

Higher Education in the First Year of COVID-19: Thoughts and Perspectives for the Future

Stefano Cesco¹, Vincenzo Zara², Alberto F. De Toni^{3,6}, Paolo Lugli¹,
Giovanni Betta⁴, Alexander C.O. Evans⁵ & Guido Orzes¹

¹ Faculty of Science and Technology, Free University of Bozen-Bolzano, Bolzano, Italy

² Dipartimento di Scienze e Tecnologie Biologiche ed Ambientali, Università del Salento, Lecce, Italy

³ Polytechnic Department of Engineering and Architecture, University of Udine, Italy

⁴ Dipartimento di Ingegneria Elettrica e dell'Informazione "Maurizio Scarano", Università degli Studi di Cassino e del Lazio Meridionale, Italy

⁵ School of Agriculture & Food Science, University College Dublin, Ireland

⁶ Conference of Italian University Rectors Foundation (Fondazione CRUI), Italy

Correspondence: Prof. Guido Orzes, Faculty of Science and Technology, Free University of Bozen-Bolzano, Piazza Università 5, 39100, Bolzano, Italy.

Received: November 26, 2020

Accepted: February 8, 2021

Online Published: March 3, 2021

doi:10.5430/ijhe.v10n3p285

URL: <https://doi.org/10.5430/ijhe.v10n3p285>

Abstract

In the last year a new virus (SARS-CoV-2) and the disease caused by it (COVID-19) has quickly spread around the world, leading the World Health Organization to declare a public health emergency and, then, a global pandemic status. The strategies adopted by many countries to reduce the impact of the pandemic were mainly based on social distancing rules and on stay-at-home measures or lockdowns. These strategies had severe disruptive consequences on many sectors, including all levels of education. While the “traditional” (face-to-face) Higher Education (HE) system was unprepared for the lockdown (e.g., no plans for a massive shift to online teaching were available/ready), it reacted in an extremely quick and effective way, replacing face-to-face teaching with online teaching. While COVID-19 has been extremely challenging for education, the experience has undoubtedly provided positive inputs for the digitalization of the HE system. The question is however, if whether after the COVID-19 emergency everything will go back to the previous situation or instead if the pandemic has irreversibly changed HE. While we are still in the middle of the crisis, it is in our view beneficial to start to reflect on the challenges and open issues that emerged during this period and the lessons learned for the “new normal” (as it is often referred to). In this conceptual paper we seek to start this discussion by focusing on the following relevant aspects that should be considered to succeed in the digital transformation: broadband network infrastructure and hardware devices; e-learning software; organization of teaching activities; pedagogical issues; diversity and inclusivity; and a number of other issues. We conclude that the COVID-19 pandemic will irreversibly change HE and probably for the better.

Keywords: higher education, Covid-19, online learning, challenges, social distancing

1. Introduction

In the last few years, virologists (e.g., Dr. Anthony R. Fehr), also businessmen, like the founder of Microsoft Mr Bill Gates, and others forecasted that a pandemic might happen (BBC, 2015; Kansas City Magazine, 2020), warning not that it would happen but rather when it would happen. In December 2019 a new disease was identified in the Chinese city of Wuhan (Hubei province) caused by a “new” coronavirus that started to infect humans: the Severe Acute Respiratory Syndrome Coronavirus 2 also known as SARS-CoV-2 (Tian et al., 2020). Despite the control measures implemented by the Chinese government, the virus SARS-CoV-2 and the disease caused by it (Coronavirus Disease 2019; COVID-19) quickly spread around the world. As a consequence, the World Health Organization (WHO) declared a public health emergency (on 30th January 2020) and then a global pandemic (on 11th March 2020) (World Health Organization, 2020a). On 15th June 2020, more than 7.82 million cases and 431,500 deaths were reported, with 100 million cases and over 2 million deaths reported at the end of January 2021, across 187 countries (World Health Organization, 2020b).

Despite the forecasts given, COVID-19 caught the virologists, doctors, healthcare systems, and societies as a whole off-guard (Webster, 2020). It was indeed a “new” virus, despite belonging to a known family (i.e., the coronaviruses), and we had little information, tools or plans to deal with it (e.g., strategies, drugs or vaccines) (Kalil, 2020). Almost 6 months after its discovery, many relevant questions about the transmission of the virus and the “best” medical treatments and drugs to be used still need to be answered. Twelve months on, vaccines against SARS-CoV-2 were beginning to be rolled out in many countries. The strategies adopted by many countries, starting from China but then spreading around the world, were mainly based on social distancing rules and more strongly on stay-at-home measures or lockdowns (World Health Organization, 2020c). These strategies have had severe disruptive consequences on many sectors, including tourism, retailing, manufacturing and education (Gössling, Scott, & Hall, 2021; Fernandes, 2020).

Education and the higher education (HE) system was one of the first to be affected by lockdown and social distancing strategies. Universities are indeed a place where many people from different cities (and countries) meet and are therefore highly risky for the spread of COVID-19 (World Health Organization, 2020c; Weeden and Cornwell, 2020). In April 2020, schools and Universities were closed in 191 countries and these measures affected over 1.5 billion learners (i.e., 90.2% of total enrolled learners) (UNESCO, 2020). A systematic analysis of how the HE systems of twenty countries have responded to the COVID-19 emergency has been carried out by Crawford, Butler-Henderson, Rudolph, & Glowatz (2020).

The “traditional” (face-to-face) HE system was unprepared for the lockdown – for instance no plans for a massive shift to online teaching were available/ready – but it was soon identified as a necessary response. After an initial phase, aimed at understanding whether the lockdown would only last a few weeks, most Universities replaced all face-to-face teaching with online education (Gonzalez et al., 2020; Study EU, 2020; Toquero, 2020). In most countries, the HE systems have reacted in an extremely quick and effective way (Strielkowski, 2020) with few or no additional resources. Actually, more progresses on online teaching have been achieved in recent months than in the last 20 years. Just as an example, according to a survey carried out by the Conference of Italian University Rectors, 88% of the courses of Italian Universities have been offered online since 24th March 2020 and half of the Italian Universities are offering 96% or more of their courses online (CRUI, 2020). Similarly, all top-25 Universities in the United States according to the Times Higher Education/Wall Street Journal declared emergency eLearning policies (Murphy, 2020). The current situation requires therefore profound reflections to define future HE strategies.

2. Challenges and Open Issues for Online Education

While we are still in the middle of the COVID-19 crisis and still in a very demanding position for the HE system, it is beneficial to reflect on the challenges and open issues (not all strictly related to online teaching), as well as to the potential benefits of online teaching and the lessons learned from the “new normal”, as it is often now referred to (Toquero, 2020). Wissemma (2009) identified three evolutionary stages in the development of HE systems: the medieval Universities, the Humboldt-type Universities (i.e., research Universities) and the high-tech science and technology entrepreneurial Universities. Strielkowski (2020) and Witze (2020) argue that COVID-19 has launched a digital revolution in academia, and this will create 4th stage of Universities, i.e., “online and digital Universities”. By analogy with the Industry 4.0 paradigm that has emerged in the industrial world, we can call this stage as “University 4.0”.

Based on a review of the relevant literature, on the impact of the COVID-19 on higher education and on online education, as well as on some conceptual elaborations, we identify some aspects worth considering in this context: (1) broadband network infrastructure and hardware devices; (2) e-learning software; (3) organization of teaching activities; (4) pedagogical issues; (5) diversity and inclusivity; and (6) other issues. These aspects will be presented in the next paragraphs.

2.1 Broadband Network Infrastructure and Hardware Devices

The first pre-requisite for online teaching and learning is certainly the availability of an adequate broadband network infrastructure as well as the availability of at least one suitable hardware device (desktop, laptop, tablet or mobile phone) for the professor/teacher as well as for each student (McGreal and Elliott, 2008). This was also identified by Doyumğaç and colleagues in their survey as one of the most important issues/barriers for online education (mentioned by 47% of respondents) (Doyumğaç, Tanhan, & Kiyamaz, 2021). As far as network connections are concerned, while the European situation has significantly improved in the last 5 years (from 78% households with internet connection in 2015 to 88% in 2019), there are still some critical situations in certain countries (e.g., Bulgaria with 75%, Greece and Portugal with 78%; Eurostat, 2020a) and regions / geographical areas (e.g., the Serbian region Juzne i Istočne Srbije with 70%, the French region Limousin with 71%, and Italian regions Sicilia, Molise, Puglia,

and Calabria with 76-77%; Eurostat, 2020b). In this context it is worth mentioning the debate and development plans concerning the roll out of Fifth Generation (5G) telecommunications systems, that are still experiencing significant challenges and resistance in some countries (Schneir, Whalley, Amaral, & Pogorel, 2018; Raut, Shevada, Malekar, & Kumar, 2021).

As far as hardware devices are concerned, the situation still varies significantly by country, with a leading position of Switzerland (65 laptops per 100 people), US (57 laptops per 100 people) and Sweden and Denmark (51 laptops per 100 people) (Sawe, 2017). The number of devices per capita is much higher if we also consider mobile phones and tablets; however, these devices are certainly not an optimal solution for e-learning. When analyzing the abovementioned figures, it should be recognized that during lockdowns (as well as previous or subsequent stages with partial opening) more members of each family were studying, teaching or working at home. This can lead to situations where there is competition for technical resources (including network connectivity, the speed/quality of the broadband internet connection) and the availability of hardware devices within the household (e.g., insufficient devices for all members of the family). This is recognized as a particular challenge in low- and middle-income households and is certainly much worse in developing countries in Africa, Asia and South America (Witze, 2020). On the topic it is interesting also to see the survey conducted by Adnan and Anwar (2020) on online learning during the COVID-19 in Pakistan. Therefore, this aspect is a critical consideration for HE systems that have a heavy reliance on online learning and that aspire to be open and inclusive, allowing people to climb the social/economic ladder (Buarque, 1973; Murphy, 2020). This issue will be discussed more in detail in Section 2.5.

2.2 *E-learning Software*

The second technical issue for online education is related to e-learning platforms (mostly video-conference software, learning management systems, learning content management systems, online forums, proctoring software and virtual learning environments).

At the beginning of the COVID-19 emergency, traditional Universities – at least in Europe – were not involved, or had minimal involvement, in online teaching and, therefore, were not adequately equipped with ICT systems and platforms for a massive online learning. While some had relatively well developed virtual learning environments, the issue was however quickly solved – at least for video-conference software needed for synchronous online teaching – with the help of technology providers, who quickly made available (sometimes also free of charge) a set of solutions and supported the Universities in the adoption of new processes.

The most adopted system by Italian Universities is Microsoft Teams, followed by Cisco WebEx, Google Meet, and Blackboard (CRUI, 2020). Another system frequently used in particular by Irish, US and Asian Universities is Zoom. These systems have some similar features (i.e., video and audio transmission, sharing of the screen or some documents by the presenter, the possibility to mute the microphone of participants, a chat where the participants can type their messages, and the possibility to record the lessons) but also some differences. For example, Microsoft Teams has a useful system to archive data within the group/class directory; Zoom provides a very easy and efficient way to create, manage and supervise a set of sub-classes/sub-groups of students that is very useful in case of group works. A very critical point of these systems is cybersecurity (Elsawy and Ahmed, 2019), as demonstrated by the recent cyber-attacks and scandals that have happened to Zoom (Forbes, 2020; Pandaily, 2020) but is tempered by the fact that on-line education is generally open and not commercially sensitive. The choice of the most suitable online platform, taking into account the specific needs (and budget) of each HE institution, needs to be done in a systematic way. Furthermore, in general it is preferable to adopt the same system platform for all courses of a University/Institution in order (1) to maximize the efficiency and effectiveness of the ICT support to professors/teachers/students and (2) to avoid forcing the students to use different systems. For a systematic review or some examples of e-learning systems, the interested reader might see Rodrigues Almeida, Figueiredo, & Lopes (2019) and Khoza (2020).

As far as the other software is concerned (learning management systems, learning content management systems, and online forums), the Universities have just widened and deepened the use of the programs/platforms that had already been adopted before the COVID-19 emergency for archiving the material of the in-class teaching or of the few courses that were already offered online (e.g., Moodle). These systems would however in our view require attention by HE institutions in the “new” normal stage if they want to increase their online (or perhaps blended learning) offer (see Maphalala and Adigun [2021] among others).

Also proctoring software that supports teachers/professors in administering written exams online and that supervises the students during such exams are increasingly important (in particular for large classes and disciplines that require exercises/written exams, such as the technical-scientific subjects). Some examples of these software are: Mercer

Mettl, ProctorU, Examity, ProctorExam, Conduct Exam, and Proctorio and some Universities are testing these systems for the first time during the COVID-19 emergency.

Finally, in order to better exploit e-learning software, the characteristics of the different generations of students and teachers/professors should be taken into account. We are currently in a situation in which “digital immigrants” (Baby Boomers, Generations X and Y) are teaching digital natives (i.e., Generations Z and Alpha; Prenksy, 2001). Teachers and professors, who have the technical or domain specific skills, need therefore to be adequately trained, motivated, and supported for the most effective use of the online teaching tools. This applies not only to higher education institutions but also to primary and secondary schools (Rasmitadila et al., 2020; Viner et al., 2020). In this regard it is interesting to note that many countries have started to offer courses and webinars on these topics to professors and university leaders.

2.3 Organization of Teaching Activities

Another important aspect for online teaching, which from the practical point of view should be considered before the hardware and software, concerns the organization (or re-organization) of teaching activities. During the COVID-19 emergency, due to the time pressure but also to the lack of experience and plans for online teaching, most Universities just transformed the in-class lessons into online synchronous (streaming) or asynchronous lessons. The adaptation of the contents, materials, methods, languages, activities, and teaching formats has been left mostly to the initiative of each teacher/professor. Is this enough in the medium/long-term for ensuring high quality higher education, or is there instead a need to re-think and re-design the study programs (to maximize the advantages of online or blended learning)?

If we consider the literature and best practices on online teaching, we notice that: (1) a significant restructuring of the study programmes would be needed to make them more suitable for being offered online (Witze, 2020) and (2) there are also other valid alternatives to online synchronous teaching, such as asynchronous teaching (video recording) and online communities of practice (e.g., forums) (Bao, 2020). Asynchronous activities have both advantages (e.g., they solve the issue of time zone differences in case of international students, they give more flexibility to students to learn at their own place, they give flexibility where internet or hardware access is intermittent, and they require less professors/teachers) and disadvantages (e.g., less interaction with the professor and among students, absence of real-time feedback).

In the “new normal”, HE institutions that want to increase their online (or blended learning) offering, need to start a deep and systematic analysis of the pros and cons of the different organizational features and a possible re-organization of their teaching activities. In our view, some relevant questions need to be answered. For example:

- (1) How could online or blended learning elements or courses be included in “traditional” study programs?
- (2) How should in-presence activities (e.g., intensive on-campus weekends or weeks) be included in online programs?
- (3) Is it better to have synchronous (streaming) or asynchronous (video recorded) teaching or a combination to achieve the learning outcomes of each study program?
- (4) Does it make sense to use online communities of practice (e.g., forums), in particular for courses with high numbers of students in which there is little interaction among students and with the teacher/professor?
- (5) What is the correct relationship between ECTS requirements and teaching hours for synchronous and asynchronous activities? Similarly, how should the teaching load of each teacher/professor be modified in case of synchronous/asynchronous activities?
- (6) How should the semester structure and weekly timetable be modified for online teaching (e.g., students might need more breaks as online classes are “denser” and heavier to be followed than on-campus ones)?
- (7) How should other teaching activities (e.g., laboratories, field/company trips, internships) be organized?

The online Universities – which have undoubtedly significant experience in designing and supplying online study programs – could perhaps co-operate with (and support) the “traditional” Universities in this transition. An interesting case study for the organization of teaching activities has been developed by Bao (2020). The author provides some potentially useful suggestions, including (1) dividing the teaching content into smaller units to help students focus; (2) involving teaching assistants in providing online support; (3) strengthening students' active learning outside the class; and (4) combining online learning and offline self-learning effectively (Bao, 2020).

Furthermore, the study programs and curricula might also require updating considering the increasing importance of

some subjects and competencies, for instance offering optional or mandatory basic environmental and health course to all students (Türkoğlu, 2019; Toquero, 2020) as well as strengthening the teaching offer on digital technologies and organizational practices for smart working and work safety. Similarly, student support services – including medical and mental health services – should also be strengthened (and offered online) to help students to successfully overcome the COVID-19 emergency but also to succeed in their study career (Toquero, 2020; Cao et al., 2020).

2.4 Pedagogical Issues

There are some important pedagogical issues to be considered before the above-mentioned organizational challenges of teaching activities. The final goal of each study program is to provide students with a set of knowledge and competences that have been carefully defined during the design of the study program (also based on the discussion with relevant stakeholders). Some competences – in particular those related to the Dublin Descriptors “applying knowledge and understanding”, “making judgements”, and “communication skills” – are however not easily taught online. This is particularly critical for technical-scientific programs, in which practical activities (e.g., lab activities, field activities, excursions, company visits, internships) are particularly important to provide students with all the competences needed. In this respect, it should be noted that some study programs (e.g., medicine, nursing, veterinary medicine, agriculture, and engineering) are not possible to be taught completely online due to extensive need of practical activities (laboratories and internships giving real life experience). Are we sure that during the COVID-19 emergency we are able to allow the students to achieve all the learning outcomes that were defined when the study programs were designed? Practical activities have been mostly done through video-recordings (e.g., of lab experiments). Is this sufficient to provide students with their needed competences? Similarly, how can internships (required by certain study programs) be carried out online, if at all (e.g., in smart working), or be replaced? This is not always feasible or possible.

On the other hand, a recent exploratory study has shown that the COVID-19 lockdown and confinement of students had a significant positive effect on their performance since it led to more continuous and efficient study (Gonzalez et al., 2020). Furthermore, some research activities (i.e., those that are not possible to be carried out in smart working environments) were completely stopped during the most severe stages of the COVID-19 emergency and were later significantly affected by social distancing measures. This poses another important question: how can the link between research and teaching (the peculiar characteristics of “traditional” Universities) be maintained?

2.5 Diversity and Inclusivity

Diversity and inclusivity of education (and in particular HE) is another very important aspect to be considered in online education (Joubert and Harrington, 2020). On the one hand, online teaching is more inclusive since it allows working students, parent students, and students living in remote areas to attend the lessons. On the other hand, there is the risk that the economic, class and support inequalities among students increase (Murphy, 2020; Farhadi, 2019; Braga, Checchi, & Meschi 2013). At this context, and according to a recent study carried out by Fondazione Agnelli and some Italian Universities, one out of four high school students with special needs or disabilities is not adequately supported for effective e-learning (Fondazione Agnelli, 2020). Another potential issue includes the likelihood of an economic recession that will be brought on by the COVID-19 pandemic. Different sources have forecast that this might cause a significant reduction in the number of newly matriculated HE students because of an increase in the proportion of students that have the economic means needed to start or completing their HE program. Furthermore, the number of international students will be significantly lower, leading to a significant drop in the revenue that might cause significant problems to many Universities (Witze, 2020). Again, a big challenge for Universities is to remain inclusive despite these issues.

2.6 Other Issues

Schools/Universities also need to strengthen their medical services with increased emphasis on monitoring and implementation of public health practices within their vicinity and beyond. Due to global trends of the pandemic, higher education needs to prioritize the academic, career counselling, and even the medical services, and programs that should be accessible to all students in the University and even through online means. In fact, mental health needs in Universities have gained significant attention (McBride, Van Orman, Wera, & Leino, 2010) due to the increasing number of mental issues among college students (Cao et al., 2020; Dalky & Gharaibeh, 2019; Pedrelli, Nyer, Yeung, Zulauf, & Wilens, 2015; Hunt & Eisenberg, 2010).

Finally, academic life does not only consist of lessons but also of communication, friendship, sport and community activities, collaboration skills, tolerance and respect, interpersonal skills, self-discipline, passion, supervision/mentoring, and rules (Bao, 2019). Collectively these can be termed as the Student Experience and are

often a distinctive feature of campus university life. These aspects are particularly important for the future careers of students in jobs that may be outside the Universities or inside them (i.e., becoming doctoral students and/or professors), and are not easily developed (or taught) through online interactions. Universities are indeed communities of people operating in a physical place and their value-added comes mainly from human, scientific and professional interactions.

3. Discussion

Has the COVID-19 pandemic irreversibly changed HE, or instead after the emergency will everything go back to the previous situation? In other words, is the “traditional” HE system going to go back to normal (only in-class activities) or to a “new normal”, characterized by online teaching or in-class teaching that are also video-recorded and/or streamed? This question is part of a wider debate on whether the world and society will be able to take advantage of the changes that have occurred during the COVID-19 crisis with regard to the reduction in greenhouse gasses and waste emissions, and, more generally, towards a more sustainable future (Sarkis, Cohen, Dewick, & Schröder, 2020). Let us consider, for instance, that forgoing one transcontinental flight per person per year would decrease carbon emissions more than that of a person driving a hybrid car, buying green energy, or eating vegan food (Kumar et al., 2019). A significant future challenge for Universities is therefore to be more international but at the same time reducing travels of students and teachers/professors and online education systems will play a role in addressing this.

From our field experience, we would say that in-class education, that is also video-recorded and/or streamed, is more likely in the future than online only education in many Universities. According to some feedback collected by us during our teaching activities, some students are very happy with online teaching, are more proactively attending their lessons (e.g., asking questions), and are asking to have the streaming option available to them in the future even if the lesson will be given in class (e.g., for students living far from the Universities, or for working students). This is also partly confirmed by a data collection project on how students and academics experience online education carried out by Cennamo and Mol at the Copenhagen Business School (Financial Times, 2020). The abovementioned scholars (and our interactions with students) also suggest that the classroom atmosphere and the on-campus interaction and socialization are perceived by students as critical aspects missing from online education. Furthermore, the “traditional” Universities should not become an alias of the current online (or telematic) Universities, but rather exploit the digital technologies while keeping a strong link between research and teaching activities and the unique on-campus student experience. This is particularly true in technical-scientific fields, in which the face-to-face practical and research activities (in laboratories, field sites, as well as companies) are particularly important. Therefore, traditional Universities should take advantage of the experience gained during the COVID-19 emergency to reshape the content as well as the didactical methodologies of their study programs in order to meet changing students’ needs.

4. Conclusions

The COVID-19 emergency has led to significant changes in the primary, secondary and tertiary sectors (Gössling et al., 2021; Fernandes, 2020; Alipio, 2020). Smart working, working from home and online working have become the preferred working practice in many instances, and while this has emerged on a large scale during the lockdown period it is likely to continue into the future post-pandemic period. This emergency has also provided some potentially positive inputs for the digitalization of the HE system (Strielkowski, 2020; Witze, 2020). Significant (and to some extent unexpected) progresses have been made by many Universities in Europe and around the world. Some choices and strategies were affected by the “urgency” of the emergency situation and still require more systematic analyses and discussion in the future.

In order to be ready for this “new” normality and to succeed in digital transformation (Uni 4.0), Universities – but also more generally countries and policy makers – should consider the key aspects discussed in Section 2 (perhaps in a different order). First, what are the knowledge and competences that should be taught to students and how can this be done, also exploiting the digital technologies (pedagogical issues)? Second, how should the teaching activities be re-organized to exploit these technologies (e.g., videorecording of lessons, asynchronous lessons for the theoretical part of the courses and then only exercises, discussion of case studies, and laboratory activities done in-class)? Third, what is the best software to support the implementation of the pedagogical and organizational aspects defined in the two previous points? Fourth, is the country system ready from a technical/infrastructural point of view (internet connection, number of laptops per person) for massive online education or blended learning? In many countries there are projects for the development of the broadband network infrastructure (based both on optical fiber and on 5G). If these projects do not adequately consider all the possible future users of such networks (e.g., the smart workers, the students of online programs, and the people interested in entertainment or gaming), there is a risk that, once

completed, the speed and quality of the connection will not be adequate for the needs and, then, the different users could “compete” each other. Finally, how could the inclusivity of the study program (or the entire University) be enhanced during this digital transition? The HE system should indeed ensure to reduce/eliminate the structural inequalities of income, social class, and physical/mental abilities (Murphy, 2020; Farhadi, 2019). This is also foreseen by the Sustainable Development Goal 4 (SDG4) set by the United Nations, which is focused on ensuring inclusive and equitable quality education (and promote lifelong learning opportunities) for all. While similar aspects were highlighted for high schools (see for instance the interesting analysis carried out by Almanthari Maulina, & Bruce (2020) on secondary schools’ mathematics teachers in Indonesia or the review done by Viner et al. (2020) on school practices during the COVID-19), our paper is among the first to extend them in the higher education context.

All the aspects mentioned above for the digital transformation of the Higher Education system (Uni 4.0) require a comprehensive and systemic vision and implementation by both University leaders and policy makers that are in charge of developing the policy reforms. We end by concluding that the COVID-19 pandemic will irreversibly change HE and probably for the better. Traditional Universities should be able to address the current challenges by innovating their missions (teaching, research and impact), but without renouncing their identities and traditions. Policy makers should also foster, support, and guide this transition.

Acknowledgements

This work was supported by the Open Access Publishing Fund of the Free University of Bozen-Bolzano.

References

- Adnan, M., & Anwar, K. (2020). Online Learning amid the COVID-19 Pandemic: Students' Perspectives. *Journal of Pedagogical Sociology and Psychology*, 2(1), 45-51. <https://doi.org/10.33902/JPSP.2020261309>
- Alipio, M. (2020). Education during COVID-19 era: Are learners in a less-economically developed country ready for e-learning? ZBW – Leibniz Information Centre for Economics, Kiel, Hamburg. <https://doi.org/10.2139/ssrn.3586311>
- Almanthari, A., Maulina, S., & Bruce, S. (2020). Secondary School Mathematics Teachers’ Views on E-learning Implementation Barriers during the COVID-19 Pandemic: The Case of Indonesia. *Eurasia Journal of Mathematics, Science and Technology Education*, 16(7), em1860.
- Baldwin, R., & Weder di Mauro B. (2020). *Mitigating the COVID economic crisis: Act fast and do whatever it takes*, London, UK: CEPR Press. <https://doi.org/10.29333/ejmste/8240>
- Bao, W. (2020). COVID-19 and online teaching in higher education: A case study of Peking University, *Human Behavior and Emerging Technologies*, 2(2), 113-115. <https://doi.org/10.1002/hbe2.191>
- Barro, R. J., Ursúa, J. F., & Weng, J. (2020). The coronavirus and the great influenza pandemic: Lessons from the “spanish flu” for the coronavirus’s potential effects on mortality and economic activity (No. w26866), National Bureau of Economic Research. <https://doi.org/10.3386/w26866>
- BBC (2015). *TED 2015: Bill Gates warns on future disease epidemic*. Retrieved from <https://www.bbc.com/news/technology-31956344>
- Braga, M., Checchi, D., & Meschi, E. (2013). Educational policies in a long-run perspective. *Economic Policy*, 28(73), 45-100. <https://doi.org/10.1111/1468-0327.12002>
- Buarque, C. (1973). The university and society: The role of the university: criticisms and hopes, *Higher Education Quarterly*, 27(3), 346-355. <https://doi.org/10.1111/j.1468-2273.1973.tb00738.x>
- Cao, W., Fang, Z., Hou, G., Han, M., Xu, X., Dong, J., & Zheng, J. (2020). The psychological impact of the COVID-19 epidemic on college students in China. *Psychiatry Research*, 287, 112934. <https://doi.org/10.1016/j.psychres.2020.112934>
- Crawford, J., Butler-Henderson, K., Rudolph, J., & Glowatz, M. (2020). COVID-19: 20 Countries' Higher Education Intra-Period Digital Pedagogy Responses, *Journal of Applied Teaching and Learning*, 3(1), 1-20. <https://doi.org/10.37074/jalt.2020.3.1.7>
- CRUI (2020). *Stato sulla didattica on-line al 24/3*.
- Dalky, H. F., & Gharaibeh, A. (2019). Depression, anxiety, and stress among college students in Jordan and their need for mental health services. *Nursing forum*, 54(2), 205-212. <https://doi.org/10.1111/nuf.12316>
- Doyumğaç, İ., Tanhan, A., & Kiyamaz, M. S. (2021). Understanding the most important facilitators and barriers for

- online education during COVID-19 through online photovoice methodology. *International Journal of Higher Education*, 10(1). <https://doi.org/10.5430/ijhe.v10n1p166>
- Elsawy, A. M., & Ahmed, O. S. (2019). E-Learning using the Blackboard system in Light of the Quality of Education and Cyber security, *International Journal of Current Engineering and Technology*, 9(1), 49-54. <https://doi.org/10.14741/ijcet/v.9.1.7>
- Eurostat (2020a). *Households with broadband access*. Retrieved from <https://ec.europa.eu/eurostat/databrowser/view/tin00073/default/table?lang=en>
- Eurostat (2020b). Households that have broadband access by NUTS 2 regions. Retrieved from <https://ec.europa.eu/eurostat/databrowser/view/tgs00048/default/table?lang=en>
- Farhadi, B. (2019). “*The Sky’s the limit*”: *On the impossible promise of e-learning in the Toronto district school board*. Doctoral dissertation. Toronto: University of Toronto. Retrieved from <http://hdl.handle.net/1807/97442>
- Fernandes, N. (2020). Economic effects of coronavirus outbreak (COVID-19) on the world economy, IESE Business School Working Paper No. WP-1240-E.
- Fondazione Agnelli (2020). *Oltre le distanze. Indagine Preliminare*. Retrieved from <https://www.fondazioneagnelli.it/wp-content/uploads/2020/05/OLTRE-LE-DISTANZE-SINTESI-RISULTATI-QUESTIONARIO-1.pdf>
- Forbes (2020). *New Zoom Security Warning: Your Video Calls At Risk From Hackers—Here’s What You Do*, Retrieved from <https://www.forbes.com/sites/zakdoffman/2020/01/28/new-zoom-roulette-security-warning-your-video-calls-at-risk-from-hackers-heres-what-you-do/#212e512e7343>
- Gonzalez, T., de la Rubia, M. A., Hincz, K. P., Comas-Lopez, M., Subirats, L., Fort, S., & Sacha, G. M. (2020). Influence of COVID-19 confinement in students performance in higher education, *PLoS ONE* 15(10), e0239490. <https://doi.org/10.1371/journal.pone.0239490>
- Gössling, S., Scott, D., & Hall, C. M. (2021). Pandemics, tourism and global change: a rapid assessment of COVID-19, *Journal of Sustainable Tourism*, 29, 1-20. <https://doi.org/10.1080/09669582.2020.1758708>
- Hunt, J., & Eisenberg, D. (2010). Mental health problems and help-seeking behavior among college students. *Journal of adolescent health*, 46(1), 3-10. <https://doi.org/10.1016/j.jadohealth.2009.08.008>
- Joubert, R., & Harrington, I. (2020). Inclusive Education: Origins, 'Defectology', and Kosovo's Experiences of Inclusive Education. *International Journal of Higher Education*, 9(1), 52-59. <https://doi.org/10.5430/ijhe.v9n1p52>
- Kalil, A. C. (2020). Treating COVID-19—off-label drug use, compassionate use, and randomized clinical trials during pandemics, *JAMA*, 323(19), 1897-1898. <https://doi.org/10.1001/jama.2020.4742>
- Kansas City Magazine (2020). *A coronavirus expert from KU predicted this pandemic—here’s what he says will happen next*, Retrieved from <https://www.kansascitymag.com/heres-what-could-have-stopped-the-covid-19-epidemic-according-to-a-kansas-coronavirus-expert/>
- Khoza, S. B. (2020). Academics’ “Why” of Knowledge-Building for the Fourth Industrial Revolution and COVID-19 Era. *International Journal of Higher Education*, 9(6). <https://doi.org/10.5430/ijhe.v9n6p247>
- Kumar, B., Jensen, M. M., Strielkowski, W., Johnston, J. T., Sharma, V., Dandara, C., ... & Abdul-Ghani, R. (2019). *NextGen Voices: Science-inspired sustainable behavior*. *Science*, 364(6443), 822-824. <https://doi.org/10.1126/science.aax8945>
- Maphalala, M. C., & Adigun, O. T. (2021). Academics' Experience of Implementing E-Learning in a South African Higher Education Institution. *International Journal of Higher Education*, 10(1). <https://doi.org/10.5430/ijhe.v10n1p1>
- McGreal, R., & Elliott, M. (2008). Technologies of online learning (e-learning), *Theory and practice of online learning*, 115.
- Murphy, M. P. (2020). COVID-19 and emergency eLearning: Consequences of the securitization of higher education for post-pandemic pedagogy. *Contemporary Security Policy*, 41, 492-505. <https://doi.org/10.1080/13523260.2020.1761749>

- Pandaily (2020). "Zoom's Security Scandal Likely to Improve Video Conferencing Services For All", available at: <https://pandaily.com/zooms-security-scandal-likely-to-improve-video-conferencing-services-for-all/>
- Pedrelli, P., Nyer, M., Yeung, A., Zulauf, C., & Wilens, T. (2015). College students: mental health problems and treatment considerations. *Academic Psychiatry, 39*(5), 503-511. <https://doi.org/10.1007/s40596-014-0205-9>
- Preksy, M. (2001). Digital natives, digital immigrants, *On the Horizon, 9, 5, 1-6*. <https://doi.org/10.1108/10748120110424816>
- Rasmitadila R., Aliyyah, R. R., Rachmadtullah, R., Samsudin, A., Syaodih, E., Nurtanto, M., & Tambunan, A. R. S. (2020). The perceptions of primary school teachers of online learning during the COVID-19 pandemic period: A case study in Indonesia. *Journal of Ethnic and Cultural Studies, 7*(2), 90-109. <https://doi.org/10.29333/ejecs/388>
- Raut, H. D., Shevada, L., Malekar, R., & Kumar, S. (2021). High Gain Wideband Antennas for 5G Applications: A Review. *Inventive Communication and Computational Technologies, 777-787*. https://doi.org/10.1007/978-981-15-7345-3_67
- Rodrigues, H., Almeida, F., Figueiredo, V., & Lopes, S. L. (2019). Tracking e-learning through published papers: A systematic review, *Computers & Education, 136*, 87-98. <https://doi.org/10.1016/j.compedu.2019.03.007>
- Rothan, H. A., & Byrareddy, S. N. (2020). The epidemiology and pathogenesis of coronavirus disease (COVID-19) outbreak. *Journal of autoimmunity, 109*, 102433. <https://doi.org/10.1016/j.jaut.2020.102433>
- Sarkis, J., Cohen, M. J., Dewick, P., & Schröder, P. (2020). A brave new world: lessons from the COVID-19 pandemic for transitioning to sustainable supply and production. *Resources, Conservation, and Recycling, 159*, 104894. <https://doi.org/10.1016/j.resconrec.2020.104894>
- Sawe, Benjamin Elisha (2017). Countries With The Most Personal Computers Per Capita, WorldAtlas, May. 1, 2017. Retrieved from www.worldatlas.com/articles/countries-with-the-most-personal-computers-per-capita.html
- Schneir, J. R., Whalley, J., Amaral, T. P., & Pogorel, G. (2018). The implications of 5G networks: Paving the way for mobile innovation? *Telecommunications Policy, 42*(8), 583-586. <https://doi.org/10.1016/j.telpol.2018.06.001>
- Strielkowski, W. (2020). COVID-19 pandemic and the digital revolution in academia and higher education, *Education Studies*. <https://doi.org/10.20944/preprints202004.0290.v1>
- StudyEU (2020). Impact of COVID-19 on studying abroad in Europe: Overview. Retrieved from <https://www.study.eu/article/impact-of-covid-19-on-studying-abroad-in-europe-overview>
- Tian, H., Liu, Y., Li, Y., Wu, C. H., Chen, B., Kraemer, M. U., ... & Wang, B. (2020). An investigation of transmission control measures during the first 50 days of the COVID-19 epidemic in China. *Science, 368*, 6491, 638-642. <https://doi.org/10.1126/science.abb6105>
- Toquero, C. M. (2020). Challenges and Opportunities for Higher Education amid the COVID-19 Pandemic: The Philippine Context, *Pedagogical Research, 5*(4), em0063. <https://doi.org/10.29333/pr/7947>
- Türkoğlu, B. (2019). Opinions of Preschool Teachers and Pre-Service Teachers on Environmental Education and Environmental Awareness for Sustainable Development in the Preschool Period. *Sustainability, 11*(18), 4925. <https://doi.org/10.3390/su11184925>
- UNESCO (2020). *COVID-19 Educational Disruption and Response*. Retrieved from <https://en.unesco.org/covid19/educationresponse>
- Viner, R. M., Russell, S. J., Croker, H., Packer, J., Ward, J., Stansfield, C., ... & Booy, R. (2020). School closure and management practices during coronavirus outbreaks including COVID-19: a rapid systematic review. *The Lancet Child & Adolescent Health, 4*(5), 397-404. [https://doi.org/10.1016/S2352-4642\(20\)30095-X](https://doi.org/10.1016/S2352-4642(20)30095-X)
- Webster, P. (2020). Virtual health care in the era of COVID-19. *The Lancet, 395*(10231), 1180-1181. [https://doi.org/10.1016/S0140-6736\(20\)30818-7](https://doi.org/10.1016/S0140-6736(20)30818-7)
- Weeden, K., & Cornwell, B. (2020). The small world network of college classes: Implications for epidemic spread on a university campus, *Sociological Science, 7*, 222-241. <https://doi.org/10.15195/v7.a9>
- Wissema, J. (2009). Towards the third-generation university: Managing the university in transition. Edward Elgar Publishing, UK. <https://doi.org/10.4337/9781848446182>
- Witze, A. (2020). Universities will never be the same after the coronavirus crisis, *Nature, 582*, 162-164.

<https://doi.org/10.1038/d41586-020-01518-y>

World Health Organization (WHO) (2020a). *WHO Director-General's opening remarks at the media briefing on COVID-19 - 11 March 2020*. Retrieved from <https://www.who.int/dg/speeches/detail/who-director-general-s-opening-remarks-at-the-media-briefing-on-covid-19---11-march-2020>

World Health Organization (WHO) (2020b). *WHO Coronavirus Disease (COVID-19) Dashboard*. Retrieved from <https://covid19.who.int/>

World Health Organization (WHO) (2020c). *COVID-19 Strategy Update*. Retrieved from https://www.who.int/docs/default-source/coronaviruse/covid-strategy-update-14april2020.pdf?sfvrsn=29da3ba0_19

Copyrights

Copyright for this article is retained by the author(s), with first publication rights granted to the journal.

This is an open-access article distributed under the terms and conditions of the Creative Commons Attribution license (<http://creativecommons.org/licenses/by/4.0/>).