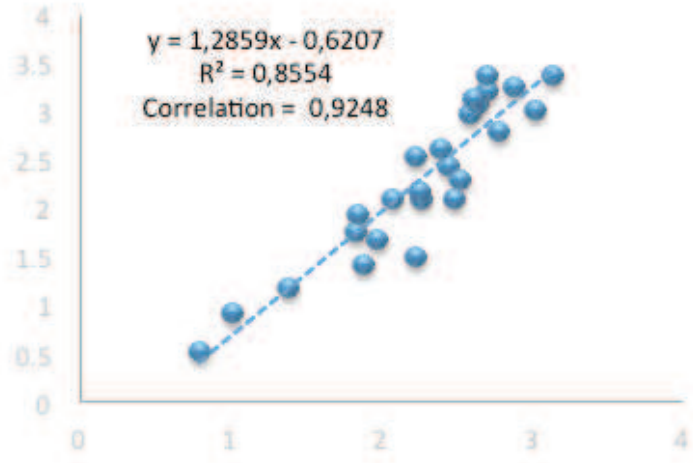
Source: Own research

Although the HEIs have to the best of their ability tried to ensure that the education continues, the result is mixed at best. When asked whether online education is considered to be disadvantageous, 412 out of 543 responses agreed. Hence, 75.87% of all respondents stated there was at least one subject in which distance education was weak. The biggest problem was the acquisition of professional and technical subjects along with the understanding of mathematics. Still, most respondents (71.27%) generally agreed that some subjects which could be easily mastered through home processing may remain in the form of distance learning on a lasting basis.

The research also sought to determine how distance learning is perceived overall by students. Interestingly, only 11.78% of the respondents were dissatisfied with distance learning, while almost half (45.85%) were satisfied or very satisfied with the quality of distance learning provided by their institutions. More than half the students (55.80%) could also accept the arrangement if they had to study by way of distance education for a longer period of time, but before any introduction of this they pointed to the need for significant changes. It was indicated that a prerequisite for well-functioning e-learning is that the interface would be uniform and well organized.

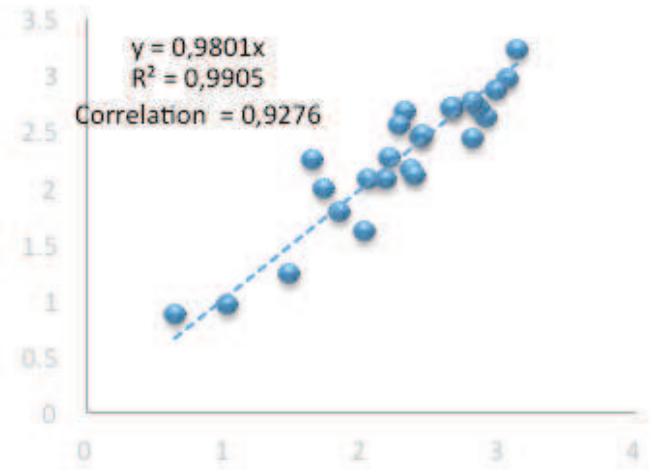
Although the variance of the data was relatively high, as well shown in Graphs 3, 4 and 5, there was no tendency in variance within the study population due to age, gender, or even pre-pandemic form of education.

Graph 3: Comparison of the responses regarding satisfaction with distance learning of the age groups 18-28 and over 28



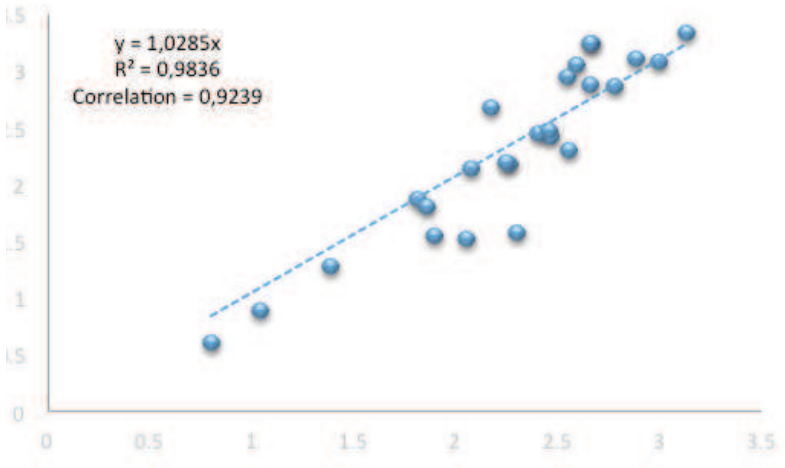
Source: Own research

Graph 4: Comparison of the responses regarding satisfaction with distance learning of groups created on the basis of gender



Source: Own research

Graph 5: Comparison of the responses regarding satisfaction with distance learning on the basis of their pre-pandemic student status (full-time, pert-time)



Source: Own research

Those involved in the research repeatedly indicated that, because the curriculum was available online and for the most part there were no interactive lectures and/or exercises, they did not receive background information and it was much more difficult to understand the material. It all just depended on the teacher's attitude (helpfulness, activity and preparedness – from the subject and the use of the various applications required). Where appropriate, it was possible to carry out e-learning smoothly. Many teachers made video materials, which was positive for the students because they listened to them several times if they did not understand the curriculum. They also found it useful that it was possible to stop and restart a lecture at any time. Regular homework-type assignments helped the students keep up their regular study schedules.

Several respondents also indicated that, while the quality of the education was similar, evaluation was often more difficult and required greater studying than would have been the case in person. Based on the feedback, the system should have been standardized to make the teaching smoother. They were evaluated in many different ways, with teachers communicating through many applications or interfaces, thereby making it very difficult to make the evaluation criteria of the subjects more transparent, while the system of requirements was also often confusing.

According to a survey conducted by the Ministry of Information and Technology (TKA, 2020) in March 2020, the most common problems in higher education related to:

- the availability of electronic curriculum;
- knowledge transfer and learning methods, with the help of use of digital teaching materials;
- the availability of information technology and communication teaching aids;
- human resources associated with the organization of distance/online education;
- student participation in distance/online learning;
- the provision of infrastructural capacities and conditions of education organized as distance/online learning;
- the organization of practical training as distance/online learning; and
- the organization of foreign language training as distance/online learning.

The above-mentioned confirms the research findings of Vincze and shows that not only was there considerable uncertainty about the pandemic on the student and faculty levels, but also on the institutional level many phenomena had to be addressed instantly without proper resources and prepared plans. Feedback from the leaders of the 43 institutions participating in the survey (TKA, 2020) reveals that the vast majority of courses were implemented in the absence of any contact hours. According to the feedback from the institutions, 45.6% of the courses were completed and a further 52.2% were at least partially successful, with only 2.2% not managing to be completed. The reasons for failed courses were largely the lack of hardware and the IT-unpreparedness of the participants.

International research results paint a similar picture to that for Hungary. In summarizing the experiences of 100 British HEIs, Walker et al. (2020) found that non-Covid-related research was being pushed into the background in the institutions surveyed due to the pandemic. Education, examinations and administration consumed significant extra energy, with less time spent on research during this period. Respondents largely agreed that online education made it difficult to deliver and explain the curriculum, to interact with the students. Online education was considered more tiring and time-consuming by the instructors. In their view, the workload had considerably increased. In education, working hours had generally been extended (due to the increased examination burden and administration). The situation was also a great mental challenge. Despite all of this, university lecturers showed the same commitment to their work and worked with the same enthusiasm as before the pandemic.

Marinoni et al. (2020) examined the practices of 424 universities in 109 countries with respect to conditions during Covid-19. Based on the research results, almost all of the HEIs (91%) already had a communication infrastructure in place suitable for online education prior to the pandemic. Still, the respondents indicated it was a challenge to ensure a clear and effective communication processes with both staff and students. The most common effects of Covid-19 were restrictions on international travel (83% of HEIs) and the cancellation or postponement of scientific conferences (81% of HEIs). Some scientific projects were not completed in over one-half (52%) of HEIs as a result of the pandemic. The majority of respondents reported the Covid-19 pandemic had weakened their links with their partner institutions and universities, although 18% stated that these links had been strengthened, with 31% saying the Covid-19 pandemic had created new opportunities for contacts with partner institutions. The pandemic affected international student mobility in 89% of HEIs. The extent of the impact varied from institution to institution, but in all cases was negative.

1.4 The situation of digital competencies in Hungary

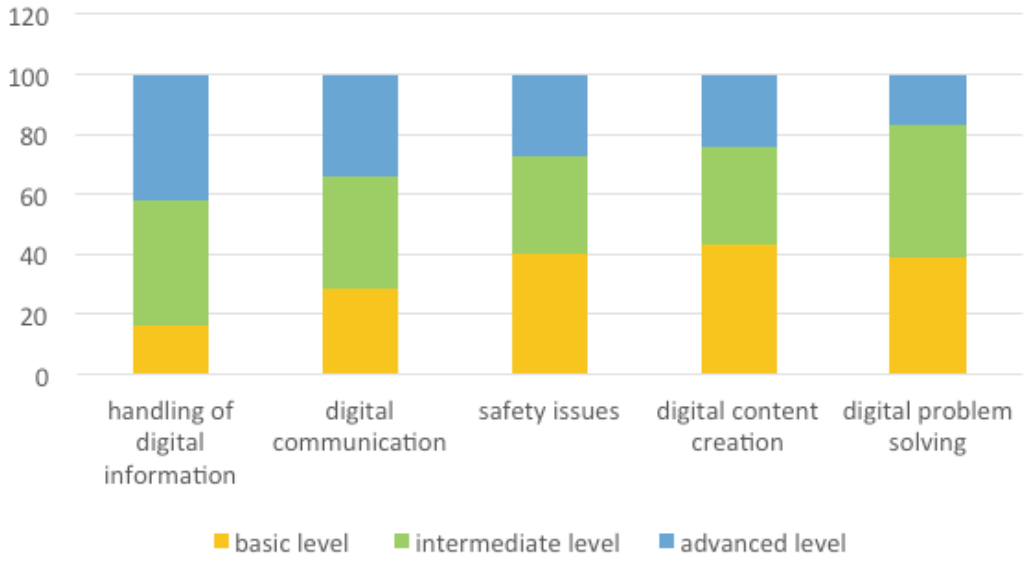
According to the European Commission, the innovative activity of Hungarian companies is severely limited by the lack of talented professionals and often by the lack of sufficient digital skills (Andrews et al., 2015). The productivity of leading Hungarian companies would benefit from more flexible product market regulation, increased digitalization, and high-quality higher education and research, areas in which Hungary lags behind the most innovative economies (European Commission, 2020).

In Hungary, the teaching of digital competencies starts from an early age and forms an integral part of the National Core Curriculum (NAT, 2012). The NAT defines the content elements of digital competence as follows: "Digital competence encompasses the confident, critical and ethical use of information society technologies (information and communication technology, hereinafter ICT) and ICT mediated content made available by technologies in social relations, work, communication and leisure". As seen in the definition, digital competencies appear in all areas of life and well support the European Commission's view that they are key preconditions for greater employment and economic development (Borbély, 2013).

In the wording of the NAT, digital competencies are based on skills and activities: "recognition (identification), retrieval, evaluation, storage, production, presentation and exchange of information; digital content creation and sharing; and communication, collaboration over the Internet" (NAT, 2012). Acquiring digital competencies requires the following skills, abilities, knowledge and attitudes: "Digital competence means understanding, gaining a thorough knowledge of the nature, role and potential of ICT and applying it to personal and social life, learning and work. Includes major computer applications – word processing, data spreadsheets, databases, information storage and management, the opportunities offered by the Internet and communication through electronic media (email, networking tools) – in the fields of leisure, information sharing, collaboration, networking, learning, the arts and research. The learner should understand how ICT fosters creativity and innovation, be familiar with the problems surrounding the authenticity and reliability of the information available and the basic techniques used to filter it, as well as the dangers and ethical principles associated with interactive use of ICT, the legal framework of software ownership. The skills required include finding, gathering and processing information, critical application, and distinguishing between real and virtual connections. These include the use of tools to produce, present and understand complex information, as well as accessing, searching for and using Internet-based services, and the use of ICT in critical thinking, creativity and innovation" (NAT, 2012).

The areas of digital competence identified by the NAT are usually and chiefly examined among students in public education, but for the purposes of this study the digital competencies of the faculty are even more important. According to Borbély's (2018) research, teachers in many areas are not yet prepared for the transition to digital education. Based on the results of a 2018 research study, all of the digital competencies articulated in the NAT had on average been acquired on an intermediate level by teachers. They are mostly at home in the field of digital data content and information management, but also have a high level of skills in the area of digital communication. As the following graph shows, the biggest shortcoming is in the area of digital problem-solving, which draws attention to the issues created by the pandemic situation and the digital teaching it has triggered.

Graph 6: Digital competencies of trainers in the competence areas examined by NAT



Source: Own compilation based on Borbély, 2018

In order to develop the population's digital skills, the government launched a Digital Education Strategy in 2016. The Strategy targets the working age population with the Digital Workforce Program, whose results are not yet visible (Gál et al., 2019). Resolution of the situation from higher education's point of view is the responsibility of the Ministry of Innovation and Technology (ITM), the Digital Welfare Programme (DJP), and the Digital Higher Education Competence Centre (DFKK), which have created a strategic package aimed at the successful digital transformation and further development of Hungarian higher education. Their mission is aligned with the views of the OECD and the European Commission's DG Reform programme (Directorate-General for Structural Reform Support).

This cooperation benefits not only Hungarian HEIs, but other players in Europe's educational sphere and the international higher educational community. The project's positive results will transform the academic lives of hundreds of students and teachers, both domestically and internationally. The strategic cooperation will start from the existing Hungarian higher education strategies, further develop, and remodel them. This requires the examination of previously identified problems formulated in the Gearing up the Hungarian Higher Education programme and in Hungary's Digital Education Strategy. It is important to note that several EU and nationally-funded programmes also exist in Hungary to support the digital transformation of higher education. This is all very important because in the last 4 months prior to writing this article, universities have also had to transform their teaching and learning processes to allow them to also function on digital interfaces (DJP, 2020). Although most institutions have retained their best practices, the pandemic has also seen innovative solutions surface. One of these is the unique collaborations of the University of Szeged in Hungary with Coursera with accreditation of one of the most popular courses on the online education platform "Learning How to Learn".

The pandemic has drawn attention to the need for coordinated strategic development not only in Hungary, but across Europe, so as to enable the development of high-performance digital infrastructure and the widest possible improvement of user competencies through the high-quality, inclusive and accessible development of the digital education system (EU, 2020).

This requires (EU, 2020):

- infrastructure, connectivity and digital equipment,
- effective digital capacity planning and development, including up-to-date organizational capabilities,
- digitally competent and confident teachers and education and training of staff,
- high-quality curriculum, user-friendly tools and secure platforms that respect privacy and ethical standards.

Of course, these steps should not be taken during the emergencies created by the epidemic, but as soon as possible.

While assessing the results and the risks faced by HEIs, it is important to note that, although Hungary has already embarked on the digitalization of higher education, problems remain on the institutional level that must be addressed (including accreditation, employment, salaries) and that the systems of promotions – continuing in use today – were all created before the challenges of digitalization. Still, the good news, is that there are quite a few areas of digitalization where Hungary is at the forefront (such as building digital administration systems for higher education). Through the Higher Education Information System (FIR), the Student Scholarship Tracking System, and the Graduate Career Tracking System (DPR), a large amount of comprehensive, valuable and systematic data is made available for expert evaluation. The use and possible provision of this data to the EU might offer many new opportunities to promote Hungary in the international higher educational arena. Hence, the key to success is systemic cooperation among all Hungarian and international stakeholders (DJP, 2020).

The Presidents of the European Commission and the European Council adopted a joint European roadmap for tackling the Covid-19 pandemic on 15 April 2020. This roadmap sets out their guidelines for the member states concerned to abolish the general emergency regulations as soon as possible once the pandemic situation improves and to return to the targeted government measures according to their constitutional requirements. Based on the higher education sector's exit strategy from Covid-19, the post-pandemic decisions seek to gradually restore education and institutional governance to pre-emergency levels; and to be consciously prepared to any future recurrences of a pandemic.

1.5 Digital competencies of higher education students

The pandemic has seen many young people (aged 16–24) forced to study online. The question then arises of whether they have possessed the digital competencies they need to learn effectively. While according to a 2019 European Union survey 80% of young people possess basic or higher levels of digital competencies, according to the sample, the Hungarian average was considerably lower (67%) (Eurostat, 2019). The situation is also very diverse within countries. Many low-income households do not have access to a computer. Depending on household income, access to broadband Internet also shows very different pictures for the EU as a whole and for Hungary (Eurostat 2019). The picture is further nuanced by the fact that, according to an OECD 2018 study (OECD, 2019), the economic 'scissor effect' is opening wider every year.

In some respects, the foundations of modern culture are being changed by the digital world (Lehmann 2017), which provides a more secure space for manoeuvring, especially for the younger generation. Digital culture lives mostly in the world (network) of info-communication tools, while other fields of the world have to keep pace with it as info-communication and digital tools appear in ever more places (e.g. language exam, industry, translation studies, computers, dictionary editing). The vitality of information technology and its role in shaping living and working conditions is now beyond question (Ala-Mutka, 2011).

Yet, it is also a fact that the social groups joining this info-communication space are not a homogeneous community, with social groups pushing the phone and exchanging messages on one end of the continuum (even at the extreme) to technocratic self-taught programmers at the other end. In terms of the use and

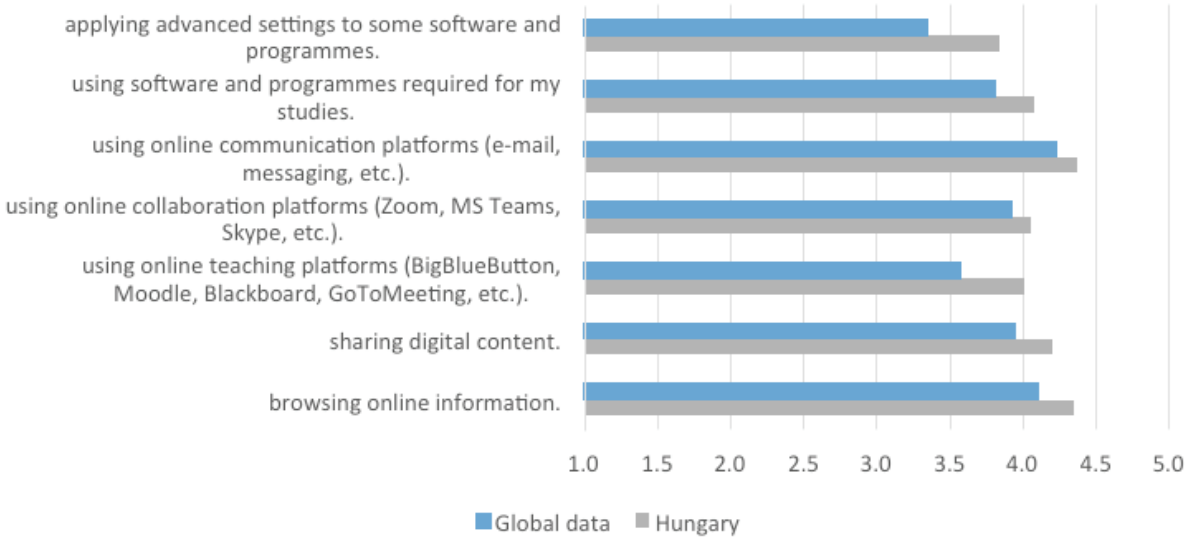
exploitation of devices, these groups are presumably quite different, but the spread of digital devices is now unstoppable (Pintér, 2019).

The technological development of the 21st century increasingly requires programming and software development skills to be part of general education. In Hungary, the laws regulating public education (Nefmi, 2016) emphasize knowledge regarding the acquisition, understanding, processing and use of information. The main objective of the government's concept is that, in addition to the IT professionals of the future, the everyday user should also obtain the knowledge expected to be needed by the professions of the future. While it is currently very difficult to identify the competencies that will be required by the labour market in the coming decades in a dynamically changing economic and social environment, the spread of info-communication technologies makes it clear that the use of devices which can be freely configured and programmed by the average user will be essential (Árgyilán, Kelemen, 2016). The starting point of the concept is that general user knowledge (word processing, spreadsheets, presentation, image editing etc.) should be implemented in an integrated way within all other subjects since the use of digital competencies will soon form a fundamental aspect of everyday work.

Based on the results of an international survey of the opinions of 30,383 higher education students (Aristovnik et al., 2020a), on a 5-point scale students rated their level of digital competencies as good in most of the measured dimensions. The Hungarian results of the research on the same dimensions are shown in the following graph.

As can be seen in the above figure, the study participants were comfortable with the level of their own

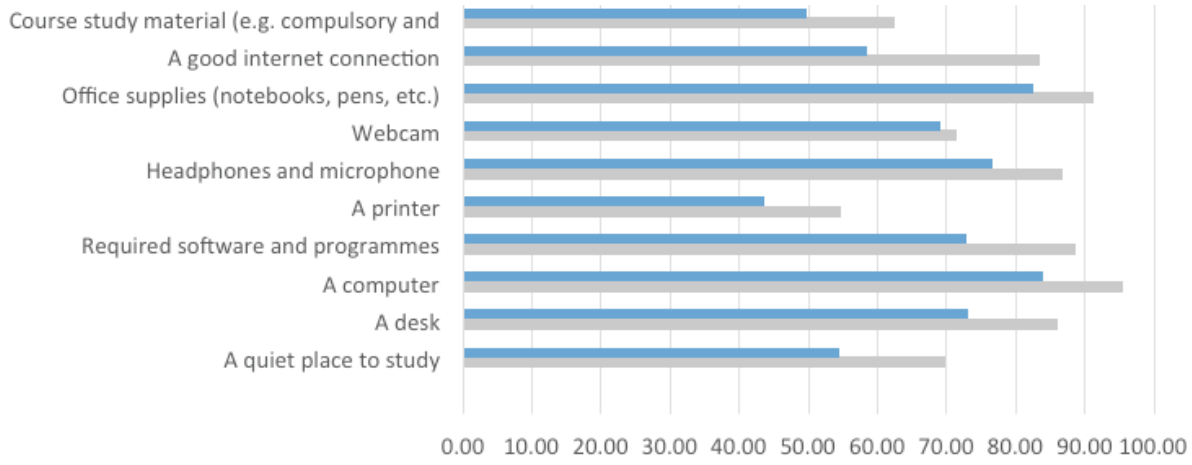
Graph 7: Level of satisfaction with one's own digital competencies – Hungarian and global data compared



Source: Own compilation on the basis of Aristovnik et al., 2020a

digital competencies. The Hungarian situation was also better than the global average in terms of access to infrastructure. The graph below shows the proportion of those who have frequent or permanent access to the listed elements of infrastructure in connection with their studies, as measured by a 5-point Likert scale of infrastructure access.

Graph 8: Proportion of those who often or always have access to the infrastructural conditions necessary for learning - Hungarian and global data compared



Source: Own compilation on the basis of Aristovnik et al., 2020a

Of course, this still does not allow complete reassurance as the data also show many higher education students in Hungary are still not provided with the basic infrastructural conditions they need to learn from home at all.

1.6 Recommendations for institutions and policymakers

To help repair the economic and social damage caused by the coronavirus pandemic, the European Commission, the European Parliament and EU leaders have agreed on a recovery plan to help Europe recover and lay the foundations for a modern and sustainable future. Improving the EU's competitiveness is based on future generations, their knowledge, and their ability to innovate. This explains why member states must seize every opportunity to ensure that young people graduating from their education systems hold up-to-date and competitive knowledge with which they can compete internationally.

The aim of the renewal of higher education is therefore to serve the needs of the regional labour market, the adaptation of the economic and social spheres to the digital expectations of the 21st century, and the increase in equal opportunities. By strengthening the practice-oriented nature of higher education and its adjustment to economic needs, the infrastructural, educational and operational modernization of Hungarian higher education is necessary in order to produce as many highly qualified workers as possible in line with labour market expectations. The pandemic has drawn attention to the need for development and renewal in many places.

It is necessary to create and develop an appropriate building infrastructure, with educational rooms and laboratories being created that can stand up to the digital challenges of the era. The pandemic has also drawn attention to the importance of areas related to a healthy lifestyle and health promotion, making developments improving the building infrastructure in support of higher education service activities especially important in connection with health-development and sports activities. During the pandemic, the 'social scissors effect' continued, students in underdeveloped regions did not have adequate digital infrastructure while the dormitories of HEIs were also not ready to deal with this sudden demand; hence the need to develop colleges and dormitories (construction, extension, conversion, modernization, renovation).

Although the digital switchover was smooth in the first wave compared to other countries, student and institutional feedback reveal the need to modernize the educational environment. There is an imminent need to create infrastructure that supports distance learning and open-source learning, as well as infrastructure

and tools for further training and teachers training along with the acquisition of tools for developing digital competence.

However, in addition to infrastructure and asset development, organizational and educational development actions are required. The distance learning introduced during the pandemic shows the institutional modernization of the higher education curriculum – its training structure, method and content – proved to have been timely. Its relevance of the labour market must be increased by incorporating economic needs into the training content (adapting higher education training courses' content, methods and modes of delivery to suit the needs of the economy).

The already mentioned OECD (2019) report draws attention to the need for innovation in education and training that fits the profile of HEIs, for which relevant key competencies – including digital skills and competencies – must be acquired by all stakeholders in higher education. It is necessary to encourage the acquisition of digital learning strategies and novel pedagogical methodologies, to expand services in support of digital learning, to provide skills and practice-oriented education, and to develop skills-based curricula.

All of these tasks cannot simply be performed on the institutional level as state and EU resources are also called for. Moreover, in addition to financial instruments, cooperation on the national and international levels and the exchange of relevant information are essential for both post-pandemic recovery plans and the creation of the new digital education.

To help with this, the EU can play a more active role by creating, identifying and sharing good practices, and assisting with their implementation; in supporting member states and the education and training sector with tools, frameworks, guidance, technical expertise and research, and by facilitating cooperation among all stakeholders.

The EU already recognizes these challenges and, in response, has initiated the establishment of a new European Digital Education Centre to link national and regional digital education initiatives and actors, support cross-sectoral cooperation and the exchange of digital learning contents, and address common standards with regard to interoperability, accessibility and quality assurance.

1.7 Conclusion

In line with the data presented in the study, we can say that Hungary may consider itself lucky based on the first experience of its HEIs during the 1st wave as the transition was relatively smooth, thanks to its HEIs' previous distance learning practices and the infrastructure and software framework conditions in place. However, the situation highlights the fact that neither teachers nor students currently possess a suitable level of digital competencies if they are to take full advantage of online education, and that the infrastructure needed for ensuring solutions to address the expectations that have arisen must be further developed on the institutional side. Methodological recommendations and teacher training must also undergo several changes in order to be able to better respond to the challenges of the 21st century.

The study presented data with respect to the first wave of the Covid pandemic in Hungary, the government's decisions made in connection with the epidemiological situation, with special regard to the regulations affecting the life of HEIs. We covered the institutional decisions and response strategies associated with the situation and their reception. The level of digital competencies of Hungarian students and lecturers in connection with the distance learning methods introduced during the pandemic was also described as was the infrastructural situation, which may fundamentally influence the issue of 'social scissors' through digital access.

In the study, we also presented data from two primary research studies on students 'digital competencies and their perceptions of the transition process, as well as showcased the findings of international literature on the institutional, national and European Union levels. The aim of our study was to show that while the situation in Hungary is relatively good due to the cooperation of stakeholders and the positive government interventions, several more steps are needed to ensure the level of digital education and students' digital competencies can move up to the level expected in the 21st century.

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HIGHER EDUCATION POLICIES FOR DEVELOPING DIGITAL SKILLS IN RESPONSE TO THE COVID-19 CRISIS: THE CASE OF ROMANIA

Florin Lazăr, George Valentin Roman

2.1 Introduction

The global health crisis brought on by the Covid-19 pandemic has not affected all social sectors with the same severity. The massive loss of regular jobs has been accompanied by the closure of schools and universities or vocational institutions, forcing 3 million Romanian children and almost half a million youth to solely rely on online education. Vulnerable children and young people with poor Internet connectivity and limited digital skills have been most impacted by the new restrictive measures, both at the beginning of the pandemic and in the following months. In addition, from a social and economic perspective, inside the country, according to the military, 1,000,000 employees have been sent into technical unemployment, benefiting from an allowance of 75% of their basic salary (Emergency Ordinance 32/2020), with over 200,000 having been laid off, which in turn led to a sudden social vulnerability, especially for families with children or students entirely supported by their family. Outside the country, most of the 2 million migrant Romanian workers lost their seasonal jobs, making it very difficult continue to supporting their families left at home.

Although the Romanian education system is thought to have improved in the past 20 years, inequality, the politicization of school leadership, and chronic underfunding have seen the low quality of education being maintained, especially in rural areas or impoverished small towns. This is reflected in the significant share (41%) of 15-year-old children who participated in the PISA evaluation (41%) in 2018 and were found to be functionally illiterate, lacking basic skills in reading, mathematics or science (level 1), while a very small minority (less than 3%) performed at the top 5 and 6 levels (OECD, 2018; Kitchen et al., 2017). A vast number of children (between 500,000 and 900,000), deprived of digital technology or learning in schools that lag behind in digitalization, have not participated in online classes during the pandemic (Save the Children Romania, 2020, 2021). This situation hampers the access of a large proportion of children and youth living in socio-economically disadvantaged communities to 21st-century skills and, consequently, limits their attainment of a higher education. The same international evaluation revealed great gaps between children; only one-third of the low-performing students affected by poverty expressed their intention to attend a university, compared to 9 out of 10 high-performing students (European Commission, 2020).

The national higher education in Romania is provided by 55 public civil and military universities and 38 private accredited universities attended by 448,964 students. The educational and administrative processes are based on a set of principles among which the principle of university autonomy lay at the core of the decision-making during the pandemic.

While the percentage of university graduates has grown significantly every year, the demand for university graduates in the labour market is not at all satisfied. The proportion of Romanian university graduates aged between 30 and 34 did not exceed 25.8% in 2019, a level below the country objective set by Romania in the Europe 2020 Strategy to increase the share of tertiary educational attainment in the population to 26.7%. This situation places Romania in last in the European Union, after Bulgaria (32.5%) and Hungary (33.4%), far from the European average of 40.3%, while the impact of investments made by other countries in the region has led to the attainment or surpassing of country objectives in Czechia, Slovakia, Slovenia and Poland (ECDPC, 2021).

The national education law requires that authorities to allocate a minimum of 1% of GDP to the research-development sector annually, with the commitment set in 2014 for 2020 to increase this figure to 3% of GDP. This goal has not been achieved since the law was adopted in 2011. On the contrary, budget allocations have continually fallen from 0.3% in 2010 to an all-time low of 0.14% of GDP in 2020 (European Commission, 2021; UEFISCDI, 2020; ANOSR, 2021).

At the beginning of 2021, the Romanian National Council of Rectors and the National Alliance of Student Organizations in Romania requested the granting of at least 1% of GDP, which would have entailed a double financial allocation from the state budget for higher education. However, the basic financing of university education stipulated by the 2021 draft law approved by the Romanian Government on 22 February in absolute numbers shrank by 3.62% compared to 2020 (Ministry of Finance, 2021). Eurostat figures for 2019 indicate a gap between the Central and Eastern European countries regarding the total public spending on higher education as a share of GDP. The highest public spending on higher education was seen in Slovenia (5.4% of GDP), followed by Czechia (4.9%) and Croatia (4.8%). Public spending was only 3.9% in Bulgaria and 3.6% in Romania – the lowest values compared to the European average of 4.7% (EUROSTAT, 2021).

2.2 The Covid-19 situation in Romania in 2020

On the 25th of February 2021, almost 1 year after the World Health Organization's (WHO, 2020) declaration of the ongoing Covid-19 pandemic on the 11th of March 2020, the number of victims around the world exceeded 112.3 million cases and 2.48 million deaths, of which the European Union accounted for 531,869 (ECDPC, 2021). In Romania, out of 20 million tests, 795,732 cases and 20,233 deaths were recorded throughout the entire period after the first case of community transmission was confirmed on the 26th of February 2020 (GCS, 2021).

The pandemic's evolution in the first 5 months in Romania indicates an infection growth curve similar to that of other Central European and Eastern European countries (Bulgaria, Hungary, Serbia, Ukraine, Croatia, Slovenia, Slovakia, Moldova, Czechia, North Macedonia, Bosnia and Herzegovina, Montenegro), with an average of 15 confirmed cases per million per day, significantly lower than that seen in Western Europe, where the average incidence for the same period was up to five times higher (Italy, Spain, France, Great Britain). This was enabled by the earlier implementation of the lockdown in most countries of this region, following the frightening news of the situation in Italy, where the number of infected people and the death rate were rising significantly one day to the next.

With the second wave of Covid-19 beginning in October, the statistical configuration of the accumulated confirmed cases in Eastern and European countries changed drastically, placing countries like Slovenia, Czechia or Montenegro in the worst situation relative to their population, not only among European countries, but also worldwide, thus far registering some of the highest numbers of cases and deaths per

million (90,000–110,000 cases and, respectively, 1,800 deaths) compared to Romania, which reached 40,000 cases and 10,040 cases per million. Two main arguments were given for this turn of events: first, the authorities' reluctance to reintroduce the same restrictive measures in September, determined by the lack of support from the population which did not receive financial assistance during the first-wave lockdown; and, second, the underestimation of the threat of the new pandemic spread announced by the experts and international institutions, a broad attitude generated by the 'success' in containing the pandemic's first wave.

As for the vaccination campaigns, in 2021, the Covid-19 vaccine doses administered thus far per 100 people, counted as a single dose, are higher in Romania (around 7 doses per 100 people), as well as in Hungary, Slovenia and Slovakia, than in the European Union (6 doses per 100 people), with a remarkable situation observable in Serbia, which has registered almost 14 doses per 100 population (Our World in Data, 2021).

Following the outbreak at the start of last year, the Romanian authorities declared a state of emergency in March 2020 and imposed a lockdown, which brought drastic changes to the social and economic life. In May, the country entered a state of alert, which continues today. Many institutions and business units were closed and educational activities were moved from face-to-face to online, with a brief exception for the pre-university education system early in the 2020–2021 school year.

While the Ministry of Education has set out specific guidelines for the pre-university system that stipulate three functioning scenarios (green – physical attendance, yellow – online and physical attendance, red – online attendance only), in the 2020–2021 university year, the authorities have decided that the educational activities will be carried out as established by the universities' Senates, based on the universities' autonomy, by taking into account of the epidemiological situation, the peculiarities of the educational activities, and the European regulations regarding the minimum number of practical classes.

For the second semester of the school year, the Joint Order of the Ministry of Education and Research and of the Ministry of Health (MOR, 2021) states that the physical presence of all students is mandatory within early childhood education, and primary, secondary and high-school education. This Order also confers the same autonomy to HEIs in adopting one of the three scenarios described in the law – the physical presence of all students, a mixed system, or online attendance only – considering the epidemiological situation, the infrastructure, the resources and the peculiarities of the curriculums.

2.3 Higher education in Romania during the Covid-19 pandemic

Within the Bologna Process, the Romanian government set out to elaborate a national public policy framework for developing university education. This was materialized through the National Strategy for Tertiary Education 2015–2020, which did not include any specific measure for the digitalization of tertiary education or for the development of the digital skills and competencies of the actors within the system – the teachers and students. The lack of clear objectives for accelerating the digitalization process and the resulting precarious digital education infrastructure have put the Romanian university system in a vulnerable situation during the pandemic (ANOSR, 2020). This situation has led to the difficult and unequal adaptation to the online teaching system.

The difficulties encountered by students and teachers in their efforts to adapt the curriculum content to the new online teaching context have forced the authorities to admit the precarious situation of the entire education system (pre-university and tertiary) and to initiate a national consultation process (December 2020 – February 2021) with regard to the SMART-Edu 2021–2027 Strategy for the Digitalization of Education in Romania (MEC, 2021). This strategy may be seen as a transposition of the new European Skills Agenda for sustainable competitiveness, social fairness, and resilience to Romania's social and educational conditions.

In this context, the Covid-19 pandemic has forced the university system to find a quick social connection solution based on the universities' recommendations or the choices made by teachers after consulting with students, depending upon the digital competencies and immediate access to adequate technology. The collaborative platforms and their video-conferencing applications (Zoom, Skype, Moodle, Microsoft Teams, Google Meet, Webex, GitHub and, on a small scale, Blackboard Collaborate), as well as the social network platforms (like Facebook, Google Docs, Hangouts and Classroom, YouTube, WhatsApp), were promptly adopted as universal eLearning platforms, despite not being entirely suitable for the pedagogical needs of various disciplines or for periodical examinations. In the early months of the pandemic, universities were more open to the use of different platforms for continued online education. Since the end of March 2020, monthly activity reports have been requested from teaching staff and, in some cases, also evidence of interaction with students. Since the start of the new academic year in October 2020, the regulations have enacted synchronous education, imposed by the government level based on the specific timetable of each study group. Whilst training courses focused on the use of different online learning platforms were carried out in some big universities, these courses were first aimed at the teaching staff and only to some extent at the students.

According to a research study conducted immediately after the lockdown was declared (April and May 2020), most Romanian students (70%) included in the study group from the country's main university centres (Bucharest, Iași and Cluj) expressed being satisfied with the online learning platforms provided by the universities, given that nine out of ten students declared themselves experienced with web-based courses, while eight in ten possessed the necessary resources (Maier, Alexa and Crăciunescu, 2020). A similar level of access to adequate technical means was confirmed in another study for the vast majority of students (and teachers) from Bucharest University, who said they had a high-quality laptop, a mobile phone and an Internet connection (UNIBUC, 2020).

However, not all students from Romania managed to quickly adapt to the online education, with their past eLearning experience being somewhat limited. This constraint has led to considerable difficulties in attendance and in understanding the information content. In a smaller Romanian university located in a mining area affected by unemployment and poverty (Petroșani University), 86% of respondents declared they had participated in online courses between March and May 2020, considering that WhatsApp is an eLearning tool and, for 40% of them, the smartphone was the preferred device, despite its obvious limitations in allowing students to actively engage in rich and engaging communication with their teachers and colleagues. In fact, the students' involvement proved to be much smaller. Out of a total of 5–7 disciplines, the average of the online courses for which a video-conferencing system had been used was about 25% (only 1.78 courses) (Edelhauser & Lupu-Dima, 2020).

Actually, this situation was reflected in another 16 university towns in Romania, where half or less than half of courses were held in a synchronous online system. Over one-quarter of the overall number of students stated they had attended classes using a mobile phone. The online communication problems most often encountered consisted of Internet connection interruptions (55%), followed by technical problems related to the device used to communicate and the lack of digital skills needed to use the platforms or to solve connectivity-related technical issues. These aspects resulted in a reduced level of focused attention (62%) and in a superficial understanding of the subjects taught or of the materials transmitted (54%). Most students were dissatisfied with the quality of the classes, compared to face-to-face learning. At the same time, because of the lack of face-to-face interaction and the artificial configuration of the online classes, which were methodologically anchored in offline teaching practices, the student–teacher communication became, according to almost half the students, more deficient or much more deficient than before. Only onequarter of students consider it to be better or much better. As a result, online classes are negatively rated by most students (59%), while a minority are very pleased with their quality (Lup & Mitrea, 2020). It turns out that during the Covid-19 pandemic, when teachers in Geography used three instruction models based on photographs, either synchronous or asynchronous, three factors influenced the efficiency of the teaching and the students' satisfaction: the models' adequacy for specific contents of the disciplines,

the teachers' competencies for the selected content, and the success of the didactic transposition of the "scientific knowledge into knowledge to be learnt" (Dulamă, Ilovan, 2020). From the students' perspective, the barriers to online education during the first wave of the Covid-19 pandemic (April 2020) are manifold (Molea & Năstasă, 2020) and include: use of the web camera, the sound quality, poor technical and digital skills, and the lack of some teachers' online activities.

Considered as having an unprecedented and long-lasting impact on mental health, the Covid-19 pandemic has led to a greater risk of developing mental health problems, especially symptoms of anxiety, depression, posttraumatic stress disorder, psychological distress and stress reported in the general population (Xiong, 2020) or the intensification of less severe or chronic pre-existing mental health disorders (Pan, Kok, Eikelenboom, 2021). Moreover, the physical distancing guidelines, the social isolation, and the significant decrease in peer support have created difficulties for students while coping with shifting their entire student life and their academic development plan to the online world. At the same time, most students missed the face-to-face interactions with their colleagues and teachers and felt a need for support groups. Half of them indicated being worried about the future and having felt bored during the pandemic (UNIBUC, 2020).

2.4 Digital skills and competencies for the digital transformation during Covid-19

Access to the Internet in Romania is lower than in most other EU countries (with 84% of all households vs. 90% on the EU level), but children and young adults are Internet and social media users (Tsitsika, et al., 2014). According to Eurostat, in 2019, Romanian youngsters aged between 16–24 years came in last in basic or above basic overall higher digital skills (56%), compared to the European average, which shows that 4 out of 5 youngsters (80%) hold such digital competency levels. This is a composite indicator about Internet activities performed in four specific areas (information, communication, problem-solving, software) (EUROSTAT, 2019).

The overall picture shows differences/inequalities between different groups of youth, based on area of residence (less access in rural areas compared to urban ones), family socio-economic situation or infrastructure. The uneven access to technology – the 'digital divide' – existed prior to the accelerated adoption of online communication caused by the Covid-19 pandemic and has been further extended. The gap between digital natives and youth coming from disadvantaged backgrounds is expected to have expanded in the past year since the start of online education.

Moreover, one in two teachers does not use or barely uses digital technologies in the teaching process and, when they state they possess digital competencies, they usually mean they can install a video projector and connect it to a laptop (Syene, 2018).

Technological literacy is also unequally distributed among the students. In this context, the success of the sudden shifting of education from the face-to-face traditional style to online depends on the digital skills and competencies of both students and teachers, as well as the infrastructure in place to facilitate or hamper the e-learning process.

The aims of this paper is to describe how students adapted to the online education during the first wave of the Covid-19 pandemic, their level of satisfaction with the e-learning process, and how satisfied they are with their own performances and computer skills.

2.4.1 Methods and sample

A cross-sectional online survey was conducted between May 15–June 15, 2020 among university students from various universities in Romania as part of the larger study of more than 30,000 students around the world - "Impacts of the Covid-19 pandemic on the life of higher education students" (Aristovnik et al.,

2020). After data cleaning, the final sample includes 933 students from Romania distributed across 22 universities (8 universities with at least 20 responses). The sample is not representative of all universities in Romania or all areas of study.

The biggest proportion of students who responded come from the University of Bucharest (about 48%), followed by the Carol Davila University of Medicine and Pharmacy of Bucharest (20%), the Polytechnic University of Bucharest (8.1%), the Polytechnic University of Timișoara (6.8%), Craiova University (4.1%), Bucharest University of Economic Studies (3.5%), Alexandru Ioan Cuza University of Iași (2.4%) and the University of Agriculture and Veterinary Medicine of Bucharest (2.4%).

The study participants' average age in years is 25.5 (min. 19, max. 52, SD=6.572), with more than three-quarters being women. Only 2.3% of the respondents are part-time students and 83% are undergraduate students, whilst 16.2% are master's students. The highest share of students are in the Social Sciences (47.7%), followed by the Applied Sciences (29.7%), Natural and Life Sciences (17.3%) and Arts and Humanities (5.3%).

Table 1: Study sample characteristics

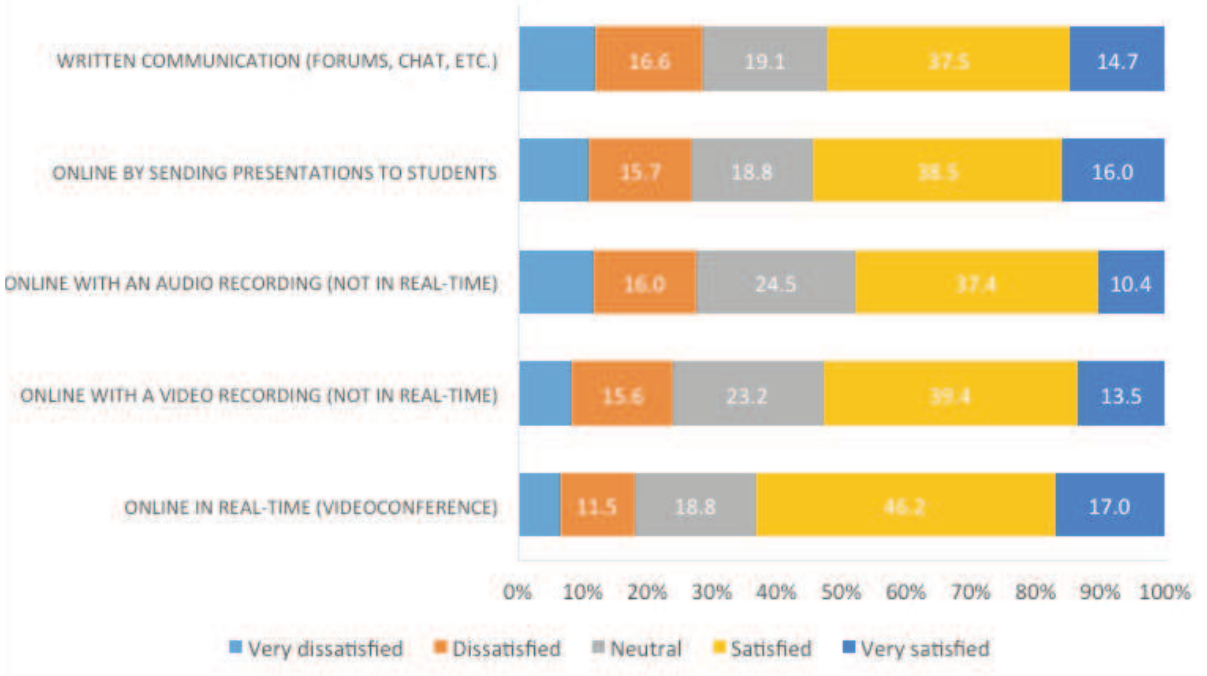
Variable	Attributes	N	%
Gender	Male	195	21.0
	Female	731	78.6
	Gender diverse	3	0.3
	I prefer not to say	1	0.1
Student status	Full-time	907	97.7
	Part-time	21	2.3
Level of study	Bachelor's degree	770	83.0
	Master's degree	150	16.2
	Doctoral degree	8	0.9
Main field of study	Arts and Humanities	49	5.3
	Social Sciences	440	47.7
	Applied Sciences	274	29.7
	Natural and Life Sciences	160	17.3

Source: Author's calculation based on valid responses

2.4.2 Results

The Romanian students included in the study sample are generally satisfied with the different forms adopted by the lecturers to carry out the education process after the on-site classes had been closed (Graph 1), around 50% to 63% being satisfied or very satisfied with the new forms of education. Students are the least satisfied when lecturers provided audio-recordings of their lectures (not in real time), which was rarely (1%) the preferred mode of interaction (see Graph 2 below) and when they received presentations (reported as the dominant way of interaction by 13% of students). Students preferred online video interactions either in real time or with video recordings.

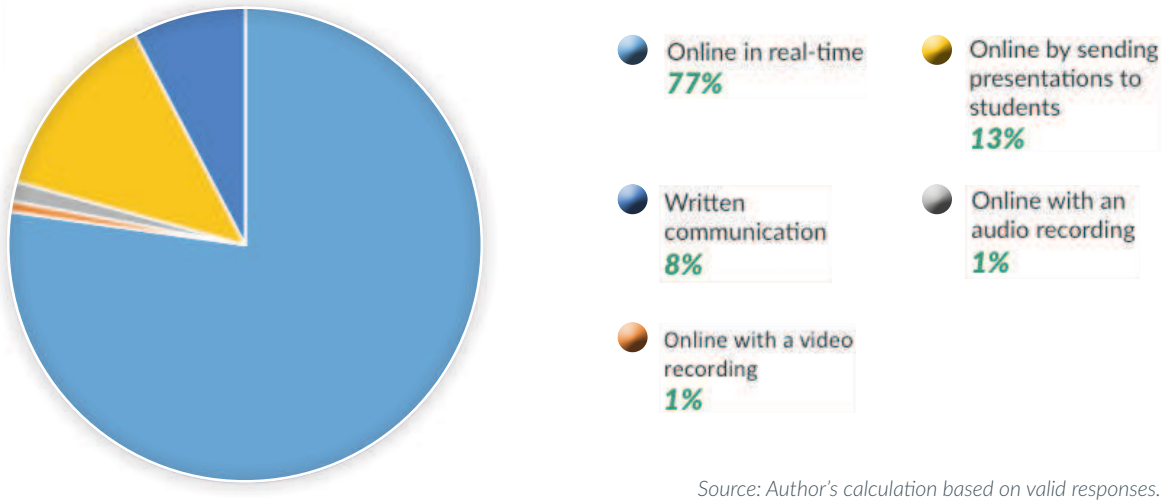
Graph 1: Level of satisfaction with different forms of lectures carried out-Romania



Source: Author's calculation based on valid responses.

The dominant form of lectures was online in real time (77%), followed by online by sending presentations to students. Only 8% reported that written communication was dominant and 1% video or audio recordings. This situation may be explained by the requirements of the universities and of the Ministry of Education for teachers to carry out lectures in a real-time format, accompanied by monthly reports of the teaching activities, provided as proof for their salaries to be paid. Previous studies show the positive role of using video-recorded presentations, especially when they are interactive (Hung & Chen, 2018).

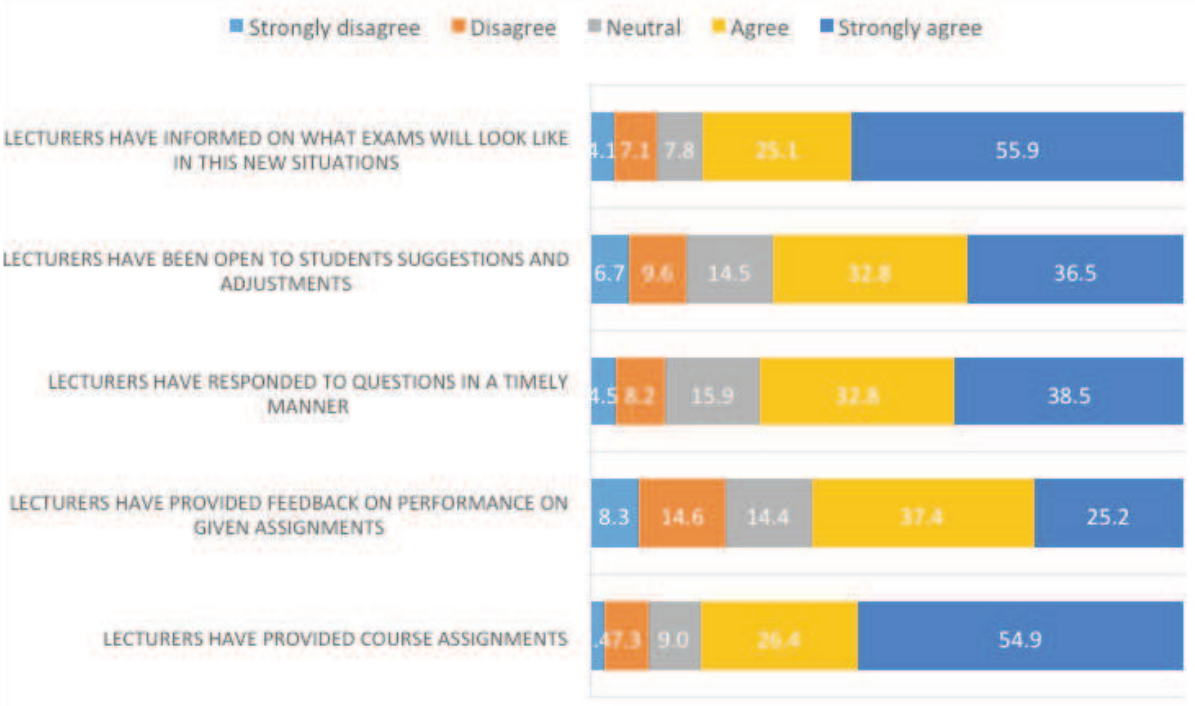
Graph 2: Most dominant form of lectures



Source: Author's calculation based on valid responses.

Regarding the types and quality of student interactions with their teachers/lecturers (Graph 3), between 62.6% and 81.3% disclosed they had received detailed information from lecturers about their exams and assignments, but fewer teachers had offered feedback to students (62.6%) or been open to students' suggestions and adjustments (69.3%). Seven out of ten students agreed or strongly agreed that their lecturers had responded to their questions in a timely manner. The quality of these interactions plays an important role in the students' adjustment to the new online environment and can facilitate their learning experience (Sun, 2018).

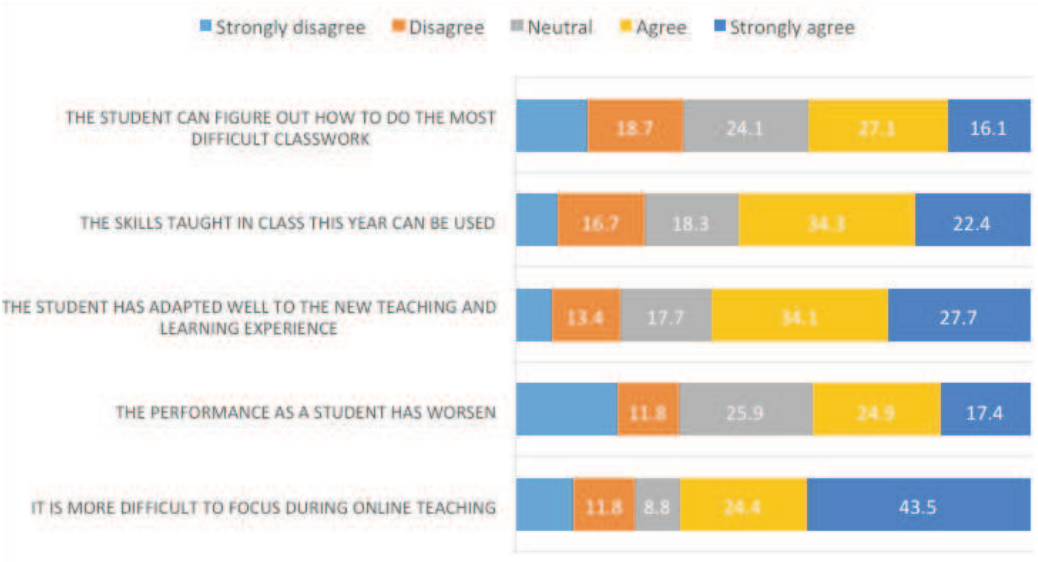
Graph 3: Types and quality of interactions between students and lecturers



Source: Author's calculation based on valid responses.

Students' perception of their skills and performances during the online teaching is positive for the majority of respondents included in our survey (Graph 4). However, nuances are to be taken into consideration, since the balance between positive and negative perspectives is only slightly positive when referring to students' confidence that they can perform the most difficult classwork (43.1% positive vs. 32.7% negative). Although most students find it more difficult to focus during online teaching (67.9%) and tend to perceive that their academic performance has worsened (42.3% agree with this statement vs. 31.7% who disagree), the majority of them (56.7%) consider that the skills taught this year can be used and they have adapted well to the new teaching and learning experience (61.8% agree with this statement).

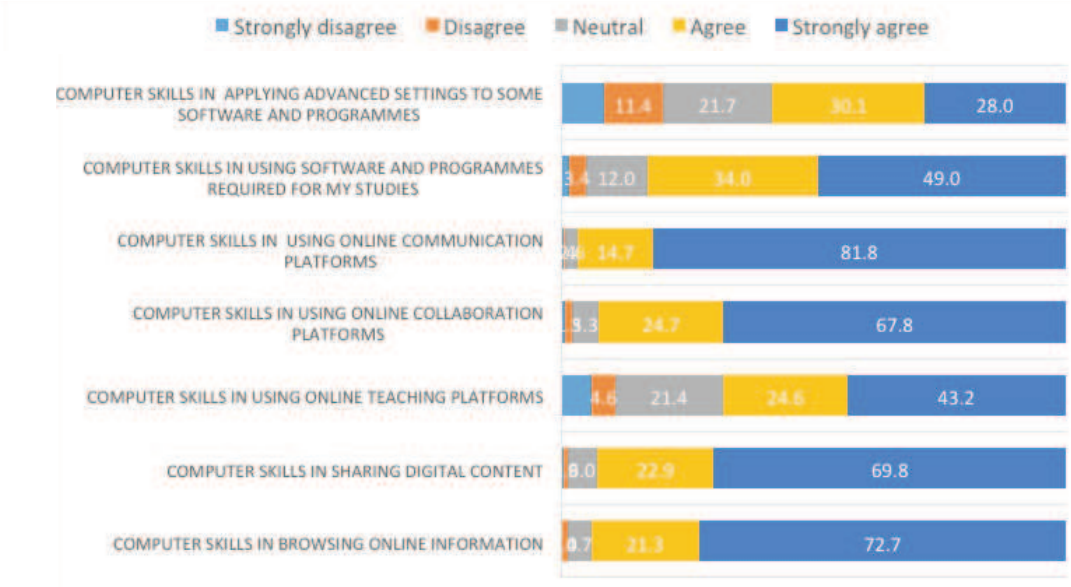
Graph 4: Students' satisfaction with own skills and performance



Source: Authors calculation based on valid responses.

While examining the students' perceived computer skills in greater detail (Graph 5), it appears that almost all the students consider themselves to be knowledgeable with respect to browsing online (94%), sharing digital contents (92.7%) and using various platforms for communication (96.5%) and collaboration (92.5), but less confident in using teaching platforms (67.8%), the software and programs required for their studies (74%) or applying advanced settings to software and programs (58.1%). This situation suggests that specific digital skills must still be built in order to be familiar with various platforms and software which can be used in e-learning.

Graph 5: Students' perceived computer skills



Source: Authors calculation based on valid responses.

2.5 Policy Recommendations

The SMART-Edu 2021–2027 Strategy warns that "this Covid-19 crisis marks a point from which there is no return to the previous situation regarding the use of technology in education and training" and summed up the challenges faced in 2020 by the education system: the lack of predictability, the heterogeneous school network, with a big gap between school units; insufficient digital competencies for efficiently organizing the online teaching process; poor access to technology and poor Internet connectivity; families' limited possibilities to support their children in attending online classes. This general failure to provide a better and safer digital environment for learning has led to the setting up of two priority axes (I. Digital competencies relevant to the digital transformation, II. High performance digital ecosystem for education and training) and to establishing eight ambitious actions: developing the digital competencies of pupils and students, a school curriculum for emerging jobs, lifelong digital learning, initial and continuous digital training of teachers, digital infrastructure and technological resources, connectivity, the creation of Open Educational Resources and cybersecurity, data protection, online safety and IT ethics.

The success of this strategy will depend on the existence of a broadband connection at the national level, including in all villages, and on the extent to which each family or individual will be able to afford access to the Internet. Presently, in seven countries (Estonia, Finland, France, Spain, Greece, Costa Rica, India) regulations are in place to guarantee access to the Internet as a fundamental human right, which allows everyone to equitably participate in the 21st-century information society and is indispensable in ensuring all other human rights. To meet the new strategy's above-mentioned objectives by intensifying the digitalization of all of society, Romania needs to consider adopting the necessary legal norms and policies aimed at establishing the right of Internet access.

The year of the pandemic has caused profound changes in educational routines through the sudden transition and adaptation to online teaching and it is becoming increasingly likely that education will gain a substantial online dimension, irrespective of whether the pandemic is efficiently controlled through vaccination and other infection-prevention measures or not. Thus, the European institutions and the national authorities are responsible for eliminating, via strategies and consistent programmes, the gaps already produced by connecting children and youth to a quality and inclusive online education. They are also responsible for preventing the subsequent intra-societal disparities created by the unequal access to the new digital culture.

Moreover, in order for the positive projection of a mix of offline education and online education to materialize, amplifying the advantages and limiting the shortcomings, teachers and students reiterated the need to rethink the entire system of educational and non-educational offers for students through an elaborate adaptation to the various interactive pedagogical programmes and information content of the university disciplines.

Here are the measures the Romanian students considered to be essential, as put forward by their representatives:

- creating and consolidating a high-quality digital education infrastructure and eliminating the barriers that prevent students and teachers from using modern technologies;
- prioritizing the development of the universities' organizing capacity in supporting the online or hybrid education, purchasing software and licences for students and teachers, integrating open educational resources and constantly consulting with students;
- supporting programmes for students and teachers to improve digital education practices and related services, including through the use of continuous training opportunities and by setting up online libraries;
- since the transfer of education activities to the online environment is not a mere transition from one context to another, it is vital to adapt the content of each discipline to the online digital tools;

- providing psychological support to affected students by increasing the number of counsellors or psychologists within the Counselling and Career Guidance Centres and creating a free hotline for students and teachers, so that they benefit from remote psychological support; and
- creating a digital learning environment by using high-quality digital resources, own e-learning platforms and by encouraging and building the students' learning autonomy (ANOSR, 2020).

The epidemiological uncertainty and the revealed fragilities and precarities of the social, economic and education systems require the development by decision-makers of a multisectoral post-Covid-19 preparedness plan at the earliest opportunity. It was argued that any post-pandemic strategy should start from the analysis and transformations of three areas that were overtly disputed: the process through which scientific data is integrated into evidence-based policies, the drawbacks of conventional economic growth, and the alterability or resilience of the citizen-state relationship when confronted with a prolonged worldwide health crisis (Leach, et al., 2021). Within this whole-of-society conversion, a fourth area to be considered as a priority is education, seen as a foundational social institution which brings benefits to society, technological advances for sustainable economic growth, improved upward feedback and a better relationship between people and representatives holding decision-making power. **A performant and flexible learning process in higher education entails understanding the future challenges in terms of equity, inclusion, individual/interactive learning and offline-online convergence, as well as in terms of the financing and implementation of relevant and adaptive educational programmes.**

2.6 Conclusion

The Covid-19 pandemic has created unprecedented disruptions on all levels of society, as well as at the individual level, which can and must be treated as an opportunity for change. The approach to the education system in Romania was quite paternalistic, in an attempt to protect children and youth, but also by taking the constraints of the health and education institutions into consideration. The speed of the digital transformation in the Romanian society and in the education system will have to be adapted to the inequities and inequalities still present. Education policies alone are insufficient and cannot compensate for the digital and social divide. They need to be complemented by measures in other areas (i.e. infrastructure), which could create the premises for another type of social development.

The Covid-19 pandemic must be seen by Romanian decision-makers as a critical starting point for embedding sustainability and redrawing (technologically and financially) the strategic approaches applied hitherto for pre-university and tertiary education. Moreover, in its Communication for the Digital Education Action Plan 2021–2027, the European Commission urges the member states to adjust their education accordingly, by calling the process "Resetting education and training for the digital age" (European Commission COM/2020/624, 2020). In this respect, the European institutions play a fundamental role in ensuring a high-quality, inclusive and accessible digital education ecosystem for children and youth. In the future, the entire education system should contain efficacious pathways to consider children and young people's agency and their representative structures as key partners in the digital transformation of the educational environment and practices.

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DIGITAL SKILLS, SELF-EFFICACY AND EMOTIONS: IMPACT OF COVID-19 ON ITALIAN UNIVERSITY STUDENTS

Daniela Raccanello, Giada Vicentini, Roberto Burro

3.1 Introduction

The impact of the Covid-19 pandemic covers a wide range of negative consequences in the different life domains of individuals, including university students. An increasing amount of literature is paying attention to their reactions and how they are coping with the challenges brought by the pandemic. Among such challenges, great relevance is held by their abilities to use digital instruments, abilities which were already key to learning in the 21st century even before the outbreak of the pandemic.

In a historical period in which traditional learning has been abruptly forced to be transformed into e-learning and to rely on digital skills, we explored the antecedents of emotions pertaining to e-learning, focusing on the role of self-efficacy and worries due to students' changed life circumstances. The relevance of this research is twofold. Beyond extending the current literature on understanding of the short-term consequences of Covid-19 on university students concentrating on psychological processes related to their digital skills, it holds several applied implications. The findings can underpin suggestions for evidence-based policy recommendations to support stakeholders on the European, national and local levels, whose actions can include practices to improve emotions pertaining to e-learning, also focusing on related beliefs concerning digital skills such as self-efficacy, on students' worries, and on the corresponding sources. These actions can have a long-term impact on the life of students, whose current worries entail a variety of aspects also centred on their future.

3.2 The Covid-19 situation and higher education in 2020: Impact on European and Italian students' life circumstances

The Covid-19 pandemic is having a wide range of negative consequences in several areas of people's lives, concerning health, education and social relationships among many. From the outbreak of the pandemic until the end of June 2020, in Europe over 2,690,900 people were reported infected; of these, more than 195,400 people died (WHO, 2020). In Italy, the first two cases of Covid-19 were declared at the end of January 2020 (Raccanello et al., 2020b). The earliest measures pertaining to the lockdown were

introduced at the end of February 2020, involving the whole of Italy at the start of March 2020. Since then, a sequence of ordinances and decrees introduced measures to limit the spread of the virus, resulting in serious constraints on people's freedom, including increases in social distancing. The first restrictions began to be loosened in early May 2020. By the end of June 2020, over 240,500 infected people had been reported; of these, more than 34,700 people had died (Dong et al., 2020).

Education systems have also been strongly impacted. A worldwide survey involving more than 424 universities and HEIs during March and April 2020 (Marinoni et al., 2020) revealed that in Europe 55% of them had closed. However, most European universities and HEIs (85%) were able to rapidly replace the on-site classes with on-line courses, with only a very small share of the courses (3%) having to be cancelled. Moreover, most institutions (97%) in European countries had efficient infrastructures enabling communication with students. Finally, most of such institutions declared that they had been consulted (69%) and supported (53%) by public or government officials concerning Covid-19-related challenges. In Italy, most universities were closed after the end of February 2020 and, in many cases, they quickly activated online courses (Raccanello et al., 2020b).

Beyond the pandemic's threats to physical health, a growing number of studies is also documenting its traumatic impact on psychological health. Some studies report an increase in psychopathological symptoms for university students during periods of lockdown and/or quarantine, including anxiety, depression, post-traumatic stress disorder, and stress in both European and non-European countries like China, France, Israeli, Spain, Switzerland, and the United States (Cao et al., 2020; Elmer et al., 2020; Husky et al., 2020; Odriozola-González et al., 2020; Son et al., 2020; Tang et al., 2020). Other researchers have described decreases in their quality of life and increases in levels of fear, involving for example samples of Cypriot, Israeli and Swiss university students (Elmer et al., 2020; Panayiotou et al., 2020; Zolotov et al., 2020). Certain findings suggest that a negative perception of online learning behaviour, the 'e-learning crack-up', is positively linked to students' psychological distress (Hasan & Bao, 2020). After the pandemic started, students' social relationships were also negatively impacted, mainly due to the measures to contain the virus, which entail social distancing. For example, interactions and co-studying networks became sparser, with many students studying alone; in line with this, the perception of being lonely increased (Elmer et al., 2020, for Swiss students). Not having the possibility to relocate with one's family was also associated in high proportions with symptoms of poor mental health (Husky et al., 2020, for French students).

Despite the high number of researchers documenting these changes, there is still a paucity of studies exploring which life domains are more impacted in terms of the perspective of university students, which can also differ according to the level of instruction, area of study, or gender. It is also worth studying whether such concerns are linked to how the students feel in relation to the e-learning due to Covid-19, the 'achievement emotions'.

3.3 Digital skills and competencies for the digital transformation during Covid-19

3.3.1 State-of-the-art regarding digital skills, self-efficacy, and achievement emotions

Digital skills are crucial abilities enabling one to cope with the challenges of e-learning education. Their relevance has rapidly and considerably risen due to the changes which characterize education systems during the pandemic. Increasing the understanding of the psychological processes related to digital skills is a key priority to better sustain their development among students. Focusing on motivational constructs like self-efficacy and emotional constructs such as achievement emotions can play an important role in extending such knowledge.

Digital skills and competencies. Notwithstanding differences in meaning, the concept of digital skills has often been used as a synonym for others like digital competence (Iordache et al., 2017; Martin & Grudziecki, 2006).

However, skills are more characterized by technical, practical and measurable aspects than competence (Iordache et al., 2017; Martin & Madigan, 2006; van Deursen, 2010). The following definition is provided by an OECD project (2005, p. 4), "A competency is more than just knowledge and skills. It involves the ability to meet complex demands, by drawing on and mobilizing psychosocial resources (including skills and attitudes) in a particular context". At the European level, digital competence is a key competency that must be developed for lifelong learning. It "involves the confident, critical and responsible use of, and engagement with, digital technologies for learning, at work, and for participation in society" (Council of the European Union, 2018, p. 9). Within this framework, digital skills relevant for the development of digital competence comprise "the ability to use, access, filter, evaluate, create, program and share digital content" (Council of the European Union, 2018, p. 10). We can also distinguish different digital skill types. For example, van Deursen (2010) classified Internet skills in six categories, i.e. operational, formal, information, strategic, communication, and content-creation skills. Focusing on digital skills relevant for 21st-century working professionals, van Laar et al. (2017) included technical skills, information-management, communication, collaboration, creativity, critical thinking, and problem-solving. To sum up, there is currently no broadly accepted consensus on the definition of digital skills. Yet, they are strictly related to digital competence, which considers them together with the socio-emotional aspects needed for utilizing and comprehending digital devices (Ilomäki et al., 2016).

Self-efficacy related to digital skills. Self-efficacy refers to an individual's belief in being able to successfully complete a task (Bandura, 1997). It is positively associated with a good performance in a variety of learning contexts (Schunk & DiBenedetto, 2016). It affects learning, motivation, self-regulation and achievement; in particular, it positively influences students' choices of activities, effort, persistence and interest. Schunk (Schunk & Pajares, 2009; Schunk & Usher, 2012) refers to the calibration concept which underlies the importance of how well self-efficacy is related to actual performance. Self-efficacy which slightly exceeds one's capabilities is adaptive given that it fosters motivation; still, the excessive overestimation or underestimation of one's abilities can bring detrimental effects (Bandura, 1997). The former can frequently turn into failure, which undermines motivation and learning. The latter tends to avoid tasks, negatively affecting the development of skills. According to Bandura (1997), self-efficacy has four main sources: real performance, vicarious/observational experience, social persuasion such as positive feedback and praise, and physiological indexes and emotional reactions like anxiety and stress.

Students develop self-efficacy beliefs also with regard to their digital skills. Some authors distinguish e-learning self-efficacy from computer self-efficacy (Compeau & Higgins, 1995; Sharma et al., 2007). The former concerns the confidence in students' capabilities to learn with e-learning, while the latter refers to the confidence in one's capabilities to use computers. E-learning self-efficacy but not computer self-efficacy seems to be associated with an increase in perceived e-learning performance (Sharma et al., 2007). We can nevertheless speculate that computer self-efficacy could be at the basis of the development of e-learning self-efficacy given that knowledge of computer functioning is essential for success in e-learning tasks and environments.

Achievement emotions related to digital skills. Achievement emotions are extremely relevant to students' learning and well-being. According to the control-value theory (Pekrun, 2006, 2018; Pekrun & Perry, 2014), these are the emotions students feel in relation to their learning activities or outcomes. They can be described by considering at least two underlying dimensions, i.e. valence and activation. Control appraisals, such as perceived control, self-efficacy or self-concept, are the core determinants of achievement emotions beyond beliefs in the value of a task. Control appraisals refer to a learner's perceived causal influence over one's actions and outcomes. Achievement emotions, in turn, influence academic performance: Positive activating emotions (e.g. joy, hope, pride) are positively related to performance, while negative deactivating emotions (e.g. hopelessness, boredom) are usually negatively related. The pattern is more complex for positive deactivating emotions (e.g. relief) and negative activating emotions (e.g. frustration, anger, anxiety, shame). However, it seems that, overall, positive emotions are positively linked with performance, while negative emotions are negatively linked with performance (Pekrun et al., 2017). A recent meta-analysis

examines how achievement emotions have been studied in technology-based learning environments (Loderer et al., 2020). The authors looked at 186 studies published between 1965 and 2018 which assessed emotions like enjoyment, curiosity/interest, anxiety, anger/frustration, confusion or boredom. The findings reveal that the functional relations postulated by the theory – i.e. between appraisals and achievement emotions, and between achievement emotions and achievement – were stable across contexts. Still, the mean levels of achievement emotions varied according to the characteristics of the different environments. To promote students' learning and well-being, it is relevant to determine whether, also for e-learning due to the Covid-19 pandemic, students' beliefs about control are key predictors of their achievement emotions, and to explore how they vary according to factors such as level of instruction, area of study, or gender.

3.3.2 The case of Italian students: A study using the Global Student Survey data

This study forms part of a larger project promoted by the University of Ljubljana in Slovenia which involved more than 30,300 students from 62 countries (45% of the respondents were European). The students participated in an online survey between May and June 2020.

In this study, we sought to increase understanding of the short-term consequences of Covid-19 for university students, specifically referring to their digital skills, to provide evidence-based policy recommendations to support stakeholders. We addressed two research questions while focusing on a sample of Italian university students who had to attend e-learning courses due to the first wave of the pandemic in 2020. In this situation, digital skills took on a key role for all the courses they attended independently of their level of instruction (bachelor, master's, PhD) or area of study (Social Sciences, Applied Sciences, Natural and Life Sciences, and Arts and Humanities). For all of them, the on-site classes (i.e. those classes which typically take place at the location/campus of their institution) had been cancelled because of the Covid-19 pandemic.

Research question 1 (RQ1). Were the students' beliefs about control over their digital skills (i.e. e-learning self-efficacy, computer self-efficacy) and their general worries related to their achievement emotions? First, we expected that computer self-efficacy would be positively associated with e-learning self-efficacy (Hypothesis 1a). In line with the assumptions of the control-value theory, we expected e-learning self-efficacy to be positively linked to positive achievement emotions and negatively to negative achievement emotions (Hypothesis 1b). Moreover, we hypothesized that students' general worries were negatively associated with positive achievement emotions and positively with negative achievement emotions (Hypothesis 1c).

Research question 2 (RQ2). Did the motivational (e-learning self-efficacy, computer self-efficacy) and emotional (worries, achievement emotions) aspects pertaining to digital skills vary according to the students' level of instruction, area of study, or gender? We also explored the extent to which the students perceived different life circumstances as sources of worries.

3.3.3 Method

Participants. The sample included 846 Italian university students (mean age = 24.57, SD = 6.33; 72% females). Most of them were bachelor students (63%), followed by master's (36%) and PhD students (1%). The most frequent field of study was the Social Sciences (51%), followed by the Applied Sciences (19%), Natural and Life Sciences (16%) and, finally, Arts and Humanities (14%).

Procedure and materials. The students participated in the online survey "Impacts of the Covid-19 Pandemic on the Life of Higher Education Students" promoted by the University of Ljubljana, Slovenia (Aristovnik et al., 2020). The Italian data were gathered by Daniela Raccanello, Giada Vicentini and Roberto Burro from the University of Verona, in collaboration with Cristina Mollica from the Sapienza University of Rome, and Michela Cortini and Stefania Fantinelli from the G. d'Annunzio University of Chieti–Pescara. For Italy, the study was approved by the Ethical Committee of the Department of Human Sciences, University of Verona (protocol no. 152951).

The questionnaire was adapted from the European Students' Union Survey (European Students' Union,

2020). Invitations to participate were issued by advertising on university communication systems around the world and on social media. All students gave their informed consent before participating. The online survey was administered via the open-source web application 1KA (One Click Survey; www.1ka.si) between 5 May 2020 and 15 June 2020. The standard version was in the English language. There were translations in different languages, including Italian. The questionnaire was formed by 39 closed-ended and open-ended questions focused on socio-demographic, geographic and other aspects pertaining to the life of university students.

Below, we describe the measures examined in this study:

- Self-efficacy related to digital skills. We assessed two types of self-efficacy, relating to e-learning and to computers. We measured e-learning self-efficacy with four items (e.g. I can figure out how to do the most difficult classwork since the on-site classes were cancelled; adaptation from the subscale on academic self-efficacy of the Patterns of Adapted Learning Scale, PALS, Midgley et al., 2000). We assessed computer self-efficacy with seven items in which the students had to evaluate their self-confidence in browsing online for information, sharing digital contents, using online teaching platforms, using online collaboration platforms, using online communication platforms, using software and programs required for their studies, and applying advanced settings to some software and programs (adaptation from Lu et al., 2016). The students evaluated each item on a 5-point scale (1 – strongly disagree and 5 – strongly agree).
- Achievement emotions related to digital skills. We used a brief version of the Achievement Emotions Adjective List, AEAL (Raccanello et al., 2020a, 2021), adapted to measure four positive achievement emotions (4 items: joyful, hopeful, proud, relieved) and six negative achievement emotions (6 items: frustrated, angry, anxious, ashamed, hopeless, bored). The students evaluated the frequency with which they felt each emotion on a 5-point scale (1 – never and 5 – always).
- Worry-related life circumstances. We assessed worry-related life circumstances with ten items focused on different areas, i.e. physical and psychological health (2 items: Personal physical health; Personal mental health), education (2 items: Studying issues; Future education), economics/occupation (2 items: Personal finances; Professional career in the future), relationships (1 item: Family and relationship), and others (3 items: Covid-19 or a similar pandemic crisis in the future; Leisure activities; Traveling abroad). The students evaluated the frequency with which they felt worried about each life circumstance on a 5-point scale (1 – a little of the time and 5 - all of the time).

Data analyses. We used the R software for all the analyses (R Core Team, 2021). First, we carried out a structural equation model (SEM) for ordinal data, with the DWLS estimator. We considered as fit indexes the comparative fit index (CFI), the Tucker-Lewis index (TLI) and the root-mean-square error of approximation (RMSEA), with CFI and TLI ≥ .95, and RMSEA ≤ .08 as threshold values (Kline, 2016). We then conducted three linear mixed models (LMMs), with students' level of instruction (bachelor, master's – we excluded PhD students due to their small number), area of study (Social Sciences, Applied Sciences, Natural and Life Sciences, Arts and Humanities), and gender (males, females) as categorical fixed effects, and the participants as the random effect. In the three respective models, we also considered the type of self-efficacy (computer, e-learning), valence of achievement emotions (positive, negative), and type of worries (10 types) as a within-subject categorical fixed effect, and scores on self-efficacy, achievement emotions, and worries as the dependent variables. For each model, we studied only the main effects of the four factors and the two-way interactions between the within-subject factor with the other factors. For all LMMs, we performed a type-III analysis of variance table with Satterthwaite's method. For the post-hoc tests, we used the Bonferroni correction (Lenth, 2021). The level of significance was $p < .05$.

3.3.4 Results

Structural Equation Model. We report the intercorrelations and the descriptive statistics concerning self-efficacy, worries, and achievement emotions in Table 1.

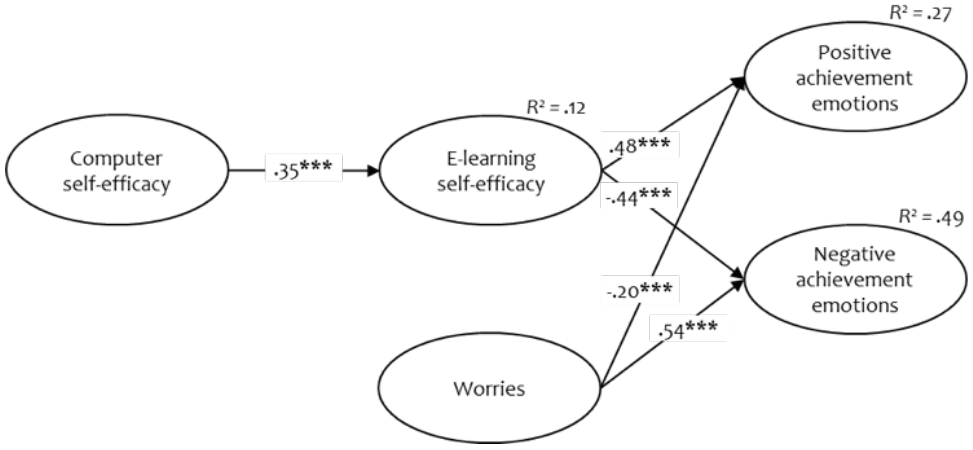
Table 1: Use of various educational platforms before and during the Covid-19 pandemic in Hungary" zamenjati z "Intercorrelations, descriptive statistics, and reliability indexes for self-efficacy, worries, and achievement emotions

	1	2	3	4	5
1. E-learning self-efficacy	/				
2. Computer self-efficacy	.288***	/			
3. Worries	-.189***	-.035	/		
4. Positive emotions	.367***	.162***	-.129***	/	
5. Negative emotions	-.376***	-.120***	.424***	-.443***	/
Means	3.09	4.00	2.73	2.81	2.97
Standard deviations	0.83	0.65	0.68	0.72	0.72
95% confidence intervals	3.04, 3.15	3.96, 4.05	2.69, 2.78	2.77, 2.86	2.92, 3.02
McDonald's omega	.762	.875	.787	.761	.778
Cronbach's alpha	.757	.877	.785	.752	.765

Note: *p < .05, **p < .01, ***p < .001

Source: Own research

Graph 1: Structural equation model concerning self-efficacy, worries, and achievement emotions



Note: *p < .05, **p < .01, ***p < .001

Source: Own research

In a preliminary SEM, we inserted the direct links between computer self-efficacy and achievement emotions, which proved to be non-significant. We therefore deleted them from the final model. The indexes of fit of the SEM indicated the adequacy of the final model (Graph 1): CFI = .961, TLI = .958, and RMSEA = .071. Computer self-efficacy was positively linked to e-learning self-efficacy (β = .35, p < .001). E-learning self-efficacy was positively associated with positive emotions (β = .48, p < .001) and negatively with negative emotions (β = -.44, p < .001). Worries were negatively related to positive emotions (β = -.20, p < .001) and positively to negative emotions (β = .54, p < .001). Therefore, Hypotheses 1a, 1b and 1c were confirmed. It is worth noting that e-learning self-efficacy fully mediated between computer self-efficacy and achievement emotions.

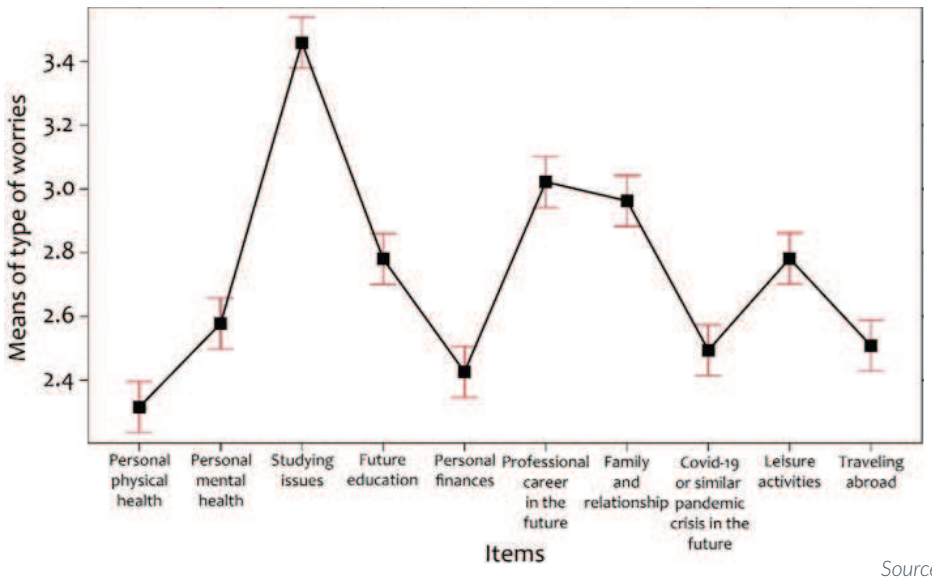
Linear Mixed Models. Referring to self-efficacy related to digital skills, the LMM revealed a significant effect of gender, F(1, 818) = 4.292, p = .039: Scores were lower for females (M = 3.52, SD = 0.86, 95% CI [3.48, 3.57])

than for males (M = 3.60, SD = 0.89, 95% CI [3.52, 3.68]). In addition, we found significant effects of area of study, F(3, 818) = 2.648, p = .048, and type of self-efficacy, F(1, 818) = 593.922, p < .001, moderated by a significant type of self-efficacy X area of study interaction, F(3, 818) = 6.487, p < .001. The post-hoc tests indicated that computer self-efficacy (M = 4.00, SD = 0.65, 95% CI [3.96, 4.05]) was higher than e-learning self-efficacy (M = 3.09, SD = 0.83, 95% CI [3.04, 3.15]). Moreover, e-learning self-efficacy was higher for students of the Arts and Humanities (M = 3.30, SD = 0.81, 95% CI [3.15, 3.45]) compared to those of the Applied Sciences (M = 2.89, SD = 0.82, 95% CI [2.76, 3.02]).

As regards achievement emotions related to digital skills, we found a significant type of achievement emotions X gender interaction, F(1, 1636) = 20.946, p < .001: females' negative emotions (M = 3.04, SD = 0.69, 95% CI [2.98, 3.09]) were higher than their positive emotions (M = 2.78, SD = 0.72, 95% CI [2.72, 2.84]) and males' negative emotions (negative: M = 2.81, SD = 0.79, 95% CI [2.71, 2.91]; positive: M = 2.91, SD = 0.69, 95% CI [2.82, 3.00]).

With respect to worry-related life circumstances, the LMM indicated a significant effect of type of worries, F(9, 7362) = 64.325, p < .001 (Graph 2). The post-hoc tests showed that the most frequent worries regarded studying issues, while the least frequent referred to personal physical health, personal finances, future similar crises, and traveling. Specifically concerning health-related worries, those related to the psychological domain were more frequent than those related to the physical domain. As for education, worries about current studying issues were more frequent than those related to the future. Regarding economics/occupation, personal financial issues were less relevant sources of worries than those concerning students' future professional careers. Social issues concerning relationships were on an intermediate level. Finally, worries regarding leisure time were more frequent than those related to traveling.

Graph 2: Means of type of worries (the bars represent the 95% CI



Source: Own research

In addition, the LMM revealed a significant effect of area of study, F(3, 818) = 7.807, p < .001, moderated by the significant interaction type of worries X area of study, F(27, 7362) = 1.595, p = .026. The post-hoc about such interaction highlighted differences about worries over personal finances, lower for students of the Applied Sciences (M = 2.06, SD = 1.13, 95% CI [1.89, 2.24]) than for those of the Social Sciences (M = 2.54, SD = 1.25, 95% CI [2.41, 2.66]) and the Arts and Humanities (M = 2.62, SD = 1.14, 95% CI [2.41, 2.83]), and future professional career, lower for students of the Applied Sciences (M = 2.66, SD = 1.16, 95% CI [2.48, 2.84]) compared to those of the Social Sciences (M = 3.13, SD = 1.21, 95% CI [3.02, 3.25]).

3.3.5 Discussion

This study increases understanding of the short-term consequences of Covid-19 for university students, with a particular focus on the motivational and emotional processes related to their digital skills.

RQ1. The findings support our hypotheses, revealing that computer self-efficacy was positively related to e-learning self-efficacy. In turn, e-learning self-efficacy was positively linked to positive achievement emotions and negatively to negative achievement emotions. It is worth highlighting that the impact of computer self-efficacy on achievement emotions was completely mediated by e-learning self-efficacy. These data allow generalizing the control-value theory to the context of the current pandemic in which digital skills are playing such a relevant role. Given that the relations between appraisals, achievement emotions, and performance, as described by such model, are invariant across different contexts (i.e. traditional learning and e-learning) and different countries (i.e. Loderer et al., 2020; Pekrun, 2006; Pekrun & Perry, 2014), it may be speculated that the links between the constructs we examined involving Italian students can be generalized to students in other countries. Our findings also indicate that general worries impacted achievement emotions, even if their impact was less than that of e-learning self-efficacy.

RQ2. We found that computer self-efficacy was higher than e-learning self-efficacy, indicating the students were quite confident in specific technical abilities pertaining to their digital skills. Moreover, negative achievement emotions were particularly frequent among females. Concerning the antecedents of worries, students of the Social Sciences and the Arts and Humanities were particularly concerned about their personal finances, and those of the Social Sciences also about their future occupational career. Nevertheless, there were clear differences in the salience of the different types of worries. Studying issues were the most salient, while personal physical health, personal finances, future similar crises, and traveling were among the least salient. It is interesting to note that worries about personal physical health were less relevant than those about personal psychological health. Moreover, while the current educational issues were more salient than the future ones, it was vice versa for the economical/occupational domain, i.e. the issues about future careers were more salient than those concerning current financial problems.

Limitations. First, the data were self-reported and can therefore be characterized by desirability biases. However, self-report instruments are still the best way to gain access to individuals' inner world (Pekrun & Bühner, 2014). Second, we could not gather data on students' performance given that the survey was conducted prior to the usual period in which academic assessments occur. Still, prior literature also reveals the links between achievement emotions and achievement in technology-based contexts (Loderer et al., 2020). Third, while recruiting the participants we could not control the reasons underlying their decision not to participate in the research, as is typical of many online surveys.

3.4 Evidence-based policy recommendations

While fostering students' learning and achievement is the primary traditional objective of education systems, in the 21st century it is amply recognized that another crucial objective is promoting students' well-being. Noting the challenges facing education systems and students due to Covid-19 (Sahu, 2020), both objectives have currently become absolute priorities. Our findings, together with previous studies corroborating the core assumptions of the control-value theory (Pekrun, 2006, 2018; Pekrun & Perry, 2014; Pekrun et al., 2017), promote acting on appraisals of achievement emotions and on achievement emotions to improve students' short- and long-term learning and well-being, also for e-learning. Specifically concerning the psychological constructs related to digital skills, it is therefore relevant to work on students' beliefs about control, on their achievement emotions and, whenever possible, also on the life circumstances giving them worries. This is consistent with the inclusion of digital skills within the more general concept of digital competence (Iordache et al., 2017; Martin & Madigan, 2006; OECD, 2005; van Deursen, 2010), which also comprises socio-emotional aspects for utilizing and comprehending digital devices (Ilomäki et al., 2016). This means it is essential to support the development not only of digital skills per se, but also of those social and emotional factors that support their understanding.

To provide improvements to the existing policies and measures of EU institutions, national ministries, universities, schools, students, teachers etc., below we propose some evidence-based guidelines to ameliorate some of the psychological processes associated with digital skills relevant to e-learning.

3.4.1 Increasing self-efficacy related to digital skills

Coherently with the assumptions of the control-value theory (Pekrun, 2006, 2018; Pekrun & Perry, 2014; Pekrun et al., 2017), our findings indicate that e-learning self-efficacy was positively linked to positive achievement emotions and negatively to negative achievement emotions. Hence, actions by EU, national and local institutions should aim to increase students' beliefs in e-learning self-efficacy, triggering cascade effects for students' achievement emotions and performance in e-learning contexts. Given the documented links between computer self-efficacy and e-learning self-efficacy, it is important to foster the former to increase the latter. Following Bandura (1997), self-efficacy can be improved by acting on different fronts:

- Supporting students' confidence in their competence to enable them to experience success. For computer self-efficacy, this can be fostered through courses focused on digital skills, incrementing "the ability to use, access, filter, evaluate, create, program and share digital content" (Council of the European Union, 2018, p. 10). A prerequisite for using technological devices and software is having access to them, therefore economic support also plays a key role where needed. For e-learning self-efficacy, experiences of success in new and complex tasks such as those required by e-learning (e.g. making a group project for assessment) could be favoured by teachers through the use of modelling as one of the didactic practices, i.e. dividing the task into sub-tasks (e.g. archiving new materials into an online repository; practising in the use of rooms within software for video-conferences; writing through wiki resources etc.) corresponding to specific sub-goals and supporting the students until they learn to autonomously master the whole task.
- Taking advantage of the benefits of a vicarious/observational approach through which an expert demonstrates how to successfully perform e-learning tasks. Since e-learning requires mastery and understanding of both specific knowledge in disciplines and technical competence, it is relevant to offer students the support of both teachers and tutors for their technical skills.
- Providing students with positive feedback and rewards concerning their digital skills. Particular attention should be paid to avoid creating unrealistic self-efficacy beliefs.
- Diminishing the frequency and intensity of negative reactions. This includes reactions like e-learning-related anxiety and stress, as discussed for example in the next two sections.

Further actions to improve self-efficacy beliefs concerning digital skills and related self-efficacy should:

- Focus directly on the control over the situation perceived by the students. On one hand, greater control can be associated with clear, unambiguous, and timing communications concerning all changes characterized by aspects such as the organization of classes, the assessment mode, and the management of problems arising from technological malfunctioning. On the other hand, students can benefit from attributional retraining interventions aimed at changing their causal attributions (Hamm et al., 2014), for instance attributing possible unexpected failures to an external cause (e.g. constraints due to the pandemic crisis) rather than to internal causes (e.g. deficient abilities), which could undermine their self-esteem.
- Focusing on specific student categories. Finally, it is worth noting that, for the Italian context, students of the Applied Sciences were particularly in need of actions to improve their self-efficacy, and specifically their e-learning self-efficacy, which was nevertheless lower than their computer self-efficacy.

3.4.2 Improving achievement emotions related to digital skills

The psychological literature shows that achievement emotions are particularly relevant to students' well-being and achievement, including in technology-based contexts (Loderer et al., 2020; Pekrun et al., 2017). Several ways exist to improve students' achievement emotions beyond those aimed at ameliorating their beliefs of control. Below we describe some possible strategies which might be applied by institutions on the EU, national or local levels.

• Fostering students' emotional competence. European, national and local policies should promote programs seeking to improve students' emotional competence, which includes the abilities of expressing, understanding and regulating emotions, and plays a key role in social adaptation. There is a variety of socio-emotional learning programs whose efficacy with regard to different outcomes (including achievement) is amply demonstrated (Brackett & Rivers, 2014; Durlak et al., 2011). These actions assume the relevance of priority also considering the constraints of online communication whereby individuals cannot rely on the non-verbal cues to express and understand emotions which are available in face-to-face communication.

• Conducting specific actions to increase disaster-related emotional competence (in particular awareness of emotions and adaptive coping strategies), with a focus on Covid-19. Such actions may include: (1) developing applications, online courses or webinars (e.g. HEMOT®, a web application for children on earthquake-related emotional prevention; Raccanello et al., 2020a); (2) activating online trainings (e.g. www.hemot.eu); and (3) conducting public communication campaigns (e.g. Raccanello et al., 2020b).

• Fostering social relations. Such actions could include: (1) promoting community engagement to preserve students' well-being; (2) building networks between different stakeholders to share best practices, in particular those concerning efficient e-learning strategies.

• Providing mental health support to students in need. This may be done by maintaining current social support services and activating online psychological resources such as help-desks for students.

• Longitudinally monitoring students' emotional reactions. Relevant institutions should economically support research on this issue.

• Focusing on specific student categories. Like for Italy, these actions should pay particular attention to females, who declared having felt the highest levels of negative achievement emotions.

3.4.3 Reducing sources of worries

Institutions on the EU, national or local levels should act to reduce students' worries to both foster their well-being and because they have an impact on their achievement emotions and hence their learning.

• Flexibly and timely adapting the provision of any educational service. Given the relevance of studying related worries, different institutions on various levels should prioritize changes in teaching and learning organization to guarantee the students the possibility of accomplishing their objectives also in the use of digital resources (e.g. passing exams, graduating, doing trainings etc.), flexibly and timely adapting the provision of any educational service to external threats.

• Working on a future-time perspective. The actions of universities and other institutions should include online/on-site info days etc. that focus on occupational rather than educational issues.

• Focusing on specific student categories. As for the Italian context, these actions should pay special attention to students of the Social Sciences, who show particular worries about their personal finances and future professional career.

3.5 Conclusion

Beyond extending the theoretical knowledge on these topics, our findings provide the foundation for evidence-based policy recommendations to support stakeholders in developing students' digital skills. Such actions may prove to be extremely relevant in sustaining and fostering students' learning and well-being, in a period of history in which digital skills hold overriding relevance for students' everyday e-learning.

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DISTANCE LEARNING IN HIGHER EDUCATION IN FRANCE DURING THE COVID-19 PANDEMIC

Sébastien Jacques, Abdeldjalil Ouahabi

4.1 Introduction

Since the start of 2020, the 1,674,700 students enrolled in French universities, like all students in universities around the world, have seen their education totally disrupted by the unprecedented health crisis caused by the Covid-19 pandemic. Since 31 December 2019, the severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) has affected nearly 1 French person in 20 and unfortunately claimed the lives of approximately 2.4% of those infected; this percentage is of the same order of magnitude for European Union (EU) countries (ECDC Europe, 2021). Around the world, the year 2020 was marked by numerous periods of containment and sudden closures of schools and universities (e.g. for the first containment period, from the end of January 2020 in China and other Asian countries; mid-March in most European, American, and Middle Eastern countries; and the end of March in most African countries). Faced with this situation, teachers around the world have had to adapt and even reinvent themselves to deliver virtual courses, communicate with their students on social networking platforms, and sometimes learn on the job how to deliver quality distance education (Viner et al., 2020).

In the face of this unrivalled health crisis, countries around the world have had to come up with an educational continuity plan able to be implemented as quickly as possible (Reich et al., 2020). In the event of the temporary removal of students or school closures, pedagogical continuity plans are designed to maintain the pedagogical connection between teachers and pupils. The main objective is to preserve the knowledge already gained by the students while helping them acquire new knowledge. The stakes are therefore high and the need to provide quality education continues, despite the many difficulties associated with distance education, both synchronously and asynchronously. These include, but are not limited to, issues relating to: physical distance and socio-emotional support; support for students who are at risk of dropping out; the successful mastery of information and communication technologies (ICT); access to a stable and secure Internet connection; and access to appropriate computer equipment (e.g. computers, tablets, smart phones etc.). For example, on this last point, according to the Organization for Economic Cooperation and Development (OECD), 95% of students in Switzerland, Norway and Austria have a computer on which they can do their schoolwork; in contrast, just 34% of Indonesian students have access to such a device (Bol, 2020; De Quervain et al., 2020; Yulia, 2020).

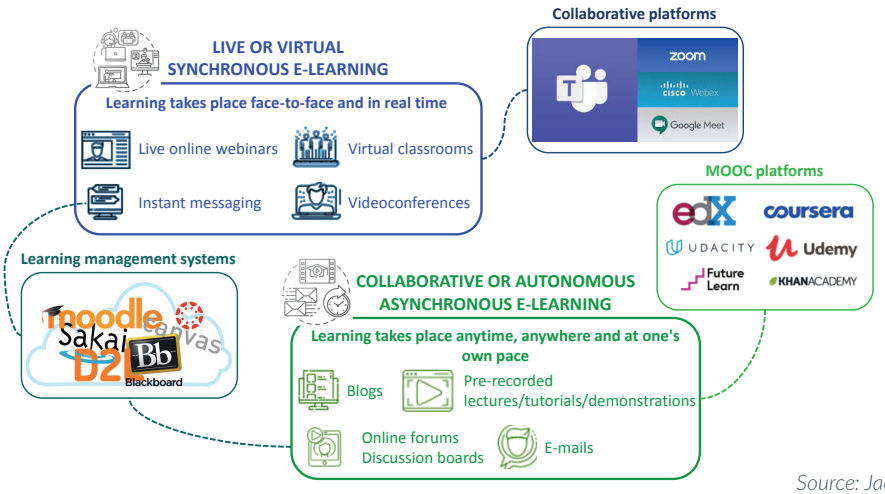
Thanks to the mobilization and unwavering commitment of the teaching and administrative staff, under the impetus of strong political incentives on both national and university levels, the vectors and tools used by educational teams have multiplied. These tools have included: websites; digital workspaces (DWS); email discussion lists; document sharing and homework management applications; group registrations for interactive applications; Padlet-type collaborative walls and other multimedia creation tools; videos; radio podcasts and online tutorials; and pedagogical challenges given via social networks (e.g. Facebook, Twitter) (Sistek-Chandler, 2020).

Today, a multitude of applications, platforms and educational resources are being used in higher education for both synchronous and asynchronous distance education (see Graph 1). Many classifications involving several categories have already been proposed in the literature.

As such, the following list, with illustrative examples, is by no means exhaustive (Henriksen et al., 2020):

- Digital learning management systems: one example is the globally supported open learning platform MOODLE (with more than 60 partners in the Asia-Pacific region, Europe and the United Kingdom, America, and Africa). During the Covid-19 pandemic, a wide range of activities (from the simple submission of documents, to forums, online exercises, and online chat etc.) have been offered to students.
- Massive open online course (MOOC) platforms, covering a wide spectrum of disciplines including engineering, medicine, economics, arts and culture etc. During the Covid-19 pandemic, nearly 200 higher education courses have been offered free of charge to students around the world.
- Self-directed learning content: one example is the Khan Academy's interactive platform, which since 2008 has delivered thousands of online tutorials covering many scientific fields for use by undergraduate students. During the Covid-19 pandemic, students from all over the world have been able to benefit from this platform.
- Collaboration platforms that support live-video communication: three good examples are Google Meet, Microsoft Teams, and Zoom. In fact, these two last tools were widely relied on in the study presented in this policy paper. Teams offers chat, dating, calling and collaboration features built into Microsoft Office software. Zoom, which can be used as a Teams application, is a cloud-based platform offering video and audio conferencing, collaboration, chat and webinars. Like the Proctorio platform, the use of Zoom in universities has raised many concerns, particularly in France, about both the confidentiality of the data it shares and how the tool is used, for instance, for the remote monitoring of exams.

Graph 1: Examples of applications, platforms and educational resources used for both synchronous and asynchronous distance learning



Source: Jacques et al., 2021

While the Covid-19 pandemic has accelerated the digital transformation of higher education, there are major issues concerning the quality of distance education, the learning process itself, and the evaluation of the knowledge and skills acquired over a distance. This policy paper is intended to provide some answers to these questions. The discussions proposed here are especially based on the qualitative and quantitative results collected in engineering schools in France.

The structure of this document is as follows. Section 2 looks at the development of digital skills in the face of the health crisis. In particular, in this section, we present the policy initiatives put in place, examine the perception of synchronous distance education, including virtual classrooms, within universities and, finally, describe the digital tools currently in use and the problems associated with the acquisition and evaluation of knowledge and skills. Section 3 presents feedback on how the health crisis was managed in French engineering schools during the first containment period (12 March 2020 to start of summer 2020). This analysis helps identify the problems faced by engineering students and to bring them to the level of authorities and university policies in order to improve their situation. Section 4 provides, for illustration purposes, a case study of the follow-up of approximately 100 electrical and mechanical engineering students during the first containment period. We detail the method established to ensure the effective acquisition and evaluation of knowledge and skills at a distance, and discuss the main results obtained. Section 5 presents conclusions and recommendations not to extol the virtues of distance education, but to reflect on common practices adapted to the sustainable and broadly accepted digital transformation of university education.

4.2 Developing of digital skills in the face of the health crisis

4.2.1 Political incentives in France

In France, in response to the unparalleled health crisis that has considerably affected higher education, the Ministry of Higher Education, Research and Innovation, from the first period of containment, i.e. declared on 16 March 2020, has made sure that the available training courses are built to be delivered over a distance. This pedagogical continuity must make it possible to support the good continuation of pedagogical activities, to ensure students are not penalized and, for teachers, to provide good teaching conditions. Although there have been many individual actions during this period, France has made available a digital toolbox containing three main pillars to meet the above challenges:

• "France Université Numérique" (FUN): We are particularly interested here in two digital platforms: FUN-MOOC and FUN Campus. Since 2013, FUN-MOOC is the French platform for MOOCs. It offers the best of higher education online through a rich catalogue of training courses designed by professors from universities, schools and their partners. Students can train for free, acquire skills interactively and above all at their own pace. FUN Campus, intended for HEIs, is implemented to enable teachers to deploy online courses as part of a curriculum and to integrate, for example, small private online courses (SPOCs) into their teaching practices.

• Virtual university: The Digital University is an association composed of six thematic digital universities in France. Its purpose is to provide teachers and students in HEIs, as well as their governance, with peer-reviewed digital scientific and educational resources that can be used in different pedagogical forms: the inverted classroom, enriched face-to-face, complementary resources, distance learning etc. In the vast majority of cases, these resources, which cover a wide range of fields (e.g. arts, economics and management, literature and languages, health and sport, engineering sciences, humanities and social sciences etc.), are easily accessible and free of charge. For the governance of HEIs, the concept of digital university is very important because it should enable them to support them in the development and implementation of their digital strategy/policy.

• Connected Campuses: Places labelled "Connected Campuses" are individual/collective work spaces where students can follow higher education courses at a distance near their homes, with local support. They aim

to help young people succeed in a higher education they would not necessarily have undertaken, by giving them the means to overcome geographical, urban and social barriers, without forgetting psychological barriers (e.g. self-censorship, fear of failure, ...), which create inequalities. This scheme's success is due to the personalization of the support: each student is supervised, motivated and supported by a qualified professional. Like the digital university, connected campuses offer numerous distance learning courses and certifications (BTEC Higher National Diploma, bachelor's and master's degrees) and all the main disciplinary fields are accessible (e.g. law, human and social sciences, engineering sciences, sciences and techniques of physical and sports activities etc.). The experiment, which began in 2019, involved 13 connected campuses accredited by the French Ministry of Higher Education, Research and Innovation. In February 2020, a new call for projects with a budget of EUR 25 million was launched in order to have 100 connected campuses by 2022 at the latest, with 25 projects being selected. In total, 33 connected campuses have been labelled and 31 are open and welcoming students in 11 regions.

4.2.2 Current perception of the virtual classroom in higher education

One key to successful distance education during the Covid-19 pandemic is the maintenance of strong interaction both between students and teachers and among students themselves. Many experiments recently reported in the literature show this level of interaction is much more intense in a virtual classroom, i.e. when distance education is conducted synchronously (Basilaia et al., 2020). The authors further explain that students may, in this case, feel less shy to ask questions when they are separated by the barrier of a computer tool. Some authors also note that distance learning can significantly reduce absenteeism. However, some forms of teaching, like practical work and projects, which require specific laboratory equipment, do not lend themselves well to distance learning. These authors also point out that in these cases, the quality of human interaction in a physical classroom is difficult to match in a virtual environment.

Despite the many positive points made about it, several authors indicate that the teaching style of virtual education must make use of various innovative methodologies to fully involve students and help them achieve the main pedagogical objectives, namely successful learning and the acquisition of relevant skills. The effort required by teachers to design effective virtual classrooms is huge and takes much more time than with face-to-face teaching.

Another extremely important point addressed in the literature concerns the management of knowledge assessments and measurement of class participation and attendance. In both face-to-face and distance learning, teachers need effective ways to measure their students' performance. This is usually done through the submission of homework, the administration of tests, exams and quizzes, and the creation of participation points. In a distance learning environment, table-top examinations and classroom participation and 'attendance' are more difficult to measure.

To conclude this section, distance education is not new – many prestigious universities around the world (e.g. in the USA, Europe, the UK, China, India, Australia, South Korea, Malaysia, South Africa) have been practising it for many years. What is new, however, is the extent to which universities are using collaborative digital platforms and online resources to teach both synchronously and asynchronously while ensuring their students remain motivated.

4.2.3 Overview of current digital tools for conducting virtual courses

Although originally intended for commercial applications, collaborative platforms such as Google Meet, Microsoft Teams and Zoom have been widely used around the world in recent years, particularly for the digital transformation of higher education. For example, Microsoft Teams, available on its own or as part of an Office 365 package, is a customizable collaborative platform that integrates many features, including: video conferencing; scheduling team meetings via Microsoft Outlook, as well as sharing contacts and emails; file storage and transfer with SharePoint; and note-taking using OneNote. Many applications, such as Forms and Zoom, can be directly integrated into the tool. As another example, the Zoom video

communication tool provides a remote conferencing service that combines video conferencing, online meetings, chat, and mobile collaboration using proprietary applications. This tool has pedagogical potential as it allows the creation of a virtual room accessible to a large number of participants and offers many features useful for the realization of an online course, including: the creation of a videoconference for a large number of participants; the ability to record a videoconference and chat, allowing students to learn at their own pace; audio and chat interactions; screen sharing with teachers; as well as content sharing, real-time co-notation, and a digital whiteboard.

Long before the health crisis brought by Covid-19, many authors were already emphasizing the integration into education of technological innovations in networking and communication. Microsoft Teams permits the creation of rich and functional learning environments where students play a proactive and constructive role throughout the learning process, as well as in/during all interactions in fully interactive computer-supported collaborative learning (CSCL) environments. Its use has become even more visible during the period of Covid-19, allowing us to also test the robustness of computer networks. Despite this, the use of Microsoft Teams is still in its infancy, especially in higher education. Crawford et al. point out that, with regard to the assessment of knowledge and skills, further study is needed to ensure that distance education does not degrade student performance. To this end, it is necessary to compare, for a given study programme and with classes of equivalent size, the performance of students in face-to-face and distance education. This is the chief motivation for the work presented in this policy paper.

The Zoom platform has been used by many universities around the world during the Covid-19 pandemic. This California-based application has seen its number of downloads grow drastically since March 2020. Nevertheless, it is now being criticized for its lack of security and shortcomings in terms of personal data protection. For example, on 26 March 2020 the American media outlet Vice revealed that the iOS version (Apple's operating system) of the application had, until recently, been sharing some of its users' personal data with Facebook without informing them – a practice the company immediately assured it had put an end to. Over the same period, the NGO Access Now asked Zoom to publish a "transparency report" on its policy for managing and sharing user information. Still, these examples have not prevented prestigious universities such as Harvard, Princeton and Stanford from widely using Zoom for all their students, in particular because of its simplicity and user-friendliness. In France, its use seems less systematic. On a case-by-case basis, it is often left to the discretion of teachers to work with the tool that suits them best, especially in classes preparing students for university entry. Yet, Zoom is clearly highlighted on the social networks of certain institutions, including the NEOMA Business School, the University of Evry, and the EM Normandie Business School.

To conclude this section, the choice of a distance learning tool relies on the balancing of sometimes contradictory criteria, including: efficiency, quality of service, data protection, parameterization possibilities for different types of user, user ergonomics, and cost. A particularly critical point concerns the organization of assessments of the knowledge and skills acquired by students. Several questions arise: Which are the best digital tools to use? How to ensure equity among students, in terms of both the provision of hardware and software resources and the examination conditions? Which measures are needed to protect personal and/or sensitive data? So many questions, as to which we will attempt to answer in the last part of this article.

4.3 Health-crisis' impact on distance higher education in 2020

4.3.1 Foreword

In this section, we analyse the results of a survey offered to engineering students in France by the National Office of Student Engineers; the survey aimed at sharing their experience and feelings on how the Covid-19 crisis had been managed by the 165 engineering schools since they had closed (Jacques et al., 2020). The 11,107 responses obtained are compared with recently published European and global data (Aristovnik et al., 2020), (Covid-19 Social Science Lab, 2021). In particular, we compare our results with those of our

neighbour Germany (although the number of responses there should be taken with caution), Europe's leading economic power, whose university education system is close to ours. As an indication, we also compare our results with those obtained on the global level, i.e. with the article by Aristovnik et al. who conducted a survey of 31,212 students from 133 countries and 6 continents.

After addressing the issue of students' access to computer resources, both hardware and software, we discuss how they feel about the shift from face-to-face to distance education. Students expressed their views on how universities and policies should manage this transition.

4.3.2 Access to computer resources

Table 1 shows that access to the Internet, as well as to hardware and software computing resources, was not only satisfactory in France during the period under consideration, but that the figures are, for example, comparable to those of our German neighbour.

Table 1 shows that 12.3% of French students felt their Internet connection was of poor quality, which had an impact on the conditions for distance education; 2.6% of students did not always have a computer available; 5.9% of the engineering students considered they did not have all the software required for the smooth running of the teaching activities (in half the cases, for technical reasons: insufficient computer performance and problems accessing licences and with installation).

Table 1: Access to computer resources – Comparison between data from engineering schools in France (Jacques et al., 2020) and the literature (Aristovnik et al., 2020)

Percentage of students with access to a personal, professional or shared computer	Percentage of students with an adequate Internet connection	Percentage of students with access to software needed to conduct educational activities
97.4% (engineering students in France (11,107 responses collected))	**87.7%** (engineering students in France (11,107 responses collected))	**94.1%** (engineering students in France (11,107 responses collected))
98.0% (higher education students in Germany (between 200 and 500 responses collected))	**81.0%** (higher education students in Germany (between 200 and 500 responses collected))	**91.0%** (higher education students in Germany (between 200 and 500 responses collected))
84.0% (higher education students worldwide (17,192 responses collected))	**59.0%** (higher education students worldwide (17,192 responses collected))	**73.0%** (higher education students worldwide (17,192 responses collected))

Source: Jacques et al., 2021

4.3.3 Transitions between face-to-face and distance courses

Table 2 reveals that 27.4% of the engineering students (see Q1 in Table 2) found the shift from distance education to face-to-face teaching too abrupt. There are two main reasons for this. The first relates to the ability to work and concentrate. Indeed, nearly 59% of the students (see Q2 in Table 2) consider they are less effective in distance than in traditional courses. The second relates to workload; 23.4% of the students surveyed (see Q3 in Table 2) consider that the workload is much less important when over a distance and they therefore lose all motivation to continue their training.

Despite all the measures put in place to ensure the pedagogical continuity of higher education in France (see Section 2), students feel they lack information from their professors, universities and national institutions. Of the engineering students surveyed, 19% consider they had not received enough information about continuing their studies during the Covid-19 pandemic, with 45% thinking the imposed measures should have been more thorough.

Table 2: Transition between face-to-face and distance courses

	1 (Not good at all)	2	3	4	5 (Perfectly good)
Q1–How did students experience the sudden transition between face-to-face and distance education?	**7.8%**	**19.6%**	**35.9%**	**26.2%**	**10.5%**
Q2–How did students perceive their ability to work and concentrate at a distance compared to traditional courses?	**20.0%**	**38.8%**	**21.4%**	**15.4%**	**4.4%**
Q3–How did students perceive the workload of distance education compared to traditional courses?	**7.6%**	**15.8%**	**28.8%**	**27.6%**	**20.2%**

Sources: Jacques et al., 2020; National office of student engineers, 2020

4.4 Case study of a French engineering school

4.4.1 Research objectives

Although the Covid-19 health crisis reveals the critical need for digital technologies in many areas, particularly in higher education, three key questions arise, which may be formulated as follows:

- How can we ensure that the knowledge presented through a distance learning course is of sufficient quality?
- How can we make the distance learning process as smooth as possible for all parties involved (i.e. students and teachers)?
- Which are the best tools for assessing knowledge and skills acquired over a distance and how can we guarantee their relevance?

This section of the policy paper aims to provide a qualitative and quantitative assessment of the tools put in place in engineering schools during the current global health crisis to make sure of the quality and continuity of higher education pedagogy (Jacques et al., 2021). The feedback is complemented by an assessment of the students' knowledge and skills. To this end, about 100 students in the field of electronic and mechanical engineering from the University of Tours in France were monitored for several months. The objective was to discuss the relevance of the evaluation of the knowledge and skills acquired by the

distance students. We accordingly compared the distributions of the results obtained by the students in the face-to-face and distance courses. Finally, the feelings of these students were analysed at the end of the distance education period and the results were compared with currently available national data.

4.4.2 Methodological aspects

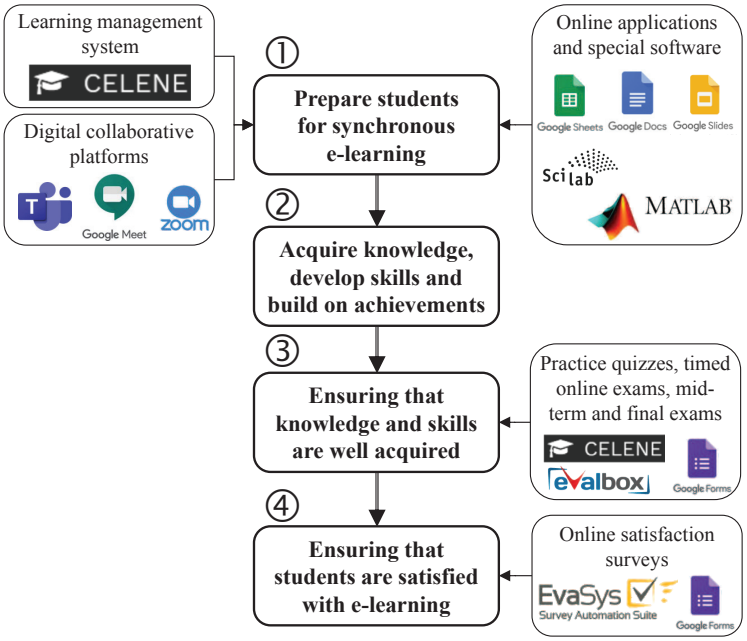
The research presented in this case study was conducted with the participation of 97 first-, second- and third-year students in electrical and mechanical engineering at the College of Engineering of the University of Tours, France. These engineering students were divided into four groups; each group took a specific course given by distance learning. Group 1 (26 students) and Group 2 (26 students) each took a course in engineering sciences. Each of these two courses consisted of lectures, tutorials and practical work; the latter did not require the use of specific materials and therefore lent themselves well to distance learning. The 16 students in Group 3 took a course in numerical analysis, mainly taught in the form of practical work using appropriate computer tools available free of charge online. Finally, the 29 engineering students in Group 4 carried out a project on the design and construction of an electronic system for audio applications. Confronted with the unprecedented health situation, the students did not have access to the school premises, let alone all the laboratory equipment needed to design their final project. As a result, attention was focused on applying an analytical approach to the design of the architecture of such an electronic system. They were also able to apply what they had theoretically seen in their teaching of project management (e.g. definition of milestones and deliverables, team management).

Before starting the experiment, a survey was sent to determine the proportion of engineering students with sufficient computer equipment and software to take the various courses through synchronous distance education. The survey results showed that only 8.2% of the students felt they did not have adequate computer equipment (e.g. personal or shared computers, graphics tablets and smartphones) to comfortably take these courses at a distance. Besides, just over 6.2% of the students surveyed felt they lacked much of the software they needed to participate in synchronous e-learning. These figures (below 10%) are of the same order of magnitude as those obtained on the national level (see Table 1).

The approach to remote knowledge acquisition and assessment described in this case study entails four key phases (see Graph 2):

- Phase 1: Preparing students for distance learning. This phase consists of giving each student access to different collaboration platforms (i.e. CELENE, Microsoft Teams, and Zoom), as well as online applications (Google Drive) and specific software (MATLAB, Scilab).
- Phase 2: The actual learning phase, during which pupils are expected to acquire knowledge, develop skills, and build on their achievements. The first two groups tested a teaching method that sees the reversal of the traditional pedagogical sequence “Lectures; Tutorials; then Practical Work”. The third group benefited from a traditional approach to university education. The fourth group carried out a project; at least, only with regard to the functional definition of the system and organization studied (milestones, deliverables, team management).
- Phase 3: Assessment of knowledge and skills through synchronous knowledge tests
- Phase 4: Student evaluation of the distance learning experience through online satisfaction surveys

Graph 2: Proposed method for the remote acquisition and evaluation of knowledge



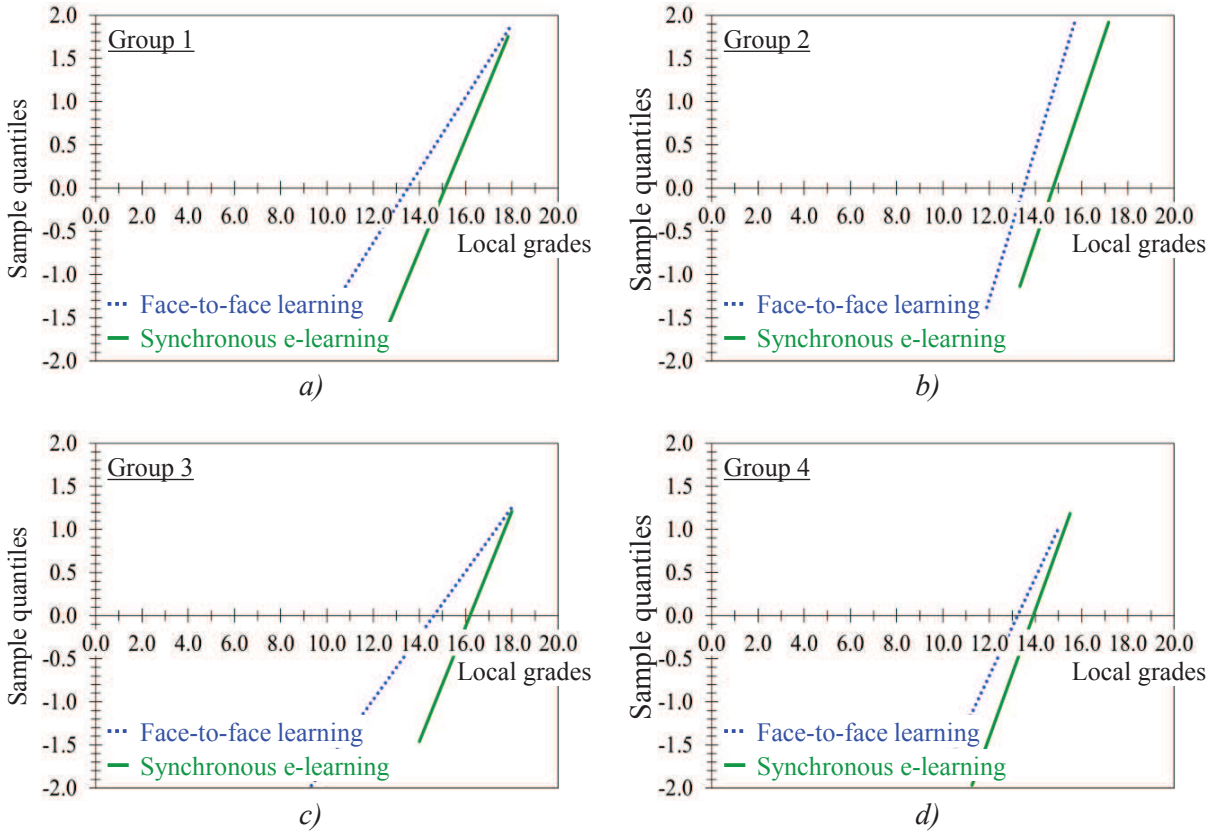
Source: Jacques et al., 2021

4.4.3 Main results

Graph 3 shows the distribution of local scores (from 0 to 20, with 0 being the lowest and 20 the highest) for the four groups of engineering students who took the distance education (see the solid green line in each graph in Graph 3). The results for each group are compared with the results of a class of equivalent size that took the same course, but face-to-face (see the dashed blue line in each graph in Graph 3). Regardless of the groups, the results in Graph 2 show that synchronous distance education does not degrade the performance of engineering students. On the contrary, and this is evident for groups 1, 3 and 4, the consistency of student performance is closer (i.e. the standard deviations of the local grade distributions are much smaller).

Finally, the 97 students completed a satisfaction survey to assess the quality of their distance education (see Table 3). The questions asked concerned the teaching itself (clarity of the course, prerequisites, content, selected illustrations), its organization (coordination of teaching activities, preparation for knowledge evaluation), the teacher (dynamism, mastery of distance learning tools, interactions between teachers and students) and the general satisfaction of engineering students. The results in Table 3 reveal this experience was overwhelmingly positive and that only 2% of the 97 engineering students surveyed were not completely satisfied with the quality of their distance education experience. The results in Table 3 show that 2% of the 97 students surveyed were not entirely satisfied with the method used to ensure the quality of their engineering education at a distance. Although these results are overwhelmingly positive, four points of vigilance were identified by students: the dynamism of synchronous e-learning, the coordination of pedagogical activities, exam preparation and the interaction between students and teachers. The last point is moreover one that has been broadly identified at the national level, i.e. by the 11,107 students of the 165 French engineering schools (National Office of Student Engineers, 2020). Indeed, distance generates significant difficulties in conducting group work, such as projects, especially when students do not have access to specific laboratory equipment.

Graph 3: Comparison of student performances in face-to-face and synchronous e-learning: a) Group 1 (26 students); b) Group 2 (26 students); c) Group 3 (16 students); d) Group 4 (29 students)



Source: Authors calculation based on valid responses.

Table 3: Satisfaction survey results (97 responses collected)

Attributes	CA*	A*	D*	CD*
1. The syllabus for this teaching was clearly presented	77%	23%	0%	0%
2. The prerequisites for this teaching were clearly presented	68%	32%	0%	0%
3. The content of this teaching has been adapted to your knowledge	64%	35%	1%	0%
4. This teaching was presented in a stimulating and motivating manner	47%	41%	12%	0%
5. Coordination between lectures, tutorials and practical work was not difficult	59%	40%	1%	0%
6. Illustrations (i.e. exercises, case studies and practical work) were sufficient	56%	44%	0%	0%
7. Instructions for preparing knowledge assessments were clear	68%	30%	2%	0%

Attributes	CA*	A*	D*	CD*
8. You have been well prepared for the various knowledge assessments proposed by your teacher	44%	52%	4%	0%
9. The skills demonstrated by your teacher are unquestionable, despite the distance	64%	36%	0%	0%
10. Despite the distance, your teacher was available and listening	73%	27%	0%	0%
11. Your teacher seems to have mastered digital tools at a distance	77%	23%	0%	0%
12. Despite the distance, the interaction between teacher and students was quite good	62%	28%	10%	0%
13. You are generally satisfied with the quality of the education provided	52%	46%	2%	0%

Note: *CA: completely agree; A: agree; D: disagree; CD: completely disagree

Source: Authors calculation based on valid responses.

Regarding the dynamism of synchronous e-learning, the students participating in the project insisted that this form of education did not lend itself to distance learning, even synchronous, because they could not build and test the functioning of their electronic system. Nevertheless, they stressed that a functional analysis was crucial before designing and dimensioning an electronic system. With regard to the coordination of the different pedagogical activities, the students pointed out the sometimes overloaded agendas that mixed many activities of the same nature on the same day. With respect to the evaluation of knowledge and skills, only the final exams were questioned. Intrusive methods, involving remote control of students' materials, were very poorly perceived. The survey results show the students attach great importance to the trust placed in them by the teachers. An examination format where the student composes on a topic for a limited time and the student must hand in the assignment in a drop box seems to be a solution to be further explored.

To conclude this section, the findings described in this case study show that the question of how best to undertake knowledge assessment and distance learning is a real headache. Distance necessarily implies a relationship of trust with students because it is almost impossible to control the conditions in which individual work is carried out unless artificial intelligence is used. Several approaches are currently being explored to help teachers assess student performance, including: stopping all assessment; focusing on self-assessment; developing a portfolio of skills to be acquired at the end of a course; and developing online quizzes (accessible via smartphones, tablets and computers) before the start of each course (for example, the Wooclap tool has been made available by the University of Tours).

4.5 Conclusion

Since the beginning of 2020, in the face of the Covid-19 pandemic, which notably led to the widespread closure of universities, and under the impetus of academic and political authorities, educational teams and students around the world have radically played a major role in accelerating the digital transformation of higher education. To maintain close student–teacher interactions, virtual classrooms have therefore become a reality, but without a genuine consensus on the pedagogical practices to be implemented to ensure quality teaching. The studies described in this policy paper confirm that certain pedagogical forms, such as lectures and tutorials, lend themselves well to synchronous distance learning. On the other hand, practical work and projects must be conducted face-to-face for both material (e.g. access to laboratory or specific equipment) and psychosocial reasons (e.g. to maintain social contact between the students themselves, as well as between students and their teachers).

With respect to the assessment of the knowledge and skills acquired by distance students, the case study proposed in this policy paper shows that distance education does not reduce the performance of engineering students. Indeed, they achieve local scores similar to those expected from face-to-face teaching. The results of the various satisfaction surveys reveal that the 97 engineering students participating in this study are generally satisfied, especially when the forms of education do not require practical implementation.

With the emergence of variants of the virus, it is clear that the current global health crisis is far from over. Thus, distance education will continue to grow. The widely shared observation is that blended learning can offer many opportunities and the great flexibility required for tomorrow's higher education. Still, its implementation will not be possible without an efficient and local IT helpdesk (i.e. within each teaching chair), in particular for access to computer networks, for troubleshooting computer equipment, for access to virtual machines, for the implementation of new digital technologies etc.

4.6 Recommendations

The challenges of digitization of higher education concern digital sovereignty and control of learning data; questions especially arise about the nature of educational content, the control of learning data and the necessary openness of systems. There are also economic issues in a world in which we want to preserve access to education for all, regardless of budgetary constraints. Finally, there are the challenges of digital training throughout life, underlining the importance of generic or transversal skills that enable people to adapt, to learn to learn.

This policy paper intends to contribute to this by actively formulating seven recommendations grouped under three main themes: research, digital training, and public action.

Recommendation 1. Developing Scientific Research Projects: Digital Technology for Academic Success:

There are many areas around academic achievement where digital science research could bring benefits, including engaging students in the learning process through computer-based approaches. The first question is how to promote academic success. It should be answered by developing research programmes in connection with cognitive, educational and digital sciences based in particular on AI, automatic language processing, robotics, and virtual/augmented reality with a view to developing learning environments adapted to individual characteristics and even more clearly for people with academic adaptation needs, especially according to their disability situation.

Recommendation 2. Develop Rigorous Methodologies for the Evaluation of Digital Education:

Digital inclusion has been achieved without any evaluation of its impact on learning or in experiments of too limited scope. There is hence a need to develop multidisciplinary research leading to rigorous studies producing robust results on the effects of digital literacy. Another limitation of some research on the effects of digital literacy is its a posteriori evaluation, trying to compare situations with and without the use of technology. The development of educational digital education has relied on technological developments sometimes achieved through collaboration between digital and education actors.

Another point is the evaluation of students using remote digital tools. This issue remains the weak point in the use of digital distance learning, although the integration of artificial intelligence (AI) technologies is tending towards an acceptable solution (Adjabi et al., 2020), (Adjabi et al., 2021).

Recommendation 3. Training Teachers in the Digital Technologies of Tomorrow:

The training of teachers must allow for the development of their digital culture and development of their digital skills for different age groups and professions.

Recommendation 4. Towards a 'Civic and Popular Digital University' Capable of Training Everyone in the Digital World:

Digital training is a civic issue that must give rise to actions aimed at developing digital culture and skills.

Recommendation 5. Create Conditions for the Development and Maintenance of Digital Educational Resources as a Common Good:

It is necessary to create educational common goods that are modular and based on resources that are free and able to be modified by the actors of education. These resources must be indexed in order to facilitate their use by teachers.

Recommendation 6. Guaranteeing the Portability of Personal Educational Data and Developing the Interoperability of Software Solutions, and Providing Optimal Hardware Solutions:

The legal aspects relating to the portability of personal data in the field of education must be arranged. In addition, it is important to ensure that students and teachers are equipped with top-of-the-range equipment in terms of computers accompanied with high-end peripherals (headphones, lighting, graphics tablets), sensors (microphones, cameras etc.), 5G or even 6G wireless networks.

Recommendation 7. Transitional Provisions: A Hybrid Education System:

Lectures and tutorials will be given over a distance, but projects and assignments will be done in person.

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GENDER AND DIGITAL SKILLS IN PORTUGUESE HIGHER EDUCATION DURING THE COVID-19 PANDEMIC

Thais França, Bertil P. Marques

5.1 Introduction

Technology is a defining feature of modern society. Its progress has allowed new different forms of social interactions and dynamics to emerge as well as old ones to be reshaped. In developed countries, most teaching facilities in both secondary and tertiary education are well equipped with computers and projectors. Professors and students communicate frequently using e-learning platforms, while students share notes and contents among themselves via WhatsApp and Facebook groups.

As the presence and relevance of technology across the different work sectors grows in the 'digital economy', the need for digital literacy is also growing. In the last few decades, the European Commission has developed different initiatives to foster the training of the workforce and students with a view to responding to the demand for labour market digital skills in both the present and the future (EC, 2020). For instance, 40% of businesses in the European Union indicate they struggle to find well-trained IT specialists to fill vacant positions.

However, levels of access and proficiency in the use of computers and other technological devices are not the same among groups. Gender as well as socio-economic factors and race, among others, differently impact users' engagement with technology. For instance, compared to men, women are not enjoying the same gains from technology's advances, and are hence being left behind. This leads to women's exclusion from working in the ITC sector and hinders their chances of a high-status career (Hill et al., 2010).

The Covid-19 pandemic demonstrates the importance of digital solutions for the teaching and learning process. In order to maintain the delivery of their courses and trainings, HEIs have shifted most of their activities from their physical facilities to on-line platforms as they adopt the e-learning modality, generally referred to as a learning experience assisted by online technologies, as the "new normal" (Ebner et al., 2020).

In the last few decades, different e-learning modalities have spread rapidly across Portugal's higher education system and on online learning platforms, with social software becoming progressively more popular among the country's higher education institutions (Azeiteiro et al., 2015; Costa et al., 2012). In spite of this, during the coronavirus outbreak, students have struggled with the forced transition from an

on-campus to a virtual teaching/learning environment. The inequalities already existing among students regarding technology access and their digital skills have impacted the quality of the training delivered.

Based on analysis of data from the project "Impacts of the Covid-19 Pandemic on the Life of Higher Education Students" coordinated by the Faculty of Public Administration at the University of Ljubljana, Slovenia (Aristovnik, et al., 2020), this chapter compares how male and female Portuguese students experienced the move of classes from on-campus to on-line during the first wave of the pandemic in 2020.

5.2 The Covid-19 situation in Portugal in 2020

During 2020, the pandemic's development in Portugal may be considered as successful. Portugal's impoverished national health service (NHS), with some of the lowest numbers of beds in intensive care units in the European Union (6.4 against the EU average of 11.5 per 100,000 population (SNS, 2017)) and its third position regarding old population in the EU (only behind Italy and Greece) has put the country in a very vulnerable situation with respect to facing the disease, forcing the government to promptly implement social distancing measures. Therefore, responding to the WHO's recommendation at a very early stage of the outbreak, Portugal took fast and critical measures to enforce strict bans on individuals' mobility together with a range of other measures to prevent the spread of Covid-19. Moreover, the first two cases in Portugal were confirmed somewhat later than in other European countries, on 2 March, with the first death being registered 2 weeks later, which allowed the country to buy time to increase the capacity of healthcare, increasing the number of ventilators from 1,142 in early March to 2,582 by the beginning of April, and boosting their testing capability (DGS, 2020).

The two fundamental stages of the Portuguese response to the virus' spread were the declaration of a state of alert on 13 March and the declaration of a state of emergency on 18 March (FRA, 2020). Decree 14-A/2020 imposed more restrictive measures with a special emphasis on mobility; mandatory staying home for persons without health problems and teleworking whenever possible, compulsory isolation of patients and people under a disease surveillance general order of closure of the services of private companies, except for essential services (food sector, pharmacies etc.). Further, civil and criminal penalties for non-compliance were enforced. The state of emergency lasted two periods and officially ended on 4 May, however by then only a limited number of Covid-19 restrictions had been eased while the wearing of masks in public spaces had become compulsory and remote work continued to be required where possible. These measures are to be considered every 2 weeks, with further easing to be allowed when deemed appropriate.

In relation to HEIs, their initial response to Covid-19 was not coordinated. On 10 March, the Council of Rectors of Portuguese Universities (CRUP) issued a statement affirming that there were "no public health reasons that so far justify the closure of facilities at the universities, similar to what is happening with most sectors of activity in Portugal" (CRUP, 2020). Yet, some HEIs already cancelled their physically attended classes since some members of the academic community (staff and students) had tested positive for Covid-19, while others did so purely as a preventative measure. It was only upon the decree of a state of alert, 3 days after the CRUP's announcement, that all Portuguese HEIs embraced the same position and suspended all activities in their facilities and implemented remote classes. The resumption of the HEIs' work was seen in the lifting of certain lockdown measures and expectations to restart on 14 May.

Like what occurred across most of the European Union, the arrival of the traditional summer holiday season undermined the efforts to curtail the spread of the virus since the social distance measures were relaxed. Hence, after September Portugal saw a spike in its case numbers. Aimed at avoiding a second lockdown due to the fragility of its economy, the government opted for a weekly curfew and partial lockdown on the weekends. Although the cases did not fall to the pre-summer levels, they were partially under control and the NHS was able to respond to the demand.

At that time, HEIs were autonomous in choosing the teaching format to be adopted for the 2020/2021 year. Most institutions chose what they called a "hybrid format" whereby some students attend classes online and others are present at university facilities. Some institutions decided to implement full remote classes, with only practical activities being carried out at the teaching facilities.

This positive scenario, however, did not survive the Christmas holidays when once again the social distance measures were relaxed. The numbers spiked to levels not seen before and by the second week of January Portugal was the country with the highest number of cases per million inhabitants in the world, with an average of 1,328.3. When the NHS collapsed and the number of deaths increased to new levels after the first failed attempt to impose a partial lockdown until 15 January by keeping schools and HEIs open, once again supported by the CRUP, the government was forced to implement a second full lockdown on 22 January. Since then, HEIs have remained closed, with courses and training being delivered online.

At the time of writing this report (16 February 2021), despite the number of cases dropping drastically, the NHS is continuing to operate at its limits and the government has just amended the decree enforcing a full lockdown. This means that universities remain closed and the classes are being conducted remotely. The government has announced the country might stay closed until Easter in order to avoid another wave during the holidays, as happened at Christmas.

5.3 Gender and digital skills

Gender, digital skills together with Science, Technology, Engineering and Maths (STEM) continue to be hot topics among scholars, policymakers, female activists and entrepreneurs as technology gradually becomes more embedded in our societal spheres – labour market, education, health etc. Despite the growing number of women in both STEM and ICT, the gender gap in access to and use of technologies among female higher education students is still remarkable (Terry & Gomez, 2010). The European Commission recognizes that increasing the share of women in the ICT sector would boost its competitiveness and sustainable inclusive growth (EC, 2018). Studies on the gendered use of technology, however, show that male students have greater opportunity to interact with technological devices than their female peers do. The male students are more likely to have a personal computer at home, attend computer clubs and are more strongly encouraged by their parents to improve their digital skills than the female students (Baker & Aspray, 2006; Vekiri, 2010; Volman & van Eck, 2001). In addition, Imhof et al. (2007) argue that, as opposed to female students, males use computers for activities other than learning, autonomously exploring different functions and tasks, playing games and programming and thereby spending longer hours interacting with digital environments. Likewise, the male students access the Internet and use Internet-based applications more often than their female colleagues (Sánchez-Franco, 2006). These gendered differences in use, access and proficiency in ICTs, known as the "digital gender divide" (Cooper, 2006), exclude women from working in the field of science and technology and hinder their chances of high-status technological careers. Moreover, they contribute to the shortage of skilled workers in this area, and limit the range of diversity, creativity and expertise in the field as technology "reflects the values of its developers, and that of the information they draw from" (EC, 2018, p. 14). Further, low levels of digital skills among women foster workplace and labour market gender inequality (Krieger-Boden & Sorgner, 2018).

Scholars argue that boosting girls' interest in developing digital skills while still at school may be an effective strategy for resolving this gender imbalance in the technology and digital fields (Papastergiou, 2008) as middle-level education is considered a turning point in girls' thinking about career choices and future professional interests (Koch, 1994; Margolis & Fisher, 2002; Valenza, 1997). The strong negative stereotype of ICT as being male-dominated, technologically-focused, socially-isolated, lonely, highly demanding, not engaged with communal goals and excellence-oriented (Diekman et al., 2010; Leslie et al., 2015; VanLeuvan, 2004) are identified as some of the main factors that undermine girls' interest in technology. The gender-biased socialization process in our society directly adds to girls being diverted

away from training in digital skills because from a young age they tend to be pushed towards nurturing and caring activities (Spieler et al., 2019). Complementarily, gender stereotypes also support discourses that girls are less talented in maths, hindering their performance in the subject (Cheryan et al., 2015; Huguet & Régner, 2007) and pushing them away from technology and digital environments. In addition, safety-related issues due to the rise of sexist hate-discourse, cyber-bulling, stalking and harassment and other gendered-based threats (Adam, 2002; Li, 2006) on the Internet are preventing female students from making more frequent use of the Internet.

As they are less exposed to the digital and ICT environment, female students are often less confident in their digital skills than their male peers (OECD, 2015). Scholars, however, stress the key role played by students' perception of their capability to effectively perform certain tasks (Vekiri, 2010). The fact that digital technologies call for new learning skills – such as locating information online, evaluating online sources, and judging the accuracy, reliability and bias of information (Kuiper et al., 2005; Walraven et al., 2008) – makes female students more hesitant and less motivated to engage with ICT. This then limits their opportunities to build their digital skills.

Likewise, the pervasiveness of technologies in the labour market has transformed the nature of work as well as job assignments and goals that demand a special ability with ICT and digital environments. In his study, Zhou (2014) found that female students' problem-solving tasks in the performance of digital technologies as well as their Internet navigation skills are inferior to those of their male peers, which thwarts their chances of being found in the most skilled occupations, due their intensive use of ICT.

The Covid-19 pandemic has led to a digital transformation of global higher education because HEIs were forced to shut their facilities so as to reduce mobility and prevent the virus' spread (Aristovnik et al., 2020). The abrupt shift of learning activities over to the digital environment to mitigate the lost learning took for granted that students all have adequate digital and ITC skills and disregarded the various kinds of social digital divides. Although e-learning is not entirely new in higher education, since before the Covid-19 crisis different modalities such as blended learning, massive open online courses etc. were being progressively introduced (Alario-Hoyos, Pérez-Sanagustín, & Kloos, 2015; Cheng et al., 2017; Zarzour et al., 2020), overall neither the HEIs nor the students were prepared for such an unexpected move from on-site to on-line activities. This forced choice of privileging online technologies – through websites, learning platforms, mobile apps webinars, video conferencing, YouTube etc. – to deliver classes on and off campuses has exacerbated already existing gender digital inequalities (Diab & Elgahsh, 2020).

Pioneering a global level study on the impact of the first wave of Covid-19 pandemic on higher education students, Aristovnik et al. (2020) examine their transition learning experience from the on-site to on-line environments and show that male and female students have reacted differently to this situation. In their analysis, female students are among the groups least affected by the Covid-19 pandemic, revealing greater satisfaction than their male peers, even though in their view their workload has increased significantly. Moreover, the females have been able to adapt more quickly and better to the digital learning environment, even if they had a lower assessment of their own confidence in computer skills than the males.

In the same vein, Shahzan et al. (2020) found a similar result by comparing the difference between female and male students' use of e-learning portals after the Covid-19 outbreak began in Malaysia and forced the closure of HEIs. Their study reveals female students were more attentive and dedicated to using the e-learning portal than their male colleagues, indicating a positive impact on their learning success.

Their results underline a new dynamic in gender and digital skills that is in favour of female over male students. The pandemic might therefore prove to be a turning point in bridging the gender digital skills gap.

5.4 Impacts of the Covid-19 pandemic on the life of higher education students: The Portuguese case

With a view to improving knowledge on the topic while considering the previous studies, we compared Portuguese male and female students' learning experience in an online environment during the first wave of the pandemic. Evidence comes from the project "Impact of the Covid-19 Pandemic on the Life of Higher Education Students" coordinated by the Faculty of Public Administration, University of Ljubljana (Slovenia), which drew responses from over 130 countries, including Portugal. The survey was conducted during the pandemic's first wave in spring 2020. Our sample was composed of 1,172 responses.

Initially, we present some data on the sample's profile. Table 1 below presents the respondents' profile by gender, where their answers reveal the majority of the population was female.

These numbers are consistent with data from the Directorate General of Education and Science Statistics at the Portuguese Ministry of Science, Technology and Higher Education, which reveal that in Portugal the population of higher education students mainly comprises females (DGEES, 2020).

Similarly, by looking at the respondents' enrolment level in tertiary education in Table 2 we may conclude that women represent the majority of the population on the three levels: bachelor, master's and PhD. These results also correspond to official data of the Portuguese Ministry of Education (DGESS, 2020).

Table 1: Student population by gender (%)

Gender	%
Male	**64.4**
Female	**34.9**
Prefer not to say it	**0.7**

Source: Aristovnik et al., 2020

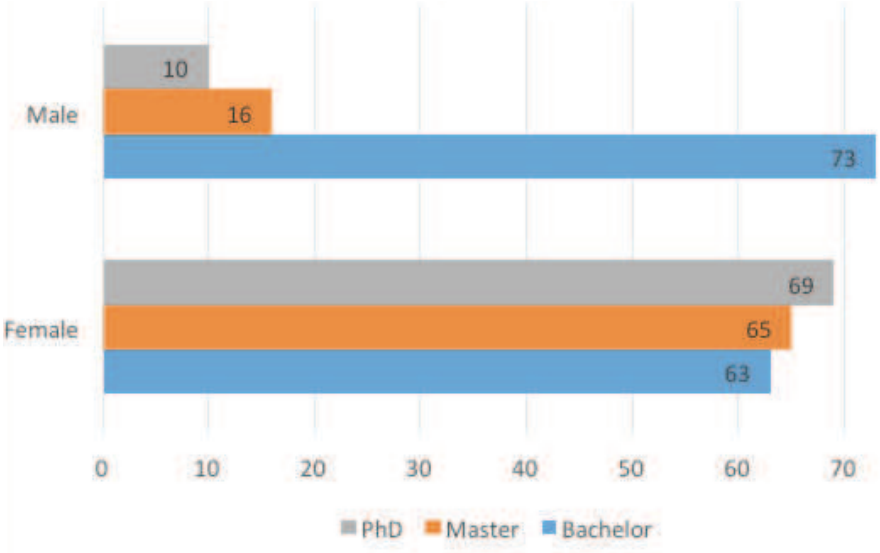
Table 2: Enrolment level by gender (%)

Level – Gender %	Male	Female
Bachelor	**37**	**63**
Master's	**34**	**66**
PhD	**32**	**69**

Source: Aristovnik et al., 2020

In addition, as seen in Graph 1 below, among both males and females most respondents (70%) are bachelor students; a pattern also observed for the female group in which 65.5% of respondents were enrolled in the first cycle of tertiary education. These figures are not surprising since the bachelor student population in Portugal is the biggest one within the national higher education system (DGESS, 2020). Yet, this might also be explained by the fact that their greater workloads meant the master's and PhD students were not so available to participate in surveys.

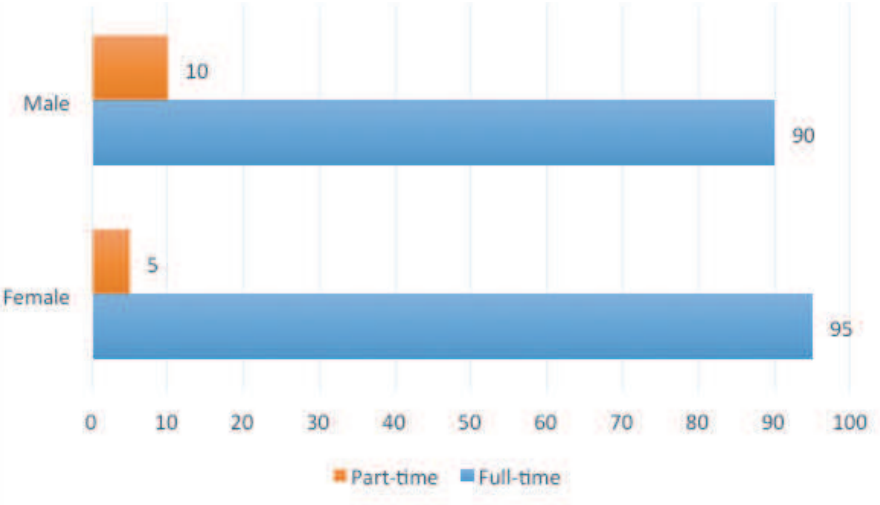
Graph 1: Enrolment level by gender (%)



Source: Aristovnik et al., 2020

Graph 2 shows the spectrum of responses regarding the students' status: full- or part-time. We see the majority (95%) of students of either gender were attending their university training full time, with those attending part time accounting for just 5%. Looking at the two groups separately, the participants' tendency to be a full-time student persists, with only a small difference between the two groups: 95% of the females are full-time students as are 90% of the males. These numbers suggest the students' socio-economic background is high to medium income since they do not need to work to fund their studies. It can also give some hints about exposure levels to digital environments since the literature shows a strong correlation between digital skills and income level (Darvin, 2018).

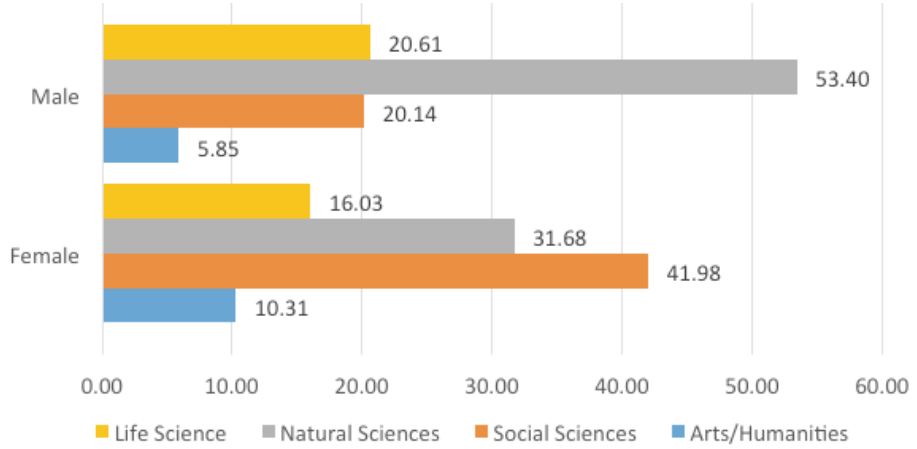
Graph 2: Status as full- or part-time students (%)



Source: Aristovnik et al., 2020

The last question related to the students' profile in terms of area of studies. The Arts and Humanities had the fewest participants with only 8.7%, where female students represent the lion's share of them (76%). Most students who completed our survey were taking a course in the applied sciences (39.3%), with women also making up the majority of this group. This result is very interesting as the literature shows how gender stereotypes have prevented women from taking STEM courses in tertiary education (Smeding, 2012). The graph below illustrates the distribution in this study field of by gender.

Graph 3: Enrolment level by gender (%)



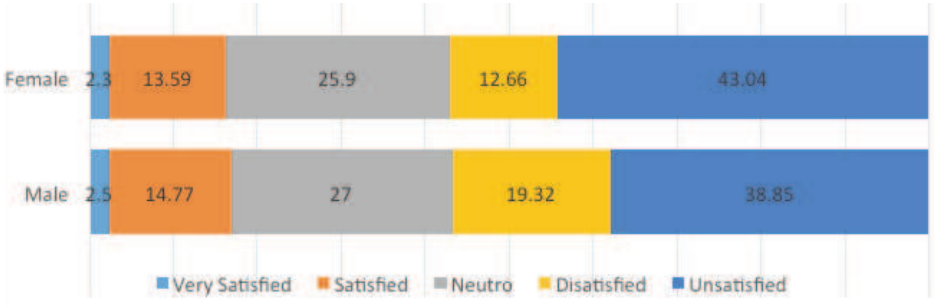
Source: Aristovnik et al., 2020

The results we established are closer to the findings of other studies (Brone, 2011) since the majority of the female population is attending a course in the Social Sciences, which may be explained by the persistence of gender segregation in higher education among students.

After presenting the participants' profile, we move on to a comparative analysis of Portuguese female and male students' e-learning as experienced in the pandemic's first wave in 2020.

In graph 3 below, we may see that female students report greater satisfaction with the institutional support (Teachers, Technical or computer support, Student Support Office, Financial/Accounting office, International Relations Office, Library, Public Relations/Communications Office, Tutors, Student and Counselling Service) received up until the suspension of the face-to-face classes and the transition to the virtual modality.

Graph 4: Students' perception of the institutional support received in the pandemic's first wave regarding the shift from on-site to on-line activities

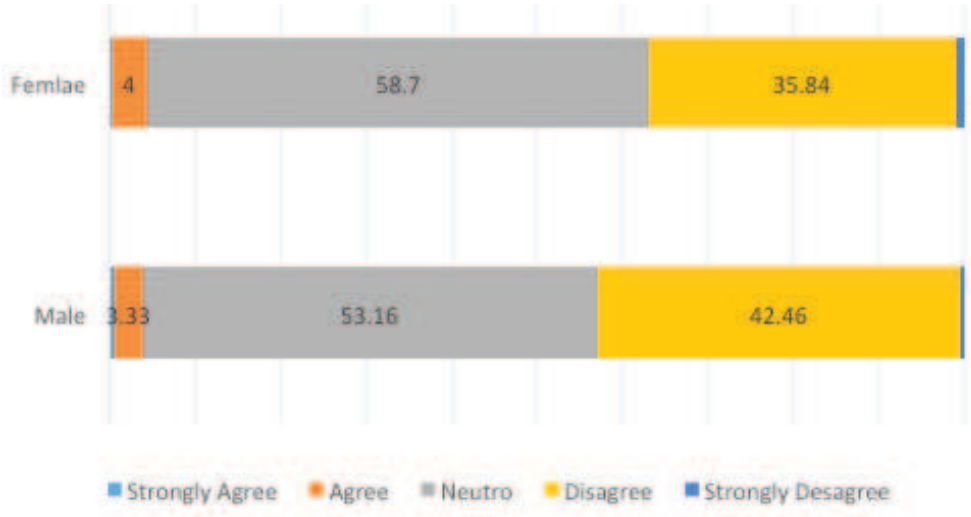


Source: Aristovnik et al., 2020

Overall, the participants' satisfaction with the support at the level of their institution is very low – just 16% of the respondents indicate they are very satisfied or satisfied with it, while 57.3% of the students' state they are very unsatisfied or unsatisfied with it. However, 58% of the male, respondents were unsatisfied or very unsatisfied with the support received, while females were a little less at 55%. Looking at these numbers in light of the literature presented above, we may say the female students adapted more easily and quickly to the new learning environment than their male peers. While the literature discusses female students struggling more in the digital environment, we may argue that their tendency of having better learning habits than their male counterparts means (Urh and Jerebe, 2014) they have encountered fewer challenges in this transition and thus needed less support.

By analysing the students' perception of their workload after the university facilities closed and the subsequent shift to on-line classes (Graph 4), we seek to determine their level of commitment to the new learning modality.

Graph 5: Students' perception of their workload in the first wave of the pandemic

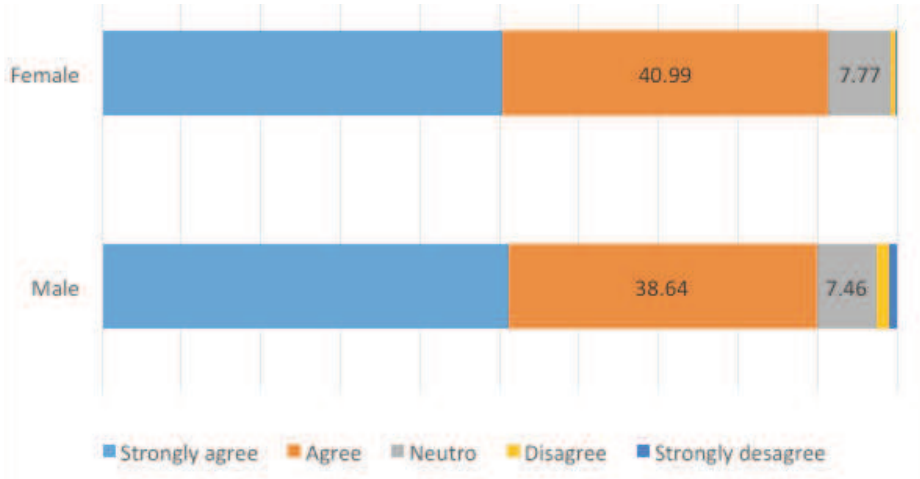


Source: Aristovnik et al., 2020

While the majority of students (38%) stated their workload had not changed during the online classes, 28% noted their workload had grown considerably. When analysing the results separately for the males and females, our results are similar; both groups declared their workload had not changed. Yet, 43% of the female respondents agreed their workload had increased during the online classes, but only 35.9% of the males held the same view. We may assume the female students were more engaged in the online learning and teaching modality than their male peers. An explanation for these results might be that the females were working harder to catch up with the newly imposed demands than the males.

More directly in relation to the students' agreement on adequacy of digital skills for online learning or their perceptions of the level of their digital skills, the results given in Graph 5 are in line with the mentioned broader study from which we have drawn our evidence: "The Impact of the Covid-19 Pandemic on the Life of Higher Education Students survey".

Graph 6: Students' perception of the level of their digital skills



Source: Aristovnik et al., 2020

By digital skills, we refer to browsing online for information, sharing digital contents, using online teaching platforms, communication platforms, using the software and programs required for e-learning, applying advanced settings to certain software and programs. Most of the respondents (51%) strongly agreed that they possess adequate digital literacy to perform well in an e-learning environment. After analysing the answers of the two groups, both male and females strongly agreed they possess good levels of digital skills, 51.19% and 50.35% respectively. When comparing these results, our analysis is in accordance with Aristovnik et al.'s (2020) study that shows female students have a lower assessment of their confidence in computer skills than males. As revealed in the literature review carried out for this paper, as women are less exposed and incentivized with respect to developing their digital skills, they tend to have greater doubt in their digital skills. Namely, this could hinder female students' learning outcomes in the future and, in turn, their professional career. This means that further analysis of the pandemic's impact on their student trajectory should be conducted.

5.5 Policy recommendations for EU policymakers and practitioners

Our data reveal an interesting pattern in female Portuguese higher education students' digital skills in the context of the pandemic that should be more deeply explored so as to take advantage of its potential to reduce the gender digital divide. It is important to not let this momentum fade away if we are to ensure the next generation of women in STEM and ICT by improving their digital literacy and their interest in technology. Hence, gender differences in digital skills should be considered in all future planning activities aimed at digital literacy monitoring, data collection and programme design. Further, developing clear indicators that allow analysis of these improvements and the areas in need of better addressing are also fundamental.

The policies and programmes should take into account that female students are not a homogenous group, meaning that among them one may find various aspects of digital skills: access, use, affordability and proficiency. Activities should neither be planned nor designed without taking these aspects into consideration since variables like race, age, religion and social class can shape female students' experiences in the field. The 'one-size-fits-all' approach should be avoided to ensure that female students' specific needs are properly addressed.

On the European level, many initiatives focus on promoting girls, young females and women's digital literacy: the European Network for Women in Digital; the Girls Go Circular Cross-KIC project – closing the digital gender gap in Europe; Women4IT; Hypatia; as well as on the national level: Closing the gender gap in digital technologies "no one left behind"; and #Eusoudigital; Engenheiras por um Dia. It is vital to map the already existing gender-related polices in an effort to better understand their goals and strategies and to foster synergies among them.

As concerns promoting female tertiary education students' digital skills, it is essential that HEIs compile and circulate all of the programmes and initiatives they had put in practice before, but especially during, the pandemic to enhance and promote their digital literacy. A network of HEIs in the European Union should be created to ensure the efficient sharing of experiences. This network would facilitate HEIs being familiar with other initiatives that could be replicated in their own settings while also identifying common bases for future partnerships.

Namely, digital literacy will from now on be a fundamental transversal skill to be developed in any higher education training. This means HEIs should include in their pedagogical plans special sections dedicated to promoting female students' digital skills. This might involve seminars and workshops aimed at raising the awareness of professors and staff of the gender digital divide, and training courses on how to avoid biased behaviour with regard to female students' digital skills. Special attention should also be given to inclusive language and representation in the areas of ICT and technology as they can influence girls and female higher education students' sense of belonging to the digital environment. By creating a stimulating and welcoming environment for female students, HEIs will help promote and boost their interest in the fields of STEM, ICT and technology.

Digital skills mentoring is an underestimated strategy for bridging the digital gender divide in higher education. There is extensive literature highlighting the importance of formal mentoring for encouraging and motivating students, fostering their independence and autonomy in a field they are not very familiar with (Thomas et al., 2015). States could set aside funds for calls to finance formal mentoring programmes at HEIs, aimed at guaranteeing female students' systematic guidance for developing their digital literacy. Further, HEIs should create a structured mentoring programme involving senior female students who would be responsible for motivating and supervising their junior peers' acquisition of technological skills. Mentoring collaboration schemes between HEIs and primary and secondary schools could also be developed with a view to providing the foundations for girls' future interest in ICT, STEM and technology while already still at a young age.

Affirmative action programmes to raise the number of female primary and secondary ICT teachers and university professors can also have a positive impact as they work as role models for girls and young females. Female teachers and professors act as a good example to encourage female students and girls in primary, secondary and tertiary education to pursue technological-related training and careers. Moreover, this also helps them build their self-confidence in their digital skills.

Female students should be given greater opportunities to be exposed to extra-curricular activities that seek to improve their digital literacy as part of their university training. Digital labs for females or ICT girls-only clubs are examples of fun, relaxed and informal learning environments able to enhance and explore their digital skills and talents. These activities might be promoted in partnership with companies and start-ups working in the technology fields as a strategy to introduce female students to labour market opportunities in the area of ICT, while also allowing some initial professional networking. Young female students might consider changing their career path as they become more aware of job market opportunities. Therefore, promoting occasions for them to become involved with technological and digital activities might prove beneficial for their final professional choice. Such initiatives could have a long-term impact as they already try to create channels for participants' future insertion in the technology and STEM fields.

Initiatives outside of the higher education formal learning environment should also be stimulated; that is, informal learning environments. For instance, online games also help develop female students' interest in ICT. However, as such games tend to be tailored to a stereotypical male setting, female students feel less

motivated to make use of them. Hence, reserving special funds on both the European and national levels for open calls to fund gender-inclusive online games would open up a new digital skills training path for female students.

5.6 Conclusion

The Covid-19 pandemic is not only a health crisis, but is the defining event of our era by affecting every sphere of our social life – work, family arrangements, leisure and mobility. This makes, it crucial to look at its future consequences from different angles. Although its disruptive impact is likely to mainly associated with the negative consequences on society, the pandemic has also seen some positive transformations that might be worth exploring in the post-pandemic context.

Long before the pandemic's arrival, the progress made in technology and ICT and its pervasiveness were already primary features of society. Since the early 1990s, the popularization of Internet, portable computers and, more recently, smartphones have altered how we interact with each other as well as the labour market, education, health services, leisure etc. Yet, due to the sharp social inequalities that lay in the background of these transformations, not everyone was benefitting equally from the advantages of ICT. Gender, race, age, social class, and capabilities are some of the variables that have shaped individuals' access, usage, affordability and proficiency with respect to technology.

The gender digital divide has been a major concern of both the European Commission and the member states as it limits women's career options and also hinders the ICT market's development because there is a lack of skilled workers to respond meet the demand. Due to inequalities based on gender stereotypes, from a young age girls are discouraged to explore their digital skills, a pattern that is extended throughout their primary and secondary school years, tertiary education training and professional career.

Still, the literature on the pandemic's impact on students' e-learning experience and our data show female higher education students have adapted to the shift from on-site to on-line classes better than their male peers. During the pandemic, female students have been highly engaged with their learning process through the online platforms. This then reveals an opportunity that should be carefully explored so as to offer appropriate digital skills training to young females and ensure their retention in the areas of STEM and ICT in the future. Guaranteeing female higher education students sustained exposure to digital technologies is a strategy for promoting the next generation of women in the field of technology.

On all levels – institutional, national, European Commission – strategies for addressing the digital gender divide should make the most of this encouraging momentum to boost female higher education students' digital skills. As a turning point in our society's dynamics, the pandemic could also help establish a new pattern of girls', young females and women's interaction with technology.

Creating specific measures to improve the digital literacy of female higher education students is not expected to be detrimental for their male peers given that overall they already have greater opportunities to develop their technological skills in both formal and informal learning environments. The recommendations presented in this policy paper focus on promoting measures and initiatives prevent the STEM and ICT gender brain drain as a strategy to rectify the gender digital divide in the future.

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HIGHER EDUCATION POLICIES FOR DEVELOPING DIGITAL SKILLS IN RESPONSE TO THE COVID-19 CRISIS: EVIDENCE FROM SLOVENIA

Dejan Ravšelj, Eva Murko

6.1 Introduction

Covid-19 has turned the world upside down. The pandemic has impacted everything: the way we live and interact with each other, how we work and communicate, and how we move around and travel. It has affected every aspect of our lives and every person in the world. Dreadful consequences of this pandemic are already evident in the historic recession felt in most developed parts of the world. In the USA, GDP plummeted annually by 32.9% in the second quarter of 2020 according to an early estimate (US Department of Commerce, 2020). Similarly, in the euro area GDP dropped by 12.1% and in the European Union (EU) by 11.9% over the previous quarter (Eurostat, 2020).

Regarding health, the novel coronavirus SARS-CoV-2 has impacted all age groups, with the worst indicators and highest death rates being found among older individuals and patients with comorbidities (Goldman, 2020; Mamun et al., 2020). Besides causing many problems and challenges in the area of health, the Covid-19 pandemic has created numerous unexpected disturbances in society and the economy (Cao et al., 2020; Eurofound, 2020; Rajkumar, 2020), just like other pandemics in history. In the last few hundred years, pandemics, e.g. the bubonic plague, Ebola, the Spanish flu, SARS, influenza A (H1N1) etc., have brought notable impacts and changes in geopolitical and demographic situations by altering patterns of travel, trade, migration, urbanization, and technology use (McMichael, 2004). A few months into the novel coronavirus (Covid-19) pandemic, it is clear that the corona crisis with its many consequences on all levels will last for a long time, hence representing an enormous impact on our lives for many years to come. The challenges of Covid-19 will in one way or another affect each and every one of us – the well-being of all groups in society in every affected country and globally (Brook et al., 2020; Eurofound, 2020).

By being young, students are generally not included in any specific risk group with regard to the risk of coronavirus infection causing serious health consequences. Still, students are a population group that experienced substantial effects of the Covid-19 pandemic's first wave in the first four or five months of 2020, which are still strongly present, and therefore immense changes to their everyday lives. Perhaps even more alarming are the possible consequences for their immediate and distant future prospects (Aristovnik et al., 2020a).

The study process has generally been interrupted around the world, and in Slovenia most of the students located away from their place of residence departed from the centres of study. The Slovenian Ministry of Education, Science and Sport instructed all students to move out of the dormitories. An additional shock, meanwhile, was the disappearance of student work, falling by 50% in the second half of March and April, while the overall demand for student work was only slowly growing, still around 40% lower in May and 30% lower in June compared to the previous year. The supply of student work fell by 90% in the second half of March and in April. This means many students were left without their most important income source as the average income of university (also high school) students arising from student work is three times greater than the scholarship funds received. As far as the educational process itself is concerned, students are at once encountering distance learning and a lack of social contacts, with many not even knowing their classmates. For success in distance learning, they also require different skillset than in a typical academic year (ŠOS, 2020a).

The main purpose of studying the state-of-the-art sources concerned with the higher education area during the Covid-19 pandemic in the EU is to detect challenges and opportunities along with best practices that facilitate students' development of digital skills and competencies and prepare them for a post-Covid-19 world. The study findings are interesting from both the academic (research and debate) and practical (suggestions for improvements) perspectives. The research entails a literature review and analysis of secondary data produced by different stakeholders, e.g. the European Commission, other international organizations, government institutions, networks, research and educational institutions.

6.2 The Covid-19 situation in Slovenia in 2020

The Covid-19 pandemic (caused by the SARS-CoV-2 virus) has affected the health and socio-economic situation of millions of people around the world in unprecedented magnitude and scope (Eurofound, 2020). The new coronavirus seemingly emerged in China during December 2019 and started to spread, first to Thailand, Japan and the Republic of Korea, then to the United States, Singapore and Vietnam. By the end of January 2020, it had appeared in Australia, Nepal and Europe, with the earliest cases found in France on 25 January 2020 and later in Germany, Finland, Italy etc. (WHO, 2020a). Its spread continued around the world and, on 11 March 2020, the World Health Organization (WHO) declared Covid-19 a pandemic (WHO, 2020b).

The first case of coronavirus in Slovenia was announced on 4 March 2020, having been brought in by a tourist traveling from Morocco via Italy (Reuters, 2020). The number of coronavirus infections then began to rise. On 12 March, former Minister of Health Aleš Šabeder signed an order declaring an epidemic based on Article 7 of the Infectious Diseases Act due to the increased risk of the spread of the new coronavirus (Government of the Republic of Slovenia, 2020). Consequently, a national emergency response plan for Covid-19 was activated and various epidemiological measures proclaimed by the government to prevent the virus' spread (EICS, 2020). All EU member states adopted similar measures to those in Slovenia and were gearing up for any further spread of the virus (Government of the Republic of Slovenia, 2020). The government limited social contacts to the greatest extent possible to keep the health system operational. Preventive measures started with the cancelling of events involving more than 500 people, first indoors, then outdoors. The provision of non-essential preventive health services was suspended in healthcare institutions. All sports competitions were then cancelled, while the border with Italy was closed to most traffic (MMC, 2020).

The first days of the pandemic were challenging for Slovenia due to the resignation of Prime Minister Marjan Šarec in January and the formation of a new government. On March 13, a new government led by Prime Minister Janez Janša (Slovenia Democratic Party) took office. Preventive measures continued by prohibiting or restricting movement in infected or directly endangered areas. In March, all educational units, including kindergartens, primary and secondary schools and non-essential stores were closed, apart from

grocery stores, pharmacies, petrol stations, banks, post offices and traffic. The restaurants and bars were all closed. Public transport was abolished, and hospitals only provided emergency or very fast services, except for oncology and the treatment of pregnant women. Work was halted in the courts and several companies across the country. The Foreign Ministry repatriated over 800 citizens who had remained abroad due to measures to limit the coronavirus' spread. On 14 March, however, the first patient with Covid-19 died. At the end of March, under a new package of measures the government temporarily restricted movement to the municipality of one's permanent or temporary residence, with some exceptions. On 20 March, de facto quarantine was established in Slovenia. The number of patients with Covid-19 exceeded 1,000 in the first wave, and just over 100 patients were treated for Covid-19 in hospitals at the most critical moments in April. By mid-May, a little over 100 patients had died from Covid-19. The number of people infected was declining and on 14 May the government declared the end of the Covid-19 epidemic in Slovenia (MMC, 2020). Slovenia's initial handling of the coronavirus outbreak was hailed as a significant success as Europe faced the first wave of the pandemic and earned praise for its effectiveness (The Slovenia Times, 2020a). Together with Jordan, Greece, Iceland and Vietnam, Slovenia was among the most effective at handling the coronavirus outbreak.

In May, crossing the border was made possible, but strict epidemiological measures remained in force in Slovenia in summer, especially when compared with the neighbouring countries and countries in the region where restaurants were open until late into the night the possibilities for socializing, in contrast to Slovenia, were unlimited. Slovenia otherwise introduced 'traffic lights' to indicate safe, partially safe or dangerous countries. During summer, Balkan countries were on the list of dangerous 'red' countries due to the large number of new infections there. All new arrivals coming from these countries had to be quarantined. Due to the seemingly relaxed summer, the first warnings emerged that infections were "being imported from Croatia". Still, the government left the border with Croatia open until 20 August. With assurances from both healthcare and the government that they were well prepared for any second wave of Covid-19, the number of new cases began to rise upon the start of school, with the government starting to adopt new decrees. On 18 October, the government declared an epidemic again for 1 month, which remains the case even in February 2021. Nevertheless, by the end of October, the number of infections, the number of patients in need of medical care in hospitals, and deaths due to Covid-19 all began to increase sharply. At the beginning of October, the number of hospitalized Covid-19 patients exceeded 100. Within a month, the number of thousands, which still persists, had already been exceeded (MMC, 2020).

As Slovenia became one of the worst affected countries in the second wave, one of the strictest measures seen in Europe was introduced in the final months of 2020. Immediately after the declaration of an epidemic, a curfew was introduced in Slovenia for the first time since the Second World War (from 9 pm to 6 am). At the time of writing, the spread of the new coronavirus has declined somewhat, but high numbers persist. Therefore, concerns have been raised as to whether the government measures to curb the Covid-19 pandemic are still appropriate at all or that some may not be working (MMC, 2020).

Since an epidemic was declared, many service activities have been banned in Slovenia, including some economic activities, while others have become completely paralyzed. As a result, the government has already drafted eight anti-corona laws (PKPs) containing measures by which the state seeks to help those most financially disadvantaged as well as the economy suffer as little damage as possible during this period. One of the worst affected industries is tourism, where the government tried to step in and offer help with EUR 200 tourist vouchers which citizens of Slovenia could redeem at tourist accommodation providers across the country (GOV, 2020).

By September 2020, over 2.2 million people in the European Union had contracted the virus. The impact on the economy is equally miserable. In July, the European Commission estimated the European economy would contract by 8.3% in 2020 (European Commission, 2020d). It also predicted the member states would grow further apart due to large differences in the scale of the pandemic's impact and the level of recovery. In response, the EU and the member states have introduced a range of measures to tackle

the pandemic's social and economic consequences. At the centre of such efforts are measures focussed on rebuilding national economies, safeguarding jobs and promoting social cohesion. On 27 May 2020, Commission President Ursula von der Leyen announced plans to borrow EUR 750 billion to support the recovery efforts in the EU. On 21 July, Heads of State and Government of the 27 EU member states agreed on the plan at a special European Council meeting (the longest European Council meeting ever held) (Eurofound, 2020).

6.3 Higher education in Slovenia during the Covid-19 pandemic

Like other countries around the world, the Slovenian government decided to close all school facilities on 16 March 2020, although some educational units had already suspended personal attendance a few days prior. The Covid-19 situation rapidly transitioned education from on-site to on-line study, bringing many challenges to HEIs as well as students (ELF, 2020a).

The Slovenian government responded with a set of measures for the first, and later also the second, wave of the pandemic. These included several measures also targeting universities and their students (Government of the Republic of Slovenia, 2020b): 1) HEIs could make changes to the compulsory obligations of study programmes, becoming effective immediately; 2) students unable to meet their obligations by the set deadlines because of the extraordinary circumstances were allowed to extend their student status to the next academic year; and 3) all full-time students with residence in Slovenia received a crisis bonus of EUR 150 before 30 April 2020.

Aside from the damaging health consequences for those directly affected by the virus, the pandemic has strongly impacted the way higher education students work and live, bringing profound affects for their physical and mental well-being. To capture the economic and social effects of the pandemic, the Faculty of Public Administration at the University of Ljubljana together with international partners launched a large-scale online survey across the world between 5 May and 15 June 2020. With the title "Impacts of the Covid-19 Pandemic on the Life of Higher Education Students", the online questionnaire targeted higher education students, asking about their life during the pandemic, including teaching and learning, social contacts, as well as how they had been emotionally coping with the situation in different parts of the world (ELF, 2020b; Aristovnik et al., 2020a).

According to the survey, 86% of students in Slovenia reported their on-site classes had been cancelled due to the Covid-19 pandemic, while the remaining 14% already had on-line study before the pandemic. When the government declared the closure of all educational facilities, the transition from on-site to on-line study had to be immediate and not much time was available to properly examine the new forms of organization. Attention should be drawn to the quality of teaching and learning in these new circumstances (Aristovnik et al., 2020a). This rapid change holds considerable implications for students' academic life and work. Nevertheless, the Slovenian students were very satisfied with the organization of the online lectures. They were also very pleased with the support provided by the teaching staff. Still, almost two-thirds (62%) of the students perceived a larger or significantly larger workload (Aristovnik et al., 2020b). These results are aligned with those of the Slovenian Student Union survey reporting that Slovenian students are fairly satisfied with the overall implementation of online study. In addition, the students emphasized that online study is less effective and less productive than on-site study, complementing the findings of many students reporting a bigger workload in the new learning environment (ŠOS, 2020b).

The unfolding of events was similar as for other universities around the world. Various courses had to be quickly transferred from on-site to on-line, with online learning (e-learning) becoming a mandatory teaching and learning process of educational institutions. In Europe, 86% of students reported their on-site classes had been cancelled due to the Covid-19 pandemic. The most dominant form of online lecturing were videoconferences. Further, 86% of student respondents from Europe had access to suitable

electronic equipment, placing Europe alongside other developed economies, namely North America (94%) and Oceania (96%). Moreover, a quality Internet connection required for online learning was emphasized by 68% of students from Europe, which is similar to North America (71%) and Oceania (70%). However, students reported not having regular access to printers and study materials. Regarding the students' confidence in their computer skills, 53% of students from Europe felt confident in using online teaching platforms. The results show the students were most pleased with the support of the teaching and support staff. Lastly, the students were asked to compare their workload before the on-site classes were cancelled with the post-lockdown online circumstances. The findings reveal the biggest increases in workload in Europe (58%) and Oceania (60%) (ELF, 2020b).

6.4 Digital skills and competencies for the digital transformation during Covid-19

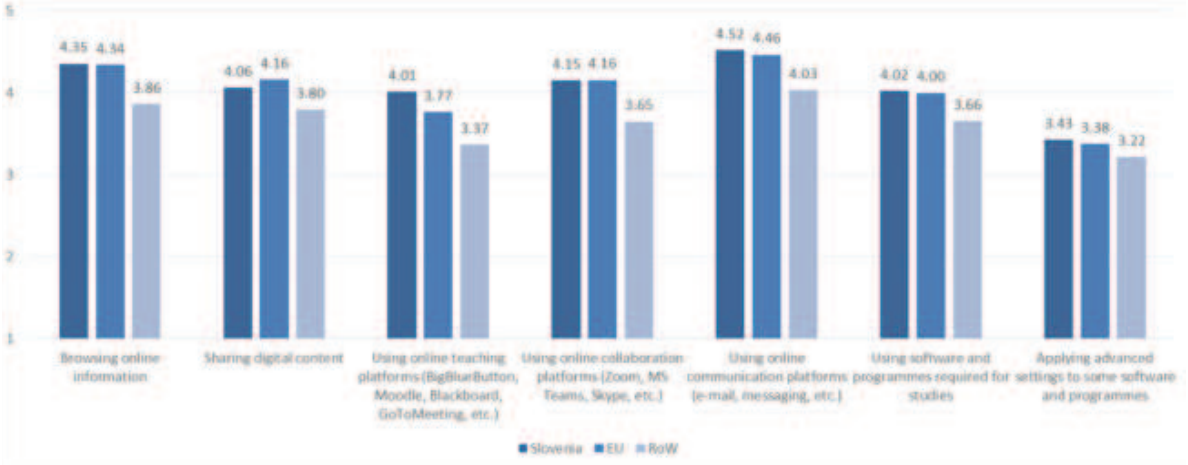
Education and training systems are the main drivers of personal fulfilment, social cohesion, innovation and economic growth. They are also identified as critical building blocks for a fairer and more sustainable EU. In addition, they are increasingly part of the digital transformation and able to harness its benefits and opportunities. However, they also need to effectively manage the risks of the digital transformation, including the risk of a digital divide between developed and developing countries whereby certain people can benefit more than others. The digital transformation in education is being driven by advances in connectivity; the widespread use of devices and digital applications; the need for individual flexibility and the ever-increasing demand for digital skills (European Commission, 2020a). However, in early 2020, the Covid-19 pandemic shocked the world, almost bringing it to an unparalleled stop. It has profoundly transformed the lives of masses of people, including higher education students faced with interrupted education processes (Aristovnik et al., 2020a). Namely, the efforts to curb the outbreak of Covid-19 led to the closure of education and training buildings, campuses and other sites and a forced shift to emergency modes of digital education in countries around the world. It is therefore not surprising that raising the inclusiveness and quality of education and training systems as well as the provision of digital skills for all during the digital transition is of huge strategic importance for the EU (European Commission, 2020a).

As stated in the previous section, the Slovenian government officially declared an epidemic on 12 March 2020 and thus decided to close all educational institutions on 16 March, even though some institutions had already suspended personal attendance some days prior (Government of the Republic of Slovenia, 2020). This meant that about 77,000 higher education students in Slovenia had to stay at home (SORS, 2020). Teaching rapidly moved from classrooms and lecture rooms to homes, largely facilitated by information and communication technologies (ICTs). According to the Global Student Survey Database (Aristovnik et al., 2020b), 86% of students in Slovenia reported their on-site classes had been cancelled due to the Covid-19 pandemic, while the remaining 14% already had on-line study before the lockdown. The new and unprecedented circumstances have reshaped the basic conditions for distance teaching, including specific equipment, Internet access and digital skills, i.e. skills that enable the use of ICTs and digital service. Still, deficient ICT infrastructure, computer skills as well as the perception of a greater workload had prevented students from perceiving their own improved performance in the new teaching environment (Aristovnik et. al., 2020a). Thus, it is no surprise that the Digital Education Action Plan (2021–2027) emphasizes the call to action for stronger cooperation on the EU level to: 1) learn from the Covid-19 crisis, during which technology is being used on an unprecedented scale in education and training; and 2) make education and training systems fit for the digital age. It especially stresses the need for basic digital skills and competencies (i.e. digital literacy, including fighting disinformation; computing education and good knowledge and understanding of data-intensive technologies, such as artificial intelligence) as well as advanced digital skills that produce more digital specialists and also ensure that girls and young women are equally represented in digital studies and careers (European Commission, 2020a).

The presentation and short analysis of the Slovenian case, including a comparison of the EU and the rest of the world (RoW), is based on the most comprehensive and large-scale global student survey entitled "Impact of the Covid-19 Pandemic on the Life of Higher Education Students" (http://www.covidsoclab.org) that aimed to examine higher education students' perceptions of the impacts of the Covid-19 pandemic's first wave in early 2020 on various aspects of their lives on a global level (Aristovnik et al., 2020a). The global student survey was originally promoted by the Faculty of Public Administration, University of Ljubljana (Slovenia) that, thanks to the support of international partners, was disseminated worldwide. The online questionnaire remained open from 5 May to 15 June 2020 and targeted higher education students. Participation in the study reached global proportions by exceeding the milestone of 30,000 responses submitted by students from 62 different countries (with a sufficient response from at least 30 or more respondents) from all 6 continents (Aristovnik et al., 2020c). Accordingly, the comparative analysis presented below is based on 1,041 Slovenian students, 9,765 students from selected EU member states, and 19,575 students from the RoW, resulting in a total of 30,383 students.

Graph 1 presents a comparison of Slovenia, the EU and RoW in confidence in different computer skills. The comparison across different computer skills shows the greatest confidence in using online communication platforms (e-mail, messaging etc.) and the lowest confidence for applying advanced settings to certain software and programs. Overall, it is evident that students from the EU, including Slovenia, are far more confident in all computer skills than their counterparts from the RoW, covering predominantly developing countries. This reveals a gap between developed and developing countries in technical skills and/or physical access to the Internet, often referred to as the digital divide (Antonio & Tuffley, 2014). Interestingly, smaller differences among these three regions can only be observed for the application of advanced settings to certain software and programs. Although Slovenia ranks in the top third of countries, where students are confident in all computer skills, further comparison with the EU reveals that in some cases Slovenian students are comparable with the average EU student in most computer skills, i.e. in browsing online for information, using online collaboration platforms (Zoom, MS Teams, Skype etc.), using online communication platforms (e-mail, messaging etc.), using the software and programs required for studies and applying advanced settings to certain software and programs. Interestingly, although Slovenian students are more confident in using online teaching platforms (BigBlueButton, Moodle, Blackboard, GoToMeeting etc.) than their peers from EU member states, it seems they are less confident in sharing digital contents.

Graph 1: Confidence in computer skills during the first wave of Covid-19 pandemic (Slovenia, EU, RoW)

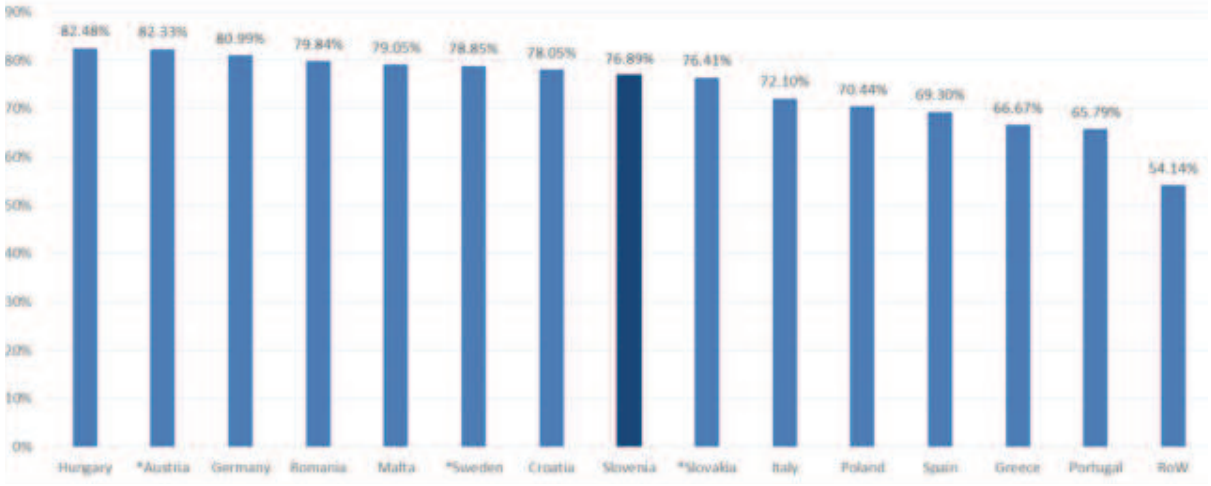


Note: The statements were measured on a five-point Likert scale: 1 - strongly disagree to 5 - strongly agree

Source: Aristovnik et al., 2020b

The appropriate ICT infrastructure is a precondition for acquiring digital skills and competencies. On a global level, computers were identified as the most frequently used electronic equipment in the largest share chosen by students from Oceania (96%), followed by North America (94%) and Europe (86%). Moreover, a good Internet connection, which is essential for online learning, was on the global level available at the level of 60% (just 29% in Africa, followed by 58% in Asia and also 58% in South America, 68% in Europe, 70% in Oceania, 71% in North America). This meant still about 40% of students on the global level or 32% of students in Europe faced poor access to an Internet connection (Aristovnik et al., 2020d). Graph 2 adds to this by showing the share of students who had access to a good Internet connection during the Covid-19 pandemic's first wave and a comparison between Slovenia, selected EU member states, and the RoW. It reveals that students from EU member states, including Slovenia, have far better access to the Internet than their counterparts from the RoW. However, Slovenia is still behind some Central and Eastern European countries (e.g. Hungary, Romania and Croatia), Northern and Western European countries (e.g. Austria, Germany, Sweden) and Malta. It seems the Covid-19 pandemic has exposed inequalities in both the EU and beyond in terms of access to appropriate infrastructure (i.e. a good Internet connection) and thus also in terms of access to education. Therefore, closing the digital education gap should become a priority (European Parliament, 2020).

Graph 2: Access to a good Internet connection during the Covid-19 pandemic's first wave (Slovenia, selected EU member states, RoW)



Note: 1) The share of students who answered often or always. 2) *The results for these countries are not very reliable due to a low response rate.

Source: Aristovnik et al., 2020b

The Covid-19 pandemic confirms the need to bridge the gaps in Internet access, which can in turn lead to students obtaining adequate digital skills and competencies and preparing them for the era following Covid-19. Unfortunately, the digital divide exists across borders, fields and generations, impacting virtually every aspect of life. Within the digital realm, the pandemic has increased the digital divide – the uneven distribution in the access to and use of digital technologies whether based on age, geographical, geopolitical, social or economic factors. During the Covid-19 pandemic, the digital divide's impact has been observable especially in higher education systems struggling to ensure that all their students have equitable digital access and appropriate digital skills and competencies for virtual learning.

6.5 Policy recommendations for measures of different institutions and other stakeholders

The year 2020 is one the world will measure itself against in terms of 'life before Covid-19 and life after'. Namely, the Covid-19 pandemic has profoundly transformed the lives of masses of people and interrupted education processes. Since education is the single biggest force bringing benefits to society, it is important to make sure that education can continue to deliver the hopes and opportunities so greatly needed during this time of uncertainty. As the pandemic continues to transform education, online learning is crucial for powering the EU, including Slovenia, and global economies with the digital skills they need to thrive/survive. The EU economy is constantly evolving and the demand for relevant knowledge, skills and attitudes is changing over time. Not only that, the additional demand for digital skills and competencies has been exposed by the Covid-19 pandemic. To deal with these changes, students must be equipped with a set of key competencies – including literacy, numeracy and digital competence (European Commission, 2020b). Education and training play a crucial role in enabling young people, in particular, to develop these competencies and, thereby, provide the conditions for the best possible start in life. To better identify and manage the acquisition of the required knowledge, skills and attitudes, and to prevent the emergence of skills gaps and mismatches, effective communication of the needs of the EU economy to the education and training sector is essential (European Commission, 2020c).

Europeans need digital skills to thrive in a technology-driven economy. Everyone, but especially students who will be seeking jobs in the near future, will have to be digitally skilled and confident if they are to succeed in a rapidly changing environment and adapt to new and emerging technologies. While the level of digital skills in the EU is gradually improving, the Covid-19 pandemic has brought to light inequalities among the EU countries, especially in ICT infrastructure, i.e. access to a good Internet connection, while the digital transformation is accelerating. The vast majority (90%) of jobs in all sectors will in the future require some form of digital skills, yet 35% of workers in the EU lack such skills. The demand for digital skills will grow with the skills in demand ranging from basic to advanced, and including AI, data literacy, supercomputing and cybersecurity (European Commission, 2020a). Accordingly, not only Slovenia but the EU as a whole should ambitiously address the opportunities and challenges of the digital transformation in education and training while also reducing the digital divide in the EU.

This could be facilitated by adopting the following guiding principles, which are embedded in the Digital Education Action Plan (2021–2027) and summarized below (European Commission, 2020a):

- High-quality and inclusive digital education, which respects the protection of personal data and ethics, should be recognized as a strategic goal of all stakeholders active in education and training. That is, the Covid-19 pandemic has revealed that digital education is not a marginal concern but a crucial component of teaching, learning and assessment in the modern age, especially in the post-Covid-19 era.
- The digital transformation of education should be considered as a task for all of society. It should include an enhanced dialogue and stronger collaboration between relevant stakeholders, i.e. educators, the private sector, researchers, municipalities and public authorities. Moreover, also parents, companies, civil society and students themselves should become more closely engaged in attempts to make affordable, equitable and high-quality digital education a possibility for all. The aforementioned should be underpinned by facts and data to help evaluate the success with and enhance the awareness of the challenges and opportunities created by the digital transformation in education.
- The promotion of investment in equipment, connectivity and organizational capacity and skills should ensure that everybody has access to digital education since education is a fundamental human right, which must be guaranteed regardless of its form – physical, digital or hybrid.
- Digital education should play a critical role in enhancing inclusiveness and equality. Digital skills and

competencies are crucial for the development and use of digitally accessible and inclusive systems. On the contrary, the deficient digital skills or competencies and lack of accessibility mean that some disadvantaged groups of teachers and students have been unable to continue work and learning during periods of lockdown, which then added to the educational inequality.

- Digital competencies should be seen as a vital skill for all educational staff and be embedded in all areas of teacher professional development. Therefore, educational staff should have access to ongoing opportunities for professional learning and development tailored to their needs and discipline.
- Education policymakers have an important role in digital education. They should understand how and where digital technologies can enhance education, provide appropriate and sufficient resources or investment, empower educators, learn from best practices, and support relevant organizational change.
- Digital literacy, including basic and advanced digital skills and competencies, is essential for life in a digitalized post-Covid-19 world. A sound understanding of this digital world should form part of the formal and non-formal education provided at every education and training institution.

In the guidelines proposed for the EU level, Slovenia should ensure long-term strategic guidance on the accessibility of remote learning with an emphasis on a safe, stimulating and inclusive educational environment (The Slovenia Times, 2020). It is especially important that policymakers prepare and implement coordinated and future-oriented actions that support the development of digital skills and competencies for the digital transformation during the Covid-19 pandemic, particularly in the post-Covid-19 era.

6.6 Conclusion

The Covid-19 pandemic is responsible for the biggest disruption to education and training seen in Europe's recent history –100 million students, teachers and education across the planet have been affected, with many having turned to digital education to complete the academic year. For many, this was the first time they had fully used digital technologies for teaching and learning (European Institute of Innovation & Technology, 2020). The digital transformation in education is being driven by advances in connectivity, the widespread use of devices and digital applications, the need for individual flexibility, and the ever-growing demand for digital skills (European Commission, 2020a). The efforts to curb the outbreak of Covid-19 led to the closure of education and training buildings, campuses and other sites and a forced shift to emergency modes of digital education in countries around the world. It is therefore understandable that raising the inclusiveness and quality of education and training systems as well as the provision of digital skills for all during the digital transition is of huge strategic importance for the EU (European Commission, 2020a). This means it is not surprising that the Digital Education Action Plan (2021–2027) emphasizes the call to action for stronger cooperation on the EU level to: 1) learn from the Covid-19 crisis, during which technology has been used on an unprecedented scale in education and training; and 2) make education and training systems fit for the digital age. It especially emphasizes the need for basic digital skills and competencies (i.e. digital literacy, including fighting disinformation, computing education and good knowledge and understanding of data-intensive technologies like artificial intelligence) as well as advanced digital skills which produce more digital specialists and also ensure that girls and young women are equally represented in digital studies and careers (European Commission, 2020a). Since it is unclear what the future holds, it is important more than ever to make sure that people, particularly higher education students, have the skills they need to benefit from the new employment opportunities in the digital economy. In turn, this will help society succeed in the post-Covid-19 world.

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WHAT CAN WE LEARN FROM THE COVID-19 PANDEMIC IN TERMS OF DEVELOPING DIGITAL SKILLS IN HIGHER EDUCATION? A BOSNIAN AND HERZEGOVINIAN PERSPECTIVE

Maja Arslanagić-Kalajdžić, Amra Kapo

7.1 Introduction

We live in a world of rapid change where people's lives move fast and all aspects of life are quickly consumed. In the last few years of technological advancement, one word that has come to the fore is "instant" – everything now and immediately. We have seen very intense and significant advances in technology in recent years that have impacted several areas of our lives.

One area greatly affected by these changes is higher education. Higher education institutions (HEIs) play a crucial role in digital transformation, especially in meeting the need for adequate skills (Jørgensen, 2019). Nowadays, almost all developed countries are investing significant resources in improving their education systems to provide the foundation for students to develop the skills and competencies they need for the labour market. For this reason, all governments of developed countries are launching initiatives to ensure that all citizens are ready for the digital economy. One of the EU's main goals is to promote a powerful digital education ecosystem. In this way, the most important skill to be mastered by both educators and students is digital literacy. Digital literacy and digital competence (Spante et al., 2018) have shifted from a purely technical focus on the use of technology to a knowledge-based, cognitive, critical and responsible perspective. Digital literacy is considered one of the key competencies for all European citizens (European Commission, 2006).

Policies and plans for digital literacy development in developing countries also exist since they are seen as a necessity. Unfortunately, they are mostly underrepresented and appear low on the priority list. Indeed, it has become evident that the governments of developing countries also need to transform their education systems and bring about policy change to support digital learning (Kalolo, 2018).

Parallel to this stronger focus on digitization, the entire world was hit by the Covid 19 pandemic in 2020. The pandemic-related closures have had a major impact on digitization processes and will have long-term consequences. This is especially true for higher education systems where most lectures in the last three semesters have been delivered online through some form of distance learning support.

This policy paper brings the perspective of Bosnia and Herzegovina (hereafter BiH) and the response of its higher education system to the Covid-19 pandemic. We compare current actions and measures with

those on the EU level and derive policy implications and recommendations. The remainder of the paper is organized as follows. First, we present the Covid-19 pandemic situation in BiH in 2020 while creating an overview of the higher education system in BiH and the Covid-19 pandemic's impact on educational activities, before presenting evidence on digital skills and competencies for the digital transformation in BiH during Covid-19. Based on these analyses, we prepare a set of policy recommendations for different institutions as well as for the main actors in the higher education system.

7.2 The Covid-19 situation in Bosnia and Herzegovina in 2020

In January 2020, a new disease began to attract worldwide media and public attention. Scientists soon discovered the cause of the disease was a new type of coronavirus, officially named SARS-CoV-2, which first appeared in the Chinese city of Wuhan and for which an appropriate medical response has yet to be found (UNDP, 2020). This virus can be transmitted in just a few minutes by droplets or even by touching fomites. Although older and very young children are susceptible to milder symptoms, no one is immune to this new infectious disease once it enters the body, making everyone vulnerable to its devastating effects.

In Bosnia and Herzegovina, the first case was confirmed on 5 March 2020, while the number of infected individuals has increased rapidly since then. By 25 February 2021, the cumulative total number of people infected with coronavirus worldwide was 113,267,696, with a total death toll of 2,512,190. The total number of infected people in BiH by 25 February was 130,510, whereas there had been 5,062 deaths from coronavirus infection. Regardless of the health aspect, the pandemic has put the world economy and globalization to the test and created a challenge that threatens an acute global economic crisis. If we compare BiH with countries in the region (Table 1), we see an extremely high number of deaths per million inhabitants, that is, 1,525 people (the only country with a higher rate is Slovenia with 1,820 deaths per million people), which is the result of the current macroeconomic situation and the complex and laggard health infrastructure in our country.

Table 1: Number of Covid cases in BiH vs. the Region in February 2021

Country	Total cases	Total deaths	Active cases	Deaths/1M p.	Population
Bosnia and Herzegovina	128,661	5,016	10,766	1,535	3,267,613
Bulgaria	236,666	9,854	26,560	1,425	6,914,577
Croatia	240,017	5,449	2,111	1,333	4,088,885
Greece	180,672	6,321	14,581	608	10,390,128
Montenegro	72,395	957	8,158	1,524	628,117
North Macedonia	99,408	3,076	6,590	1,476	2,083,319
Romania	781,329	19,894	35,909	1,039	19,154,628
Serbia	439,596	4,351	34,898	499	8,714,619
Slovenia	185,014	3,784	11,032	1,820	2,079,122

Source: Worldometer, 2021.

Due to its complex institutional system, BiH has been relatively slow in responding with measures to help various aspects of life affected by the Covid-19 pandemic, and it remains slow given that BiH has not yet formally procured vaccines (as of February 2021). Regarding economic measures, two entities (Federation of BiH and Republika Srpska) have introduced measures such as: (1) the deferral or subsidization of taxes and contribution payments, (2) the creation of special aid funds, and (3) a moratorium on loans. It is very unfortunate that most of these measures offered have still not been used and that various studies report companies affected by the Covid-19 pandemic do not use any measures at all.

One of the main consequences of Covid-19 for the economy and businesses is definitely the digital transformation and many countries across Europe have recognized this, thus offering various digital services and special support and solutions related to online shopping, online treatments, digital entertainment etc. These developments place an even stronger focus on the importance of digital skills and education, with HEIs being places that make people fit for the market – i.e. they hold a big responsibility to equip them with the skills they need for the market.

7.3 Higher education in Bosnia and Herzegovina and the Covid-19 pandemic

7.3.1 Forced transition from the traditional to the online environment

Much has been written about technology-enhanced learning and its benefits. Yet, many educational institutions around the world, especially in developing countries, have maintained the traditional ways of teaching and not readily accepted new technological solutions and pedagogically supported ways of educating. Table 2 compares traditional learning with the technology-supported (Covid-19-enforced) learning and outlines the advantages and disadvantages of both models, plus the technology used in its implementation. Learning that is technology supported can be equated with Covid-19-enforced learning in the higher education setting today since most of the learning is actually going on in a technology-supported environment.

Table 2: Traditional vs. technology-supported (Covid-19-enforced) learning

	TRADITIONAL LEARNING	TECHNOLOGY-SUPPORTED/COVID-19-ENFORCED LEARNING
ADVANTAGES	• Automatic feedback • Student motivation • Social cultivation	• Orientation to learners • Flexibility in terms of location and time • More cost-effective for learners • Unlimited access to knowledge • Archiving knowledge and its reusability • Collaboration • Updating teaching units
DISADVANTAGES	• Focus on the lecturer • Transmission of information • Limited time and space • More expensive way of transferring knowledge	• Lack of automatic feedback (asynchronous learning) • Lecturers need extra time to prepare the material • Not suitable for certain people
TECHNOLOGY	• Blackboard and chalk • Projector	• Multimedia • Audio/Video • Web 2.0 • Learning management systems • Virtual worlds • m-learning

Source: Adapted from Zhang, Zhao, Zhou & Nunamaker (2004)

While traditional educational practices focus on lecturers and the transmission of their knowledge (Alonso et al., 2005), online learning allows learners to be self-directed and curious (Al-shehri, 2010). Zhang et al. (2004) state that e-learning requires much more maturity and self-discipline than the traditional way of learning in the classroom.

It is obvious that online learning and knowledge transfer hold many more advantages than the traditional method, with the most significant ones being reflected in the following: oriented and adapted to learners, provides flexibility, it is an easy way to update lessons and unlimited access to knowledge. However, in addition to the advantages offered by online learning, Vrasidas (2004) states that lecturers must use technology imbued with pedagogical postulates in order to reap all of the benefits and also notes that "technology should not be studied in isolation, but should be considered in the context and structure of the program or training to examine how the synergy of technology, teaching methods, concrete training and other contextual factors creates the necessary conditions to support the construction of knowledge and learning".

Due to the outbreak of the pandemic, most HEIs (in both developed and developing countries) were forced to make a sudden shift from exclusively traditional or blended learning to a fully online instruction mode. All of this presented a number of challenges for institutions (i.e. if they had not earlier used the technology in the classroom, such as LMS systems, virtual classrooms etc.), for lecturers (especially those not trained to provide online lectures) as well as for students. Obviously, in the future this type of education could be at least partially represented in the educational processes of all HEIs, at least due to the sudden investments, training and creation of online teaching content that probably took place during 2020. This is where the blended learning model of education prevails, which is generally the best of both worlds (traditional or fully online) and will likely be the future in HEIs.

7.3.2 Technology trends in online education and learning

As early as in 2009, Johnson et al. (2009) identified key technologies that can have an impact on learning: mobile technologies, cloud-computing technologies, websites, geocoded data, semantic pages and smart learning objects. Similar recommendations can be found in a report by Borgman et al. (2008) who emphasize the importance of digital content, which they believe is "becoming more real than paper, lab, devices, or books". Such technological trends may still apply, except today they have become ubiquitous.

The traditional way of imparting knowledge, i.e. teaching, may or may not be successful and depends on the instructor, professor or lecturer and whether they can impart knowledge adequately. The same is the case with e-learning. The quality of the e-learning content itself, on the other hand, depends on the person who creates the e-learning content. It is precisely because of this need to create the most successful and high-quality e-learning content possible that every day one can find new technologies and trends that facilitate knowledge transfer and are currently the most popular:

Gamification – a way to motivate, engage and entertain all learners. According to Deterding et al. (2011), this term is defined as "the use of game elements in a non-game context". In the service context, it can also be defined as "a service improvement process that enables a game experience with the goal of adding value to the user" (Huotari, 2012). Gamification in e-learning follows advanced technologies and innovations in the gaming industry with the aim of creating the most realistic and virtual learning environment (e.g. virtual worlds) enriched with many games that include simulation, animation and narration.

Massive Open Online Courses, MOOCs – are a trend in both educational institutions and the corporate world. MOOCs are actually an extension of online education, but in the sense that it is open and accessible to a wider audience as such. Currently, the beneficiaries of this type of education and courses receive certificates that can be converted into ECTS credits and are recognized as part of formal education. McAuley et al. (2010) define it as "a way of integrating knowledge through social networks by facilitating access to professionals in the field of interest and free access to a collection of online resources". There is a high growth rate in the emergence of MOOCs, created and paid for by corporations and universities, which are preferred by participants over free online education.

Personalized learning – is a type of learning that puts the control in the hands of the learner in a way that allows them to "pull off" information according to their needs and create a unique path and learning process. According to Lu (2004), a personalized learning environment is a way of delivering knowledge that best meets learners' needs and is adapted to their needs and preferences. It also provides learners with a variety of media that can be used according to their learning style and pace.

m-learning and bring your own device – this was born out of the need for location- and workplace-independent learning. Employees and other learners increasingly expect to be able to learn or access training from anywhere at any time. Mobile learning is interesting; yet its usefulness must be assessed in detail: Is it really possible to learn using such small devices? In which situations is such learning useful? Is this type of learning already in use? It is necessary to make a detailed analysis of the needs, the specific devices in use, the people who would use this type of learning, and the like (Al Hamdani, 2013; Jairak, Praneetpolgrang, & Mekhabunchakij, 2009; Male & Pattinson, 2011; Wu et al., 2012)?

Cloud learning management system – the learning management system is a repository through which it is possible to create, execute and store instructional content (Bohl et al., 2002). All instructional content is placed on the systems using certain standards, e.g. SCORMs, which allow the monitoring of user performance and activity. The main problem with all learning management platforms (whether they use specific standards or not) is their inability to share learning facilities (teaching materials) directly with other learning management systems. For this reason, the learning management cloud is a necessary basis for sharing learning objects between different learning management systems (Wang et al., 2011). Moreover, the popularity of this technological achievement brings significant cost savings that may arise from converting learning materials from one system to another.

Video in learning – nowadays, most people turn to video channels to learn something they need at a certain moment. For example, videos to solve simple things like how to prepare a favourite dish, to help with specific business problems on an individual (e.g. instructions for how to use certain software) and organizational level. They can be a very useful tool for higher educational purposes.

Web 2.0 technologies – educational and training institutions are increasingly being forced to move away from traditional teaching towards an approach that is oriented to social methods (Arshad, 2014). Since technology is interwoven into all spheres of life, it strives to integrate and come as close as possible to the education system. The latest trend is the integration of Web 2.0 technologies (Wikipedia, social networks, blogs etc.) so that everyone has access to an unlimited repository of works, but also mutual communication and collaboration with other people. This way of organizing learning allows the construction of knowledge on different levels (pupils, students, companies, teaching staff etc.).

7.3.3 Current state of higher education in Bosnia and Herzegovina

The pandemic hit countries around the world in early 2020, leading to significant positive and negative changes in almost every industry. Due to the global emergency caused by the Covid-19 pandemic, many schools and universities around the world were temporarily closed and switched to online teaching (Bao, 2020). The coronavirus disease (Covid-19) pandemic has disrupted education for 1.6 billion children and youth worldwide, threatening to exacerbate the already existing learning crisis (UNICEF & UNESCO, 2020). Many researchers have confirmed that Covid-19 has affected educational institutions all over the world and posed challenges to them in terms of their work system (Toquero, 2020).

Figure 1: Current state of HE in BiH

Source: Adapted from Zhang, Zhao, Zhou & Nunamaker (2004)

In Bosnia and Herzegovina, 15 authorities manage education for 31 HEIs and more than 81,000 students who have been affected by the country-wide university closures since mid-March 2020. First, there are two entities (Federation of BiH and Republika Srpska) and the separate entity of Brčko District. Then, on the level of Republika Srpska, education is managed from the entity level, as well as in Brčko District, while on the level of Federation of BiH higher education is managed at the cantonal level. There are 10 cantons and each deals with the HEIs separately. Thus, the education sector in Bosnia and Herzegovina is highly decentralized and there has been a wide variety of approaches to e-learning and no single e-learning platform. Further, there are 8 public universities and many private ones – totalling 31 HEIs.

Universities have continued their teaching activities using some of the available information technology (IT) and Internet tools, ranging from exchanging materials by e-mail to more advanced video conferencing tools. Due to the nature of the complex organizational structure, i.e. the decentralized university, there are different, non-systematic approaches to the organization of online teaching. Only at the University of Sarajevo are there different platforms among the organizational units, where even within a single organizational unit there are multiple platforms, which creates additional stress and fatigue for the students. Education authorities in different administrative units across the country have opted for locally-specific quality assurance mechanisms during the Covid-19 pandemic. While the approaches are similar in some areas, there are differences in the implementation of quality assurance mechanisms (UNICEF & UNESCO, 2020).

As mentioned, the pandemic has forced certain educational institutions in our country to invest and reinvent technology. Now teachers and students have access to new, faster software solutions for teaching, which for most teachers have certainly improved the quality of their teaching in a particular segment.

7.4 Evidence regarding digital skills and competencies for the digital transformation in Bosnia and Herzegovina during Covid-19

The European Commission (2020, p. 95) has defined digital competence and recognized it "as one of the key competences for lifelong learning. Being digitally competent involves the confident, critical and responsible use of, and engagement with, digital technologies for learning, work, and participation in society … key components of digital competence in five areas: information and data literacy; communication and collaboration; digital content creation; safety; and problem solving".

In its Digital Education action Plan 2021–2027, the European Commission (2020) acknowledges that the response to the Covid-19-caused lockdowns in Europe was better among HEIs since they were better prepared than other education sectors due to their previous experience in blended learning options and the online digital content they offer.

During the first months of the pandemic, through an initiative of the School of Economics and Business, University of Sarajevo, Bosnia and Herzegovina participated in the global survey entitled "Impact of the Covid-19 Pandemic on the Life of Higher Education Students" (Aristovnik et al., 2020), which covers different aspects of student life such as socio-demographic and academic characteristics, academic life (lectures, tutorials/seminars and practical classes, supervisions/mentorships, assessment and workload, teaching and administrative support and student performance/expectations), infrastructure and skills for studying from home, social life, emotional life and life circumstances (general circumstances, financial circumstances, support sand behaviour, general reflections).

In Bosnia and Herzegovina, 409 unique responses from students were collected, encompassing the majority of universities in the country. Descriptive information about the respondents is presented in Table 3 below.

Table 3: Descriptive information about the respondents from BiH

Descriptor	Percentage	Descriptor	Percentage
Age		**What level of study are you enrolled in?**	
Up to 20	18.40	Bachelor's degree (1st level)	88.20
20	25.80	Master's degree (2nd level)	10.60
21	14.50	Doctoral degree (3rd level)	1.20
22	17.90		
23	11.30	**Field of study**	
24	6.20	Arts and Humanities	1.73
25+	5.90	Social Sciences	70.12
		Applied Sciences	3.46
Gender		Natural and Life Sciences	24.69
Male	36.48		
Female	63.52	**Have your on-site classes (those taking place at the location/campus of your study institution) been cancelled due to the Covid-19 pandemic?**	
What is your student status		No, my on-site classes have not been cancelled	19.43
Full-time	96.60	Yes, my on-site classes have been cancelled	77.98
Part-time	3.40	Not applicable (e.g. I do not have classes this semester/term)	2.59

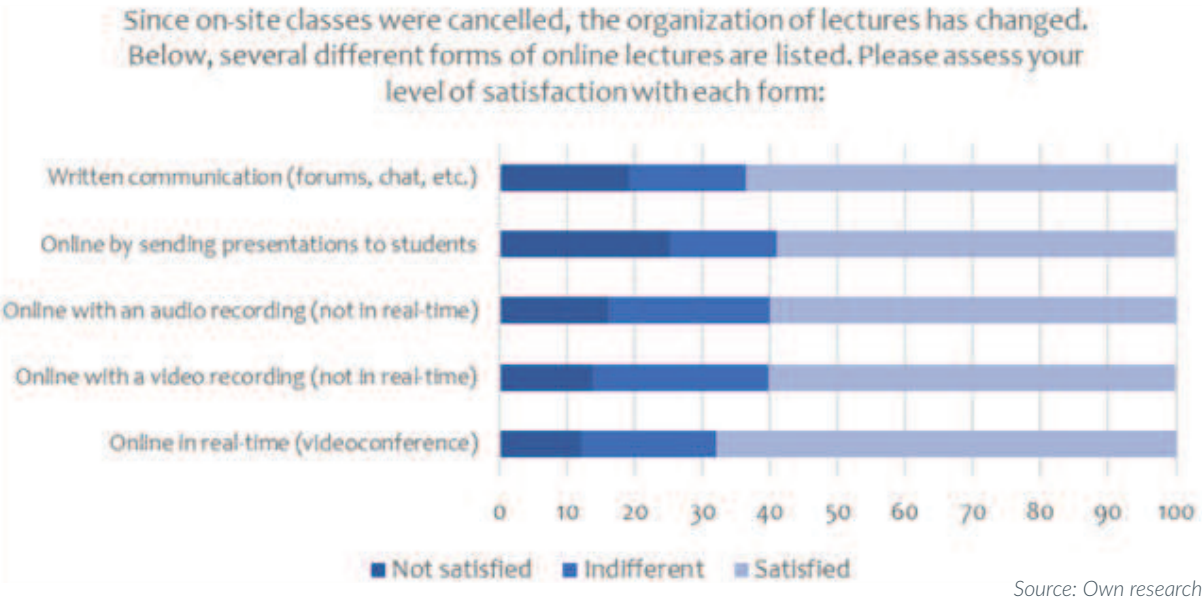
Source: Own research.

Students coming from seven out of eight public universities responded to the questions, namely: University of Sarajevo, University of Banja Luka, University of Tuzla, University of Mostar, University of "Džemal Bijedić" Mostar, University of Tuzla, University of Zenica, as well as students from several private universities (e.g. Sarajevo School of Science and Technology; International University of Sarajevo). A variety of programmes, years of study and demographic background is included in the sample from B&H.

More than two-thirds of the respondents are aged 22 or younger and females (64%) dominate in the sample. Most respondents (97%) are studying full-time at BiH universities. Further, 88% of the respondents are studying on the bachelor level of studies, 11% are pursuing a master's degree and 1% are doctoral students. The large majority (70%) of students come from the Social Sciences, followed by the Natural and Life Sciences (25%), the Applied Sciences (3%) and the Arts and Humanities (2%). Finally, in the first wave of Covid-19, the on-site classes were cancelled for 78% of the respondents.

Graph 1 shows the satisfaction of the students with the organization of online lectures after the on-site classes were cancelled. Five different forms of online communication and lecturing are offered: Online in real-time (videoconference); Online with a video recording (not in real-time); Online with an audio recording (not in real-time); Online by sending presentations to students; and Written communication (forums, chat etc.).

Graph 1: Satisfaction of BiH students with the organization of online lectures



Source: Own research

Our findings show that BiH students are mostly satisfied with the 'new normal', that is, with the new way of organizing lectures. They are the most satisfied with the online in real-time (videoconferencing) way of teaching (68%), which is then followed by written communication in the form of forums, chat and other (64%), with online with video or audio recording (not in real-time) receiving a similar level of satisfaction (60%), while they are the least satisfied with the online mode consisting of sending presentations to students (59%). A total of 43% of students claimed their workload has become larger or significantly larger, 38% of students stated their workload has stayed the same, while for the rest the workload has become smaller or significantly smaller.

Graph 2 shows the challenges of the new teaching and learning environment for BiH students. Most of them (65%) agree they have managed to adapt to the new teaching and learning experience, while at the same time 60% of students believe it is more difficult for them to focus during on-line teaching in comparison to on-site teaching. For 36%, their performance as a student has improved since the on-site

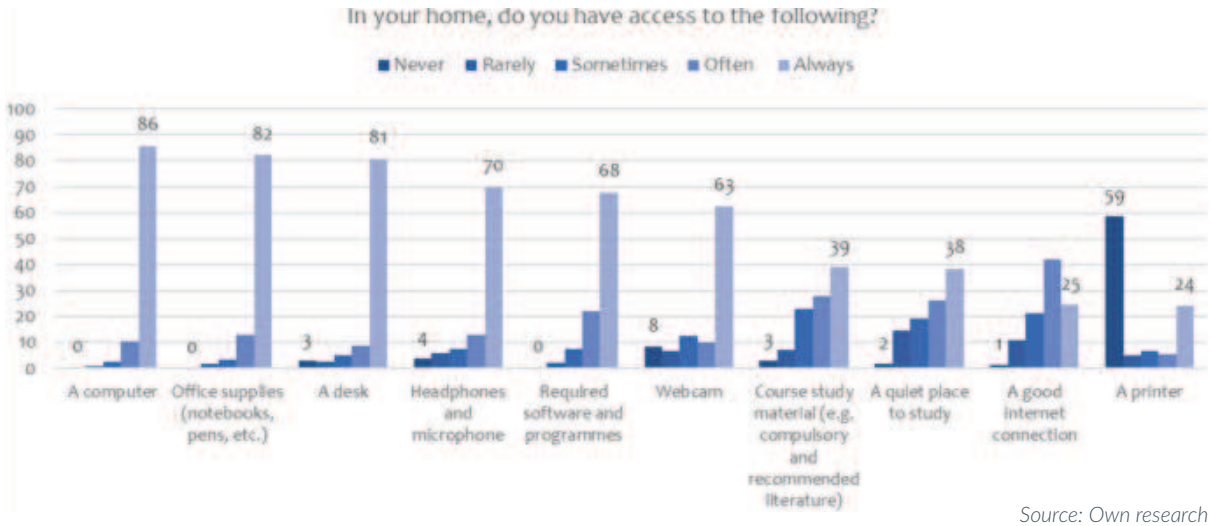
classes were cancelled, yet for 37% of the students their performance has worsened since the lockdown started. More than half the respondents (56%) believe they have been able to master the skills taught in class even after the on-site classes were cancelled.

Graph 2: Challenges of the new teaching and learning environment for students

Source: Own research

In Graph 3, we present the situation regarding BiH students' access to the necessary study materials from home. Most students have no problem with access to a computer, office supplies, desk, headphones & microphone, the required software and a webcam. However, when it comes to the course study materials, only 39% have constant access. Just 38% of the students have a quiet place to study available in their homes and only 25% constantly have a good Internet connection. Interestingly, 59% students claim they never have access to a printer at home.

Graph 3: Access to necessary study materials from home



Source: Own research

Finally, in Graph 4 we can see the level of computer skills of the BiH students. Almost all, that is, 96% of the students are confident in using online communication platforms (e-mail, messaging etc.) while 90% know how to browse online for information. Up to 89% know how to share digital contents and 84% claim that they do well in using the software and programs required for their studies. Again, a large share of students (82%) knows how to use online collaboration platforms. Two categories for which the students are least confident, but where once again they have a high degree of confidence in, are: using online teaching platforms like BigBlueButton, Moodle, Blackboard, GoToMeeting etc. (78%) and applying advanced settings to certain software and programs (61%).

Graph 4: Level of computer skills of BiH students

Source: Own research

Taking all of the above into consideration, we may conclude that students in BiH have a high level of digital skills and that the Covid-19-forced transition to the online environment did not present too much of a challenge for them. It would however be interesting to see the other side of the picture – the professors and the lecturers – and to compare their level of skills and assess their challenges in these times, to obtain a full overview of the situation.

7.5 Policy recommendations for measures of different institutions and other stakeholders

Considering the above facts, which mainly relate to the complex environment in which the education system in BiH operates and the findings of the early Covid-19 survey with students, the recommendations listed below are largely in line with the EU's recommendations and focus on five key areas: (1) improvement of teaching and learning; (2) continuous digital skills education; (3) the well-being of teaching staff and students; (4) equal opportunities for all students; and (5) improved coordination of efforts on all levels in BiH. Details are presented below and in Table 4.

The first recommendation relates to a general improvement of education. In the run-up to the worldwide closure of educational institutions and the ending of non-formal education, there were notable innovations in responses to support learning and teaching. These innovations are here to stay for the long term. But the responses also show great variation, beginning with the different non-systemic delivery of knowledge, and there was certainly a decline in the quality of education in certain areas due to their nature and the inadequate willingness of teachers to innovate. Another problem is the inability of a certain number of students to participate equally in the online courses, while the impact of student dropouts has yet to be measured. The other side of the coin is the inability of several professors and lectures to adequately implement online courses with all of their possibilities. In this

manner, besides planning on government level, it could be helpful to create and – upon the establishment of budget funding – maintain a long-term system for the social exchange of teaching materials through a repository of open (and free) teaching content (and complete "MOOC" courses), for all levels of education and for all professors/lecturers. Further, professors and lecturers also need additional education, potentially also through best practice examples and an examples-based approach (from successful institutions to less successful ones).

The second recommendation aims to respond to the current need for digital skills due to technology improvement. All HEIs are responsible for ensuring their students possess the skills they need to make use of the new technologies, and must prepare them for labour markets where the probability of disruption is high (Jørgensen, 2019). This could be done by expanding the range of university undergraduate programmes in the field of IT and related borderline disciplines (e.g. business, design, design, journalism, media). For example, the following programmes should be considered and developed: Certificate in Computing, Certificate in Web Design, Diploma in Dynamic Web Applications, BSc in Computer Science. Also, introducing a system of continuing education in the field of digital technologies, project writing, online security and privacy and entrepreneurship should be considered for HEIs, with a special system for evaluating the acquired knowledge and competencies by establishing some sort of Digital Education Academy (e.g. on the highest level in BiH – the national level).

Table 4: Policy recommendations for BiH

#	Recommendation	Description	Policy level	Priority
1	Improve education and accelerate positive changes in teaching and learning	Use the current level and willingness of the teaching staff to improve education and secure possibilities for all students to learn	M, U, F, S	High
2	Continuous education on digital skills	The focus of change should be on improving the digital competencies of both teachers and students through systemic interventions that require: planned and long-term consistent policy, budget support for implementation through curricula funds for the implementation of projects that should encourage an entrepreneurial spirit and work on building entrepreneurial abilities and skills	M, U, F, S	High
3	Well-being of teaching staff and students	Because of global pandemic trends, higher education must prioritize academic, career counselling, and even medical services and programmes that should be available online to students at the university. All educational institutions should offer online counselling and mental health support for their staff and students given the uncertain duration of the pandemic.	M, U, F, S	Medium
4	Equal opportunities for all students	Government should provide access and equal opportunity to lower-income students	M, U	Medium
5	Improved coordination of efforts on all levels in BiH	Increased coordination of efforts related to digital transformation and digital competencies should be implemented through a top-down approach on all levels in BiH	M, U	High

Notes: F – Faculty level, U – University level, M – Ministry, S – Students and supporting persons

Source: Own research

The third recommendation refers to ensuring the well-being of teaching staff and students. Well-being and particularly psychological health are crucial for overcoming the difficult times brought by the Covid-19 pandemic. Therefore, HEIs and ministries in charge must focus on academic counselling, offering medical services and advice – all in an online environment. Mental and psychological health support should be available to all staff and students given the uncertain duration of the pandemic and the general uncertainty about what the future may bring. These efforts should be coordinated among all stakeholders: ministries, universities, faculty/staff and students.

Equal opportunities for all students is the title of the fourth recommendation in this policy paper. Namely, as we can see, although the majority of students say they possess the necessary tools and equipment for online teaching, in BiH it is still reported that an Internet connection is a problem, as well as finding a quiet place to study (in the absence of libraries and study places on-site). The programmes of ministries and universities should focus on providing equal opportunities for all students, and in particular help and support lower-income students with the necessary facilitating elements for their online studies.

Finally, in order to achieve the abovementioned recommendations, BiH needs to follow the fifth recommendation: to improve the coordination of efforts in terms of digital competencies on all levels of government. There is a need for an improved policy on digital competencies and their importance for BiH society on the national level and for the actions that should be implemented through a top-down approach (from the national ministry in charge – the Ministry of Civil Affairs, down through the entity-level ministries in charge to, finally, the cantonal ministries which are managing the universities).

7.6 Conclusion

The whole world has witnessed how the Covid-19 pandemic has been changing all aspects of life, quickly turning to technology and all of its benefits. Classes, work, grocery shopping, buying clothes through to the most basic contact with other people have all assumed an online form. It is safe to say that people without access to the Internet have indeed been deprived of many things, and their way of life has become much more difficult. The shock of the Covid-19 crisis in education is unprecedented. Although the pandemic will have lasting consequences for the education system, the education community has proven resilient and has laid the groundwork for a comeback. Online education and learning have experienced their absolute heyday during this time, first in schools and colleges, and then in organizations and in daily life. Certainly, even those who questioned the usefulness and importance of online learning have had to change their minds about it. The Covid-19 pandemic has rapidly expanded the use of online learning systems, even in countries that in some ways lag behind the development and the way things are done in the West. This can certainly be seen in Bosnia and Herzegovina, and while some were not enthusiastic about this type of learning, many (especially younger ones) have still recognized what online learning can offer and have embraced it.

At the very beginning, this paper presented the need for the sudden transition from the on-site to the on-line environment due to the coronavirus pandemic and points out the main technological trends in online knowledge transfer and learning.

The rest of the paper presented the most important facts related to the pandemic in BiH and its impact on higher education. We are experiencing a very complex educational infrastructure, which certainly complicates the modernization process and leaves each educational institution the autonomous right to decide on which direction and to what extent it will develop in relation to the new technological trends. Therefore, we have a heterogeneous approach in all parts and much worse infrastructure in less developed cantons in BiH. Clearly, the pandemic has brought something positive – the necessary and urgent purchase of new equipment, which has accelerated the process of the digitalization of

educational institutions in our country, which were previously on a basic level. On the other hand, students have easily adapted to the new learning methods and will certainly need a similar treatment and approach to teaching in the future.

The last part of the paper presented the main recommendations for the different levels of decision-making, from the ministry through to the educational institutions. We also prioritized those policy recommendations to make it easier for decision-makers to act. Based on the literature search as well as primary data from the student survey (Aristovnik et al., 2020), the recommendations are largely in line with the EU's recommendations and focus on: (1) an improvement of teaching and learning, (2) continuous digital skills education, (3) the well-being of teaching staff and students, (4) equal opportunities for all students, and (5) improved coordination of efforts on all levels in BiH. These recommendations would help all stakeholders in the higher education system in BiH adopt the learning points from the Covid-19 pandemic and optimize further efforts into raising the digital competencies of its students and professors. Further, improvements in digitalization processes and online learning gained through the lockdowns and off-site experiences with learning should be accepted, acknowledged and the best elements of them should be kept for the future, for some kind of a blended learning approach even beyond the pandemic.

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THE COVID-19 PANDEMIC'S EFFECT ON DIGITALIZATION AND INTERNATIONALIZATION POLICIES OF TURKISH HIGHER EDUCATION

Cenay Babaoğlu, Onur Kulaç

8.1 Introduction

Higher education, which is a significant stage of any education system and policies, is found at the top of the priority list of any country. The outputs of higher education affect both scientific development and the labour market in different sectors. While governments plan budgets and create future projections, they strive to improve their higher education institutions (HEIs). The concepts of internationalization and global engagement have come to the fore in terms of enabling HEIs to provide more efficient education and training, carry out scientific research and produce projects that add value to society. For this reason, universities have developed short- and long-term strategies to rank higher up in world success rankings and become a centre of attraction for international students. Besides, academic staff mobility is maintained by various programmes, scholarships, bilateral agreements and international projects. All of these efforts and initiatives make it essential to ensure the sustainability of higher education developments and the goals set.

In history, many issues, especially epidemics, have triggered crises around the world. Covid-19, a new type of coronavirus that emerged in the People's Republic of China at the end of 2019, soon saw the whole world fall under its influence. The pandemic conditions have led to radical changes in almost every policy field, especially in health and the economy, with governments implementing new policies to reduce the pandemic's adverse effects. Higher education policies are among the topics most affected by the pandemic. Dramatic changes have been experienced, particularly in terms of the continuation of education. The Covid-19 pandemic is a window of opportunity emerging with respect to digitalization and digital skills development in higher education. Digitalization in the public sector has been an intensively studied process over the last 20 years, and reform-like transformations have taken place in many fields. In the pre-pandemic period, distance education programmes and platforms formed the basis of digitalization in higher education. Yet, the digital transformation and increased capacity for digital skills in higher education, which are expected to spread over extended periods, have made progress during the pandemic within a short time. In this context, the study's foremost aim is to scrutinize the processes of change and transformation that have occurred within the scope of e-learning, digital skills and internationalization in Turkish higher

education during the pandemic. To this end, the impacts and contributions of digitalization with respect to the internationalization and Europeanization processes in the Turkish higher education system will be discussed and policy recommendations set out.

8.2 Turkey's higher education policy and Covid-19

The coronavirus was first detected in December 2019 in Wuhan/China, while on 11 March 2020 the WHO announced the name of the new coronavirus disease: Covid-19. By 11 March, Covid-19 had become a global pandemic. In Turkey, the first case was seen on 10 March, with the government announcing new measures for the country. Turkey has had to develop new policies in many different areas to combat Covid-19. On one hand, health policies have come to the fore in the fight against the epidemic. On the other hand, supportive economic policies were emphasized. Turkey, which holds an advantage with its advanced health sector capacity, has tried to prevent the virus' spread in the country through restrictions and isolation (Ahsan & Babaoğlu, 2020; Babaoğlu, 2021; Babaoğlu & Kulaç, 2020; Kulaç & Babaoğlu, 2020). About 30% of Turkey's population has been tested. Further, among the population the number of cases is about 3%, and 8% among those tested. The ratio of coronavirus-related deaths to the number of cases is 1% (MoH-Turkey, 27/02/2021). Updated data are provided below (see Table 1):

Table 1: Covid-19 Cases in Turkey

Date	No. of Tests	No. of Cases	No. of Deaths	Pneumonia Rate of Patients (%)	No. of Intubated Patients	No. of Recovering Patients
26 February 2021	**32,939,661**	**2,683,971**	**28,432**	**4.2**	**1,195**	**2,556,785**

Source: Ministry of Health in Turkey, 2021

Due to the population's location and mobility, Turkey is among the countries most affected by the pandemic. While formulating public policies to respond to the pandemic, specific decisions were taken for each city. In this process, the prohibitions and restrictions imposed also differed in each city. In implementing the decisions taken, non-governmental organizations, street-level bureaucrats, and public employees on all levels have shown outstanding dedication. Also, public support has contributed to the successful outputs of the policies implemented during the pandemic. Coordination between ministries, central government and local government collaborations have been fundamental in combating the pandemic.

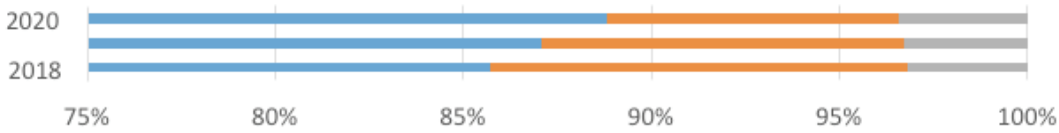
8.2.1 Internationalization and Europeanization policy in Turkey

There is a direct relationship between the quality of higher education policies and countries' socio-economic development levels. Even though countries like Britain, Germany, France, Sweden and Finland already have developed economies and high levels of prosperity, there are efforts to further improve higher education (Teichler, 1996). Turkey has been involved in developing higher education goals for many years, and the development of higher education has become one of the highest priorities of the 5-year development plans. In addition, various reports prepared by the European Union also guide Turkey's higher education policies. Parallel to these developments and effects, Turkish higher education policies are gaining significant momentum on the way to internationalization (Babaoğlu, 2018).

The number of students at HEIs in Turkey and the number of academics working there have also increased

in recent years. The establishment of new universities and increased university quotas directly affect this process. The number of university students and instructors in Turkey by years is shown in Graph 1.

Graph 1: Number of Students and Instructors in Turkey (2018-2020)



	2018	2019	2020
Undergraduate	4241841	4420699	4538926
Postgraduate	549,773	490,373	397243
Instructor	158098	166225	174494

Source: YÖK, 2021.

Graph 1 reveals a significant increase in the number of academics working at Turkish HEIs between 2018 and 2020. Similarly, a notable increase is seen in the number of students on the undergraduate level. However, one may see a decrease in the number of students on the postgraduate level. When all of these processes are evaluated, one may say that Turkish higher education is developing and promising data show that it can achieve better levels in the coming periods.

Turkey, which saw increases in its enrolment rates in higher education between 2004 and 2012 and is trying to develop in this area with new universities and scholarships, is continuing to develop the associated capacity of its young population (Gür & Özoğlu, 2015: 310). UNESCO's international student data show Turkey has become one of the ten countries with the most international students in higher education in the world. The USA takes first place, followed by the UK and Australia. The number of international students in Turkey, around 50,000 in 2014, reached 200,000 in 2020 (YÖK, 2020). The table below (Table 2) shows the top 10 countries with the most students in Turkey.

Table 2: Number of Students in Turkey

Country	No. of Students (Annually)
Syria	**27,606**
Azerbaijan	**18,830**
Turkmenistan	**16,592**
Iran	**7,144**
Iraq	**6,468**
Afghanistan	**6,632**
Germany	**4,310**
Somali	**3,077**
Bulgaria	**3,003**
Egypt	**2,752**

Source: Ministry of Health in Turkey, 2021

As well as international students, students going abroad from Turkey also influence internationalization. When Table 3 is examined, one may see that roughly 80,000 students travel abroad to pursue a higher education. England, the USA and Germany are the top three targets for abroad study from Turkey. Besides, Malta is a suitable location for Turkish students' short-duration English courses (see Table 3).

Table 3: Turkish Students' Most Preferred Countries for International Education

Country	No. of Students (Annually)
England	**30,000**
United States of America	**25,000**
Germany	**10,000**
Malta	**5,000**
Canada	**3,000**
Australia	**1,500**
France	**1,500**
China	**1,000**
Ireland	**800**
Egypt	**2,752**

Source: Erhan & Gümüş, 2020: 207

Turkey has taken the necessary steps in line with internationalization strategies in the field of higher education. Other international and supranational organizations that Turkey is a member of or interacts with have had direct influences on internationalization and Europeanization in Turkish higher education policies. For example, EU Youth Programmes have impacted education programmes in Turkey. Similarly, the Bologna Process has had various effects on the Turkish higher education system (Çelik, 2012). On the other hand, it is stated that the studies of the European administrative space enable internationalization and similar policies to be carried out in different countries (Van Damme, 2001). It may be said that the EU, like in many other policy areas, has an impact on national policies in Turkey in the area of higher education.

Turkey is experiencing a process of Europeanization in its public administration with its EU membership process. These reflections are also seen in the higher education system and structure. Van Damme (2001) and Teichler (2009) claim the internationalization efforts in higher education have accelerated this process, and European Higher Education Area studies have facilitated similarities. Taylor & Henry (2000) also note that the globalization process facilitates this analogy while Porter & Vidovic (2000) state that neoliberal policies developed after 1980 feed this analogy. According to Johnson (2006), transfers in higher education policies from developed countries to developing countries also spread these similarities.

The development of higher education in Turkey formed by Europeanization, internationalization and global engagement is overwhelmingly substantial. Especially in recent years, the increase in the number and variety of international students in Turkey is promising for policies to be designed in the short- and long-term. Yet, the analysis of reflections on the Covid-19 process in Turkish higher education also holds a functional value for identifying the current state and offering policy recommendations.

8.2.2 The pandemic's effects on higher education in Turkey

As an EU candidate country, Turkey stands out for its higher education system, the number of its universities, the number of students at HEIs and the extent of its global engagement. Besides, it is one of the countries most affected by the pandemic due to its geographical location, population density and high human mobility. The Turkish higher education system has undergone significant transformations over the years according to various factors and demands. In this transformation, issues like the EU membership status process, relations with international actors, the vision for 2023, internationalization, quality management, reverse brain drain, scientific development goal and regional development have been in play. Globalization's impact on higher education, as in all areas, has made the internationalization concept even more essential and laid the foundation for milestones in Turkish higher education (Porter & Vidovic, 2000; Van Damme, 2001). Countries such as Germany (Süngü & Bayrakçı, 2010: 898), England (Trowler, 2002) and Sweden (Rhoades & Sporn, 2002: 356), which previously experienced similar processes, still maintain the importance they attribute to higher education policies and are developing strategies in this direction. Following the onset of the pandemic, significant improvements have been made in digitalization activities related to Turkey's higher education. Relevant policy actors and stakeholders have made practical efforts to ensure that undergraduate and graduate students are not adversely affected by the pandemic. As part of developing digital skills in higher education and e-learning, significant transformations have been observed in the Turkish higher education system.

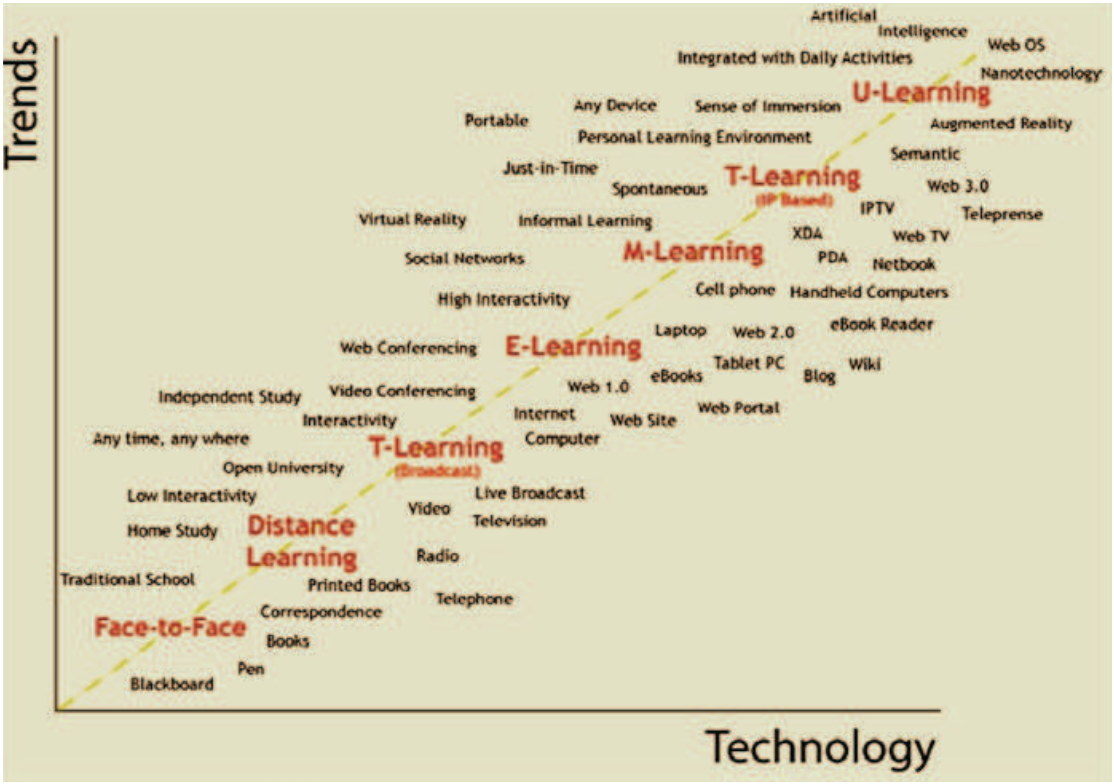
Despite the pandemic's disadvantages, the relationship between internationalization and e-learning offers some hope for the future. The pandemic may be said to have generated vital windows of opportunity for many students. Higher tuition fees and living costs at reputable universities abroad pose significant obstacles for students in ordinary periods. Students who plan to pursue a higher education abroad can succeed through government or private foundation scholarships. Due to limited quotas in scholarships, most students continue their education in HEIs in their own countries. This situation holds negative consequences for internationalization and sees students continue their education at home in their own countries. However, due to the pandemic, with the e-learning process in which their various digital skills have risen to the fore, students have had an opportunity to study at universities abroad at an affordable cost. In this case, students can study at the best universities globally without the additional cost of living abroad, which will significantly affect the development of internationalization.

In a strategy book published by the Council of Higher Education in Turkey in 2007, the subject of e-learning was considered one of the strategic moves and it was found that providing programmes with the e-learning method accounting for up to 30% would support universities in Turkey, especially in terms of their capacity (YÖK, 2007: 156). During the pandemic, the number of distance learning centres has increased rapidly, and in the first phase establishment works were completed in 123 out of 209 universities (YÖK, 2020). In this context, digitization processes were examined under a separate heading and how the pandemic has played a role in this process were questioned.

8.3 Digitalization in higher education and e-learning

Toffler (1981) described the information age as having a massive impact on states, private sectors, and everyday lives. These developments impact educational processes, approaches, institutional structures, and the tools and equipment used. E-applications have eliminated the need for corporate structures' physicality and moved the distance education system to a new stage (Khan, 2005: 1) Telli-Yamamoto, Ozan, & Demiray (2010) prepared a historical development chart reflecting today's conditions by following innovative technologies. They claimed that face-to-face learning processes have evolved into a U-learning approach fuelled by innovative technologies such as artificial intelligence and augmented reality (see Graph 2).

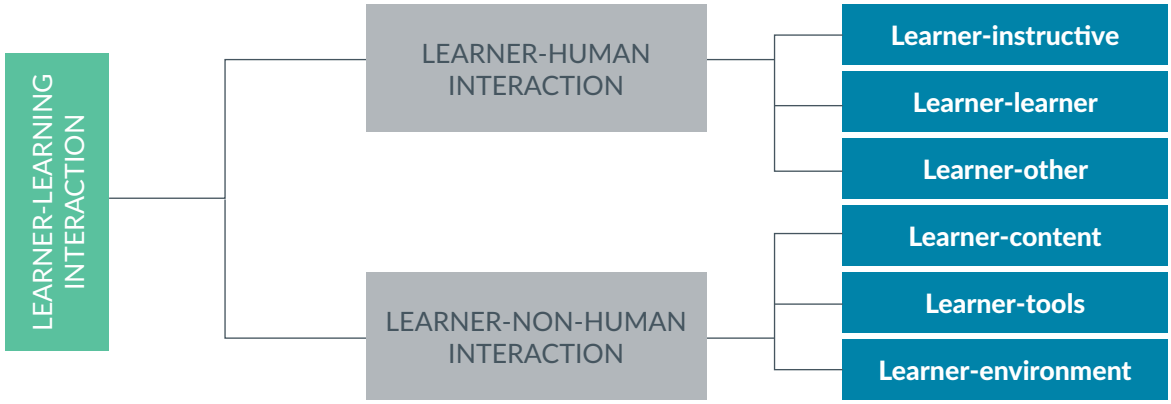
Graph 2: Learning Method Trend Chart



Source: Telli-Yamamoto, Ozan & Demiray, 2010: ii

As shown in Graph 2, attempts have been made to make learning processes more interactive over time. Graph 2 also indicates an increase in interaction by following this development chart. The interaction aims to understand the course content well and/or increase the objectives' realization. The interaction styles and titles created by Kumtepe et al. (2017: 11), compiled from different studies, are included in Graph 3.

Graph 3: e-Learning and interaction



Source: Kumtepe et al., 2017: 11

The limitations of discussion platforms and the prolongation of reaction times restrict the opportunities for e-learning platforms. The learner and the learning process interaction, on one hand, and the other human elements are also gaining in importance in e-learning programmes. Increasing interaction affects the success of the learning process. On the other side, teaching tools, the learning environment, contents and instructors are growing in importance. Different variables like age, income, and degree of technological literacy determine success in this process. In other words, e-learning, which functions to reduce the digital divide, also includes the digital divide's adverse effects (Ndou, 2004: 8; Babaoğlu & Öktem, 2017). Based on these discussions, some strengths and weaknesses of e-learning are shown in Table 4.

Table 4: Strengths and Weaknesses of e-Learning

Strengthens	Weaknesses
Increase accessibility	**Need for continuous update costs**
Increase technology use	**Digital divide effects**
Increase the number of students	**Inefficient**
Support lifelong learning	**Decrease interaction**
Material variety	**Inhibition of critical thinking**
Decrease education costs (building etc.) physically	**Technological costs**
	Sufficient human resource problem

Source: Garrison & Anderson, 2003: 52–54

Next to the e-learning approach, which removes the geographical constraints between the instructor and the learner, a new form has developed that does away with time constraints or even adds concurrency. This approach, defined as e-learning, synchronous or asynchronous teaching forms through information technologies and the Internet, has been implemented globally (Georgiev et al., 2004: 1). Mobile LMSs, video, audio, video side, Smart Board, sharing platforms, synchronization experiences, and interactive applications are opening new doors in teaching. In this way, it is observed that information technologies have been increasingly integrated into the education system in recent years, and their level of impact is growing.

8.3.1 Digitalization during the Pandemic

Pandemics have often been a period for transformation and breaking in human history. From the perspective of higher education, it is also possible to talk about such a break. Italy, one of the countries worst affected by the pandemic, closed all schools and universities on 24 February 2020 (Raccamello, Vicentini, & Burro, 2020; Togoh, 2020). On 16 February, 4 days after the announcement of an epidemic in Slovenia, all schools were closed (Ravšelj & Umek, 2020). In Turkey, on 16 March the schools were closed and distance learning was introduced. Despite the previously active e-learning activities, e-learning activities have increased exponentially around the world during the pandemic. This period has also forced the transformation of groups distanced from e-learning and whose compliance capacity is said to be weaker (Ewing, 2021; Telli-Yamamoto & Altun, 2020: 25). E-learning processes, which have accelerated with the pandemic, have been a new experience for many groups. For e-learning efforts to be more successful, both the learner and the instructor must be motivated. In this new system, both the creation of new material and the development of new responsibilities make the process difficult for both sides (Aristovnik et al., 2020b; Liew et al., 2021).

The pandemic requires the digitalization of education and training activities and the acquisition of digital skills in this field. In this process, cross-cultural interaction, flexible working, remote higher education,

and various learning opportunities come to the fore. Besides, online internships, hybrid applications, and models for various courses are essential for the pandemic and post-pandemic periods (Hudzik, 2020: 2–3). International student circulation, and therefore internationalization in higher education, has taken on a new dimension with the pandemic conditions. Here, serious disadvantages have emerged within the framework of global interaction. In particular, there have been severe problems in students' opportunities to study face-to-face at major universities worldwide or engage in various academic activities.

On the other hand, student and academic exchange programmes have also become unworkable, and such activities have been temporarily halted. Some HEIs, which are developing and at the beginning of the internationalization process, have also been unable to accept students and academics from abroad. For these reasons, at first glance one could say that Covid-19 has had a devastating impact on internationalization. In other words, despite the rapid rise of global higher education and interaction in recent years, the changes and transformations have been disrupted by the pandemic.

Despite the pandemic circumstances, digital opportunities also bring new opportunities. Seminars given by various universities around the world in several academic fields have been able to reach wider audiences through online platforms during the pandemic. Students and academics have been able to participate in these academic seminars free of charge and interact with academics sharing similar research areas. In this way, as a positive impact of the pandemic, students and academics have further developed their digital skills and academic knowledge and experience. Moreover, the world's leading academic congresses and workshops, which have been held face-to-face for many years, have continued online during the pandemic. In ordinary cases, graduate students and even academics who have difficulty attending these congresses and workshops due to the high participation costs have had an opportunity to participate in such events, which began to be held online for free or at a reduced cost. This increased interaction and internationalization amount to essential contributions for future periods, especially in international projects and cooperation. Considering this framework, Covid-19 has been a fundamental milestone in internationalization, global interaction and e-learning due to the developments mentioned above, despite its adverse effects and repercussions. It is beyond doubt that in the post-pandemic period the digital skills gained during the pandemic and the newly adopted learning and teaching techniques will be used extensively.

8.3.2 The pandemic's effects on digitalization in Turkey

Turkey has become one of the leading countries in Europe in the area of higher education, with the number of its universities, students and academics rising in recent years. The investments in higher education in Turkey, scholarships and housing opportunities offered to students, and many academics studying abroad have proven to be significant for international students. In this context, over the years the number of international students in Turkey has grown exponentially and created an optimistic vision for the future. However, the Covid-19 pandemic has hampered Turkey's internationalization efforts. On the other hand, e-learning has led to significant changes and transformations in Turkey's e-learning and digital skills. As with other HEIs around the world, Turkish universities have taken practical steps to adapt to the pandemic and not adversely affect the level reached in the area of internationalization over the years. In this setting, it is aimed to successfully implement distance education, develop digital skills and reduce the negative effects of the pandemic through activities implemented within the scope of internationalization.

Turkey has shown considerable improvements in its internationalization, global interaction and the e-learning model Turkey has implemented during the pandemic and the related innovations. In this context, universities are preparing their learning management systems. Developing user-friendly strategies for these systems and providing financial support for new models are some of Turkish higher education's highlights. Further, making decisions specific to each university or department regarding whether education is to be over a distance or face-to-face may be considered an important strategy. Thus, in areas where face-to-face education is functional, such as medicine, it can continue.

In the research study conducted by Aristovnik et al. (2020a), which included data on 30,383 students from 62 countries, satisfaction with the organization of classes was questioned. According to the research results, the average satisfaction level with lectures is 3.296 out of 5, for tutorials/seminars and practical classes it is 3.123 and 3.2 for mentoring activities. For Turkey, these figures are 3.522, 3.146 and 3.144, respectively. These results show Turkey with a level of satisfaction close to the average. The same study found that students in Turkey thought their performance had decreased during the pandemic and could not make enough progress in new skills (Aristovnik et al., 2020a).

Aristovnik et al. (2020a) also looked at the students' ownership of a computer and other equipment required for e-learning. Among the students who participated in the research, the computer ownership rate was about 70%. On the other hand, results of the Household Information Technologies Usage Survey conducted by TURKSTAT show the rate of telephone ownership connected to the Internet has been in excess of 90% since 2010. According to the results for 2020, the rate has exceeded 99%. The Internet access rate in households is 90.7% while the individual-based Internet usage rate is 79%. While these rates were 47.4% and 37.8%, respectively, in 2012, they have doubled in 8 years (TURKSTAT, 2020). This ratio was 91% and 85%, respectively, at the European Union average (EUROSTAT, 2020a; EUROSTAT, 2020b). As may be seen, citizens in Turkey have Internet access and usage rates at the EU average. These data indicate that citizens have access to the necessary technological infrastructure that can use e-learning platforms, and an important stage has been left behind in terms of the economic dimension of the digital gap.

Therefore, it may be claimed that students possess the necessary equipment. As part of supporting students in the pandemic, various opportunities are also offered to students who do not have access to the Internet and a computer. For example, different government agencies shared free Internet to students and some local governments distributed tablets and computers. In addition, crowdfunding applications have provided the necessary technological equipment to students. On the one hand, equipment distributions were made to students with a low income by Social Fidelity groups established under the leadership of the Turkish Red Crescent, a non-governmental organization. The implementation of student-centred practices also contributes to internationalization. Prioritizing academics working in HEIs with systematic vaccination practices indicates the importance of HEIs.

8.4 Conclusion and policy recommendations

Turkey is a candidate for becoming one of the leading countries in Europe in terms of the innovations and investments in higher education it has made in the last two decades. Significant efforts have been expended with respect to Europeanization, internationalization, global engagement, and determined goals. When Turkey's higher education attempts are examined, especially academic development, economic development, social and cultural interaction, and the development of political and diplomatic relations (YTB, 2020) come to the fore and strategies are formulated in this framework. Digitalization has gained in importance and policy implementations are included within this framework in the age of the information society. Online platforms and digital skills have been critical elements of education and business life, along with the Covid-19 process. In this context, the importance of digital libraries, especially for interdisciplinary studies, has become even more remarkable. On the other hand, it is stated that activities aimed at improving education sector employees' digital skills will become widespread (Lee & Spring, 2021; Özer & Suna, 2020: 186).

In Turkish higher education policy, some elements are hugely important for digitalization to reach the targeted levels. These elements include technological infrastructure, the development of online teaching skills, more useful online teaching contents, and measurement and evaluation systems for online training (Arkan, 2020). In this process, the instructors' technological knowledge and skills should be supported, while the necessary training should be given to ensure the developing of interactive content suitable for

digital education. Considering that pre-service and in-service training for instructors to develop digital content is limited, instructors must to be supported in this regard (Altunel, 2020). The digitalization project and transfer of authority initiated by the Council of Higher Education in Turkey before the pandemic has proven to be a tremendous advantage for universities during the crisis. For example, in 2020, more than 6,000 academics and over 50,000 students were educated within the scope of the digitalization objectives (YÖK, 2020).

It is possible to offer functional policy recommendations for both Turkey and EU countries with respect to digitalization and digital skills, experiencing their golden age in higher education during the pandemic. First of all, solutions to universities' economic problems and financial crises occurring during the pandemic should be presented. The government and relevant stakeholders should cooperate to solve the problems in this process. Changing priorities in the field of higher education during the pandemic has led to some new problems. In this process, student-centred decisions must be made and digital capacity development and flexible learning models need to be diversified (Erhan & Gümüş, 2020: 198; Ewing, 2021; IMF, 2020; Witze, 2020). Moreover, policymakers should prioritize actions that will increase digital literacy.

Improving Internet infrastructures and popularizing technological equipment is essential. Further, the popularization of user-friendly applications is significant as well. Two pillars may be mentioned here. The first pillar is the user-friendly design of the software, while the second pillar is the preparation of user-friendly course contents. In other words, it is the design of the lessons that follow digital environments (Kang, 2021; Tomaževič & Ravšelj, 2020: 5). Instructors in e-learning processes should possess skills in educational technologies, e-learning and basic office applications, or multimedia content preparation programs. Besides, for synchronous training, it is necessary to transfer information about the live broadcast experience. It is mandatory to re-learn/teach fundamental educational issues such as live control, student tracking, what to do for students' interaction, or the instructor's role in the course (Telli-Yamamoto & Altun, 2020: 31). During the pandemic, academics should be informed in a teaching model that targets international students. It should be evaluated whether there is an educational model for overcoming the challenges that the individual differences of international learners possess during their learning (Öztürk, 2017: 160).

Covid-19 contains an opportunity for transformation that cannot always be experienced. Organizations need both technological tools and systems and digital skills in this change process (Devinney & Dowling, 2020; Kronblad & Pregmark, 2021: 108; Soong-Chul, 2021: 155). This makes it essential to increase investments in these areas. The lessons learned from the early widespread digital learning experience, which has been overtaken by rapid adaptation due to the Covid-19 pandemic, will serve the development of this method all over the world, and its functionality will become even more desired for its contribution to digital learning, new technologies and systems in the near future.

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HIGHER EDUCATION POLICIES FOR DEVELOPING DIGITAL SKILLS: LESSONS LEARNT FROM THE COVID-19 CRISIS IN SOUTH AFRICA

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9.1 Introduction

The Covid-19 pandemic has made its mark in the 21st century following the crisis it has created in every sector of human life. This pandemic is significant in the sense that its devasting impacts are seen across underdeveloped, developing and developed societies of the world. This crisis has affected various spheres of human endeavour such as political, business, tourism, health, education, amongst others. For instance, in the business world, political and many other spheres, changes have been made to the usual practices: rather than meet in a common place, technological devices are now being used for meetings. Thus, a platform like Skype, initially adopted for social activity purposes, is being for serious businesses and interactions. Likewise, many other platforms such as Zoom, Microsoft Teams, Cisco WebEx Meeting Center, BigBlueButton, HighFive, Zoho Meeting and ON24 amongst others have been introduced and adapted to business and other forms of meetings. Similarly, in the education sector, this has also occurred since a considerable number of learning institutions regardless of level – primary, secondary or tertiary – are beginning to go digital. Devices and social media platforms once discouraged by institutions of learning since they tend to distract the students are now being co-opted for teaching and learning purposes. In recent times, both students and lecturers have been encouraged to employ all manner of social media platforms for teaching and learning purposes. However, the sudden shift to online teaching and learning amidst instructional and infrastructural under-preparedness due to the worldwide crisis tends to limit attainment of the intended aim. Yet, while online learning and teaching were adopted as a temporary measure to save the academic year in many parts of the world, it in fact holds far more implications moving forward. Unlike European countries, many developing and underdeveloped nations like South Africa have encountered a major crisis in online teaching and learning, especially revealing a potentially more devastating digital literacy divide. This means academics must find solutions to safeguard the future positive effects of the pandemic in the higher education sector by formulating policies and strategies for developing digital skills. This paper is therefore based more on a comparison of South African and European higher education students' experiences in online teaching and learning during the pandemic's first wave. By reflecting on some lessons learnt in this period of crisis in online teaching and learning across the world, the paper sheds light on policies for digital skills development as a long-term measure to reduce the

far-reaching negative effects of the pandemic for the higher education sector. The paper looks at various issues concerned with higher education policies for developing digital skills in view of the lessons arising from the outbreak of the Covid-19 pandemic in South Africa. Since the paper focuses on higher education students, the following areas are considered: higher education students vs. digital skills, higher education students' digitals skills development competencies and the labour market, as well as a comparison of digital teaching and learning between South Africa and European nations during the first wave of the pandemic.

9.2 Higher education students vs. digital skills

According to Eurostat (2019), in recent times several young people, especially those of school age (16 to 24 years) have had reason to access online classes. The Eurostat report (2019) also shows that in 2019, following analysis of data collected from 31 European countries that form part of the European Union, about 4 out of 5 young people of school age (16 to 24 years), namely 80% of the respondents, had some form of basic digital skills (Eurostat, 2019). Meanwhile, a review of the work of Ruseva (2015) supports the idea that many young people in Europe possess basic knowledge of digital skills. Yet, Ruseva (2015) added that the basic knowledge of digital skills young people possess is not enough for them to become gainfully employed. This implies that while in many European nations basic digital skills for online teaching and learning may be quite a common phenomenon among young people, especially those of school age, there is a need for them to have even more of such skills to enable them become employed. Conversely, a review of the works and submissions of Mohapi (2017), the European Data Portal (2020) and Aristovnik, Keržic, Ravšelj, Tomaževic and Umek (2020) suggest that young people in Africa lack basic digital skills. The reason for this deficiency is attributed to various factors. The findings of the works of Larbi-Apau, Sampong and Kwofie (2020), Aristovnik, Keržic, Ravšelj, Tomaževic and Umek (2020), Uleanya and Gamede (2019) as well as Uleanya and Yu (2019) show that issues like a low level of development, a lack of basic infrastructure, policy issues, a lack of quality electricity supply, unavailability of or poor Internet facilities, and socio-demographic-related influences constitute reasons for being weak in basic digital skills. However, following the start of the Covid-19 pandemic and the various lockdown measures, several institutions of learning on various levels, including training and vocational institutes across Africa like their counterparts on other continents, moved rapidly from the physical face-to-face teaching system to online. Still, the biggest constraint in this respect remains whether young people of school age actually possess the digital skills they need to ensure access to online learning activities. Aristovnik et al. (2020) find that Africa is one continent where young people largely lack basic digital skills, with this affecting the transition of institutions of learning from on-site to on-line teaching, especially during the pandemic. In addition, despite the non-availability of required facilities and other constraints that hinder young people's acquisition of basic digital skills, it is necessary to explore whether lecturers at African institutions of learning have the skills needed to deliver online teaching services. According to Larbi-Apau, Sampong and Kwofie (2020), lecturers are compelled to transit to providing online teaching services without appropriate training. This then affects the learning abilities of the students. Larbi-Apau et al. (2020) further opine that this pressure on lecturers to shift over to online teaching while not possessing appropriate training might lead to an increase in the drop-out rate among students.

Conversely, European nations are generally attempting to ensure that online teaching and learning activities are being appropriately conducted to assure the desired success and improvement in the education sector, especially during the pandemic. For instance, in a bid to appropriately tackle the challenges of teaching and learning during this period of Covid-19, and to meet the European Commission's vision for high-quality, inclusive and accessible digital education in Europe, the European Union (EU) established a commission responsible for looking into 'The Digital Education Action Plan (2021–2027)'. In an attempt to fulfil its responsibility, this commission outlined a two-point agenda of a call to action for stronger cooperation on the European level. The authors of this paper believe a similar commission could be considered for African

society by the African Union (AU) or South Africa as a nation. In this regard, a commission could be set up to look into ensuring that the acquisition of digital skills becomes a priority among member states.

Meanwhile, the mentioned two-point agenda for stronger cooperation on the European level according to the Digital Education Action Plan (2021–2027) is to make sure of the following, as described below:

1. that European nations learn from the crisis brought by the Covid-19 pandemic. In this case, technology is to be adopted as an exceptional and important measure in the sector of education and training; and

2. that the education and training systems in place are suitable for the current digital dispersion.

Further, in order to function effectively, the Action Plan includes two strategic priorities: (1) fostering the development of a high-performing digital education ecosystem; and (2) enhancing digital skills and competencies for the digital transformation.

9.3 Fostering the development of a high-performing digital education ecosystem:

For success here, the Action Plan considers certain requirements as pivotal. These requirements include: availability of Internet-enabled infrastructure, quality connectivity as well as good digital equipment. This aligns with the works of Salam, Faith, Martín and Ramalingam (2017), Boldizsár (2019) as well as Uleanya and Gamede (2019) who believe that the availability of good digital equipment and quality Internet connectivity promotes enhanced digital teaching and learning activities. In addition, the Action Plan also takes cognisance of actual planning and development of quality digital capacity, as well as the latest trends in organizational proficiencies. A study was conducted by the Organisation for Economic Co-operation and Development (OECD) in 2018 that focused on teachers' readiness across EU member states to use digital technologies. The study findings showed that over 60% of teachers indicated they were not ready to use digital technologies during their teaching and learning exercises. The European Digital Education Action Plan commission first conducted various studies before coming up with a workable agenda. Some of its studies targeted and prioritized the following areas: exploring ways of creatively and easily using digital technology for teaching and learning exercises, enhancing digital capabilities and skills, promoting education using improved and advanced data analysis and prudence. The findings of the research studies led the commission to prepare an agenda to boost the digital confidence and competence of teachers together with the education and training of members of staff. This agenda is considered important and treated as such because it is envisaged to foster the growth and advancement of a better performing digital education environment. In addition, the content of what is to be taught and learnt is significant. Thus, the Action Plan recommends that good quality learning content be taught with tools that are user friendly, adopting safe platforms that assure that the privacy of both lecturers and students is respected and high ethical standards are upheld. In the same vein, the measures of the Action Plan commission of the EU could be adapted to the African space by the AU to suit African society and help identify solutions to challenges limiting the presence of a smoothly functioning African society, especially as regards the education sector. Conversely, on the national level, the same could be done by the government of South Africa to help reduce or possibly overcome the challenges that are hampering such a smoothly functioning society.

After setting out the measures needed for the Action Plan to achieve its aim, it lists actions to be taken, including the following:

• Launching a planned and calculated discourse amongst all EU member states . The intention is to enable each state to formulate a practicable and adaptable scheme that can be recommended with respect to factors that can promote the success of digital education by 2022. This could also be adapted by the AU to suit the African space for African nations. In this regard, various African nations could come up with recommendations that best suit their nations.

• The recommendation concerning online and distance learning for learners in primary and secondary schools is to be explored. This is to make sure that effective online, open, distance as well as blended learning that is engaging and interactive is considered by all EU member states by the end of 2021. Again, this could be adapted by the AU for its member states.

• The Action Plan also considers supporting the Gigabit connectivity of various schools and Internet connectivity in schools. It will also ensure that it provides proper connectivity in order to create awareness regarding funding opportunities for schools. It would encourage and motivate EU member states to buy into and use the support provided to purchase digital equipment, ensure access to the Internet as well as the availability of e-learning applications and platforms. Similarly, the AU could collectively work towards assuring that schools in all member states regardless of location are assisted in successfully running e-learning applications and platforms through the provision of Gigabit connectivity as well as Internet connectivity and by supporting the provision of digital equipment and access to quality Internet facilities.

• There is need for the EU to design an online education content structure that is Eurocentric. This content should seek to build and promote European cultures as well as creative diversity while also attempting to introduce practicable exchange programmes among the member states using approved and expert online means. This could also be connected to other existing education platforms. In a similar manner, the AU could design an online education content framework that better suits Africa. This content should aim to build and promote true African cultures, creative diversity and at the same time try to introduce practicable exchange programmes amongst African nations using approved and expert online means.

• The Action Plan sees a need to support plans, proposals and projects intended to promote various forms of digital transformation on different educational levels: primary, secondary and tertiary, as well as at training institutes. The Action Plan aims to achieve this mostly through Erasmus cooperation projects, while the Plan also intends to support digital teaching, learning and the acquiring of experience using digital tools. Self-reflection on Effective Learning by Fostering the use of Innovative Educational technologies (SELFIE) for Teachers is to be considered. In the same vein, the AU could support and promote projects targeted at providing for digital transformation on all levels of education. This might be done by adopting the SELFIE or designing something suitable for the continent.

• According to the Action Plan, ethical guidelines plans and procedures while conducting research in different areas and using collected data in teaching and learning are crucial. Hence the need to design ethical guidelines to support and control research activities in the area of teaching and learning for both teachers and learners alike. Similarly, the AU could adopt the same strategy by ensuring adherence to ethical standards and practices during research in education and related fields.

For the African Union to adopt the mentioned European Union proposals, there is a need to consider the facilities and enabling infrastructures required compared to what is available on the continent. In other words, the AU would be obliged to work on ensuring that all necessary infrastructures are made available to provide for proper implementation of those proposals for success with online, digital, open, distance and blended learning.

9.4 Enhancing digital skills and competencies for the digital transformation

The Action Plan sees the requirement to enhance digital skills and competencies for the desired digital transformation as vital. Still, in achieving this, several things are first expected to be put in place. Hence, the Action Plan strategizes doing the following seen as necessary:

• ensure exposing children of tender ages to the acquisition of basic digital skills. This would allow them to become competent and experts as they grow up. They would thereby become exposed to topics like computing education, digital literacy, knowing and understanding data-intensive related technologies, which includes artificial intelligence. Similarly, African nations could be motivated to ensure that children

are helped in the acquisition of digital skills from a young age. In this regard, African society could become acclimatized with the digital world by assisting young people to obtain the skills desired in the digital world.

• Subjects and activities that promote advanced digital skills are to be considered. This is envisaged to produce experts inclined to the digital technological field. While attempting to achieve all of the above, the Action Plan seeks to provide for adequate gender representation. Namely, both male and females are to be adequately represented in digital studies and careers and other related fields. African nations could choose to promote gender equity and equality in the area of digital skills acquisition. This would help eradicate gender bias in the digital world and the careers revolving around it as it pertains to the African continent. Suffice to say that careers in the area of digital skills should be open to both males and females.

Through the Action Plan Commission, the EU intends to achieve the mentioned plan by:

• ensuring the development of a common policy to promote digital literacy and address issues of disinformation for both teachers and educational members of staff. The Action Plan is to work together with civil society, technology companies based in Europe, journalists, expert groups in media literacy, broadcasters, as well as digital media observatory groups in Europe, national authorities of European nations, young people and students. Similarly, African nations such as South Africa could design and implement policies which promote digital literacy and address issues of disinformation for both teachers and educational staff members. Such policies should be designed by stakeholders involving people from different walks of life such as: members of civil society, technology companies based in Africa, journalists, expert groups in media literacy, broadcasters, as well as digital media observatory groups on the African continent, national authorities of African nations, young people, teachers and students.

• The European digital competence structure would be updated to make sure that subjects like Artificial Intelligence (AI) and data-related skills that support the advancement of learning resources for schools, Vocational and Training (VET) institutions, and other training providers in the area of AI are upheld. Similarly, nations on the African continent could adopt such and ensure that the digital competence structure is designed and regularly updated to ensure the upholding of subjects such as AI and data-related skills which support the advancement of learning resources for schools, VET institutions, and other training providers in the field of AI.

• Explore the option of creating digital skills certificate programmes recognized and accepted by governments, employers and others across nations in Europe. This could be adopted by nations on the African continent in order to enhance and promote digital skills of help in different walks of life, especially the education sector that is the focus of this paper.

• Ensure the enhancement of digital skills in the field of education and training. It is expected that this would include investing in teacher professional development, providing for the sharing and adoption of best practices in the use of quality instructional methods in computing education. This is also expected to ensure that up-to-date skills are taught and practised, which is in line with the work of Uleanya, Uleanya and Oluyemi (2019) who believe there is a need to revisit the teacher education curriculum since the curriculum shapes those who eventually serve society. This implies that if teacher education programmes are revisited in different nations across Africa and the proper computing skills are incorporated , learners are likely to benefit as well.

• Promotion of greater involvement and contribution in the International Computer and Information Literacy Study (ICILS), which collects data on student digital skills across European nations and introduces an objective for student digital competence of above 15% by 2030 for students of school age (13 to 14 years) who fail to perform well in information and computer literacy. The AU could likewise set up a board that looks into this area that is responsible for assuring that by at least 2030 there would be a very minimal number of young people who lack computer and information literacy.

• Consider improving the digital opportunity traineeships for TVET learners and apprentices. This is to provide professional development opportunities for trainers, teachers and other relevant staff members.

Similarly, in Africa, advanced digital skills development centres could be established in order to ensure that learners from vocational and training institutions, teachers and other relevant stakeholders are given opportunities to be duly trained and empowered with digital skills.

• Promote the participation of females in Science, Technology, Engineering and Mathematics (STEM) and other related subject fields. This is to be achieved through the European Institute of Innovation and Technology (EIT), which is to support the EU's STEM alliance to design curricula for higher education capable of attracting women to Information Communication and Technology as well as engineering fields based on the STEM approach. On the African continent, women could be empowered to take programmes in the STEM field as well as other related endeavours. This could be done by adapting the design of curricula to make them more attractive to females.

Further, the EU through the Action Plan Commission highlights why the actions to be taken in this regard are needed, pointing out factors like

• socio-economics: According to the Eurostat report (2019), several homes fall in the range of low-income earners who do not have access to computers. Yet, Eurostat (2019) also shows that access to a high-speed Internet connection varies across EU member states depending on household income. This implies that the type of access to a computer or high-speed Internet connection received by people in the EU depends largely on the income of the household. Suffice to say, the success of the EU's goals in the Action Plan Commission would establish leverage for households on various levels of income. This suggests the importance of quality access to a computer and high-speed Internet connection, regardless of household income. Similarly, a review of the work of Iwaloye, Gamede and Uleanya (2019) suggests that African society is dominated by households with low-income earners. The study also shows that low-income households affect the learning abilities of learners (Iwaloye, Gamede & Uleanya, 2019). This means there is a need for the governments of African nations, especially in South Africa, to step into action to provide a platform on which all citizens can afford access to a computer and a high-speed Internet connection.

• The low level of basic digital skills among young people of school age: The Eurostat report (2019) shows that many young people across the EU continue to not have a basic level of digital skills acquisition. This implies that for various reasons young people are unable to reach the point when they can be described as possessing sufficient basic digital skills. This is however contrary to the opinion of Ruseva (2015) who states that, while several young people across Europe possess basic knowledge of digital skills, their skill level does not permit them to find work. Meanwhile, plans are being put in place to help young people in EU member states become equipped with the required digital skills given their level of importance. Similarly, the AU or the government of South Africa could explore ways of adopting similar strategies to put plans on the ground in order to give young people of school age the necessary digital skills. This would allow South Africans to reach the basic level of digital skills required especially during the Covid-19 pandemic or in this era of the Fourth Industrial Revolution (4IR).

• The Action Plan Commission also sees a need to take action and act as swiftly as possible on the dissemination and acquisition of digital skills due to the wide effects of the Covid-19 pandemic. For instance, the outbreak of the pandemic has led to a great shift from on-site teaching and learning to on-line teaching and learning exercises. This shift requires digital technologies. Namely, the pandemic has seen digital technologies become a common phenomenon for everyday use. Thus, the need to teach and assist especially young people to acquire digital skills is becoming important. This is envisaged to help them adapt to the current world of work, teaching and learning, as well as to keep themselves up to date. This means that African nations, especially South Africa which is the focus of this paper, can either through the AU or on their own accord explore ways for managing the unprecedented shift from face-to-face teaching and learning to online. This could be done by empowering young people of school age and their teachers with the digital skills they need. In this regard, this practice also remains relevant in this era of the 4IR.

In addition, the EU's Digital Education Action Plan commission undertook a survey in 2020 targeted at collecting data based on public consultations as concerns distance and online learning prior to and during the Covid-19 pandemic.

The project results show the following:

- only about 40% of respondents had ever used online and distance learning prior to the Covid-19 pandemic;
- approximately 95% of respondents saw the Covid-19 pandemic as a lasting catalyst for the adoption and use of technology in the education and training sector;
- almost all respondents responded that the online contents as well as the online teaching and learning resources are made to be very relevant, easy to use and interactive;
- more than 60% of respondents consider the impact of Covid-19 as positive in terms of how they have improved their digital skills during the pandemic. Further, 50% of respondents wish to explore the option of doing more digital technology-related activities. This implies that interest in the area of digital technologies is on the rise.

The results of the survey presented above led to recommendations of the EU's Digital Education Action Plan commission regarding what may be done to salvage the situation of the shortfall in digital skills. The recommendation is to ensure support for collaboration, assistance and exchange in digital education on the EU level. This implies allowing EU member states to strengthen their collaboration with each other, and give opportunities for exchange programmes in digital education to promote growth in this area across the continent. This recommendation could be adopted by the AU to promote growth in digital education across the African continent. In this regard, many nations on the continent will be greatly supported and allowed to thrive in digital education. Following the recommendation of the EU's Digital Education Action Plan commission, the EU is considered to be at the forefront of performing active roles.

These roles include the following:

- to recognize, categorize, allocate, and continuously improve good practices in the world of digital education. This is to enhance and promote digital education on the continent and among EU member states;
- to provide appropriate support for EU member states as well as the education and training sector. Such support includes the provision of necessary tools, structures, supervision and leadership, technical know-how, and research;
- to promote good collaboration, assistance and teamwork among all relevant stakeholders;
- to establish a European Digital Education (EDE) centre holding the following responsibilities:

  1. connect the initiatives of national and regional digital education together as well as the relevant players and experts; ***2.*** promote and support the alliance of different sectors and new models aimed at ensuring and enhancing digital learning contents, resolving issues of standards, quality assurance, accessibility and other related matters; ***3.*** serve as a reasoning bank providing relevant support for the advancement, improvement and implementation of digital education policies and practices while monitoring their development in Europe; and ***4.*** support and promote user-driven digital-education-oriented research novelties and commitments.

Following the recommendations of the EU's Digital Education Action Plan commission about the roles to be performed by the EU, this paper suggests that the AU replicate similar practices on the African continent. This is expected to support and aid the growth of digital education in member states.

9.4.1 Higher education students' digital skills development competencies and the labour market

The development of digitals skills is a major phenomenon that should be seen as an investment in the competencies higher education students need while entering the labour market (Ruseva, 2015; Lauder & Mayhew, 2020). This means that a major feature to be considered while designing higher education curricula is the possibility of such to help produce graduates who will be employable with respect to the present demands of society, especially with the advent of the 4IR, which leans towards the embracing of digital skills for daily use and problem-solving. Namely, digital skills are expected to become mandatory for higher education students so as to enable them to be relevant while still studying and after they graduate. However, the digital skills of African students, specifically those in South African higher institutions of learning, seems questionable. Aristovnik et al. (2020) conducted a study following the outbreak of the Covid-19 pandemic and the need for online teaching and learning during the first wave. This study involved 30,383 students from 62 countries, across 6 continents. One of the study's focuses was to explore students' response to digital skills and usage during teaching and learning activities after the start of the Covid-19 pandemic. Some findings of the study show that while Moodle, Zoom, MS Teams, BigBlueButton, amongst others, were being used for teaching and learning purposes across the globe, students preferred their lecturers to send them presentations in the form of PowerPoint and other means, to use video conferences, video recordings as well as written communication. However, the study findings also show that students were dissatisfied with audio recordings. Meanwhile, students from European-based HEIs, Asia and South America were more disposed to and satisfied with online teaching and learning activities than their counterparts from Africa (e.g. South Africa and Egypt), which proved to be the least satisfied with the various forms of online teaching and learning platforms. The reason for this was attributed to the undeveloped ICT infrastructure on the continent which makes online teaching and learning difficult or impossible as well as inaccessible to students. The socio-economic factor was also considered relevant for the unavailability of quality access to online teaching and learning platforms.

9.4.2 Comparison of digital teaching and learning between South Africa and European nations during the first wave of the Covid-19 pandemic outbreak

Joint research was conducted by various researchers across six continents. The study aimed to investigate the impacts of the Covid-19 pandemic on the life of higher education students across the planet. The study population is presented by continent, with the percentage share of the total sample shown in brackets: Africa 2,621 (8.6%), Asia 7,212 (23.7%), Europe 13,629 (44.9%), North America 2,381 (7.8%), Oceania 171 (0.6%) and South America 4,369 (14.4%) (Aristovnik, et al. 2020). The final sample of the study across each continent is presented along with the percentage share they represent in the study: Europe (44.9%) (EU; i.e. 47.0% of all participants: Poland, Italy and Turkey), Asia (23.7%) (AS; i.e. 47.8%: India, Bangladesh and Pakistan), South America (14.4%) (SA; i.e. 75.8%: Chile and Ecuador), Africa (8.6%) (AF; i.e. 54.4%: Ghana, Nigeria and Egypt), North America (7.8%) (NA; i.e. 81.4%: Mexico) and Oceania (0.6%) (OC; i.e. 100%: New Zealand). These statistics were retrieved from (Aristovnik, et al. 2020). The outbreak of Covid-19 has seen face-to-face teaching and learning exercises being cancelled in universities around the globe that then turned to online practices using various media. The study of Aristovnik et al. (2020) investigated how students have fared following the new dimension of online teaching and learning practice. The study notes that while the online mode of delivery was not new for many international HEIs across the globe, HEIs in Africa and South Africa were experiencing online teaching and learning for the first time. Further, the study findings show that online teaching and learning have had a very adverse effect on students from remote, undeveloped and rural areas due to factors like poor Internet connectivity, poverty, and lack of electricity. These adverse effects led students from such areas to develop a negative perception about online teaching and learning (Aristovnik, et al. 2020). Meanwhile, on the global level, students from countries with good Internet connectivity and electric power supply experienced and expressed satisfaction with the online teaching and learning activities presented in three sets following the

study: lectures, tutorials and seminars, and mentorships. The study findings reveal the African continent ranking the lowest and students there expressed greater dissatisfaction with the use of the online teaching and learning platforms. The research asked respondents questions about assignments, readings, course work, quizzes, lecturers' timely response to questions, feedback on student performances as well as issues with examinations. While respondents from Oceania and in North America reported the highest scores, respondents from Africa reported the lowest. The reason for this was attributed to poor access to Internet facilities as well as the lack of digital competency. Still, the results for students from Europe show huge disparities amongst them. Hence, while some students were satisfied, others were not. This was attributed to variances in the accessibility of digital tools and the development of computer skills among students from developed, developing and underdeveloped parts of the continent and the world at large (Aristovnik, et al. 2020). This suggests the reason behind the establishment of the EU's Digital Education Action Plan commission and the responsibilities it has been given .

The findings of works by Uleanya and Gamede (2019) as well as Aristovnik et al. (2020) point to the need for a nation like South Africa and a continent like Africa to explore options for ensuring the acquisition of digital skills and provision of facilitating equipment. This will help promote digital education as well as online teaching and learning, especially during this era of Covid-19 and the 4IR.

9.5 Conclusion

This paper explores higher education policies for digital skills development following lessons learnt in the first wave of the Covid-19 crisis in South Africa. The study showed that the lack of basic digital skills is a major constraint affecting online teaching and learning in both South Africa and many other parts of the world. Meanwhile, policy plays a pivotal role in ensuring the acquisition of digital skills. Hence, the study explored issues revolving around policies as concerns the EU in comparison with the African continent. This exploration was in a bid to attempt to generate adaptable and workable policies for the nation of South Africa and possibly the AU member states. The study findings show the EU seems to have achieved much through the EU's Digital Education Action Plan commission which is responsible for ensuring the advancement of digital education, particularly during the Covid-19 pandemic. Yet, the African continent, with a focus on South Africa following previous research studies, has experienced a setback in this area. This makes it necessary for the government of South Africa and other African nations through the AU to adopt some of the recommendations of the EU's Digital Education Action Plan commission for implementation on the continent. As a sequel to the findings of this study, the paper recommends that policies addressing the issues of digital access, skills, competencies, the sharing of resources and global collaboration for a better world should be designed and duly implemented in the nation. Global connectivity facilitates human progress. There is no going back since we are now living in a connected, wired world and we must learn how to engage with these connections and possibilities to improve our levels of student achievement. This would assist in bringing the nation on a par with its counterparts in developed nations, and could be done by promoting research that explores issues concerning the relevance of higher education, digital skills and online teaching and learning during a pandemic, as well as their relevance for society in non-pandemic times.

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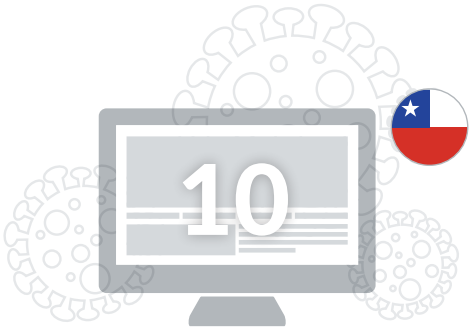

TRANSITION FROM ON-SITE TO ON-LINE EDUCATION: EXPLORING THE CHILEAN HIGHER EDUCATION EXPERIENCE IN TIMES OF COVID-19

Roxana Balbontín-Alvarado, Cristian Rivas-Morales

10.1 Introduction

The current global pandemic scenario has impacted education systems around the world. Tertiary education is no exception, with "emergency remote teaching" (Hodges et al., 2020) in response to crisis being implemented across the globe (IAU, 2020; Marinoni et al., 2020; Reimers, & Schleicher, 2020; U.N., 2020)

The closure of educational institutions has brought many challenges for higher education and teachers everywhere, forcing them to restructure and reconsider their teaching approaches to switching over to the online mode. For many European institutions, the online mode is not new. They already offered online courses and degrees and used e-learning platforms to support the learning process. Likewise, in many countries of Latin America, including Chile, the use of e-learning resources to support training such as Moodle or Canvas has become a usual practice. Higher education institutions (HEIs) are also frequently offering e-learning or b-learning courses or degrees, especially postgraduate degrees.

Even though European countries and Chile had considerable experience with the e-learning mode, this was not the case for all institutions. Moreover, the quick transition did not allow enough time for the organization or pedagogical planning of the new educational format, which led to the disruption of education systems and institutions and considerable stress for both teachers and students. In addition, other factors associated with the potential success/failure of the e-learning are the digital skills of teachers and students, as well as the necessary ICT equipment for implementing the new model.

This paper focuses on the Chilean higher education experience during the Covid-19 pandemic and a comparison with European Union countries. We first present some information about the general current situation concerning Covid-19 in Chile. After that, we explore tertiary education as well as some research findings obtained in the context of an international comprehensive large-scale study entitled "Impact of the Covid-19 Pandemic on the Life of Higher Education Students" (Aristovnik et al., 2020). This global study, in which Chile has taken part, seeks to reveal how students have perceived the impacts of the Covid-19 crisis on various aspects of their lives. The results are contrasted with national studies and reports recently undertaken and are discussed in light of the measures implemented by the Chilean educational authorities and decision-makers. These findings are then compared with those from European countries, focusing on issues like the digital skills and competencies needed for the digital transformation and equitable access to online education in

times of Covid-19. Finally, some conclusions, recommendations and implications are drawn in order to inform policymakers and educational stakeholders about the necessary steps and measures to improve the online education experience and its effectiveness.

10.2 The Covid-19 situation in Chile in 2020

Covid-19 reached Chile in March 2020 when the first cases imported from Asia and Europe were reported. Since then, we have witnessed the dramatic expansion of the virus with a significant number of confirmed cases and fatalities. By the end of February 2021, the Ministry of Health had confirmed 825,625 cases of Covid-19 and 20,572 deaths (Ministry of Health, 2021). According to data released by the Ministry of Education, the pandemic reached its peak during on 13 June 2020, with nearly 7,000 cases and 195 deaths. By July 2020, the number of fatalities had reached 10,000 people, ranking Chile among the countries with the most cases in the world by population. Since then, the number of infections and deaths has slowly decreased.

The impact of the pandemic has been enormous when we consider that Chile has a population of 19,267,288, with more than 40,000 cases and 1,100 deaths per million inhabitants. Chile is in 23rd position by number of deaths out of 190 countries (Statista, 2021). According to the Ministry of Health, these figures can be explained by the fact that Chile has a better testing capacity than many other countries, especially in Latin America.

Regarding the measures implemented to address the pandemic, we may mention the partial lockdowns and quarantines imposed from the beginning of the pandemic, the closure of schools, HEIs, non-essential retail, restaurants etc. All of this has exerted a huge negative impact on the economy. By April 2020, unemployment had reached 9%, the highest level in the last 10 years. In addition, other measures include social distancing, restrictions on movement and gathering, curfew and hygiene measures, such as frequent hand washing, use of masks and alcohol-based antiseptic gel.

At present, restrictions depend on specific places. In August 2020, the Chilean government implemented the "Step by Step Plan" (Plan Paso a Paso), which establishes criteria to determine the different phases according to ongoing monitoring of the Covid-19 situation in different cities. There are five phases: step 1, quarantine: step 2, transition; step 3, preparation; step 4, initial opening; and step 5, advanced opening (Chile Government, 2021).

Currently, there are some cities under strict quarantine, while others are in different phases (2–5), which mean some restrictions, especially on weekends. However, during weekdays, most shops are open in line with health protocols.

Regarding the immunization plan, to date Chile has imported 8.3 million doses of vaccine of the almost 40 million doses that have been ordered, a record number for Latin America. Over 3.2 million people have been vaccinated, 75% of whom are over the age of 65. The goal is to vaccinate 5 million people during the first quarter and a total of 15 million people in the first half of the year.

10.3 Higher education in Chile during the Covid-19 pandemic

According to UNESCO's International Institute for Higher Education in Latin America and the Caribbean (UNESCO IESALC, 2020), by 30 March 2020 schools and universities were closed in 166 countries, impacting more than 87% of the world student population. Likewise, by that date around 63 million teachers in the world had to move from their traditional face-to-face classrooms to virtual learning environments.

Similarly, in March 2020 Chilean HEIs closed their doors and rapidly switched to online education. However, this change was extremely quick and sudden, leaving many institutions unprepared. According to Brown & Salmi (2020), only a limited number of HEIs were well prepared for this sudden and disruptive move and a lot of improvisation occurred during the early months of 2020.

Although many Chilean institutions had learning platforms for working online, they were mostly used as repositories for material and to complement and support the traditional face-to-face learning. Considering that institutions, lecturers and students were all struggling to implement online education, the Chilean Ministry of Education released the "MINEDUC Action Plan for Higher Education Institutions" (MINEDUC, 2020), containing actions and recommendations to implement e-learning. In order to make sure institutions continue delivering quality teaching, this action plan lists actions for institutional support, including: a) the availability of a free e-learning platform for institutions that do not have one; b) funding for the development of virtual education projects; c) alliances with national and international HEIs with experience in education in virtual environments so they can share their good practices and provide training in digital skills; d) the availability of international digital resources; and e) benefits for higher education students.

In the same direction, international organizations like UNESCO's IESALC (2020) and the OECD (2020) prepared recommendations and strategies for HEIs. Some measures for Latin American and the Caribbean are listed below:

1. Disseminate among the university community solely and exclusively the information and recommendations of the national health authorities and the WHO.

2. Regularly use official websites and social networks to provide information and the latest research advances in the context of Covid-19.

3. In those institutions that have medical schools or schools of public health, facilitate health education for the general population and promote a positive attitude to scientific research.

4. Consider the instructions and recommendations of the authorities.

5. Suspend face-to-face academic activities.

6. Prepare a contingency plan.

7. Use your own online learning platform, or the virtual campus, to continue to facilitate distance learning for students. Alternatively, in the event you do not have your own platform, install any of the multiple applications and open educational platforms, bearing in mind that some students may only be able to use mobile devices. This will require the implementation of mechanisms for training and online support for teachers and students (UNESCO IESALC, 2020).

Regarding sanitary measures for students and staff who need to go to campuses in order to work in labs, do practices, and other on-site activities, in March 2020 the ministries of education and health released a document with recommendations and prevention measures to minimize risks, which include hygienic measures, social distancing, security infographics, promotion of selfcare, restrictions on the number of people gathering, among others.

During the first semester of 2020, the Chilean Superintendency of Higher Education asked universities, professional institutes and technical training centres to report how they had been carrying out the teaching and learning processes in virtual environments in order to monitor the process and gather information for future support.

In addition to the Action Plan and the recommendations provided by the ministries of education, health and the Superintendency of Higher Education, institutions have developed distance-education protocols with a view to establishing minimum standards and guidelines on how teaching should be carried out. The implementation of these protocols has brought a number of challenges, the most complex being the lack of access and connectivity faced by many students. In order to resolve this problem, institutions have made great efforts. First, to identify the cases through surveys and contact with department heads. Second, after identifying cases, they have implemented strategies for the loan of university equipment, the purchase of new equipment, such as notebooks and tablets, and the acquisition of Internet plans for students. This has all been done while considering the needs of the students, prioritising those in the lowest income groups. Despite this, in rural areas, there are students who do not have access to quality connectivity for geographical reasons. Therefore,

they have to look for other solutions such as staying with their relatives and friends who live in zones with better connectivity to allow them to get connected to their virtual classes.

In spite of the challenges Chilean HEIs have had to solve in order to ensure access for all of their students, distance education has been successful in most HEIs, albeit not exempt from problems. Now, it is worth asking whether the classes in the virtual classrooms can be compared with those taking place in traditional classrooms in terms of the achievement of all learning outcomes defined for a specific subject. In this regard, it can be argued that the learning outcomes conceived for virtual education are far from those intended for a traditional face-to-face teaching and learning approach. According to Means et al. (2014), effective online education requires a careful design and planning process, which involves decision-making on many aspects, including modality, pacing, student-instructor ratio, the instructor's role online, the students' role online and online communication synchrony. Hodges et al. (2020) indicate that well-planned online education is far from the distance courses offered in response to emergency or crisis situations and suggest that effective online learning is the result of a careful instructional design process. In this case, contingency has forced us to change rapidly meaning there is no such intentional planning of the virtual format. In this uncertain scenario, it seems necessary to adapt our traditional practices and make the curricular structures more flexible.

According to a report on the impact of Covid-19 on higher education prepared by the International Association of Universities, which includes the perspectives of different associations of universities worldwide, "the world of higher education responded innovatively and rapidly to the crisis as it emerged in each region…the disruption was also an opportunity for higher education to reflect, change and innovate in order to adapt, to meet arising societal needs" (IAU, 2020, p. 7). The European Association of Universities (EUA) contributed to the report by presenting the situation at European institutions through analysis of different sources and surveys. In March 2020, most European universities had closed their campuses, as confirmed by the EUA Survey on "Digitally Enhanced Learning & Teaching". In fact, 95% of universities have switched to distance learning, while only 4% of institutions reported they were continuing with some on-site activities in some faculties (EUA, 2020). This is similar to what happened in Chile, where most universities cancelled their on-site activities. Yet, some university programmes that require specific practical and lab work had to continue functioning under strict health security measures.

Regarding resources and tools for teaching online, most European universities already had repositories and platforms to work with digital technologies, as well as units or centres that support teachers with digitally enhanced teaching and learning. This is also the case for the majority of Chilean institutions where the problem is not the availability of resources and technological tools, but the correct use of the functions that allow online interaction and the integration of different resources to teach and evaluate remotely, which call for proper training for both instructors and students. This is not very different for the European context as the Irish National Digital Experienced Survey notes. According to this study, a significant number of academics do not have sufficient training to teach online. The findings show that 70% of academics had never taught online before the Covid-19 crisis, with a similar percentage for the UK (INDEx, 2020).

The pandemic has changed the way education and training is understood all around the world. "There have never been so many students and staff exposed to online learning and teaching" (IAU, 2020, p. 10). A significant number of European institutions see this as an opportunity to transform the teaching and learning and have declared they plan to explore new ways of teaching beyond the crisis (87%) and to improve the digital capacity (70%) (EUA, 2020).

Although there have been some major challenges in the implementation of the emergency remote education, which seems to be the best term to describe the sudden shift to remote teaching and learning (Hodges et al. 2020), the European universities, their staff and students all seem generally satisfied with the education provided thus far (EUA 2020). In contrast, findings of the Pulso Estudiantil Survey indicate that the perception of Chilean higher education students regarding online education during 2020 is quite negative. For example, 80% of the students who took part in the study indicate that the education provision they had been receiving in the last months was poorer in quality. Other findings suggest the biggest difficulties students are dealing with have to do with management of the study frequency and the time dedicated to university work. Therefore,

one may infer that their negative perception is associated with the difficulties they are having in coping with an educational model that requires a high level of autonomy and commitment (Pulso Estudiantil, 2020). Surprisingly, the problem of autonomy has also been pointed out in Europe. Autonomous learners have coped well with the crisis, but students with learning difficulties have been overwhelmed by the situation (EUA, 2020).

Some other matters highlighted by European universities include the digital gap and socio-economic problems. Many disadvantaged students do not have access to technology or high-speed Internet, while some of them have also lost their jobs and depend on family support. These issues would have been more predictable in the context of Chile given that it is a developing economy, in a better position than most Latin American countries, but with a lower GDP than most European countries. As previously stated in this paper, one of the biggest concerns of Chilean institutions is the lack of connectivity for economic or geographical reasons, which is being targeted by universities through actions plans that include the loan of equipment and provision of free Internet plans for disadvantaged students.

Finally, a last issue the universities have reported is the huge impact of the pandemic on internationalization and academic research. Many mobility programmes have been cancelled due to the travel restrictions and others have switched to an online mobility mode. Likewise, research has been impacted in terms of academic mobility and collaboration and researchers are worried about their future funding (EUA, 2020). Similarly, in Chile international mobility for students and staff has been cancelled and international research has seen its possibilities of collaboration and funding diminished.

10.4 Digital skills and competencies for the digital transformation during Covid-19

Virtual education is a subject that has been widely resisted by society and traditional academic circles that do not conceive of education without the direct and personalized mediation of teachers and academics. In Chile, for example, university e-learning programmes are frequently criticized by professional unions, accreditation councils and common individuals. The argument behind this criticism is that online professional training is supposedly lower in quality. "Online learning carries a stigma of being lower quality than face-to-face learning" (Hodges et al., 2020).

In the current scenario, it is worth asking: What happens when the educational paradigm we are used to is broken and traditional classrooms must be closed and switched with open spaces for virtual interaction? Well, the answer is probably to welcome changes and be open to the move to a new educational era where e-learning is pivotal. Despite the resistance to education in virtual environments, today we are witnessing an unpredictable reality and there is no alternative but to adapt. During the first months of last year, we were mainly responding to a crisis, while during the second half of the year we already had some learning to become stronger and recovering. At the present, we are supposed to be thriving and getting prepared for the next big challenge (Deloitte, 2020).

Before discussing the digital skills and competencies needed for the digital transformation, it is important to understand where we are as a starting point. In doing so, we will analyse some findings of two global studies. This first is entitled "Impact of the Covid-19 Pandemic on the Life of Higher Education Students" (Aristovnik et al., 2020), which has aimed to reveal how students perceive the impacts of the Covid-19 crisis on various aspects of their lives. The study includes 62 countries and Chile has taken part as one of the international partners of the main research team from Slovenia. Some factors explored were: perceptions about the quality of teaching; workload; assessment; support for students; infrastructure, technological devices and skills for studying from home; social and emotional life and life circumstances.

Below, we focus on analysing the specific factors associated with ICT infrastructure, technologies and skills. We also attempt to complement the results of both studies with findings from other surveys conducted in Chile. In addition, we contrast the Chilean results with evidence from European countries.

As concerns the "availability of home infrastructure and technological devices needed to study from home", many of the results for Chile are below the average of the participating countries for the following indicators: "a quiet place to study" (39% -); "a desk" (59% -); "a computer" (85% +); "required software and programs to study" (63% -); "a printer" (43% -); devices such as headphones, microphones and webcams (70% -). In addition, only (47% -) has "a good Internet connection" (Aristovnik et al., 2020). Some of these findings are supported by a Chilean study about education in times of Covid. According to its results, 50% of participants indicate they had experienced technical difficulties in studying from home while 41% do not have an appropriate place to study (Pulso Estudiantil 2020).

As for European countries, the results are above the average for almost all countries that took part in the study by Aristovnik and his colleagues, suggesting that in these countries students possess the infrastructure and ICT devices they need to study from home. For example, regarding "a good Internet connection", all European countries surpass 65% + and, as concerns having "a desk", the results are above 80%.

Considering the results presented above, one may infer that clear differences exist between the availability of ICT resources in Chile and in Europe, which can be explained by the fact most European countries are developed economies, while Chile is a developing economy. Aristovnik et al. (2020, p. 24) noticed this difference while analysing the variation between countries: "It is alarming than almost half of the respondents did not have a quiet place to study and one-third had no regular access to printers, where the African, Asian and South-American students reported the lowest results".

Another explanation of the difference is that the sample of Chilean universities which participated in the study are publicly-funded institutions and a big proportion of their students come from low-income groups. Nonetheless, as previously indicated in this paper, Chilean universities have responded to the crisis with actions plans that include the loan of equipment and the provision of free Internet plans for students.

Regarding the factor "confidence in computer skills", most of the results for Chile are below the average of the participating countries for the following indicators: "browsing online for information"(av. 4.1 > Ch. 3.8); "sharing digital contents"(av. 3.9 > Ch. 3.8); "using online collaboration platforms (Zoom, MS Teams, Sky)" (av. 3.9 > Ch. 3.6)"; "using online communication platforms (email, messaging)" (av. 4.24 > Ch. 4.0); "using software and programs required for my studies" (av. 3.5 > Ch. 3.8); applying advanced settings to certain software and programs" (av. 3.3 > Ch. 3.0). However, for the factor "using online teaching platforms (BigBlueButton, Moodle, Blackboard, GoToMeeting)", the results are slightly above the average (av. 3.5 < Ch. 3.6).

Findings for European countries suggest that most results are above the average for almost all of the factors analysed, except for the factor "applying advanced settings to certain software and programs". The international average is 3.33, Germany is below the average at 3.2 while Italy is just below it with 3.30, although the differences are not significant.

Overall, the results show that European students feel more confident in their computer skills to cope with the e-learning mode. Although the Chilean results suggest that students manage resources and platforms and use them without problems, they are probably less familiar with some of the tools, considering that online education is quite new in Chile. Evidence from the Pulso Estudiantil study indicates that 80% of Chilean students had never taken an online course before the crisis (Pulso Estudiantil, 2020).

An ongoing study by Aristovnik et al. (2021), which relies on data from the previous study, focuses on the relationship between different factors and their impact on students´ perceived satisfaction and performance with the e-learning mode. Hypothesis 1, about the influence of students´ computer skills on their perceived satisfaction with the e-learning mode and Hypothesis 1a referring to the inter-correlation of students´ computer skills with the quality and variety of the IT infrastructure at home were accepted. Data confirm that for the cases of Chile and the European countries that took part in the study one may conclude that students who have different digital media and quality infrastructure at home have greater digital competencies, and this in turn works in support of their perceived satisfaction with the online education. In simpler words, the more technology students have access to, the better the development of their computer skills and digital competencies. Thus, this finding confirms the importance of providing students with access to ICT.

Considering the presented results from the Impact of the Covid-19 Pandemic on the Life of Higher Education Students study by Aristovnik et al. (2020), it seems that in the case of Chile some actions must be implemented in order to improve the quality of digital training as well as to continue providing student populations with the ICT facilities they need to further develop their skills and not miss out on educational opportunities.

During the last year, efforts in the Chilean higher education sector have focused on the emerging digital training for teaching staff and on the provision of ICT equipment and connectivity plans for students. Still, everyone seems to assume that students do not need digital education because they are somehow considered to be digital natives. Apparently, this is not always the case, students are usually competent when it comes to social networks, but the situation changes in relation to working with specific learning platforms, programs, software and data.

Latin America and the Caribbean have been taking big steps to make progress in digitalization through collaborative studies and initiatives that bring together most of the region's countries through the UN programme Economic Commission for Latin America and the Caribbean (CEPAL). Since the start of the pandemic, many reports containing recommendations and proposed solutions for different sectors and countries affected have been published. Unfortunately, it appears that the largest barriers to progress have to do with the conditions needed to develop digital skills: quality connectivity, infrastructure, ICT equipment, resources, and tools.

In contrast, Europe is doing better in terms of the conditions needed for digitalization, as confirmed by the evidence presented in this paper. Nonetheless, the European Commission has emphasized that the digital competencies of the European population are not what are expected or necessary in the labour market. According to the Digital Skills and Jobs Coalition survey, 44% of European citizens do not have basic digital skills and 37% of people in the labour force – farmers, bank employees, factory workers – lack sufficient digital skills, despite the growing need for such skills in the job market (EC, 2019a). In addition, the Digital Economy and Society Index (DESI) shows that 35% of the labour force does not possess a basic level of digital skills (EC, 2019b) even though nowadays such skills are essential for most jobs (EC, 2019c).

According to Hylén (2019), one of the main points in the agenda for 2019–2024 of President of the European Commission Ursula von der Leyen is the issue of education for the digital age. One of her objectives has been to update the Digital Education Action Plan (EC, 2019d). Nevertheless, the Commission has been addressing digital competencies through the Digital Skills and Jobs Coalition initiative that started in 2016 with the main aim of bringing European actors together around the issue of digital competence, in four sub-areas: 1. Digital skills for all developing digital skills to enable all citizens to be active in our digital society. 2. Digital skills for the labour force developing digital skills for the digital economy, e.g. upskilling and reskilling workers, job-seekers; actions on career advice and guidance. 3. Digital skills for ICT professionals developing high-level digital skills for ICT professionals in all industry sectors. 4. Digital skills in education to transform the teaching and learning of digital skills in a lifelong learning perspective, including the training of teachers (EC, 2019a).

10.5 Policy recommendations for educational stakeholders

The outbreak of Covid-19 at the end of 2019 has brought major challenges for education systems around the world. In a certain way, 2020 was a year of educational changes that seems to have encouraged a great transformation of the educational paradigm. Even though education for the twenty-first century had called for digital transformation before the start of the pandemic (e.g. EC, 2019a; eLAC, 2018), the sudden need for re-structuring teaching and learning has accelerated this process.

It is expected that in 2021 vaccination campaigns will reach big proportions or even the majority of the population in many countries, especially in developed societies. Nevertheless, this is a slow process and the young population is the last priority for vaccination. Considering this, the return to on-site classes is occurring gradually and the hybrid model is seen as the best solution for continuing.

According to a UN recent report, it is important to consider that a promising educational future that puts

technologies in first place and projects hybrid modes of learning cannot ignore the imperative 'to leave no one behind' (UN, 2020). Educational stakeholders have a key role in the collective effort that must to be made in order to transform the country into a digital society. They must be prepared for today's challenges and become ready for the next ones.

Below, we provide some recommendations for HEIs, education ministries, policymakers, teaching staff and students.

10.5.1 Recommendations for higher education institutions

- Evaluate the action plans implemented to date and make the necessary improvements for the next university periods.
- Continue supporting disadvantaged students by providing connectivity solutions and technological equipment.
- Introduce intensive digital training before each semester for teaching staff and students.
- Increase the university budget to allow for the introduction of new ICT resources, tools and applications
- Update university teaching and learning, collaboration and communication platforms.
- Re-image education for the twenty-first century, prioritizing the introduction of digital education in the institutional strategic plans.

10.5.2 Recommendations for education ministries and policymakers

- Build resilient education systems to cope better with future educational challenges by strengthening strong leadership and capacity building for crisis management.
- Re-image education for the twenty-first century and promote changes in teaching and learning, including changes in curricula and teaching staff professional development.
- Support the provision of digital skills and competencies.
- Secure and protect funding to support HEIs.
- Provide institutions with updated recommendations for a gradual and safe return to on-site activities.

10.5.3 Recommendations for students

- Be resilient and understand the crisis. Education does not seem to be a predictable place anymore and overcoming the challenges of e-learning requires special commitment from students.
- Stay calm, reduce the stress and focus on your studies and personal well-being.
- Minimize the Covid-19 transmission risks by following all of the sanitary procedures and recommended security measures while on campus.
- Be open to educational changes and get prepared for them by updating/developing ICT knowledge and skills.
- Become prepared for the near future; the labour market requires professionals with advanced digital skills.

10.5.4 Recommendations for teaching staff

- Get prepared for the next big challenge by enrolling in digital professional development courses.
- Be open to educational changes and innovations and understand the need for continuous professional learning in the digital era.
- Evaluate the teaching and learning strategies implemented in 2020 and, where there is room for improvement, enhance your practices in order to provide students with a satisfactory learning experience.
- Understand the crisis and build resilience to cope better with future educational challenges.

- Re-image education and commit to provide students with the key competencies for the twenty-first century, including digital skills.
- Communicate regularly and provide constant feedback to students through collaboration and communication platforms.
- Work collaboratively with colleagues to share good practices, innovative ideas, digital tools and new applications.
- Introduce adequate innovations to the curriculum, prioritizing content and demonstrating flexibility.

10.6 Conclusion

Over the last year, HEIs around the world have closed their doors and moved their teaching and learning processes to virtual environments. Educational stakeholders have been challenged to respond to the crisis by providing quick solutions and finding creative strategies to implement the emergency remote teaching (Hodges et al., 2020).

This new teaching and learning mode has been introduced across the world, yet in some less developed countries a large share of students does not have access to appropriate infrastructure, technological devices and enough university support, which reveals issues concerning social justice and equity in education.

We attempted to present the situation of Chile, with a special focus on the educational responses of different stakeholders. Regarding the main actions undertaken, the Ministry of Education has released an Action Plan for HEIs. Universities, professional institutes and technical colleges have created their own protocols to tackle the contingency. At the same time, the Higher Education Superintendency has been supervising and supporting institutions.

We also presented some international and national findings and evidence that gave us a clear picture about the levels of students' satisfaction with the e-learning mode, their digital competency levels, and the availability of ICT resources and appropriate infrastructure for their digital education.

All of the factors described above were compared with those for European countries. The results suggest that both Chile and Europe have implemented action plans to face the pandemic. In addition, there is evidence of a digital gap in both regions and that many disadvantaged students do not have access to technology or high-speed Internet.

Regarding the "availability of home infrastructure and technological devices needed to study from home", the data show clear differences in the availability of ICT resources between Chile and Europe, which may be explained by the fact most European countries are developed economies, whereas Chile is a developing economy.

As concerns "confidence in computer skills", the findings presented indicate that European students feel more confident in their computer skills to cope with the e-learning mode. While the Chilean results suggest that students manage resources and platforms and use them without problems, they are probably less familiar with some of the more specific tools, given that e-learning is quite new for undergraduate students in Chile.

In the case of Chile, it may be concluded that it is urgent to enhance the quality of digital training for all as well as to continue providing student populations with the ICT facilities they so vitally need for e-learning, lifelong digital development, and future job opportunities.

Regarding Europe, the European Commission has issued a digital education agenda for the next years. The coronavirus has only reminded Europe about the urgent need to implement actions to ensure the development of digital skills for all.

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INDIA DURING THE COVID-19 CRISIS: HIGHER EDUCATION POLICIES FOR DIGITAL LEARNING

Sujita Kumar Kar

11.1 Introduction

The devastating Covid-19 crisis has created global havoc. It started in the city of Wuhan in China in late 2019 and rapidly spread all over the world.

There is a significant impact of Covid-19 pandemic on general health, mental health, the economy, occupations, academics, social life and many other aspects of day-to-day living. Mental health is an important domain affected by the pandemic, students being no exception. A considerable number of people have experienced anxiety, depression and perceived mental healthcare was high among the general population including students (Kar, Oyetunji, Prakash, et al., 2020; Roy et al., 2020). There have been reports of racism, stigmatization, fear of getting infected, fear of transmitting infection, burnout (among healthcare workers), boredom and issues related to a disrupted life style (Dubey et al., 2020b). The frontline healthcare workers are at the forefront in meeting the challenge despite unpreparedness and many more adversities. It has impacted the mental well-being of such people (Pollock et al., 2020). Children, adolescents and the elderly have faced different challenges. Social integrity and balance is severely disrupted by the pandemic.

11.2 The Covid-19 pandemic and India

India is one of the countries worst hit by Covid-19. The first case of Covid-19 in India was detected in Kerala on 27 January 2020 (Andrews et al., 2020). As of 24 February 2021, in India a total 1,48,718 active cases, 1,07,36,649 recovered cases and 1,56,743 deaths was recorded (Covid-19 India, 2020, p. 19). Similarly, by this date 1,21,65,598 vaccine doses had been administered in India (Covid-19 India, 2020). In India, Maharastra, Kerala, Karnataka, Andhra Pradesh, Tamil Nadu, Delhi and Uttar Pradesh are the worst affected states/Union Territories (Covid-19 India, 2020). When evaluating the spread trend of Covid-19 infection in India, it is seen that the peak of Covid-19 infection in the country was in mid-September 2020 (Covid-19 India, 2020). India imposed a nationwide lockdown in the last week of March 2020 and has extended the lockdown period by periodically reviewing the state of the pandemic in the country (The Lancet, 2020a). The impact of the lockdown has been intense and people have had restricted access to

basic facilities throughout the country. It has affected the life of every individual in a significant manner. During the pandemic, mental health issues have emerged among the general population as well as the vulnerable population due to the changes/restrictions in the lifestyle measures, limited access to basic amenities, job loss, academic loss, and fear of acquiring or spreading the infection (Dalal et al., 2020). Stigma and discrimination has also been attributed to the development of mental health issues (Dalal et al., 2020). The marginalized population (the homeless, migrant workers, people from a sexual minority community and those with comorbidities) have been significantly affected by the Covid-19 pandemic (Chatterjee et al., 2020; Kar, Arafat, Marthoenis, et al., 2020).

People have difficulty coping due to being exhausted by coping measures (Kar, Yasir Arafat, Kabir, et al., 2020). Many Indian celebrities have committed suicide during the pandemic (Kar, Arafat, Ransing, et al., 2020); following such incidents there has been a rise in suicidal behaviour, as reported by the media (Menon, Arafat, et al., 2020; Menon, Kar, et al., 2020). Also, during the lockdown there has been limited access to alcohol and people have committed suicide due to intolerable alcohol withdrawal symptoms (Ahmed et al., 2020).

Lots of myths and misinformation have propagated in social media. Fake news related to Covid-19 circulated through social media and various other digital platforms, creating an infodemic. It also provoked stigma, discrimination and xenophobia (Dubey et al., 2020a).

11.3 Higher education during the Covid-19 pandemic

11.3.1 Higher education during Covid-19: Global perspective

During the lockdown phase in India, people were homebound and there was limited access to school and colleges. Examinations were postponed and regular classroom teaching was stopped (A. Gupta & Goplani, 2020). Students were not allowed to come to classes to avoid gatherings and the subsequent transmission of infection (Zhu & Liu, 2020). A global survey of higher education institutions reported that in most countries, schools, colleges and universities have been closed during the pandemic (Marinoni et al., 2020). As per the data, the wide implementation of nationwide closures in more than 160 countries has affected more than 87% of the global student population (Araújo et al., 2020).

It was reported that by the early May 2020, universities in the UK had lost more than GBP 790 million (Burki, 2020). Financial losses in academic institutions in Australia and the United States are also significant (Burki, 2020). The financial losses have been so great that academic institutions have struggled to pay salaries to their staff (Burki, 2020).

A survey attempted to understand the perspectives of students regarding the online teaching during the Covid-19 pandemic in Pakistan (Adnan & Anwar, 2020). It was found that the majority of students have no or poor access to the Internet, which is very essential for e-learning. This position is not different in most institutions in the majority of underdeveloped or developing countries (Adnan & Anwar, 2020).

Medical education (both undergraduate and postgraduate) is significantly affected in India by the Covid-19 pandemic (Pattanshetti & Pattanshetti, 2020). Medical teaching and training have gradually shifted to an online platform. Examinations were conducted through an online platform (Pattanshetti & Pattanshetti, 2020). Medical teaching for the graduates requires lots of demonstration related to clinical skills. Understanding basic medical subjects like anatomy needs the dissection of organs and looking for their association in the cadaver, which cannot be done through online teaching. A survey of UK and Irish medical graduates revealed that students faced challenges due to non-exposure to practical sessions (Longhurst et al., 2020).

Academic loss is one of the major concerns among students and leads to significant distress, sometimes resulting in suicidal behaviour (Lathabhavan & Griffiths, 2020).

To compensate for the deficits caused by the disruption to the teaching and training in classrooms, the

Chinese government took an initiative called "Disrupted classes, undisrupted learning" (Zhu & Liu, 2020). The government of China has also encouraged students to engage in self-directed online learning (Zhu & Liu, 2020).

A large-scale survey was conducted in 62 countries of more than 30,000 students pursuing higher education with regard to the impact of Covid-19 on the learning and satisfaction related to e-learning (Aristovnik et al., 2020). This survey found that boredom, frustration and anxiety are common phenomena in these students. It was established that low satisfaction with academic and work life is more common among males, students with a lower living standard and those from Africa and Asia. Similarly, female students and students with financial problems have greater impairment in their emotional life. The role of the university is found to play a key role in determining student satisfaction (Aristovnik et al., 2020).

In a survey of Iraqi students and faculties, it emerged that the majority of students (69%) and instructors (51%) had experienced difficulty with virtual learning, with the availability of technology and poor Internet connectivity being the main issues (Tuma et al., 2021). However, approximately one-third of the students and half the instructors found the digital learning to be at least equivalent or superior to the classroom teaching (Tuma et al., 2021). It has been recommended that adequate preparation, enhancing the audio-visual quality through appropriate technology, and engaging students in certain academic activities during the teaching will augment the teaching quality (Tuma et al., 2021).

Several core principles determine the quality of online education (Bao, 2020). For students to be effective in e-learning, there should be:

- A highly relevant online instructional design
- Effective delivery of information on the online platform
- Enhanced technical support from teachers, instructors and technical assistants
- Increased depth of discussion to enhance the learning of students
- Appropriate remedial measures to deal with unexpected happenings on the e-learning platform

Another study shows that the traditional face-to-face teaching is more strongly linked to better academic performance than online learning. This study also found that the final educational success of a student depends on course organization and supporting study materials in face-to-face teaching (Keržič* et al., 2021).

11.3.2 Higher education during Covid-19: Indian perspective

As a heavily populated country, India is a hub of approximately 320 million learners, who have been adversely affected by the Covid-19 pandemic (Jena, 2020).

A survey from West Bengal, India reported that during the Covid-19 lockdown approximately 70% of students shifted to an e-learning platform for study (Kapasia et al., 2020).

Medical education in India has been significantly affected by the Covid-19 pandemic and lockdown. Surveys have been conducted among students undergoing training in various fields of the medical sciences like ophthalmology, oncology and forensic sciences (Mishra et al., 2020; Rao et al., 2020; Thompson et al., 2020). Medical students report that poor Internet connectivity and poor sound and acoustics are the major obstacles in online teaching (S. Gupta et al., 2021).

The academic loss of students has resulted in significant distress and students have adopted various coping measures to combat their stress (Chaturvedi et al., 2021).

Students aspiring for a higher education in medical and technical courses have experienced enormous stress due to uncertainty of examinations and reports exist of suicide by medical aspirants in India during the pandemic (Kar, Rai, Sharma, et al., 2020).

Effective e-learning requires adequate preparedness on the levels of government, teaching institutes,

teachers as well as students. During the initial phase of the pandemic, when teaching institutions were abruptly closed nationwide, there was a gross lack of preparedness to face this challenge. Yet, the teaching institutions gradually moved to an online platform to continue the teaching. As there was a shift in the paradigm of teaching, students started to like the online mode of teaching. A survey reported that when there is a flexible and convenient schedule of teaching students are provided with recorded sessions and a formative assessment of students in the form of quiz occurs at the end of a teaching session, the students' satisfaction is found to be better (Muthuprasad et al., 2021).

11.4 Impact of Covid-19 on e-learning: comparison of Europe and India

The global survey conducted on students pursuing higher education in 62 countries reveals the impact of Covid-19 on the education/learning of students and considers differences in e-learning across countries (Aristovnik et al., 2020; COVID-19 SOCIAL SCIENCE LAB, 2020). In this survey, the majority of the participants were female and most were between 20 and 24 years of age.

It has been reported that students from Asia and Africa are less satisfied with their academics during the Covid-19 pandemic in comparison to European students (Aristovnik et al., 2020). The cancellation of classroom teaching has been reported by 82% of Indian students during the pandemic. The cancellation of onsite teaching in European countries like Spain (99%), Portugal (98%), Serbia (95%), Romania (94%), Sweden (93%), Poland (92%), Slovakia (92%), Slovenia (86%) and Hungary (86%) has been more widespread than in India; whereas countries like Italy (80%), Austria (74%), Greece (73%) and North Macedonia (73%) have cancelled less of their onsite teaching than India (COVID-19 SOCIAL SCIENCE LAB, 2020). There is a shift of teaching from on-site to on-line. The most common form of online teaching observed is real-time online classes (>59%). Satisfaction related to real-time online classes in Russia, Serbia, Slovenia, Croatia, Hungary, Italy, Greece, Romania, Germany, Austria, Spain, Portugal, Slovakia, Poland and North Macedonia is higher than that in India. Similarly, most European countries have better satisfaction related to online video-recorded or audio-recorded classes (not real-time), than India (COVID-19 SOCIAL SCIENCE LAB, 2020). But when it comes to satisfaction related to online teaching by adopting modes like sending presentations to the students and written communication, India is doing better than most European countries (COVID-19 SOCIAL SCIENCE LAB, 2020).

The tables below compare India with European countries (with a larger sample size) on the following parameters:

1. Students' experience with e-learning (Table 1)

2. Teachers' response during the learning and organization of classes

3. The new teaching and learning environment and the basis of teachers' response during the learning and organization of classes

4. Access to infrastructure for studying at home and skills

Notable differences are found in terms of the availability of resources, approaches and level of satisfaction of students pursuing higher education between India and European countries.

Table 1: Comparison of students' experience with e-learning between India and European countries

Parameters	India (n=1519)	European countries					
		Poland (n=2742)	Portugal (n=1247)	Slovenia (n=1049)	Romania (n=970)	Croatia (n=689)	Turkey (n=1719)
From on-site to on-line classes	82%	92%	98%	86%	94%	86%	86%
Satisfaction with Online-in-real-time-(videoconference)*	3.22	3.33	3.409	3.819	3.469	3.804	3.073
Satisfaction with Online with a video recording (not in real-time)*	3.11	3.184	3.138	3.802	3.237	3.604	3.144
Satisfaction with Online with an audio recording (not in real-time)*	3.035	3.146	3.026	3.175	3.143	3.751	2.813
Satisfaction with Online by sending presentations to students*	3.361	3.185	3.266	3.04	3.288	2.989	2.678
Satisfaction with Written communication (forums, chat etc.)*	3.251	3.195	3.166	3.114	3.221	3.384	2.812
Availability of online methods of supervisions/mentorships Via video-call	53%	45%	70%	41%	49%	37%	31%
Availability of online methods of supervisions/mentorships Via voice-call	25%	33%	13%	16%	19%	12%	14%
Availability of online methods of supervisions/mentorships Via e-mail communication	33%	71%	57%	53%	49%	59%	36%
Availability of online methods of supervisions/mentorships Via texting on social networks (Facebook messenger, Viber, WhatsApp, WeChat etc.)	49%	26%	12%	9%	38%	10%	25%
Availability of online methods of supervisions/mentorships : Not applicable (I had no supervisions/mentorships)	15%	19%	22%	37%	24%	34%	34%
Preferred online method of supervision/ mentorship	Video call	E-mail communication	Video call	Video call	Video call	E-mail communication	Video call

Note: *rated on a five-point Likert scale, where 1: Very dissatisfied and 5: Very satisfied

Source: Own research

Table 2: Comparison of experience with e-learning between India and European countries based on teachers' response during the learning and organization of classes

Parameters	India (n=1519)	European countries					
		Poland (n=2742)	Portugal (n=1247)	Slovenia (n=1049)	Romania (n=970)	Croatia (n=689)	Turkey (n=1719)
Teachers giving course assignments (e.g. readings, homework, quizzes) on a regular basis*	3.528	3.554	4.018	4.093	4.132	4.174	3.711
Teachers giving feedback on performance on given assignments*	3.298	3.26	3.156	3.483	3.498	3.558	3.233
Teachers responding to my questions in a timely manner*	3.817	3.478	3.528	3.957	3.852	3.782	3.433
Teachers being open to students' suggestions and adjustments of online classes*	3.791	3.479	3.426	3.884	3.714	3.694	3.381
Teachers informing students on what exams will look like in this new situation*	3.261	3.199	3.504	3.351	4.121	3.334	3.76
Satisfaction with the organization of Lectures*	3.194	3.233	3.229	3.764	3.432	3.611	3.522
Satisfaction with the organization of Tutorials/seminars and practical classes*	3.02	3.038	3.036	3.381	3.285	3.491	3.146
Satisfaction with the organization of Supervisions/mentorships*	3.526	3.208	3.313	3.538	3.432	3.565	3.144
Since on-site classes were cancelled, level of satisfaction with support of teaching staff*	3.492	3.302	3.526	3.931	3.555	3.685	3.331
Since on-site classes were cancelled, level of satisfaction with support of technical support or IT services*	3.114	3.101	3.262	3.6	3.341	3.622	3.183
Since on-site classes were cancelled, level of satisfaction with support of library*	3.01	2.933	3.053	3.215	3.083	3.206	3.159
Since on-site classes were cancelled, level of satisfaction with support of student counselling services*	3.231	3.109	3.121	3.541	3.217	3.54	2.912

Note: *rated on a five-point Likert scale, where 1: Very dissatisfied and 5: Very satisfied

Source: Own research

Table 3: Comparison of students' experience with the new teaching and learning environment between India and European countries based on teachers' response during the learning and organization of classes

Parameters*	India (n=1519)	European countries					
		Poland (n=2742)	Portugal (n=1247)	Slovenia (n=1049)	Romania (n=970)	Croatia (n=689)	Turkey (n=1719)
It is more difficult for me to focus during online teaching in comparison to on-site teaching.	3.555	3.58	3.934	3.735	3.732	3.22	3.799
My performance as a student has improved since on-site classes were cancelled.	2.843	2.744	2.346	2.734	2.577	2.952	2.482
My performance as a student has worsened since on-site classes were cancelled.	3.322	3.104	3.279	3.152	3.098	2.718	3.429
I have adapted well to the new teaching and learning experience.	3.346	3.307	3.131	3.594	3.572	3.733	2.808
I can master the skills taught in class this year even on-site classes were cancelled.	3.086	3.037	2.974	3.265	3.433	3.499	2.899
I can figure out how to do the most difficult classwork since on-site classes were cancelled.	3.198	2.963	3.137	3.098	3.104	3.3	3.101

Note: *rated on a five-point Likert scale, where 1: Strongly disagree and 5: Strongly agree

Source: Own research

Table 4: Comparison of India and European countries based on access to infrastructure for studying at home and skills

Parameters	India (n=1519)	European countries					
		Poland (n=2742)	Portugal (n=1247)	Slovenia (n=1049)	Romania (n=970)	Croatia (n=689)	Turkey (n=1719)
Access to infrastructure for studying at home							
A quiet place to study	47%	66%	66%	72%	74%	68%	55%
A desk	65%	86%	89%	94%	85%	91%	80%
A computer	61%	95%	97%	98%	96%	96%	77%
Required software and programmes	46%	81%	90%	93%	90%	90%	65%
A printer	17%	67%	56%	64%	40%	38%	24%
Headphones and microphone	74%	84%	92%	89%	90%	82%	73%
Webcam	47%	74%	90%	84%	86%	88%	57%
Office supplies (notebooks, pens etc.)	73%	91%	97%	96%	95%	97%	84%
A good Internet connection	53%	70%	66%	77%	80%	78%	59%
Course study material (e.g. compulsory and recommended literature)	32%	44%	60%	51%	59%	57%	58%
Confidence in computer skills*	3.838	4.238			4.664		
Browsing online information	3.722	4.001	4.344	4.436	4.617	4.386	3.805
Sharing digital content	3.734	3.993	4.189	4.131	4.585	4.177	3.712
Using online teaching platforms (BigBlueButton, Moodle, Blackboard, GoToMeeting etc.)			4.317	4.186		4.145	3.685
Using online collaboration platforms (Zoom, MS Teams, Skype etc.)	3.734	3.993	4.317	4.186	4.585	4.145	3.685
Using online communication platforms (e-mail, messaging etc.)	3.932	4.335	4.514	4.562	4.739	4.526	4.034
Using software and programs required for my studies	3.693	3.838	4.096	4.095	4.338	4.052	3.741
Applying advanced settings to certain software and programs	3.257	3.361	3.46	3.544	3.784	3.454	3.424

Note: *rated on a five-point Likert scale, where 1: Strongly disagree and 5: Strongly agree

Source: Own research

11.5 Policy recommendations

1. Strengthening the digitalization:

• Governmental focus on providing free education to students, providing a free Internet facility at school and colleges for the purpose of learning will benefit the students.

• There is need to develop online interactive learning platforms for the students, which will facilitate peer learning.

• As there are many consumers of the digital platform due to high population density, the strength of the Internet network should be adjusted according to need.

• Perhaps a toll-free number/helpline number for providing IT support to students and teachers.

2. Helping students cope with the e-learning platform and modules:

• It has been noticed that a large number of students face challenges in coping with online education (Liu, 2020). Providing support to students (medical support, logistic support, employment support) will help them cope with this challenge. Effective coping may help in achieving the sustainable development goals.

• Ensuring appropriate training for students regarding use of the online platform for learning and taking examinations (assessments) will also reduce their psychological distress.

• Mental health support for students as and when required may help them to combat loneliness and psychological issues.

• Providing/strengthening the online mentorship for students given by the teachers/tutors.

3. Developing online resources for online education

• Not having online resources and course modules produced by the education system results in compromised e-learning (The Lancet, 2020b). There is a need to develop a parallel online module for the curriculum to strengthen the teaching.

• The contents of the lectures/presentations must be organized to enhance understandability and satisfaction of the students.

4. Manpower development for e-learning programs

• Training teachers and students about the basic requirements of online teaching/training through appropriate demonstrations.

• An adequate number of trained IT staff in the institutions providing online teaching.

5. Infrastructure & skills-related challenges

• To facilitate e-learning, students should have basic amenities (a computer, quiet place, desk, webcam, Internet, course material) in the home setting and the government may develop schemes to provide such facilities at a reasonable cost to the students.

• The students should be trained about basic computer skills (e.g. browsing online for information, sharing digital contents, using the online learning/communication platforms etc.).

11.6 Conclusion

Higher education has been adversely affected by the Covid-19 pandemic which has compelled students, teachers and institutions to shift from the conventional classroom teaching to online teaching. There is considerable cross-national variation in the availability of resources, approaches and level of satisfaction of students pursuing higher education. Learning from the countries that have delivered the online learning more effectively with greater student satisfaction will definitely help policymakers and stakeholders in countries facing challenges with online teaching.

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