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Daniel Burgos · Ahmed Tlili · Anita Tabacco *Editors*

Radical Solutions for Education in a Crisis Context

COVID-19 as an Opportunity for Global Learning

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Foreword by Nian-Shing Chen

One of the important challenges in education is sustainability especially during severe crisis, such as global pandemics (e.g. SARS, Ebola and COVID-19) and natural disasters (e.g. Tsunami and Haiti earthquake). Crisis as such could seriously affect human life and disrupt several daily crucial activities including working and learning. The current COVID-19 global pandemic has affected several billions of students worldwide as many schools are closing down for months. Suddenly, teachers are forced to prepare online learning materials and transfer their face-to-face teaching activities to online learning platforms. This has posed lots of pressures and challenges to them. Students are also facing many obstacles as many of them are not used to online learning mode. Educational institutions and governments are struggling to provide online platforms with enough capacity and bandwidth to accommodate massive online learners simultaneously. Teachers' professional training and support for mastering online teaching and learning competence is urgently needed.

Hodges et al. (2020)[1] defined emergency teaching as "a temporary shift of instructional delivery to an alternate delivery mode due to crisis circumstances. It involves the use of fully online teaching solutions for instruction or education that would otherwise be delivered face-to-face or as blended or hybrid courses." However, this instant shift has caused several challenges and obstacles for many teachers and students. Lacking ICT skills for teachers and inaccessibility to appropriate learning contents are very serious problems, especially for students with disabilities.

On the other hand, since severe crisis is unlikely to disappear for a perceivable future, for education to be sustainable, how to ensure education can be continued without disruption under severe conditions, different forms of teaching and learning should be treated as a "new normal." Therefore, all stakeholders (e.g. teachers, students, institutions and policy makers) should be prepared for it. Similarly, several international organizations are now paying particular attention to the issue of "Education Response in Crises and Emergencies". As crisis may not be stopped from happening, the best strategy is to be prepared for it.

[1] Hodges, C., Moore, S., Lockee, B., Trust, T., & Bond, A. (2020). The difference between emergency remote teaching and online learning. EDUCAUSE Review.

Based on the experiences of handling educational challenges during the COVID-19 global pandemic, this book aims to provide a collection of important chapters, to share the practices and lessons learned across different stakeholders. It also provides useful information about what should be considered in the educational field to be prepared for the next crisis. There are four parts included in this book.

Part I—*About Global Learning and Crisis* discusses different teaching and learning strategies that could be implemented for students during crisis, including those with disabilities. It also discusses the design, development, implementation and assessment of emergency teaching experiences.

Part II—*About Teachers' Support* discusses the teaching challenges faced by teachers in crisis and the different teaching supports that should be provided accordingly. It also presents guidelines for teachers to successfully design their teaching experience in crisis

Part III—*About Students' Support* presents specific learning tools and strategies that were developed and implemented to facilitate students' online learning processes.

Part IV—*Case Studies* presents case studies conducted in China, Italy, Uzbekistan and Korea. Different approaches for maintaining undisrupted learning from home during the COVID-19 are presented for stakeholders to adopt the suitable ones according to their respective contexts.

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Foreword by Federico Moran

We live in times of continuous change, lately troubled. The university is no stranger to this situation. In fact, the university, which has always been in continuous transformation, now faces a challenge that is undoubtedly unique. We live in the Knowledge Society, and this knowledge is generated by multiple actors. The university world so far has represented the frontier of knowledge and the way to open new spaces for society, new solutions to problems. The university has starred in the highest educational echelon and source of knowledge generation. But we are in moments when problems are piling up and the urgency to look for solutions transcends the university environment. Companies, research organizations, multinationals, etc. they are taking the alternative in the search for solutions to problems and in the generation of knowledge.

In this situation, the university—higher education—is transforming itself. The traditional university is looking for new spaces for generating knowledge and new ways of transmitting this knowledge. This transformative capacity has acted on higher education itself, evolving the university itself: the very concept of university.

Consequently, in last decades we are witnessing truly innovative higher education proposals. They break with the traditional concept of university campus, to bring education to other spaces. Cross-border campuses, multidisciplinary teaching, tutored self-study, company training, industrial doctorates, etc. they are just some of the new proposals for higher education that break with the old scheme of great classroom—professor—lecture class.

If there is something common to all new university proposals, it is the commitment to excellence, the ability to generate, attract and preserve human talent. We talk about the excellence of the teachers and the excellence of the students. The best universities have always had the best professors who have created the best programs and attracted the best students. In turn, best students have provided the institution with innovative results that contribute to the new programs. This virtuous circle has been affected by the globalization of knowledge to which new technologies lead. On this issue we find many contributions in this text.

We are experiencing a transformation that has come hand by hand with new technologies, which have enabled new educational methodologies, that in many cases

do not require the physical presence of the student in the classroom. Non-face-to-face training has gained prominence, especially in recent pandemic months. But **change of methodology should not be confused with change of model**. The new proposals, of course that are helped by new increasingly powerful tools. But this is not just about these, it is about exploring new teaching spaces and new ways of transmitting knowledge.

The COVID-19 epidemic has forced a change in methodology at all levels of education and, obviously, also at the university level. The face-to-face has been forced to be non-face. The classroom lecture has been changed to the remote, synchronous and interactive master class. This has involved a notable effort for the traditional university based on the concept of face-to-face campus. Preparation of teachers and students, investment in computer platforms, etc. But conceptually, the model of knowledge transmission is basically the same: the class has been changed face-to-face in the classroom by face-to-face on the computer screen. This is not actually a change of model, although in many cases it has been a technological challenge.

The digitization strategy goes beyond providing a solution to the non-attendance imposed by a pandemic. The new higher education proposals stop piloting on the student-teacher axis to search for learning formulas where the student can be led in his process of acquiring competences (no longer just talking about knowledge) through challenges and tutored by other students. The very concept of a university campus has crossed physical and international borders. The involvement of companies in learning processes is increasingly frequent. The concept of evaluation itself has transcended the classic test of knowledge through different tests of acquisition of competences and learning results.

In summary, the generation of knowledge, essential in the evolution of society, is not exclusive to the university, but it contributes significantly to its transmission. The search for solutions to problems is no longer exclusive to enterprises, but they need them for survival. Companies need universities, which, in turn, are not the only space for transmitting this knowledge. We live in a complex situation where roles of higher education and society, knowledge generation and transmission, are exchanging, transforming, and being shared.

Madrid, Spain

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About the Editors

Prof. Dr. Daniel Burgos works as a Full Professor of Technologies for Education & Communication and Vice-rector for International Research (http://research.unir.net), UNESCO Chair on eLearning and ICDE Chair in Open Educational Resources, at Universidad Internacional de La Rioja (UNIR, http://www.unir.net). He is also Director of the Research Institute for Innovation & Technology in Education (UNIR iTED, http://ited.unir.net). Further, he is a Professor at An-Najah National University (Palestine), an Adjunct Professor at Universidad Nacional de Colombia (UNAL, Colombia), an Extraordinary Professor at North-West University (South Africa), and a Visiting Professor at Coventry University (United Kingdom) and Universidad de las Fuerzas Armadas (ESPE, Ecuador). His research is focused on Adaptive, Personalised and Informal eLearning, Learning Analytics, Open Education and Open Science, eGames, and eLearning Specifications. He has published over 150 scientific papers, 20 books and 15 special issues on indexed journals. He has developed +55 European and Worldwide R&D projects, with a practical implementation approach, including patents and exploitation agreements with SMEs and large enterprises like Atos, Bayer, IBM and Telefónica. He has been the jury chair of the 2016 and 2018 UNESCO Prize for the Use of ICTs in Education. He is a consultant for United Nations Economic Commission for Europe (UNECE), European Commission, European Parliament, Russian Academy of Science and ministries of Education in over a dozen countries. He is an IEEE Senior Member. He holds degrees in Communication (Ph.D.), Computer Science (Dr. Ing.), Education (Ph.D.), Anthropology (Ph.D.), Business Administration (DBA), and Artificial Intelligence & Machine Learning (postgraduate, at MIT).

Dr. Ahmed Tlili is a former assistant professor at the University of Tunis, and an expert at the Arab League Educational, Cultural and Scientific Organization (ALECSO). Currently, he is the Co-Director of the OER Lab at the Smart Learning Institute of Beijing Normal University (SLIBNU), China. He is also the Associate Editor of the IEEE Bulletin of the Technical Committee on Learning Technology. Dr. Tlili has been awarded the outstanding research award from the Smart Learning Institute of Beijing Normal University for 2019, and the IEEE TCLT Early Career Researcher Award in Learning Technologies for 2020. He has published several

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Part I
Global Learning and Crisis

Chapter 1
Education in a Crisis Context: Summary, Insights and Future

Daniel Burgos, Ahmed Tlili, and Anita Tabacco

Abstract This book presents a selected collection of research works, out of practice, worldwide. Along the four sections: (1) global learning and crisis; (2) teachers' support in crisis; (3) learners' support in crisis; and (4) case studies, the chapters provide a unique and up-to-date view on how to face adversity and uncertain times. When the pandemic caused by the COVID-19 is hitting hard, and other natural or human-made disasters are still happening, this book presents the work of many researchers, professors and teachers in active, who bring their own experience in the field. This chapter provides a summary of the contributions and a few key recommendations on the topic to think ahead.

Keywords Education · Crisis · COVID-19 · Pandemic

1.1 Education in a Context of Crisis

This book presents a selected collection of research works, out of practice, worldwide. Along the four sections: (1) Global learning and crisis (2) Teachers' support in crisis; (3) Learners' support in crisis; and (4) Case studies, the chapters provide a unique and up-to-date view on how to face adversity and uncertain times. The current pandemic (COVID-19) has forced the educational community to an instant adaptation, coming from teaching face-to-face to sharing the learning setting via online services and open educational practices (Burgos 2020; Huang et al. 2020; Smart Learning Institute 2020). Also, from being taught along the day, class after

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class, to encourage self-learning and project-based learning; and, further, to elaborate on creative ways to communicate and share work, online assessment, virtual classrooms, eGames, interactive planning and many other techniques and skills required to make the best out of this situation (Ballatore et al. 2020; Corbi and Burgos 2017; Tlili et al. 2019). We keep in mind that this pandemic is not the first or only crisis in the world, and likely it will not be the last now, including new outbreaks of the same or mutated coronavirus (Menjívar et al. 2019; Sinclair 2001). There are earthquakes, tsunamis, wars, hunger, migration waves, volcano eruptions and a long list of natural or man-made disasters, global or local, that disrupt and threaten to alter the way that we live and learn, for good (Jones 2020; Lichtenstein 1995).

However, human beings treasure a feature to find the best learning ways and teaching experiences. Learning and teaching online is not new. In parallel to the birth of the World Wide Web, a few schools started leaning on online services to complement distant learning and to, step-to-step, offer an alternative way to remote learning, for all those people that could not move to different cities or countries (Burgos 1997). It has been now 25 years of eLearning, although this pandemic has brought it to the front news now. Further, there are a lot of experiences to learn from and to share with, without the need to start from scratch (Decker 1997). Many teachers, learners and parents (for school, K-12 education) freeze in panic because of the unknown scenarios, and claim the over-burden of daily tasks when working with their kids. However, they are not alone, and they can learn from peers and experts, to achieve the competences needed for a fruitful new context, successfully and quickly (Reich et al. 2020).

Thanks to this book, all the stakeholders involved in the educational community will have a clear picture and some useful hints to face how to work and learn in times of crisis, especially, learners, school teachers, university professors, academic managers, parents and a long list of support roles (e.g., content providers, publishers and accreditation agencies).

1.2 Insights from Practice for Learners, Teachers and Global Strategy

The book has presented the following chapters, distributed in the four sections, above mentioned:

Section “Global learning and crisis” provides an overview of education, methodology and action plans to face the adversity that a crisis brings along, also to education.

Chapter 1. Affouneh and Burgos propose a practical action plan to facilitate education in times of crises. They present six keys to work on Education in emergencies or natural disasters so that the educational community can move from an imminent situation of chaos to an emergency plan that articulates learning and teaching.

Chapter 2. Cucco et al. present a strategy to prevent drop-out and demotivation. They also focus on the risk for inequalities and economic downside. This chapter discusses some evidence-based solutions, which include the active collaboration from parents.
Chapter 3. Hodges et al. work on emergency remote teaching through the application of the ADDIE instructional design. They present a framework to design, develop, implement and assess online teaching and online learning contexts, from a practical perspective that includes an external support resource.
Chapter 4. Strods et al. focus on global mobility and international recruitment. They present the effect that the pandemic has in future study intentions of prospective students. Since many universities expect a decrease in enrolment and a degree of uncertainty about the educational context, this chapter provides some countermeasures.
Chapter 5. Tlili et al. work with functional diversity and education. Many learners and teachers face the challenge of adaptation to education in this (or any other) time of crises. Further, people with a certain degree of disability face a double challenge, since eLearning might be tricky if implemented so quickly. This chapter presents some applied remote teaching methods.
Chapter 6. García-Peñalvo et al. presents a set of practical recommendations for mandatory online assessment in Higher Education. Out of their experience during the pandemic, University of Salamanca had to move all their lectures and examinations online, which led them to an extraordinary migration process for students, professors, support staff and academic managers.
Chapter 7. Ossiannilsson reflects on the challenges in education after a crisis, with her experience at UNESCO. Based on an outlook to the United Nations Sustainable Development Goals (SDG), especially to SDG #4, Quality Education, this chapter presents the need to move to online learning and teaching, which facilitates a flexible approach to education, also in future scenarios.

Section "Teachers' support in crisis" concentrates on how to support teachers and the teaching process in remote contexts, and how to migrate from face-to-face to online teaching.

Chapter 8. Corbi and Burgos explain how teachers can migrate from a face-to-face classroom to an online setting thanks to the adaptation of the methodology. The restrictions of movement, timetables, resources and access encourages education to become more creative and innovative in order to find a window of improvement out of the crisis situation.
Chapter 9. Looi et al. also focus on the role of the teacher. They support a role swift from curriculum deliverers to actual designers of learning. In their view, the teacher must become an instructional designer, more than ever, so that they can redefine their role and adapt to the situation of crisis. This transformation includes lesson structures, content presentation, collaboration, interaction, feedback, motivation, etc.
Chapter 10. Denden et al. propose a framework for teacher support, and they use COVID-19 as an example, however this framework can be implemented in other

crises. They identify and describe the most significant challenges that teachers have to deal with in remote settings and in contexts of crisis, in both, university and school institutions.
Chapter 11. Mays presents his experience in supporting teachers in online contexts, and how to migrate from campuses to online campuses. In his view, teachers are the cornerstone of a system that relies on the appropriate learning provision. They need to be supported and trained to develop online strategies that guarantee an excellent performance.
Chapter 12. Wang et al. concentrate on the transition to online teaching. They work with teachers on a daily basis and they provide a full set of recommendations for schools and teachers in order to re-design face-to-face methodologies and settings, and move them to online environments. They also comment on the teacher's perceptions about the required technology in this process.

Section "Learners' support in crisis" works with learners in the process of adaptation to online settings, including self-assessment and functional diversity features.

Chapter 13. Berrada et al. start this section with useful strategies for learners that they can adapt to the online setting, if they did not have previous experiences. They revise the last decade about transforming education and projects on the current and future scenarios. The chapter comments on technological and educational requirements for these scenarios.
Chapter 14. Papamitsiou et al. support self-assessment as a key for quality education in contexts of crisis. This chapter leans on the learners' motivation and determination to self-improvement thanks to analytics, which leads to a responsible environment where the learner becomes a self-regulator of their learning path and achievements.
Chapter 15. Othman and Al-Sinani use alternative communication to support inclusion through augmented pictograms. Digital inclusion is always a challenge, no matter when and where. In times of crisis, it becomes a double challenge since, to the current uncertainty for all, there is another layer of difficulty for some. Augmented pictograms are proven to be supportive towards inclusion.

Section "Case studies" presents experiences from China, Italy, Spain, Uzbekistan, Korea, Morocco and Canada, and how they provided adaptation and innovative methodologies towards a successful learning and teaching environment.

Chapter 16. Zhang et al. presents a case study in China focused on maintaining education against all odds. They have retrieved first-hand information through a focus group and a Web survey that highlight seven key enablers for implementing education and flexible learning during COVID-19, namely Infrastructure, learning tools, learning resources, teaching approaches, learning strategies, supports and services for teachers and students, and cooperation among different stakeholders.
Chapter 17. Ballatore et al. bring a case study from Central Asia, in Uzbekistan, and their connection to the Politecnico di Torino, which became highly effective. This chapter presents how they dealt with exams and admission tests, along

with the ICT tools used in the process. Last, they show the qualitative feedback categorized out of this process.
Chapter 18. Soriano et al. presents the case study of Universidad Internacional de La Rioja (UNIR), in Spain. Taking their experience in moving all the educational, management and support layers to a purely online ecosystem, they provide a set of insights and lessons learnt in the process, complemented by a similar process from the University of Cambridge.
Chapter 19. Banchio et al. work with children from 3 to 14 years. Their case study, in Italy, provides a collection of practical measures applied from kindergarten to secondary school, including the active communication among colleagues. This interaction between peers helps cross-providing skills and better support between neighbouring schools.
Chapter 20. Cha and So present the policies taken in Korea to mitigate the educational crisis thanks to the effective use of remote teaching and learning. In this case study, they have used e main types of online classes: real-time interaction, content-based online class, and assignments-based online class.
Chapter 21. Higueras et al. show an educational framework in Morocco, used as a case study to implement a flexible educational model in Higher Education. They present the Open Spaces Educational Framework (OSEF) as a way to support and improve remote education in the country and the region.
Chapter 22. Murgatroyd brings a personal analysis on the next scenario for universities and colleges, from the experience at the University of Alberta, in Canada. He provides a collection of predictions based on the current facts, interpreted: A drop of face-to-face international students, a growth of blended learning, a growth of short courses, a rebalancing between full-time tenure track positions and sessional positions, a commitment to ending the digital divide, etc.

1.3 About the Future

All these chapters bring experiences from the ground, much based on previous background and the adaptation to the current context. Even further, they focus on what to learn and implement to prevent a gap in education when a new crisis comes. Specifically, based on the collection of chapters presented in this book, the following recommendations are identified.

- An action plan is required to predict, prevent and work. Crises are unavoidable, however the educational community has the commitment and drive to provide in advance a sustainable and viable plan to keep on the right track even when a crisis hits again. Working for the future, with a vision in mind, is making progress at present.
- More collaboration plans and common policies should be emphasized between governments, associations and companies related to emergency responses in education. These responses could focus on how to increase Internet bandwidth

and deploy servers in crisis that handle millions of students and teachers simultaneously or developing cheap and affordable tools and assistive technologies to maintain learning from home. Also, international collaboration between universities should be further emphasized, as in time of crisis, universities could work together to release quality learning resources for everyone and save both time and cost.

- Integration of formal and informal learning settings, along with Open Education and Open Science, might be a key for a successful action plan in times of crises. An structured collection of strategies, methodologies, tools, contents and services that can be shared, used, re-used and created for a greater good, with the right license for every case, multiplies in times the outreach and power of the educational community. Resources can be Open, Universal and-or Free (OUF), and they have to be correctly tagged and used, to this matter.
- More focus should be paid to the capacity building and competences of both teachers and students in order to facilitate their remote teaching and learning experiences. This could be achieved by organizing blended workshops where they can learn online to get the theoretical knowledge and conduct hands-on experiences to practice their skills, for instance, on specific platforms (i.e., Moodle, Sakai, etc.) or on how to design an effective online course. At the same time, policy makers should encourage these workshops at both the institutional and national levels to ensure that no one is left behind.
- In emergencies and crisis, the teacher, learner or parent is the guarantor to choose and orchestrate the right resources and timing, so that instructional design becomes the actual backbone of any action plan in education. Learn and teach can happen anywhere at any time, no matter what. However, the key is to make the right planning, with a powerful structure and a sensitive use of resources. This role leans on the educators, whatever their position is, who should and will know how to adapt and to make an opportunity out of adversity.
- In times of crisis, parents may find themselves in unfamiliar situations where they have to help their children learn for a long period of time. However, they might have low knowledge about this. Therefore, more support should be given to parents, including guidelines (e.g., psychological guidelines on how to motivate children to learn at home in times of crisis) and ICT training so they can successfully help their children learn.
- As "education" is a human right, more efforts should be paid to make learning accessible to everyone, including those with functional diversities or in rural areas. In this context, more awareness should be paid on how to design accessible learning contents and platforms based on Universal Design (UD) and Web Content Accessibility Guidelines (WCAG) respectively. Also, more investigation should be conducted on how to make the best of TV and radio as learning mediums for those who do not have Internet access or with disabilities. While it is seen, through this book, that several institutions used Telecourses in this pandemic, no cases were found about using radios. Additionally, it is seen that most cases used Telecourses in a very simple way, i.e., just recorded lectures on TV. Thus, someone

may ask about how to design effective Telecourses or radio-based courses for better learning outcomes?

- Data is needed to personalize the learning support and to provide the right feedback and guidance to every group in the educational community, namely Learners, school teachers, university professors, parents, academic managers, policy makers, publishing houses, content providers, etc. Thanks to online settings, data can be collected, processed, and integrated into the daily life of the community for their benefit. If properly stored, and always keeping the required level of privacy and confidentiality, the use of analytics becomes a powerful tool to support adaptive learning to specific profiles and user groups.
- Last but not least, as in time of crisis, learning and teaching will be remotely, one of the important things that should be considered is ethics, including privacy, data protection, equity, discrimination, etc. Therefore, designing learning processes or developing systems/algorithms that ensure the user's safety is a must. Also, awareness about online safety guidelines should be raised within all stakeholders, including teachers, students, directors, etc.

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Chapter 2
A 6-Key Action Plan for Education in Times of Crises

Saida Affouneh and Daniel Burgos

Abstract Education is a human right, and many initiatives have evolved around the world so that no child is left behind. This right has been violated several times during crisis situations in many countries especially for marginalised children. It is well-known that crises could emerge for several reasons, either sudden natural events such as earthquakes or human violence such as wars and conflicts. In both cases, millions of children and youth still need to have access not only to education but also to quality formal and informal instruction. This chapter will present a step-to-step action plan with six keys to work on education in times of crises that will help designing and implementing a specific action plan adapted to every context. Further, we reflect on understanding the concepts of emergency education, the impact on students' learning and the need for a well-designed plan to reform the educational systems and decrease the impact of the crisis on students' right to access quality education.

Keywords Education and crisis · Covid-19 · Action plan

2.1 Introduction

Nowadays, as a result of the coronavirus (Covid-19), more than 1.6 million children and youngsters are unable to access formal education (UNESCO 2020), in primary, secondary and higher education. Although schools and universities have been closed in every country worldwide, many governments have decided to take the risk and shift directly to online learning. This shift is full of challenges and opportunities

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on the micro- and macro-levels. Despite the decision, education leaders have to re-think the schools' and universities' existing infrastructure, pedagogical resources that suit online learning, capacity building of teachers and students' readiness for this movement. These obstacles have affected the continuity of education for many students in the affected countries, and digital justice has not been a priority for educational policymakers to begin with.

Many learning opportunities have also emerged in this difficult time. A community of committed teachers has to learn how to record videos and upload them, how to deal with learning platforms, how to conduct collaborative learning, how to facilitate forums and respond to students' posts effectively and how to manage their time and meet learners' expectations. While huge pressure was put on teachers, still they were left with no choice whether to accept or resist this situation.

Further, it is estimated that nearly 98% of students have been affected by the pandemic (UNESCO 2020). Despite the fact that a global movement has responded to it and continuous learning communities have emerged, unfortunately digital justice has not been observed since many students have no access to learning because they have no computers or smart devices, and the shortage in digital literacy also prevents many teachers from delivering quality learning content to their students. While many other teachers can use technology, still many of them have no pedagogical background to teach online, and they have only reflected their face-to-face practices through their computers, which does not guarantee a high quality of teaching or a better learning. Continuous efforts should be done to mitigate the damage on the educational system due to closure. The good news is that education systems will not continue the same way it has since learners and teachers have experienced a new approach of freedom that could not be taken from them.

2.2 Education in a Situation of Crisis. An Action Plan from Education

We count crises by the dozen worldwide. There are many wars and armed conflicts in every continent, as well as refugees (Bach and Schraml 1982; Migration Policy Institute 2017; Menjívar et al. 2019; Mercy Corps 2019) and earthquakes, hurricanes and pandemics like SARS or Covid-19 (Buus and Olsson 2006; Lin et al. 2020). Education must face adversity to carry on (Decker 1997). Since lifetime learning is required in so many fields, a person never stops achieving competencies, skills and/or knowledge. When this approach is formalised in an official context, like in a university or a school, regular academic degrees need to overcome some obstacles. Sometimes, a new regulation or law changes the basics of education in a region or a country. Other times, a directive applies discrimination unevenly based on language, region, race, religion, gender and so many other meaningless and fake reasons (Stewart and Perlow 2001; Shah 2019; Uribe 2020). On occasion, nature also calls in with natural disasters. If a kid is attending school from kindergarten to secondary, meaning

around 12 years, so many unexpected issues can and will happen, and many of them will model, affect and change the course as it is originally planned, in both positive and negative ways. Because, of course, many good things and solid values can also emerge and be embraced (Pigozzi 1999; Sinclair 2001).

However, when a crisis comes, education does not have to be interrupted especially everyday learning (Miller 2009; Shrivastava et al. 2013). There are plenty of methodologies, frameworks and tools that provide key resources to allow students and docents to follow their regular learning and teaching patterns, adapted to the context. Education in situations of crisis should become an asset for progress, improved performance and a positive mindset (DeCapua 2016; Custodio and O'Loughlin 2017). History speaks for itself; when crises come, individuals get enrolled and trained to be better prepared to go through these very crises and deal with the aftermath (Schady 2002).

Thanks to online tools and a hyper-connected user network, nowadays this proactive approach is easier and more available to almost everyone than ever. Any person can find courses, video lectures, learning tips, mentoring and thousands of mobile apps and software applications of any kind to support learning, teaching and academic management (Nascimbeni et al. 2018, 2019; Huang et al. 2020; Liang 2020; Smart Learning Institute 2020). Most of them are to be integrated with formal learning or used in informal or non-formal settings alone (Burgos, 2013; Corbi and Burgos 2017). Further, they can be used with several licensing agreements (Stracke 2019): open, universal and free (such as the OUF code) (Burgos 2020); free-mium; free but registered; low-cost fee; pay-per-use; fixed price; free of charge during the crisis (for instance, the Covid-19 pandemic) and so on.

All these services and products become a necessary asset to be integrated in a larger view, with a medium- and long-term goal ahead, namely an action plan (Burak 1987; Lichtenstein 1995; Soriano and Corral 2020). Isolated efforts are worth it, welcome and encouraged. They make the person better, more productive and more useful to oneself and to society. However, an orchestrated assignment of efforts, people, tasks and resources is what will help that very society and particularly the educational community, to find the best out of the situation and to turn the challenge that comes with a crisis into a positive outcome.

Only a coordinated, caring and sensible action plan that involves every single layer, individual and stakeholder in the educational ecosystem will face the aforementioned adversity with a guarantee of success and, equally important, personal self-esteem and community joint effort.

2.3 Going Online as the Only Option: Moving from Chaos to an Emergency Plan

Education institutions have a shortage of time to plan for their education systems since the crisis was unexpected. This led to a sudden shift to online learning and

varying responses using different digital tools and pedagogical strategies. The sudden closure was a shock for all students, parents, teachers and educational leaders, all of whom found themselves in this vague situation and had all to find ways to continue either learning or teaching or both from home through some existing devices with different capabilities and required technical skills. They have only the determination to continue despite all the challenges and to find creative solutions to unpredictable problems.

Educational leaders have to deal with all challenges and start planning for emergency education in uncertain conditions with no clear vision. The plan should depend on assumptions and basic collected data and simple, developed, specific and realistic objectives. The following are the expected key elements for developing a plan that each institution might consider while working on it (Fig. 2.1. Important keys for an action plan).

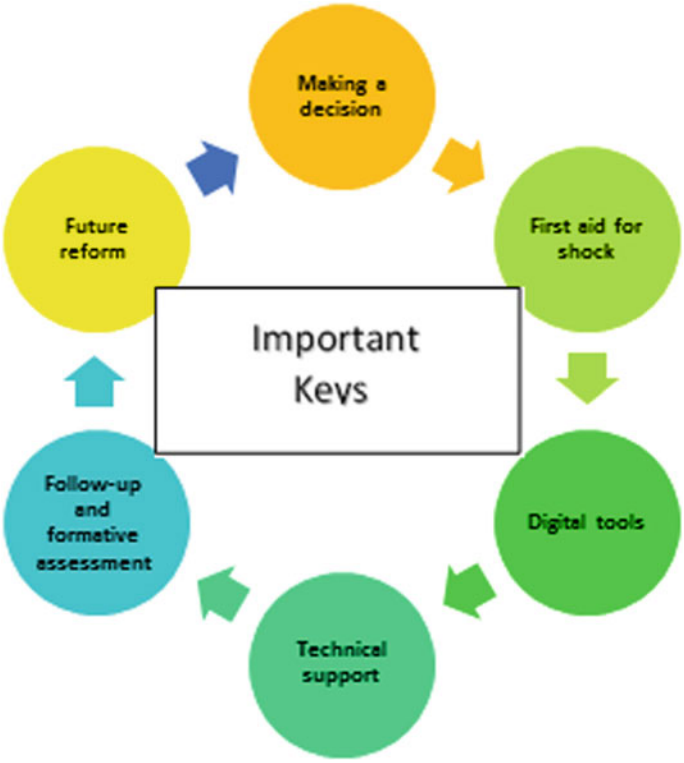

Fig. 2.1 Important keys for an action plan. (*Source* own)

2.3.1 Key # 1: Making a Decision

The first step towards developing a plan for education in crisis is to decide and agree on the movement towards online learning, which requires the will and understanding of not only technical people on the middle level but also, most importantly, people in the higher hierarchy of the institutions, and this should include individuals, councils and student leaders. Of course, reaching a consensus is not easy; it needs a lot of arrangements and negotiations such as meetings, discussions, presentations, re-negotiations and finally the initial agreement. The main issue here is that this process should be as short as possible since time is gold, and any late decision will lead to delays and late reactions and will directly slow the learning process.

According to leadership theories, especially those that value democracy, a leader should have a continuous discussion with technical teams who will present at least three different scenarios where each one depends on different assumptions and shows the degree of risks and requirements for each one to manage risk and decrease its impact. Accordingly, the management team will choose and decide. But the technical team have to prepare their assumptions according to recent data collected from local institutions' databases and also from literature reviews of similar experiences and case studies or from a quick online survey. Then a projection on the local case could be done to make the picture clearer. In other words, it is a kind of strength, weakness, opportunities and threats (SWOT) analysis with one eye on the local case and the other eye on the world. Sharing the decision should be done wisely to increase students' and teachers' involvement, belonging and acceptance in all formal media tools.

Developing a task force to follow up and lead the emergency situation on micro- and macro-levels is a must since the change is rapid (Fig. 2.2).

Fig. 2.2 Projection diagram. (*Source* own)

To sum up, the first key for decision-making should be according to projections of data collected where best practices have been analysed and assumptions discussed.

Action #1: Decide before it is too late, and leave any hesitations behind.

2.3.2 Key #2: First Aid for Stakeholders' Shock (Comfort Zone)

Humans tend to stay in their comfort zone and would be shocked if you try to get them outside it. Routine gives them the power of knowledge about what will happen next, and they generally dislike surprises. This is exactly what is happening with students and faculty members after the shift to online learning around the world during this crisis. From a psychological perspective, stepping outside the safe zone will move people to the fear zone, which leads to rejection and denial of the new situation (Waite-Chua 2012; Liepold et al. 2013). Then they start to move from the fear zone to the learning zone but only after a period of chaos, negotiations and sympathy and anger. Finally, we expect to reach the growth zone, where universities and schools will reflect their experience on future policies and strategies as in the following figure (Fig. 1.3 From comfort zone to growth zone).

Thousands of questions and comments are expected from students and teachers, and of course these need wise and well-organised answers. Listening to comments and analysing and categorising them are part of a long but important process that should be prioritised. It is advised to prepare a question-and-answer (Q&A) page form which everyone can share and learn. This developed knowledge bank could be used for future learning institution experience.

Clearly announced channels of communication among all stakeholders should be built since data flow is essential for building trust, exchanging information and sending daily instructions and new regulations. Establishing a new type of routine is vital at this stage despite the crisis. This routine will help manage the chaos and gradually result in stability. In other words, it will normalise the shift and try to sustain it to decrease its psychological impact on all stakeholders.

Part of the shock is related to real challenges while others are due to unclear vision and rumours. The lack of infrastructure, Internet, time management and skills is part of the real challenges which are expected to reshape future academic programmes' needs and policies.

To sum up, a series of actions should be taken as a first aid for students', parents' and teachers' shock to move them from fear to the learning stage. Rumours, exaggeration and resistance should be minimised as a start; otherwise, they will affect the quality of the plan.

Action #2: Create a new routine.

Fig. 1.3 From comfort zone to growth zone. (*Source* https://www.pinterest.com/pin/528961918733973861/)

2.3.3 Key #3: Choosing Digital Platforms and Tools

Some institutions have their own digital platforms while others do not and have to decide what to use. Many institutions are using open-source learning management systems (LMS) such as MOODLE, Sakai, Open edx, Chamilo, Canvas, Blackboard and Totara Learn. The criteria for choosing the LMS in emergencies are different from those in normal situations since there is no time to compare and choose; you need to deal with what you have.

It is recommended that digital tools be simple and user-friendly and not need much time to download and integrate with existing systems. It is also preferable to choose tools that your faculty has used before and is familiar with to normalise the situation and decrease the number of training hours to reach digital literacy.

Another element to consider is marginalised students who do not have computers or share computers with other family members who also work online. This is considered a main constraint to digital justice around the world, and each institution should

find their own way to solve this problem. These unprivileged students have the right to continue their learning.

Action #3: Choose tools that suit newcomers as well as old champions of online learning.

2.3.4 Key #4: Establishing Technical Support Systems

One of the main themes of a plan is establishing a supporting system. This should concentrate on using different methods to help students and faculty members. Establishing support hotlines through telephones, websites, forums or blogs could be one way while another way is through regular communication and formal instructions. For faculty members, it is recommended to establish peer-to-peer connections between old and new proponents of online learning so they can exchange experiences, express fears and share best practices. This will also help overcome the psychological impact of shock from using technology especially for newcomers.

Establishing a team of technical support personnel, distributing their contact information and conducting weekly workshops for support could be a good start to ensure the continuity of the process to move from chaos to a more systematic process.

Action #4: Support newcomers and celebrate old warriors.

2.3.5 Key #5: Continuous Follow-Up and Formative Assessment

Data is a mysterious source for planning, so a set of tools for data collection is recommended to be built from the beginning and of course online. Make it a habit to collect regular data to revise your planning process and build on your next steps. This could be through surveys or focus groups or through analysing students' posts and comments on social media.

Meeting with students, faculty members, university administrations and leadership regularly is also a rich source of data that could lead to a better plan and respond to daily changes.

At the same time, it will be a good opportunity to widen your local channels to reach other institutions in your country and globally to establish learning communities which will support your future decisions.

An assessment team, together with a research team, should work to provide the institution's leadership with a flow of information through reports.

Action #5: Without data, we are blind and deaf. Data will lead to insight.

2.3.6 Key #6: Keeping an Eye on Future Reform

This whole global experience is expected to reshape education in many ways, and many questions for the future need to be answered, such as.

1. Do we need to continue full face-to-face classes in schools and universities?
2. Can the role of the teachers and students change?
3. What ethics and codes of conduct do we need for future education?
4. How can we support marginalised students?
5. Which type of capacity building is needed for teachers and faculty members?
6. Can education be more open?

What type of relationship should be created between technology companies and the public education system?

Action #6: We need to reshape education according to the lessons learned from this opportunity.

2.4 Conclusion

A critical shift in the education system is expected to take place in the nearest future. Policy makers and educational leaders will remember this pandemic as a learning stage in the life of their institutions and this will impact their future policy decisions, while students and faculty members will take the gained skills to their face-to-face classes to improve their teaching and learning practices. Developing a plan in a global crisis is not as easy task but it seems that pressure sometimes leads to creativity. Covid-19 is an opportunity for global learning since many institutions around the world have thought separately but they act approximately in the same direction and used similar tools and strategies to survive their educations. The six above mentioned keys could be a leading guide to consider when planning for education in a crisis context. The only guaranteed lesson learned from a global crisis is that future strategic plans will consider digital justice as a principle, achieving digital literacy as a goal, reflecting on exiting pedagogy in order to enhance students' skills needed for future jobs with concreter set of values and manners as a process.

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Chapter 3
How to Fight Against Drop Out and Demotivation in Crisis Context: Some Insights and Examples from Italy

Beatrice Cucco, Andrea Gavosto, and Barbara Romano

Abstract COVID-19 is an extreme and effective representation of the consequences that a school's lockdown forced by pandemics or environmental disasters (like floods) could have on students: it contributes to a learning loss, which can eventually increase dropout rates among most disadvantaged students. Teachers can also be affected and diminish their motivation to teach. This scenario may lead to a sizeable loss in terms of economic perspectives and to an increase of inequalities. The chapter provides an estimate of the impact of the learning loss in Italy, an exercise that is replicable for each country depending on the length of the school stop. Then, we discuss some possible evidence-based solutions to address the learning loss and the increase in dropout risk, to overcome students and teachers' loss of motivation, and to enhance parents' collaboration.

Keywords Learning loss · Motivation · Dropout · Evidence based · Crisis · COVID-19

This article has been written on March 14th, 2020. The article is the product of a common work; however, Beatrice Cucco contributed paragraph 3, Barbara Romano and Andrea Gavosto paragraph 2 and 4. Introduction and conclusions are a joint effort.

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3.1 Introduction

According to UNESCO (2020), one and a half billion students around the world have been forced to stay out of school for a prolonged time, because of the COVID-19 epidemic. This represent fairly well a situation that could happen again because of other pandemics or environmental disaster (like floods or earthquake) where school is forced to stop or traditional schooling has to be partially replaced by distance teaching. In this case, all students are likely to undergo a severe learning loss. Moreover, the negative impact of the school stop will affect some groups disproportionally: the economic crisis following the health or environmental crisis, together with the learning loss, will increase the dropout probability for students coming from underprivileged backgrounds or lacking a strong enough motivation. As distance learning is less effective for younger students (elementary and lower secondary), this might also lead to higher dropout rates in the medium/long run.

We will look at these issues by focusing on the Italian schooling system: Italy was the first European country to be seriously affected by the Coronavirus. We will also describe two early programs, which attempt to contrast the higher risk of dropout from school.

3.2 Learning Loss in Italy

The COVID-19 epidemic forced most Italian schools to shut down on March 5th, 2020.[1] Schools were compelled by decree to provide online teaching to all students, despite having little previous experience with it. According to Locatelli and Mincu (2020), by the beginning of the COVID-19 pandemic, only 20% of teachers had attended training courses on digital literacy. According to Pisa 2018, only 50% of the Italian teachers had the necessary technical and pedagogical skills to integrate digital resources into instruction. At the beginning of April, the government made clear that schools were unlikely to reopen until September 2020 and that distance learning had to continue until then. The Prime Minister made this decision official on April 26th. Schools generally end their activities on June 10th (with some small differences from one region to the other), except for the final exam of the secondary cycle (the so-called *Maturità*) which will take place later on; classes will resume on September 1st, initially for those students who need to compensate learning deficits and later for everyone. At the time of writing, little is known on how schools will organize themselves in order to accommodate students in the next school year. The major constraint is that classrooms, whose size is 45 m^2 on average, are too small to allow for social distancing of the 20 odd students who fill them normally: consequently, some form of student turnover—probably between home and school learning—will take place.

[1] In some areas of the country that were more deeply affected by the virus such as Lombardy, selected lockdowns had already taken place since February 21st.

The immediate response of the school system to the shutdown exceeded expectations. Schools (and universities) immediately started providing distance lectures to their students, either through e-mails and electronic registers, which simply send homework to students, or through more sophisticated online platforms, such as G-Suite for Education, Microsoft 365 Educational and Edmodo, that allow for video-conferencing. The latter together accounts for roughly 30% of adopted solutions, according to a snap survey conducted by the Ministry of Education.

We do not know exactly how many students have been involved in distance learning from home. The Minister of Education[2] claims that 86% (around 6.5 million) of the pupils who attend State preschools, primary, and secondary, and 18% (150,000) of those in private schools are involved in distance learning. In all likelihood, this figure is an upper bound, as it was computed by adding up all the students of the schools that claim to have implemented some form of online teaching, including by e-mails or through electronic registers. However, it is unlikely that all teachers in those schools have taken up distance teaching and that all students in every class have been following regularly. In addition, we know from Istat (2020), the Italian statistical office, that 12, 3% of students between 6 and 17 years have no pc or tablet available (they might use a smartphone) and that 57% have to share it with the rest of the family, which makes regular attendance of online classes more difficult. Therefore, we can assume that at least one third of Italian students received little or no instruction during the lockdown.

Despite the remarkable effort of teachers through online teaching (according to the data from the Ministry 77% of them had no previous experience of distance teaching), the seizure of schools is bound to create a severe loss of human capital to the current cohort of students (Burgess and Sievertsen 2020). Two major issues spring to mind: the potential learning loss for everybody and the increase in the number of dropouts. On the former, it is well known that a reduction in instruction time affects the learning outcomes of students negatively (see for instance Cattaneo et al. 2017; Lavy 2015): this is especially true of the basic knowledge of subjects. Equally, the vast literature on the summer learning loss (Cooper et al. 1996) suggests that the summer break leads to a loss in achievements, especially in math, of the order of 0.1 of a standard deviation. Using the graphic representation of Aroob Iqbal et al. (2020), the learning loss is tantamount to a leftward parallel shift of the learning curve, which brings down everybody's outcome proportionally (Fig. 3.1).

By how much? At this stage, it is a difficult question to answer. However, if we take for good Burgess et al. (2020) estimate of a loss of 0.005 of a standard deviation per week, we can claim that the 14-week closure up to the end of this school year in June will cost 0.07 sd in terms of lost achievements: this is a significant number, corresponding to 7 PISA points.

What is the economic impact of such massive learning loss? It is well known that future earnings are a function of human capital. Psacharopoulos and Patrinos (2018) estimate the global average rate of return in education to be 10% of future earning for each additional year of schooling. By considering the number of months

[2] https://www.miur.gov.it/web/guest/-/coronavirus-informativa-della-ministra-azzolina-al-senato

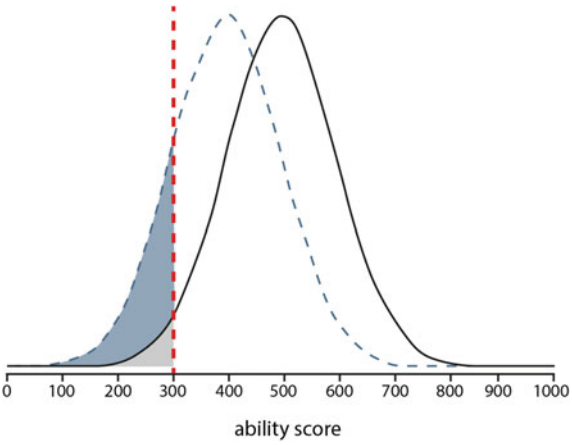

Fig. 3.1 Downward shift of the learning curve caused by school lockdown. *Source* Aroob Iqbal et al. (2020)

of education closures, we can follow Psacharopoulos et al. (2020) and generate a rough estimate of the loss in marginal future earnings. The school shutdown in Italy is expected to last until the end of school year: the loss in marginal future earnings would, therefore, be 3.5% per year over a student's working life. Assuming a 40-year working life, means annual earnings of 25,110€, and applying a discount rate of 3%, we reach an estimate of 879€ lost earnings per year per student, and a total present value of lost earnings of 21,197€ (84% of a yearly average wage). While this may not sound like too much of an individual price for young people to pay in the fight against COVID-19, a look at the impact on the whole country is much more sobering. In fact, the cost for 8.4 million Italian students will be about 178 billion euros—about 10% of annual GDP. It should be stressed that this exercise assumes, rather implausibly, that distance teaching has no effect on learning; hence, these numbers are to be interpreted as a ballpark range. On the other hand, we have to consider that the learning loss that the Italian students will undergo next summer will probably be magnified compared to that which would have been after a regular school year.

The negative impact of the COVID-19 is not limited to a linear transformation of the learning curve. At least three categories of students are more affected than others by the out-of-school learning. In the first place, students who do not possess broadband connections or devices that allow to follow classes online regularly are close to 35% of the total, according to some estimates. The government has granted 85 million euros in order to lend devices and connections to those who need them. Secondly, a disadvantaged category are certified special needs students, who account for 3.7% of the total: according to a Web survey run by Fondazione Agnelli (2020),[3] 36% do not receive a proper online training. Finally, students who lack motivation and family support and do not show up during online classes. It is plausible that most of them come from disadvantaged family backgrounds. In fact homeschooling

[3] 3170 teachers took part in it: It is not a random sample, so we cannot make any rigorous inference.

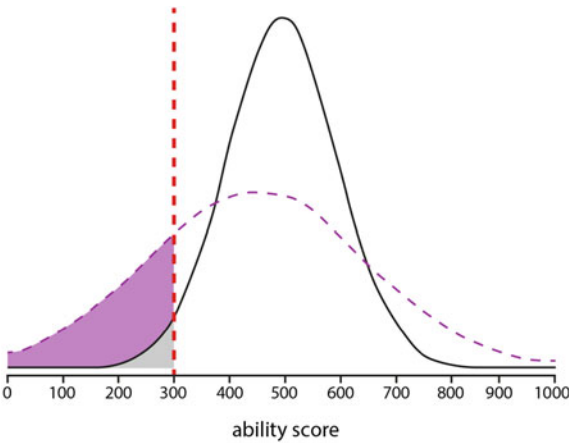

Fig. 3.2 Downward shift of the learning curve in the case of more pronounced differences in achievent. *Source* Aroob Iqbal et al. (2020)

strongly relies on parental aide, which in turn depends on the degree of education of parents, their time availability, their parenting style, and their financial resources; distance learning can make socio-economic differences in achievements even more pronounced than traditional schooling.

Graphically, this implies that the learning curve, on top of shifting laterally, becomes more skewed to the left; the left tail becomes wider, thus increasing the share of students who drop out or whose learning is inadequate (Fig. 3.2).

Clearly, as distance learning becomes more entrenched, we need to cast a special light on the lower tail of the students distribution in order to define specific policies to prevent existing inequalities in education to widen and dropout rates to increase.

3.3 Distance Learning During the Lockdown

The learning process usually takes place within an organized context where time and space are shared between two main participants: the teacher and the student. Students' characteristics have the highest impact on their learning—they explain roughly 50% of the outcomes—while teachers account for around 30% (Hattie 2003). The engine of teaching and learning is motivation. Motivation is the inclination, energy, thought, and drive that enables a person to achieve the desired goal (Martin 2013). Motivation to learn and motivation to teach are nevertheless fragile mechanisms that are affected by many challenges, particularly of emotional nature. Many students will experience emotional distress from the pandemic, ranging from anxiety to post-traumatic stress symptoms. The same conditions will affect teachers and parents as well (OECD 2020).

Thus, due to the COVID-19 emergency—like in other pandemic and environmental crisis—educational systems have been forced to rethink traditional learning models and to rapidly—sometimes clumsily—adapt to a completely different reality.

In this paragraph, we discuss which challenges do the actors involved in the process of learning face and what strategies can they adopt to overcome them.

3.3.1 Students' Motivation During the Pandemic

Motivation is connected to students' interests, enjoyment, participation, and academic achievement: All these eventually lead to more or less engagement (Martin 2013,2014). Motivation's boosters are self-belief, valuing school, and learning focus (Martin 2014); if a student believes in his/her own skills, if he/she appreciates education and is naturally thirsty for new knowledge, then he or she will develop metacognition mechanisms (persistence, planning, task management). Conversely, motivation mufflers are anxiety, uncertain control, and failure avoidance (Martin 2014); if a student feels afraid of taking tests, insecure of failing and without support, at worst he or she may decide to stop his/her education.

The school lockdown and the changes occurred to the learning context may threaten students' motivation. Even motivation booster like self-efficacy and valuing schools may become mufflers of students' learning. For instance, students who usually believe in their capabilities may be challenged by the introduction of a new learning environment; the breakdown of "barriers" between school and home—with the latter becoming the only place where every aspect of life occur—could create a sense of oppression and anxiety that easily leads to demotivation. Equally, even if the use of ICT is considered a motivation support (Education Endowment Foundation 2019), students who do not have sufficient digital competencies may feel overwhelmed by using them. Also, students may value school less, which is likely to happen in those educational systems that decide to get rid of national exams (The Economist 2020). The changes to the nature of motivation may potentially have a long-lasting impact on students' persistence, planning, and task management which are critical to building meta-cognition—awareness about own thinking (Zimmerman 2002) and can bring students into failure avoidance, self-sabotage, and disengagement behaviors.

The only student motivation booster that can sustain motivation during the lockdown is the learning focus—the appreciation to learn something new. This intrinsic motivation is highly stable, and therefore, it has to be nurtured among students. Thus, students have to be engaged in a long-term project based on their passions. Also, it is necessary to provide students with information and techniques to understand and to control their motivation (Marzano 2003). For this, it is highly recommended to provide a specific timing schedule and carry on psychological tests (Martin 2013).

3.3.2 Distance Teaching and Teachers' Motivation

Teacher's professional efficacy is related not only to mastery teaching (Hattie 2003) but also to motivation (Lauermann 2017). Teacher's motivation is important because it has a direct impact on his/her students' motivation and academic performance. Furthermore, motivated teachers are more likely to cope with educational challenges and thus be able to maintain their own psychological well-being.

Within the current situation, a teacher's motivation may be challenged in two main aspects. First, teachers may experience a low self-efficacy, in particular for those who have never experienced distance learning before. Furthermore, missing the control in the teaching process may be quite challenging for inexpert teachers, particularly for those who do not follow well-learnt automatic teaching routines and beliefs (see Hattie 2003) and for those who attribute their success to causes outside their control and skills. The second aspect is related to teachers' responsibility—the sense of internal obligation and commitment to produce a designated outcome. Personal responsibility is typically associated with teacher self-determination. Nevertheless, formal responsibility, such as accountability, may strongly challenge teachers, in particular within the Italian context, where they feel responsible to provide good teaching since students' parents observe them ("loss of face").

Within this challenging and new context, a number of solutions can be applied to raise teachers' motivation; first, to push educators toward new learning achievements and a high-quality relationship with the students; second, to support teachers with adequate professional development on technology, but also on online teaching methods. Higher wages would benefit only those teachers who look for external motivation.

3.3.3 Evidence-Based Solutions During the Lockdown

The huge development of rigorous evidence collection and systematization helps to understand what works best in teaching in order to improve students' learning and academic achievements (Centre for Education Statistics and Evaluation NSW Government 2020; Hattie 2003; Marzano 2003). Unfortunately, some of the most effective practice in boosting students' motivation are severely challenged in an online setting:

- classroom discussion;
- formative feedback;
- challenging goals provision;
- direct instruction;
- classroom management and well-being guarantee;
- explicit teaching;
- high expectations assurance;
- small groups work.

The common trait to all these practices is that they rely upon an high intensity of interaction: thinking aloud, verbalizing thinking process, concrete prompts, questioning, coaching; cue cards or modeling, activation of background knowledge, giving tips on strategies, cues, and procedures.

Unfortunately, chances of interacting with teachers and peers are drastically reduced in a virtual classroom—also in terms of non-verbal communication. The consequences could be teacher frustration, students' boredom, and demotivation on both sides.

To overcome this situation, teachers could leverage on different strategies. For example, in the case of explicit teaching—considered particularly useful to scaffold meta-cognition and valuable for learning motivation (Martin 2014)—they should focus on the quality instead of the quantity of their lessons. They can provide "pills of content": pre-recorded asynchronous videos of the approximate length of 6 min explaining key concepts. The short length should allow the students' attention to stay up and the possibility to be listened over few times let the learner to set his own pace (particularly in the case of disadvantaged learners). Hence, the synchronous time could be spent on focused discussions with the using discussion boards (like Padlet) or classroom polling that keep students engaged.

Multiple reviews highlight the importance of peer interaction during remote learning, as a way to motivate pupils and improve outcomes, even though it appears to have a higher impact on old pupils (Education Endowment Foundation 2020). Small group of students for cooperative learning and reciprocal teaching (Hattie 2003; Calvani et al. 2020) could be fairly easily organized.

What is extremely important is to provide students with techniques to learn independently and not being "spoon-fed" by their educators, whether they are teachers or parents. Even during the current lockdown, teachers can engage the students in learning independently, tailoring challenges to their needs. This is highly effective for raising student's zone of proximal development, particularly for those learners who are low achievers or have special needs. This can be done by using explicit teaching, where teachers give students general or even personal strategies on how to plan, monitor, and evaluate their learning (Education Endowment Foundation 2018). Learning evaluation can be enhanced using self-reported grades or classroom discussion. Nevertheless, it is important that students engage in meta-cognitive talks daily, during subject lessons, and not during ad-hoc "non-cognitive skills" lessons.

3.3.4 The Enhanced Role of the Family

As already mentioned, parents and caregivers play an important role: they have to keep students engaged and learning at home, thus preventing them from dropping out. Nevertheless, parents are not usually considered an active part of the learning process and are often kept from it, or rather they are often considered as the main reason behind a low stimulating home environment (Marzano 2003). In normal times, children from disadvantaged families who have limited access to books and other

learning resources typically lose one month of learning during the two-month summer break from school while this does not happen to their counterparts from advantaged families. Such disparities are likely to widen during the current period of confinement, unless someone steps in to help disadvantaged children and their families, for instance by keeping the distribution of children's books running (Phair 2020).

Even considering the socio-economic disparities, parents and caregivers are currently the only humans whom their children can interact with, the only real "peers" and "teachers" students can face. The parents role has gained importance within the learning process since they are currently the main actors who can scaffold meta-cognition abilities on a daily base. These skills are indeed essentials to keep the motivation to learn high (Evidence for Learning 2019). Even if this role is highly demanding, simple actions such as reading to children daily, making conversations with children, or engaging them in special activities can make a big difference and are effective both with children and young adults (Evidence for Learning 2019; Marzano 2003). These actions should be supported by schools and by parents' employers. For example, schools should provide specific and tailored support and resources for this task, while employers should provide flexible work arrangements to allow parents to spend time with their children.

In addition, parents can contribute to children meta-cognitive skills development and motivation—considered an important leverage for student motivation as we discussed in the previous paragraph—, particularly when learners are very young. As a way to sustain parents' engagement, it can be useful to nudge (Bird et al. 2020) them by using texts aimed at explaining which support can be given to children doing housework or dinner time (Evidence for Learning 2019). This is particularly helpful in engaging fathers, usually more detached from their children's education (Damgaard and Nielsen 2018).

Parents' involvement should happen in strict collaboration with teachers. Learners, teachers, and parents should be involved in shared communication (Marzano 2003). After all, education is—and has always been—a shared responsibility.

3.4 Prevent Dropout Among the Most Disadvantaged: Two Examples From Italy

In this paragraph, we describe two projects that have been conceived in the last few weeks in order to address the risk of dropout of two groups of students, who are particularly vulnerable during the COVID-19 emergency, as discussed in paragraph 2. In spite of the specific occasion that lead to their realization, both the projects have the potential of a wider application in future crisis that would force educational systems (or part of them) to shut down causing learning loss.

3.4.1 *Oltre Le Distanze (Beyond Distances)*

The project has been promoted by a consortium of institutions, which includes Fondazione Agnelli,[4] the Universities of Bolzano (Unibz), of Trento (Unitn), Lumsa in Rome, Gedi (a nationwide publisher), and Google. This aims at preventing dropout among special needs students. It stems from the recognition of the needs and problems arising with online learning, as highlighted by a survey administered to 3170 teachers (80% of which are special education teachers) during the lockdown.[5] It is focused on identifying solutions to the practical issues that special needs students, their families, and teachers face during the shutdown of schools and on viable pathways to inclusion, once schools reopen in the autumn. Therefore, the organizations promoting "Oltre le distanze" planned a twofold intervention: on the one hand, a professional development delivered through webinars led by experts in different fields (pedagogy, psychology, digital education); on the other hand, 79 online workshops where participants (mostly teachers) actively discuss between themselves and share experience with peers and experts to identify good practices. Each workshop has a focus on a specific school level and a well-identified topic ranging from "how to remotely recreate a significant *class-group* for the student with disabilities" to "online tools suited for students with disabilities" or "strategies to adapt materials for special students in a remote setting" and "how to train executive functions." All the events were booked in two hours, detecting once again high educators' needs during this lockdown.

3.4.2 *Educational Arcipelago (Arcipelago Educativo)*

The target of "Educational Arcipelago" project are disadvantaged students living in 30 economically deprived areas around Italy. The project—designed by Save the Children Italy with the help of Fondazione Agnelli—has the objective to help students to recover from the learning loss they undergo because of COVID-19. As we stated in the first paragraph, the effects are likely to be devastating for struggling students because the 14 weeks of lockdown will directly flow into the 12-week summer break. "Arcipelago educativo" helps students to shore up what they have learned before the closure and to go through the part of the subjects that have not been covered due to the COVID-19; in such a way, the learning loss can be reduced. The issue is how to do it without turning to traditional academic teaching, which is typically ineffective for this category of students.

Students enrolled in the project (about 1800) will receive individual online tutoring on core academic subjects and will be involved in group activities to be held in

[4]Fondazione Agnelli is a 52-year old non-profit organization committed to research and projects in the field of education in Italy.

[5]The sample is not a random one. See footnote 3.

presence, whenever possible: a blend of academic and social elements to help re-establish social relationships after a prolonged social distancing and to keep them engaged and learning. The group activities will take place in so-called "Educational Islands": spaces inside the school or outdoor, organized according to the COVID-19 distancing rules.

In the first place, schools will help to screen and identify students who are more at risk of dropout. They will also work with the students and the project staff to define the individual educational plan. School engagement will be encouraged by providing them with online teacher professional development and support in planning the reorganization of school space necessary to reopen in September.

Families will be engaged through the supply of devices and Internet connections together with a package of services: emotional support, training on basic competences (language, use of devices, financial education), and nudges (providing information/reminders on health, food, strategies on activation of the kid). In exchange, they will commit to encouraging their children's participation in the summer activities.

Arcipelago Educativo, in addition of being replicable in other crisis context, is conceived as a pilot project that set as an example on how to tackle the general problem of the summer learning loss. Therefore, data on implementation and effectiveness will be collected in the next months, in order to fine tune the project's actions and make it part of the permanent educational summer projects of the promoting partners, and also to make it replicable and scalable in other context.

3.5 Discussion and Conclusions

School closures severely hit all the actors involved in the learning process: teachers, students, and their families. Most of the schools have reacted by supplying distance learning to students at home. Despite the remarkable effort made by schools and teachers, the Italian experience since the beginning of March suggests that two negative effects of homeschooling can take place. First, there is a learning loss for all students, who are experiencing a reduced amount of instruction and no social interplay, as compared to traditional schooling. Such a loss in human capital may potentially lead to an economic loss of around 178 billion euros—about 10% of Italy's annual GDP. Second, the shutdown of schools is particularly problematic for categories of students who are more at risks, such as students coming from low socio-economic backgrounds and students with special needs. School closures has a big impact on students' and teachers' motivation as well as on family engagement that can be translated into an increment in student dropout rate in the long run.

Hopefully, the hardest phase of the COVID-19 emergency will be over when this article is published. So are we closing the barn door after the horse has bolted? We believe not. There are lessons learned that we should keep in mind for the months to come, together with open questions that need a solution in view of the school reopening. It is true that some countries had a very short interruption and others are reopening these days, but according to epidemiologists and virologists, we could

expect new waves of contagion that will cause new school closures. Probably these will not involve entire countries for prolonged span of time, but will happen "on and off" and affect limited areas. Should this occur, it would be wise to be ready and adequately equipped.

In this chapter, we suggest some possible evidence-based solutions to address the learning loss and the increase in dropout risk, to overcome students and teachers' loss of motivation and to enhance parents' collaboration, which we discuss in par. 3 and 4. But all these pedagogical solutions can happen only with a well-designed empowerment plan—possibly by the central government. It should include teacher professional development on the matter—which is badly needed as the success of "Oltre le distanze" showed—, teachers provision with adequate home-based teaching equipment, students' provision with devices, and broadband connection and, possibly, with some either economical, emotional, or pedagogical incentive for families to adequately support children. This can be usefully complemented by a proper redesign of the schools' organization and learning spaces, to minimize the risk of a new spreading of the virus, while recouping the lost ground in terms of the learning process.

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Chapter 4
An Instructional Design Process for Emergency Remote Teaching

Charles B. Hodges, Stephanie L. Moore, Barbara B. Lockee, M. Aaron Bond, and Anne Jewett

Abstract In this chapter, the authors offer a process for the design, development, implementation, and evaluation of emergency remote teaching experiences. The process is outlined by the well-known ADDIE instructional design framework with special considerations and guidance added for emergency remote teaching (ERT). A job aid to guide planning for ERT based on the information in this chapter is provided.

Keywords Emergency remote teaching · Instructional design process · Instructional design · Faculty development · Online learning · Online teaching

4.1 Introduction

The recent world response to the COVID19 pandemic required many universities to pivot from various modes of instructional delivery to 100% online delivery in a short time. This quick change to online delivery has been called *emergency remote teaching* (Hodges et al. 2020). Emergency remote teaching (ERT) refers to:

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> A temporary shift of instructional delivery to an alternate delivery mode due to crisis circumstances. It involves the use of fully remote teaching solutions for instruction or education that would otherwise be delivered face-to-face or as blended or hybrid courses and that will return to that format once the crisis or emergency has abated (Hodges et al. 2020, para. 13).

Planning and design during an emergency is different enough from the standard design and development process that it warrants specialized treatment. This chapter provides recommendations for implementing an Instructional Design (ID) process with attention to important non-instructional objectives that should inform design and decision making during an emergency.

4.1.1 Why is Emergency Remote Teaching Different

A critical aspect of ERT is it is occurring in *temporary* circumstances. While there may be some lasting changes as a result of lessons learned, the system will at some point return to a semblance of normal. Classes quickly moved online, for example, will not likely remain in an online format if the learner population for those classes are students who were residential, and will return to campus. This perceived limited time of use may have an impact on the degree of investment institutions and individuals are willing to make in time, technology, and effort.

Another important aspect of ERT is the immediacy of "emergency." There is little time to build or invest in new infrastructure or to make plans. Any in-the-moment design and planning will have to be done based on existing infrastructure with an eye towards the reality of how much infrastructure does and does not exist. For example, while it may be easy to suggest that everyone "go online," during the change to ERT in response to COVID19, over fifty percent of students had difficulty with wi-fi access or accessing needed devices or equipment (Grajek 2020). Crises highlight just how fragile and brittle or stable and resilient a system is, and a system you might have thought of as stable could be rendered quite fragile. For example, if communications infrastructure are targeted during a crisis with civil unrest, that could lead to significant unanticipated disruptions (perhaps to the point that any sort of continuity is no longer possible). The nature of the problem will involve rapid instructional problem solving that starts with a quick scan of the environment as-is, and grounds decisions in immediate realities.

The third aspect of ERT to highlight is the "remote" nature of it. By definition, it is instruction that is "removed" from its normal location. In most instances, this means it will require some sort of communications technology to bridge the physical and geographical distance now introduced for all instructors and students, although there have been cases where classes were physically removed and reconvened in person elsewhere (INEE 2011). We suggest the use of "remote" because of the points raised regarding immediacy and emergent circumstances. Remote does not necessarily mean online, and infrastructure for online at the time of the emergency may not be reliable enough to truly provide instructional continuity. Instead of limiting the options to one particular medium as a solution, the term remote captures

the range of solutions schools and institutions have implemented around the world and at other times in history in order to address immediate, temporary disruptions. In other instances of ERT, schools, and institutions have turned to radio, television, CDs or information sent by mail, and other communications infrastructure besides the internet (INEE 2011). Even during the COVID-19 responses, we witnessed numerous regions where local public television stations worked with school districts to set aside time for broadcast instruction that did not require an internet connection or cable service for delivery (i.e., Catalini 2020; RFI 2020). This keeps an emphasis on flexibility and the critical role that emergent contextual variables will play in planning and design.

These three particular design and planning constraints—temporary, emergency, and remote—influence the instructional design process and considerations sufficiently to warrant special treatment. Let's now turn to the instructional design (ID) process and how it could be approached differently in times of ERT.

4.2 Instructional Design

Instructional Design (ID) refers to the systematic planning of instruction. ID may be conducted by a team of professionals (i.e., subject matter expert, instructional designer, media developer, etc.) or an individual can serve all of those roles. It often requires several weeks or months to move through phases from the initial concept for a course to final delivery to learners. Longer times for the process are typical when individuals are serving multiple roles on the design team. As discussed by Hodges et al. (2020), the move to ERT is a situation when individual instructors have limited access to campus support staff who could typically assist with moving a course online Thus, in ERT situations an individual may be working as a team of one in the ID process.

There are many approaches to ID (i.e., Morrison et al. 2019; Larson and Lockee 2020). One approach when time to delivery is important is rapid prototyping (Tripp and Bichelmeyer 1990). Despite the name, rapid prototyping has still been documented to take as much as 36 weeks to implement by a team (Desrosier 2011).

ADDIE is a common acronym used to refer to a generic five-phase ID process consisting of the phases: analysis, design, development, implementation, and evaluation. See Branch (2009) for a detailed description of ADDIE. ADDIE will be used as a framework for our discussion of ID in an ERT context. Let us begin with Analysis.

4.2.1 ADDIE—Analysis

As tempting as it is to immediately start building solutions, especially during an emergency, it is important to do some analysis so that the decisions you make are

grounded in the realities of the constraints and infrastructure that you have at your disposal.

In the Morrison et al. (2019) model for ID, they detail specific analyses to conduct at the front-end of your process. These can be done rapidly or completed as part of a pandemic/emergency continuity planning process. Here we will walk through key types of analysis for ERT and considerations for each.

4.2.1.1 Needs Analysis

What are instructional needs, and what are not instructional needs? Some needs may be important but may not be instructional in nature—start by identifying the range of needs and separating them into instructional and non-instructional categories. During an emergency, non-instructional needs will be every bit as important to consider during your planning and may directly affect your instructional decisions. These may include safety, health, security, and other non-instructional considerations for learners as well as for staff and instructors. We will explore a framework for this in a separate section.

4.2.1.2 Learner Analysis

Learner analysis describes the learners and their characteristics. Typically, this includes general characteristics and specific entry characteristics, like prior knowledge, age, etc. For ERT, one set of characteristics is particularly important: personal and social characteristics. These aspects of your learners will have a significant effect on their learning and their stability during a time of crisis. How well do you understand your learners and their personal circumstances? How many are food- or housing-insecure? How many will have difficulty accessing instruction because of a physical or learning disability, and how will you plan for this diversity among your learners? In addition, some of your learners may have family situations or mental health situations that will greatly impact their abilities to manage learning during an emergency. In times of crisis, learners are under magnified stress. A crisis will introduce added cognitive and psychological load for learners, which will have an impact on their learning. How can you adjust your learning plans and expectations accordingly?

During COVID19, there were some trends in discarding attention to learner needs such as accessibility and universal design for learning (UDL) considerations. The overhead of making materials accessible may have been perceived as too time-consuming under the circumstances, or instructors simply may not have the knowledge or skill necessary to do so (Liu et al. 2005). Rather than discarding UDL and accessibility principles in a time of crisis, these may be among the best planning tools to support learners, including those who might not normally rely on such flexible features. A fundamental premise of UDL is that if a design works well for people with disabilities, it works better for everyone (Fletcher 2002).

4.2.1.3 Contextual Analysis

Typically, when we do a contextual analysis, we are interested in three contexts: orienting context (what context do learners bring to the instruction), instructional context (where does the instruction take place), and transfer context (what is the context like in which learners will be applying their learning). For ERT, instructional context is a particularly important consideration. We normally do not think much about this for formal education because our classrooms are the context. Under normal circumstances, the instructional context can fade from our attention because it is the ubiquitous system around us. However, it is this context that changes dramatically under ERT. How many of your learners have internet access? How many of them will have difficulty accessing or completing work or operating safely if they have to leave the school or campus environment?

It may seem easy enough to tell students to go home and connect to the Internet, but not every student will have access (Brooks and Grajek 2020). Not every student will have a supporting environment conducive to learning (online or otherwise) or a place to go. In a large survey of college students, results indicated many respondents were food insecure and housing insecure (Goldrick-Rab et al. 2019). Forcing students into an emergency transition from the stability the campus environment provides means they will be tending to meet these basic needs as a first priority.

4.2.1.4 Environmental Scan—Infrastructure Analysis

An additional, important front-end analysis for ERT and continuity planning is an environmental scan, specifically an infrastructure analysis. It does not make sense to select online as your primary intervention, for example, if the infrastructure for internet access is weak or unreliable. It may be that mobile learning is more dependable, or perhaps partnering with local radio or television stations will offer better access or an additional layer of planning richness. Also, it could be that you want to put more emphasis on flexibility for your learners and their ability to access content and submit work at times that work for their disrupted schedules.

In a survey of students representing mostly institutions of higher education (IHE) from the United States during the COVID19 pandemic, Grajek (2020) reported that the majority of students surveyed indicated at least some difficulty accessing the internet and computing equipment needed to participate in their courses after they shifted to fully online delivery. Following COVID19, institutions of higher education may be better able to help students with access if remote learning is needed. IHEs may collect information about student access to technology as part of their preparation for possible emergency remote teaching needs. Individual instructors should acquaint themselves with this type of information if it is available, or they should collect it themselves.

4.2.1.5 Content and Task Analysis

Finally, revisit and analysis of your content and tasks that inform your instructional plans. Even if you did not formally conduct a content or task analysis, you have a content plan. One common criticism of the way various schools and universities handled the COVID19 crisis is that they focused on maintaining the same learning objectives and aimed for the same degree of content coverage. Recognizing that learners are in a state of crisis should have a cascading impact on your decisions about what is truly a priority to cover and how to cover it. Davidson (2020) suggested that the trauma or crisis itself not be treated as an add on, but rather that we think activities in the moment "beyond the screen that extend the lessons of the course" (Davidson 2020). Instead of trying to ignore the unfolding situation, consider how the topic, content, and objectives of the course can pivot to "offer curiosity, imagination, knowledge, power–as antidotes to the present disruption" (Davidson 2020). The content thus becomes responsive to the emergency as the emergency itself becomes part of the content, helping students channel their cognitive and emotional load of the situation through meaningful course activities where they document their experiences, crate videos, or gather data on the situation that they analyze as a collaborative assignment, or engage in planning or community projects that count for class work but also have a clear direct impact on urgent matters they have to tend to anyway. This analysis does not have to be time-intensive. It can be conducted in a rapid manner as a way to pause for a moment, reflect on learners' changing needs and circumstances, and start to think through how you will adapt and respond.

4.2.2 ADDIE—Design

Primary design activities for ERT include selecting effective instructional strategies and technologies to facilitate their implementation. You may find that instructional strategies planned prior to a move to ERT are no longer possible or appropriate. The good news is that different strategies that are possible through technology-mediated delivery can provide engaging and effective learning experiences for students.

4.2.2.1 Strategies

It may be tempting to simplify instructional strategies to focus solely on lecture to ensure that students still have access to content. During the COVID-19 crisis, we witnessed a great deal of focus on ensuring students had access to live or recorded lectures. There are a range of strategies that can be effectively employed during a crisis, however, and some of these may be far more meaningful, especially as we consider the advice of Davidson (2020) and how to reconsider the content. While direct instruction may have a role in course design, other strategies that could be helpful during a time of crisis include more interactive instruction and experiential

learning. Strategies that put more emphasis on collaboration and interaction can help not just with the learning outcomes, but also help retain a sense of connectedness and community.

In addition to considering strategy selection from a pedagogical perspective, practical information gleaned from the initial analysis should be included in deciding the instructional method. Factors such as class size, physical location of instructor and students, and technology access can impact the implementation of strategies, especially those that require real-time interaction.

4.2.2.2 Technology Selection

The infrastructure analysis will help determine the most appropriate delivery mode for your emergency remote teaching. Head et al. (2002) note that ideally the delivery mode is driven by the necessary media attributes required for chosen instructional methods, but that is not always the case. Other factors such as available resources and student or provider infrastructure can determine the delivery mode (Head et al. 2002).

Instructor comfort with the selected teaching strategy also impacts the choice of delivery technology. During COVID19, many higher education faculty chose to move their courses onto video conferencing platforms to deliver live lectures, given the relative similarity to the classroom environment and usual instructional methods (Flaherty 2020). The design decision to use synchronous or asynchronous delivery of instruction is multifaceted. Hrastinski (2008) notes that asynchronous delivery may be best to support reflection and information processing, while synchronous delivery supports motivation through more personal participation. In general, a mix of asynchronous and synchronous delivery is often promoted as a best practice (i.e., Lowenthal et al. 2018). In any case, the choice of asynchronous or synchronous delivery should be considered carefully, considering many factors (Holden and Westfall 2007). During ERT, asynchronous delivery may be the best choice as it may not be reasonable to expect students to have easy access to technology, and additional flexibility may be needed due to family responsibilities, different time zones, etc., which may be encountered more during ERT.

Given the inherent relationship between the chosen instructional strategy and technologies used to facilitate their implementation, the ERT design experience can provide an opportunity to consider how to approach targeted learning outcomes through a variety of instructional strategies, and which technologies might best support those approaches (see Holden and Westfall 2007; Trust 2020). Beatty (2019) provides an example of an instructional design approach that aligns targeted learning outcomes with the strategies and technologies used to facilitate them, the HyFlex Model.

4.2.3 ADDIE—Develop

The temptation will be great to jump straight to development for ERT. Chances are development will occur simultaneously with analysis and design, although taking a moment to pause and write down quick ideas related to the analysis and design suggestions above will help the development process be more focused, organized, and aligned with the emerging reality. As you develop, the following course features, in particular, will be essential in making a difference between a successful transition to ERT and a stressful one: organization, communication, accessibility, and flexibility. Five principles from universal design can be helpful here in informing your decisions in each of these areas: equitable use, flexibility, simple and intuitive use, perceptible information, and tolerance for error.

4.2.3.1 Organization

Clarity of structure and organization is a hallmark of effective distance learning, and it becomes more important in ERT as learners will be stressed and will want very clear guidance on what to do and when. Having a clear organization is underscored by the UDL principles of simple and intuitive use and perceptible information. A clear organization for your course makes it simple and intuitive to use: learners can readily see what they need to do, when it is due, where to go for what, where to submit things, how and when to do that, and so on. Explicit instructions and guidance make the course design, expectations, and functionality more perceptible and intuitive for learners. One way to provide clarity and organization is to create a schedule in table format with dates of what is expected and when. Map out date ranges, what students should read in that time, any assignments details or handouts, discussions and live session info, and any assignment due dates. Link each item in the table to the corresponding documents, assignments, discussions, live session link, etc. to create a highly organized class schedule.

In addition, establish clear policies on grading, course expectations, and your anticipated response times. As you develop or revise course policies, consider how you can incorporate tolerance for error. What are likely errors students could make when trying to access materials or submit work? How can your course policies proactively prepare for human and system errors?

4.2.3.2 Communication

Moore and Hodges (2020) recommend establishing a clear communication plan that explains how students can get in touch with you, defines reasonable response times, and how they will be able to connect and communicate with fellow students and with other key offices or people. In addition, build in communication supports as you develop your class. For example, you can create a dedicated discussion forum

for students to post questions and help each other; or you can provide a link to a live meeting tool students can use any time to self-organize groups for studying, collaboration, or social connectedness. Finally, make sure you and your students can access a class roster so everyone can contact each other. You may want to consider downloading or printing that in case of any disruptions so you have student contact information for communication by other means necessary, and send that same information to students so they can connect with each other as well. Noting to always stay within privacy policies and laws regarding student records.

4.2.3.3 Accessibility and Flexibility

A lot of decisions made as you develop your ERT will impact accessibility. If you want students to watch videos or read electronic materials, select options that have already been closed captioned or have accessibility already built into the document. Accessibility and Sect. 508 standards are not new, and many libraries, museums, and federally funded repositories have invested in making their materials accessible. Similarly, textbook publishers have been required for years to make their materials Sect. 508 compliant at a minimum and many broadcast outlets (television and newspapers) are also required to address accessibility. While this does not guarantee perfect accessibility, it does mean you are starting at a point of reducing barriers to access instead of ignoring or erecting barriers. If you will be providing materials that you create, use accessibility checkers built into the software you are using. All major software providers (Microsoft, Adobe, etc.) are required to incorporate accessibility features and tools. To make this manageable, you could create a list of the materials you are using or creating, get them integrated into your course, and then circle back to address accessibility after your initial development push, but before students will access that particular material. If you attended to accessibility and UDL during the process of selecting your technology, you will have less to tend to at this stage. If you did not stop to ask questions about accessibility, now is the time to check on whether and how a tool you are considering makes not just the content but the learning interactions accessible for your learners. Specifically, ask your LMS support team about accessibility in the LMS.

For flexibility, for example, Moore and Hodges (2020) suggest that using asynchronous discussions and recorded talks instead of synchronous meetings can provide you and your learners critical flexibility in a time of crisis. Students schedules may be disrupted. Your own schedule also may be disrupted. In addition, students may not be able to join live sessions or they may be trying to access everything through their phone or other mobile devices. As you develop your course, assume students will have difficulty with connectivity, and develop your instruction to maximize flexibility around timing, viewing, and access.

4.2.4 ADDIE—Implement

During the implementation phase of ERT you will be releasing the instruction you have designed and developed to your learners. A critical component of implementation is making sure your learners are oriented to the ERT experience. At a minimum students will need to know how to access readings and course materials, how to submit assignments and receive feedback on their work, how to send the instructor questions, and they will need to know when and how the instructor will respond to them (Moore and Hodges 2020). These elements should be communicated to learners when they access the course. Once learners are oriented to the course, the instructor will shift from ERT designer and developer to the role of facilitator.

There are differences between ERT and online learning, as noted by Hodges et al. (2020), but best practices for facilitating online learning experiences apply to the facilitation of ERT. Hodges and Lowenthal (2020) recommend that those facilitating online learning experiences must provide timely responses to learner questions, clear instructions for assignments, and timely feedback on student assignments. Dunlap and Lowenthal (2018) crowdsourced experienced online educators' recommendations for teaching online, which will provide guidance to instructors facilitating ERT experiences. In addition to the facilitation elements common between online learning and ERT, the circumstances of ERT highlight a need to focus on student needs that may be taken for granted in non-emergency situations.

Learners and instructors are experiencing ERT because of a social disruption that is upending many lives and families. For many, school may have helped them meet fundamental life objectives such as access to food or housing in addition to learning.

As educators, we tend not only to the learning needs of our students, but also to their social and emotional needs. Some maxims that should be considered during the implementation of ERT are as follows:

- No students will experience increased stress and emotional or psychological difficulty as a result of the policies and requirements we establish in this emergency situation.
- No student will be required to participate in a system or platform that compromises their personal or digital safety or the security of their personal information.
- No students will experience penalties or negative consequences for inability to participate in learning activities.

Figure 4.1 includes further guidance that should be considered during the implementation and facilitation of ERT.

The implementation of ERT clearly includes elements of online course facilitation, but also must include compassion and empathy that may not be as urgently needed outside of ERT. During and following implementation, the next phase of the process will begin, evaluation.

1	**Set Flexible Expectations:** (Re-)establish clear expectations by modeling how learning on online will occur. Provide a quick screen capture video of your platform as you walk students through how to access content in the platform while also explaining the expectations. Clearly articulate the expectations that have flexibility and grace such as deadlines, linked websites, partner work, or specific assignments.
2	**Create a Sense of Belonging:** Undoubtedly, you have invested time in cultivating relationships with your students when you were meeting in-person to build a supportive learning environment. As you transition to ERT, this does not have to be lost or undone. With intentionality, you can harness these efforts to transition the supportive learning environment into the new modality. Provide time and space for these interactions. Perhaps, you'll share personal touches from life at-home, provide options for students to access you and each other, create a student-organized discussion board, or follow-up with students regarding their interests or thoughts they share.
3	**Incorporate Routines:** If you had routines within your in-person setting, it may be helpful to determine if they can transfer to the ERT setting. For example, students who normally had classroom jobs or roles may be able to continue the jobs during ERT.
4	**Prioritize Design:** Have you felt overwhelmed over the past few weeks? Students' lives have gone from one established norm to learning a new norm or to daily uncertainty. Consider prioritizing or streamlining content, instructional activities, and assessments to support ease of navigating (less words), enhanced alignment among the components, and denoting work that is non-essential as optional.
5	**Humanize Online Learning:** Online learning is more than posting content and a grade. Similar to the in-person classroom, you aim to be present, responsive, and personal. It can be helpful to schedule check-ins throughout the day, provide feedback within 24 hours on assignments, share stories from your experiences, or post non-perfect videos to model getting more comfortable with being online.

Fig. 4.1 Five practical tips for promoting the success and well being of all students

4.2.5 ADDIE—Evaluate

Dick and Carey (1996) note that all of the design and development steps in the ID process are based upon "theory, research, and some common sense" (p. 256). That is, it is your best effort to create an effective instructional experience. In the evaluation phase, you will be making a judgment about the success of your ERT. Hodges et al. (2020) provided guidance for evaluating ERT. They recommend against repeating errors in the history of online learning that have been labeled *media comparison studies.* In short, a big picture comparison between a traditional learning experience and an ERT experience comparing students' end-of-course grades, for example, is not useful, even in the best of teaching and learning scenarios. Hodges et al. recommend a more holistic approach to evaluating ERT that considers the context, inputs, process, and product. In addition to the questions Hodges et al. propose, we recommend the following evaluation questions, which are aligned with the analysis, design, development, and implementation components of the ADDIE framework used to structure this chapter:

Analysis

- Did your analysis yield enough information to guide your ERT design and development?
- What, if anything, was missing in your analysis?

Design

- Was your knowledge of potential instructional strategies sufficient for your development of ERT?
- Was your knowledge of assessment strategies sufficient for your development of ERT?

Development

- Did you have sufficient development skills to create all planned aspects of your ERT experience?
- Were you able to develop instruction that was accessible to all students?

Implementation

- Were your technology choices appropriate for the infrastructure available to you and your students?
- Were your instructional strategies effective?
- Were your assessments effective?

4.3 Supporting Faculty for ERT

If faculty are not comfortable with technology, they are less likely to incorporate learning technologies in the learning environment. Even though the number of faculty teaching online courses in increasing, many faculty members have little experience in the process of ID or how to apply such principles to online teaching. A recent survey of U.S. institutions by EDUCAUSE found that faculty overwhelmingly still prefer face to face instruction over completely online delivery (Galanek and Gierdowski 2019). This preference may be due to the lack of confidence with technology integration in the classroom or lack of distance learning best practice training and support. The rapid move to online ERT due to COVID19 is likely to diminish faculty satisfaction with online teaching. As colleges and universities explore increasing the amount of instruction delivered through online environments and seek to leverage technology to meet emergency needs, there is a need to include faculty support in strategic planning.

4.3.1 Planning Support

Support models to help with ERT should first seek to improve faculty confidence with online teaching tools and strategies. Organizational change models emphasize that one key component of any system is the people within the system (Senge 2006). ERT has the potential to feed fear and encourage faculty to dismiss online teaching as an ineffective form of teaching. IHEs should build support models that adequately

prepare faculty to design, develop, and teach with technology in any instructional situation.

IHEs should implement planning for ERT into regular faculty professional development (PD) plans. Additionally, most IHE has continuity of operations plans to guide them through crises. Continuity of quality instruction should be included in such planning to ensure the instructional experience of faculty and students is not diminished when an emergency response is warranted.

4.3.2 Support Strategies

Faculty PD can be used to help faculty prepare for ERT. We have discussed the importance of incorporating ID techniques into course planning in earlier sections of this chapter. Faculty developers can use the strategies described herein to create a variety of professional development experiences to enhance ERT planning. Studies have indicated that faculty are often influenced by their peers (Darwin and Palmer 2009, Dashborough et al. 2015). Using PD strategies that leverage the social networks and relationships among faculty may be an effective strategy to build confidence with online teaching tools and techniques (Bond and Blevins 2019; Bond and Lockee 2013). Social learning strategies for faculty can take a variety of structures and delivery approaches as well. While group-based PD offerings tend to be the norm, peer mentoring offers a viable means of supporting faculty colleagues in an ongoing manner (Driscoll et al. 2009). Pairing newcomers to online teaching with seasoned faculty provides sustained support throughout the teaching experience (Palloff and Pratt 2011). There are many social learning options for PD that may be helpful when designing faculty experiences for ERT preparedness: peer mentoring, faculty panel discussions, faculty learning communities, faculty inquiry groups, and communities of practice.

While there are many ways to prepare faculty to meet the challenges of ERT, involving faculty in the planning process is critical to successful implementation. A well-implemented support and PD strategy will help faculty meet the challenge of ERT. By providing space and guidance developers can assist faculty as they become confident with incorporating instructional design strategies into their teaching practices. To ensure a quality experience for faculty and students, Institutions should include faculty support in crisis planning.

4.4 Discussion and conclusion

In this chapter, we have offered a process for the design, development, implementation, and evaluation of ERT learning experiences. The process is outlined by the ADDIE framework for ID with special considerations and guidance added for ERT learning experiences. The chapter was inspired by the authors' experience and observations during the ERT phenomenon resulting from the COVID19 pandemic, but the

guidance is not specific to this particular crisis and may be useful in other situations. For example, online delivery has been turned to in the past to maintain continuity of instruction following earthquakes (i.e., Baytiyeh 2018), weather-related emergencies (i.e., Samson 2020), and other natural and man-made disasters (Beatty 2019). It is hopeful that the processes and strategies provided herein can help instructors respond to future challenges posed to educational systems and operations. A job aid to guide planning for ERT based on the information in this chapter is provided as electronic supplemenatary material via: https://digitalcommons.georgiasouthern.edu/leadership-facpubs/119/.

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Chapter 5
Effective Global Mobility and International Recruitment During A Pandemic

Chris Strods, Alex Berka, and Sarah Linney

Abstract The COVID-19 pandemic of 2020 has had a rapid, profound and unprecedented impact on international education and global student mobility. A near-total shutdown of international air travel over the first four months of 2020 has rendered millions of international students unable to travel to their destination country to commence or resume studies. Those students who were already in their destination country before the travel shutdown has been subject to widespread lockdowns, campus closures, and social distancing requirements, preventing them from engaging with their studies in the way they had anticipated and prepared for. Quacquarelli Symonds (QS) conducted two separate pieces of market research to quantify the impact of the pandemic on international student mobility and the expected impact on higher education institutions: a survey of prospective international students, and one of international education professionals at universities from around the world. The results of these surveys indicate that the pandemic has had an acute impact on the future study intentions of prospective students, many of whom say their plans have been affected, and express fear and uncertainty about what the future holds for their education. Most universities are expecting a drop in international applications in the coming intakes and have implemented measures to maintain learning during the period where on-campus instruction is not possible, although they too share uncertainty about what the coming months hold, and how best to respond.

Keywords Global mobility · Student recruitment · International education · Crisis response

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5.1 Introduction

The disruption caused by the COVID-19 pandemic to higher education, and to global student mobility, in particular, is without precedence or parallel. A near-total shutdown of international travel, coupled with the closure of thousands of campuses around the world due to the introduction of social distancing regulations, has left educators and administrators in higher education with twin problems. Universities are determining how to continue to provide teaching and instruction to all students in a manner which maintains their physical safety and the quality of their education, while simultaneously trying to maintain a pipeline of new enrolments in a world where traditional recruitments practices are no longer feasible, and in which no guarantees can be made about what type of experience can be offered in the coming study periods. To better understand how COVID-19 has impacted higher education, it is useful to reflect on how the pandemic has evolved over the early months of 2020, and the impediments it has implemented for the operations of universities around the world.

5.1.1 A Brief COVID-19 Timeline

The COVID-19 disease is believed to have originated in the Wuhan province of China in late 2019, and to have remained largely contained within mainland China through much of January 2020, with only 125 confirmed cases outside of China by the end of January (Dong et al. 2020). To this point, there had been little disruption to university operations outside of China. In late February 2020, the number of confirmed cases began to accelerate in other Asian countries and continental Europe, with the World Health Organization (WHO) declaring a 'Public Health Emergency of International Concern' on January 30. However, as of 3 March, 80,304 out of 90,870 confirmed cases were in China (Sohrabi et al. 2020), and there were few international travel restrictions outside of China (Salcedo et al. 2020). Over the course of March, cases continued to rapidly accelerate to other countries and regions, most prominently in the European countries of Italy, Spain, and Germany. Outside of Europe, South Korea and Iran were also reporting larger and rapidly growing numbers of confirmed cases. By the end of March 2020, there were over 850,000 confirmed cases globally, and the epicentre of the pandemic had shifted from China (where new confirmed cases had slowed to less than 100 per day) to Europe, which was reporting over 30,000 new cases per day, and hosting over half of all confirmed cases globally (Dong et al. 2020). UNESCO data indicates that by the end of March 2020, 192 countries had implemented country-wide school closures (including primary, secondary and tertiary institutions), affecting over 91% of total enrolled learners around the world. As of the end of April, 177 countries still have country-wide closures in place, affecting over 72% of enrolled learners of all levels globally (UNESCO 2020). Coupled with near-total bans on international travel and severe restrictions on domestic travel in

many countries, the aggregate effect of the global response to COVID-19 has made it infeasible to maintain normal university operations for the immediate future.

5.1.2 Impact on Student Mobility

COVID-19 has impacted the global mobility of international students in two ways. Firstly, it has led to international travel bans which have prevented many enrolled students from travelling from their home country to that of their university to commence or resume their studies, and secondly, it has prompted domestic lockdowns and social distancing regulations in most countries, in turn leading to widespread campus closures and the suspension of face-to-face teaching.

5.1.2.1 Travel Bans

The first COVID-19-related travel bans began at the end of January 2020 and were initially mostly limited to those travelling from mainland China (Kiernan and DeVita 2020), which at the time contained nearly all confirmed cases (Dong et al. 2020). This had an immediate impact on many Chinese international students who had flown home to celebrate Chinese New Year, which in 2020 was observed on 25 January. Taking Australia as a case study, which commenced its academic year in February, at least 100,000 Chinese international students out of a total of 163,000 were estimated to be in China when a ban was introduced by the Australian government on February 1 (Kellett and Ironside 2020). As of April, only 62% of Chinese residents on Australian student visas were in Australia, compared to 89% of visa holders from all other countries (Department of Education 2020).

The travel bans expanded beyond China in the following months, with further bans on travel to and from a large number of countries implemented rapidly over the course of March and April as the disease began to spread throughout the world, and precipitated by the WHO declaration of a pandemic on March 11 (ICEF 2020).

By the end of April 2020, over 96% of travel destinations worldwide had implemented travel restrictions of some type, most commonly mandatory quarantine and arrivals ban on non-residents (ICEF 2020). In response, many international airlines had ceased running their ordinary flight schedules and grounded their fleets for all but a small number of ‘repatriation’ flights.

In aggregate, these measures have made it near-impossible for any non-resident student to travel to most countries to commence or resume study (although in most cases those who were in their country of study prior to the bans being implemented were able to stay).

5.1.2.2 Campus Closures

While some students had found themselves out of their university's country and with no way of travelling there, in particular those studying in southern hemisphere destinations like Australia and New Zealand which were between academic years, most enrolled students were already in their destination country at the time the travel bans were implemented (Department of Education 2020).

Those international students who were already in their study destination when the travel bans took effect have been affected by the widespread restrictions on movement and physical interactions, and the subsequent campus closures. The inability to deliver classes in a face-to-face context has in some cases led to the temporary suspension of classes altogether, as well as a transition from face-to-face delivery to online delivery for the foreseeable future (Johnston 2020; BBC 2020; Levenson et al. 2020).

5.1.3 Impact on Enrolment Pipelines

As well as impairing the ability for enrolled international students to commence or resume their studies, the COVID-19 pandemic has (and is likely to continue to) adversely affect the capacity for universities to recruit and enrol students for future semesters, with universities largely unable to conduct any of the traditional face-to-face recruitment activities like career and study fairs which formed key components to most recruitment strategies. Furthermore, students will likely be unwilling to commit to study without any certainty that they will be able to travel to their intended destination when required, or without assurance that the student experience will be what they would expect if campus closures and social distancing measures remain in place for an extended period.

While the current restrictions remain in place, universities will continue to execute new recruitment initiatives, including pivoting to virtual events, enhancing digital marketing and branding campaigns as well as improve their remote teaching capabilities as they navigate the longer term challenges of effective and student-centric online education.

5.2 Survey Methodology

In order to better understand the ways in which global student mobility has been impacted by the COVID-19 pandemic, as well as what measures educational institutions have put in place to manage the effects of the pandemic on their capacity to deliver their curriculum and maintain a pipeline of future students, two surveys were developed: one targeted at prospective international students (the 'Student Survey'),

and one at professionals working in higher education institutions (the 'Institution Survey').

Both surveys were hosted on the SurveyGizmo platform and were written in English only. Cookie-based user filtering was used to prevent respondents from completing the survey more than once. Where possible, incomplete responses were used in the analysis as well as complete responses. Both surveys took an average of 10 min to complete, and no incentive was offered to respondents for their participation.

In total, $n = 32{,}645$ responses were received for the Student Survey, and $n = 1{,}016$ responses were received for the Institution Survey. In both cases, a convenience sample was used, and no weighting or quotas were applied.

5.2.1 Student Survey Methodology

The Student Survey comprised of an online survey sent to 'prospective international students'—that is, those who intended to study internationally within the 12 months, but had not yet enrolled at an institution. It included questions on whether and in what ways their future study intentions had been affected, their interest in alternative delivery modes, and what their expectations were of universities in helping minimize the risk of COVID-19.

The Student Survey data presented here was collected between 14 February and 30 April 2020. In some cases, data is presented as time-series with the dataset divided into weeks since the survey launched, while in other cases it is presented in aggregate.

The survey was distributed via two channels—an outbound email campaign and through promotion on QS' www.topuniversities.com website. For those who were reached via the email campaign, an initial email was sent on 18 February 2020, with periodic reminder emails sent to those who had not completed the survey. The website link was made live on 16 March.

5.2.2 Institution Survey Methodology

The Institution Survey component comprised of an online survey targeted towards professionals working in international education departments in higher education institutions. The survey included questions on how their institutions had been impacted by COVID-19 and expected to be impacted in the future, as well as what measures they had implemented, or were considering implementing to ameliorate the impact of COVID-19.

The Institution Survey data presented here was collected between 10 March and 30 April 2020. An initial email was sent to a list of higher education industry professionals on 10 March 2020, with periodic reminder emails sent to those who had not responded to the survey.

5.3 Survey Findings

5.3.1 Student Survey Findings

5.3.1.1 Mobility Impacts

In our Student Survey, we asked respondents whether the COVID-19 pandemic had impacted their plans to study abroad. Across the life of the survey, a total of 46% said that it had affected their plans, while a further 25% said that they were unsure, and 29% said they believed it had not affected them (Fig. 5.1).

There is a clear shift in opinion over time, with the proportion of those believing themselves to be affected growing from 27% in mid-February to 50% by mid-March, and then stabilizing at between 60–63% throughout late March and April (Fig. 5.1).

There was also a growth in uncertainty over the same period, with the proportion of those who were 'unsure' about whether or not their plans were affected jumping from 16 to 34% in the week of 13–19 March, when widespread travel bans began to be implemented and immediately following the WHO declaration of a pandemic on 11 March. Conversely, the proportion who did not believe themselves to be affected by the pandemic fell from 60% in the first week of data collection (14–20 February) to just 13% in the final week of data collection (24–30 April) (Fig. 5.1).

In addition to asking *whether* they were affected by COVID-19, respondents were also asked *how* they had been affected by COVID-19—that is, how did they expect that their plans would change as a result of the pandemic. Across the life of the survey, a plurality of 47% said that they intend to defer their application and/or enrolment

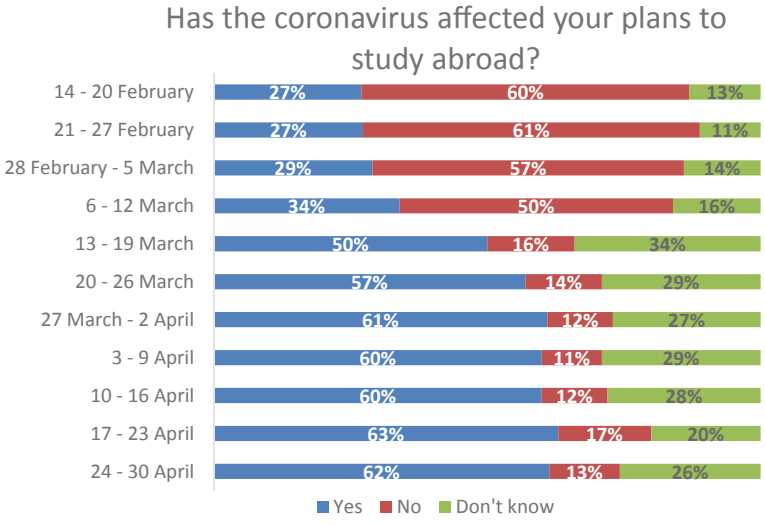

Fig. 5.1 Impact of COVID-19 on future study intentions

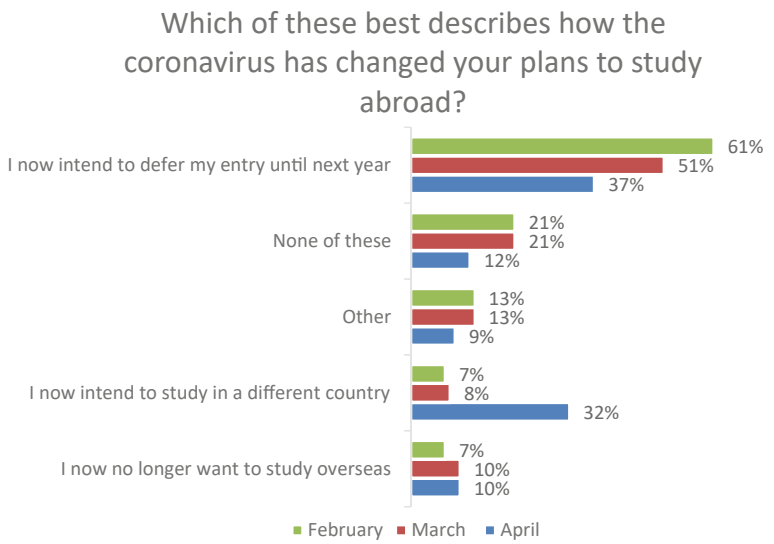

Fig. 5.2 The ways in which prospective students have responded to COVID-19

until the following year as a result of the pandemic, while only 13% said that they planned to study in a different country to the one they had initially planned to, and only 8% had abandoned their international study plans altogether (Fig. 5.2).

Again, this sentiment has shifted over the course of survey, with only 37% of responses received in February intending to defer, while 32% said that they were now intending to study in a different country. As travel bans began to take effect in March, and the prospect of choosing a different country to study in became less feasible, the proportion of those looking to defer rose to 51%, while the proportion looking to study in a different country fell to 8%. This trend continued into April, where 61% said that they intended to defer, and 7% planned to study in a different country.

Respondents were also asked to provide a qualitative response on how their study plans had been affected. Common themes included an inability to study due to cancelled language and/or entrance exams:

> Because of COVID-19, many of the exams that I needed, in order to apply, were cancelled or rescheduled. So, I missed the opportunity to study abroad.
>
> Because of the coronavirus, my GMAT test was cancelled. Not sure when or how I can complete the test. Not sure whether I can apply to the shortlisted universities on time, or whether I can make it out to get my F1 visa.

An unwillingness to pay for study without knowing what format it would take (typically with reservations about online study):

> I am unwilling to pay deposits now for the study year of 2020/2021 because I am worried that the coronavirus will not be over and that all classes will be online. I don't want to pay thousands to only get online tuition. I am also unable to book flights in this uncertainty.

And fear about travelling far from home amid a pandemic:

> COVID-19 has spread across the globe and so the airlines have stopped the incoming and outgoing of passengers of all countries. My family is now scared to send anyone anywhere, be it a foreign nation or just a trip to the grocery store! I'm now sticking to online study platforms for my studies.
>
> I am afraid of going abroad nowadays. The world is going to face an economic collapse. So, education could be come costly. That would be unbearable for my middle-class family, as well as for me.
>
> The Coronavirus is spreading too fast in nearby countries. My parents are scared to send me abroad.

The results suggest prospective international students have high levels of concerns regarding student mobility, as well as widespread uncertainty and fear about the future and how COVID-19 will impact their study aspirations, as well as reservations about the effectiveness of online study.

5.3.1.2 Perceptions of Online Learning

There is a long-demonstrated preference for international students to engage in their studies in a face-to-face, on-campus format. Research by Quacquarelli Symonds (2020) suggested that just 28% of prospective international students were interested in online learning, with 27% reporting the same in 2019 and 21% in 2018. For most international students, much of the value of a degree from an international university is in the ability to experience a different culture and make new friends, rather than simply receiving a qualification from a prestigious or well-known institution (Quacquarelli Symonds 2020).

One of the most immediate responses to the pandemic was a shift to online delivery of courses by universities in order to replace face-to-face learning, which had been rendered infeasible in most cases due to the social distancing requirements in effect around the world.

Respondents were asked about their interest in online learning as an alternative to face-to-face learning, with 58% expressing *some* degree of interest in online learning, though only 18% saying they were 'extremely' or 'very' interested in online learning. Conversely, 42% of respondents said that they had no interest in studying their degree online (Fig. 5.3).

While a majority of respondents express some level of interest in commencing their studies in an online environment (whether temporarily or otherwise), it appears that the traditional, face-to-face format is still preferred by a large proportion of prospects.

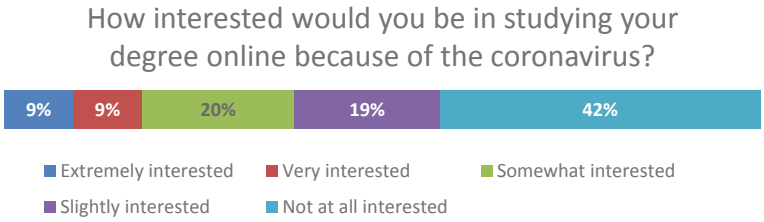

Fig. 5.3 Interest in studying online due to COVID-19

5.3.2 Institution Survey Findings

5.3.2.1 Teaching Challenges

The most immediate challenge presented to educational institutions by the COVID-19 pandemic is how to maintain normal teaching operations in the face of strict lockdown and social distancing regulations. This consists of not just the mode of curriculum delivery, but administration of assessments and examinations, management of on-campus student accommodation and curation of frequent and timely information about how operations are being affected, as well as updates on changes to student experience.

The Institution Survey solicited open-text feedback regarding what university professionals believed to be the 'biggest challenges' posed by the pandemic. The common themes in these responses included difficulties in determining the most accurate information to provide to students:

> The biggest challenge is not being able to know what information is true and what information is not. In addition, living in [a country] where the health system is not trustworthy, it's difficult to say that our institution is ready for a crisis.
>
> The Biggest Challenges Are Continuity Planning, Communications and Uncertainty.

Maintaining normal operations while ensuring safety of staff and students:

> Keeping Our Current Students, Faculty and Staff Safe and Healthy While also Trying to Keep Normal Operations Running. We Are also Very Concerned About Enrolment for Summer and Fall.

Rapidly transitioning to online curriculum delivery:

> Our Biggest Challenge Was How to Move from Traditional Education to e-learning and How to Overcome the Problem of Practical Courses and Training.

And for many, a mixture of all of these issues at once:

> The impact on student numbers has been significant, which means that there's pressure to reallocate funding to address shortages that have arisen. There are also communication and distance study options issues that are creating ongoing problems as we iron out the details of who needs what information or which resources.

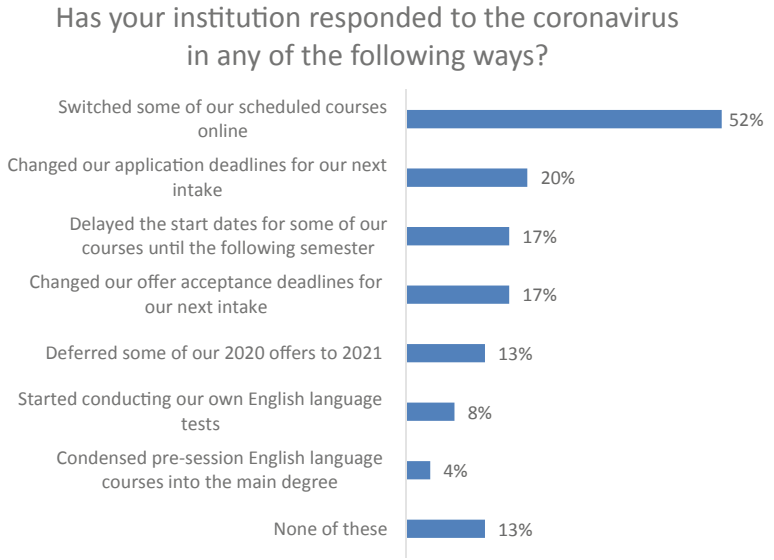

Fig. 5.4 Measures implemented by universities to respond to COVID-19

> Our biggest challenges are keeping students and staff safe and well; avoiding panic; maintaining educational progress with innovative educational solutions, like going online; the financial hit of fewer students and expenditures on coronavirus-related necessities; and keeping our international students coming.

In the face of these challenges, respondents were asked if they had implemented any of a range of measures.

By far the most common response to the challenges of COVID-19 was to switch at least some courses from face-to-face to online delivery, with most respondents reporting that they had already done this. A much smaller proportion had extended application deadlines (20%), delayed term start dates (17%) or extended offer acceptance deadlines (17%), suggesting a preference to maintain normal teaching periods during this time (Fig. 5.4).

While 52% of the survey respondents had switched some of their scheduled courses online, this number is highly likely to increase as the pandemic continues, and face-to-face teaching remains infeasible or unsafe in many parts of the world over the coming months.

5.3.2.2 Open Communications

As was previously identified, the type and frequency of communications issued by universities to their students regarding the pandemic and its impact on education operations were raised by some educators as a point of uncertainty. When asked how frequently they were making contact with their students, the modal frequency was

"a few times a week", reported by 39% of respondents, while 25% said they were in contact "daily or more frequently". In aggregate, 81% said they were in contact with their students at least weekly—a figure which is likely to be even higher, given that 10% of respondents said they did not know how frequently they were in contact.

In terms of the channels used to communicate to students, email is by far the most widely used communications channel, with 84% of respondents reporting that they used email to convey information about COVID-19. Other commonly used communications channels include social media broadcasts (45%), direct instant messaging (23%), telephone calls (22%), and in the case of Chinese students, WeChat (19%). Universities recognize the need to be in constant contact with their student during this time, and email is an effective channel for mass communications, requiring few resources and the ability to reach large numbers with a single message. However, effective content curation and personalization of content—whether through email or a more personalized 1–1 channel like instant messaging and social media, has been proven to increase open and read rates (Stupar-Rutenfrans et al. 2019).

When asked whether the satisfaction and retention of international students had been discussed in planning discussions as a result of COVID-19, 25% said it had been, 36% said it had not, and 39% did not know.

For those who had discussed the satisfaction and retention of international students, many emphasized the importance of online learning tools, training those with limited English proficiency on these tools, reassuring international students, and addressing their concerns promptly. Given the expected pipeline effect of COVID-19 on future student recruitment, it is likely that retention of existing international students will become a greater consideration in the near-term.

5.3.2.3 Growing and Nurturing the Enrolment Pipeline

Aside from the challenge of maintaining daily teaching operations and providing appropriate information and support to students, universities will also be grappling with the challenge of securing a healthy pipeline of new student enrolments for future intakes. In a period where travel is heavily restricted and there is no certainty about whether or not they will be able to offer a face-to-face learning environment at the time of commencement, this poses a significant obstacle. This is particularly the case for international enrolments, who have the added uncertainty of not knowing when international travel restrictions will be relaxed, both in their home country and destination country, and therefore whether they will be able to commence their studies at all.

Overall, 51% of respondents believed that the COVID-19 pandemic would have a detrimental impact on the number of student applications they received at their institution, while a further 20% said they did not know. It is, therefore, unsurprising that 34% of respondents said they were currently looking to diversify the source countries which they relied on for recruitment purposes, and thereby expanding their potential pool of applicants. The markets most commonly highlighted as ones which universities were looking to expand into as a result of COVID-19 included Brazil,

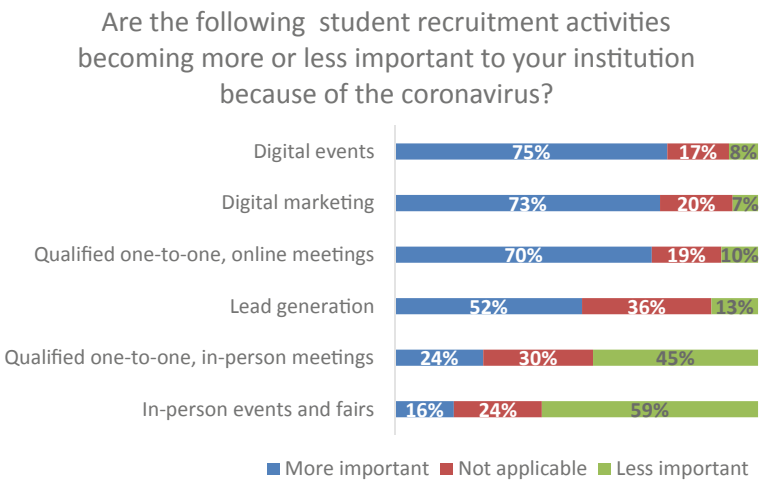

Fig. 5.5 Importance of student recruitment activities due to COVID-19

Colombia, France, India, Indonesia, Kenya, Malaysia, Mexico, Pakistan, Philippines, the Republic of Korea, Saudi Arabia, South Africa, Thailand, Turkey, United Arab Emirates and Vietnam.

In terms of the types of activities that universities are engaging in to recruit new students and maintain the enrolment pipeline, there is likely to be an increased reliance on digital recruitment initiatives in place of the more traditional face-to-face events like careers fairs; 75% of respondents said they would expect digital events to become more important, and 73% said the same for digital marketing. Conversely, 59% expect in-person events and fairs to become less important in light of the pandemic (Fig. 5.5).

Unsurprisingly, digital and online methods are becoming more vital as the coronavirus forces students and institutions to meet and communicate through digital means.

When discussing the language requirements for international students, 39% of institutions said they would not be admitting students who had not completed the required language tests, even if this was due to coronavirus restrictions.

In contrast, 17% stated that they would be admitting these students and 27% said they were still considering this change.

More than 1,000 US institutions are now accepting language test results from the Duolingo English Test (a language learning app), either as supporting evidence in conjunction with other English proficiency measures or as stand-alone proof, suggesting that many institutions are looking at alternative ways of conducting language testing (Morris 2020).

5.4 Discussion and Conclusion

At the time of publishing, there is still a high level of uncertainty over when restrictions on travel and social gathering will begin to be relaxed. However, it appears that the resumption of unrestricted international travel is not a realistic outcome in most places in the foreseeable future, and while some isolated countries are in the process of relaxing some of the most restrictive orders around internal movement and association, 'normal' university operations will continue to be infeasible in most places for some time to come.

It should come as little surprise then, that the vast majority of prospective international students either expect that their immediate study plans will be disrupted by the pandemic or are unsure whether they will be affected. In response to this disruption, there appears to be a clear preference for students to favor deferring their studies over alternative options. While online delivery will likely be the de facto standard of instruction in many places for the near future, there is a strong historical preference for face-to-face instruction, and it appears likely that many students who commence studying online would expect to transition to on-campus study when possible.

From a university perspective, many reported initial difficulties in managing to continue service delivery in the initial stages of the pandemic, including making decisions around campus closures, and the requirement to rapidly transition their face-to-face learning to online delivery. Despite these challenges, there appears to be a reluctance to quickly shift term dates, relax or delay application deadlines. There is, however, a widespread belief that applications from international students will decrease in the short term, owing to the suspension of international travel and the infeasibility of most face-to-face recruitment. As a result, many have identified a need to expand digital recruitment efforts, in order to maintain the pipeline of new students.

As the global situation develops, national responses will likely diverge, with some countries managing to control infection rates better than others, potentially enabling them to relax lockdowns, social distancing and internal and external travel restrictions sooner than others. This is likely to further complicate the university response, potentially necessitating a more complex framework which takes into consideration not only their own country's situation, but that of each individual country from which they source international students. Adaptation to the 'new normal' will be necessary, requiring universities to adjust quickly to changing circumstances in order to both maintain service levels for enrolled students and secure the pipeline of students for future intakes.

Finally, this project examined the entire global dataset as a whole. Future research could consider the impacts of COVID-19 on specific countries and regions, in terms of both inbound and outbound student mobility.

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Chapter 6
Remote Special Education During Crisis: COVID-19 as a Case Study

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Abstract Due to the COVID-19 pandemic, face-to-face teaching was banned, and more than one billion students did not return to school. While both teachers and students found themselves in a very challenging situation as they both need to quickly adapt to remote teaching and learning respectively, students with disabilities found themselves in even more difficult situations. This might be because they lack several assistive technologies at home that facilitate the learning process. The World Health Organization (WHO) pointed out that special attention should be paid to people with

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disabilities during the COVID-19 pandemic. Therefore, this study investigates the applied remote teaching methods of students with disabilities, as well as the faced challenges. In this context, a survey was created and sent out to several stakeholders (pedagogues, teachers, school directors, etc.) that are directly involved in special education to collect their inputs. Finally, based on the collected experiences, this study presents recommendations and best practices to facilitate remote teaching in crisis for students with disabilities.

Keywords Disability · Special education · Crisis · Remote teaching · Inclusive learning

6.1 Introduction

According to the recent statistics by UNESCO (2020), The COVID-19 pandemic affected more than one billion students worldwide. All these students, including those with disabilities, are experiencing education disruption. Therefore, several universities and schools started remote teaching and learning from home. Hodges et al. (2020) defined remote teaching as "a temporary shift of instructional delivery to an alternate delivery mode due to crisis circumstances. It involves the use of fully remote teaching solutions for instruction or education that would otherwise be delivered face-to-face or as blended or hybrid courses and that will return to that format once the crisis or emergency has abated." Generally, students with disabilities are less likely to attend school and complete primary or secondary education than person, without disabilities. They are also more likely to be out of school (UNESCO 2018). Specifically, during the COVID-19 pandemic, the learning challenges for students with disabilities and their parents are even greater.

According to Holloway and Foley (2018), remote learning has several advantages for students with disabilities, such as, (1) avoiding the challenges of travelling to classroom for students with physical disability; (2) learning in a familiar, comfortable environment, such as at home instead of studying at big classrooms for the students with autism disorders, or other struggles socially problems is more helpful; and, (3) communicating with others through forums or social networks which can reduce students pressure and enhance their learning performance. However, the home environment during crisis is different from school classrooms, therefore students with disabilities might experience a variety of barriers, such as:

- Learners with disabilities are easily frustrated, showing aggressive behavior since it is very difficult for them to be confined in a limit space without any social exposure.
- Learners with disabilities are often provided with less help and inadequately trained teachers (Unicef 2020).
- More time and resources are required for students with disabilities to actively participate in learning (Ohchr 2020). This includes equipment, internet access,

and specially designed materials and support. This makes learning more costly for students and their families.
- Many teachers lack ICT skills and knowledge. They are unprepared to teach online and cannot ensure student engagement, specifically for students with disabilities.

The World Health Organization (2020) mentioned that actions need to be taken during COVID-19 pandemic to provide all the required services for people with disabilities, including health care and education. Therefore, this study aims to investigate the current situation of providing remote special education during COVID-19. Special education refers to a range of educational and social services provided by the public school system and other educational institutions to individuals with disabilities. To the best of our knowledge, no study was conducted in this context. Based on the findings, best practices are reported that can help several stakeholders (educators, teachers, pedagogues, etc.) provide remote teaching/learning for students with disabilities in crisis.

6.2 Method

6.2.1 Research Questions

Since the home context is different from the classroom context. Additionally, the remote teaching can be delivered based on each country's development (i.e., high-income countries may apply some strategies that low-income countries cannot). Therefore, the first research question is: RQ1. *How learners with disabilities are learning remotely during COVID-19?*

Additionally, since assessing learners during the learning process is important, and since unlike face-to-face learning, learners with disabilities are located in an environment different from where the teacher is, investigating the potential learning assessment methods that can be carried out remotely with learning with disabilities is important. Therefore the second research question is: *RQ2. What are the methods to remotely assess students' learning performance?*

Moreover, since learners with disabilities are usually at home during this COVID-19, their parents can further play an important role in their daily life, including education. Therefore, the third research question is: RQ3.*How parents can contribute to the remote special education during COVID-19?*

Finally, just like any other remote teaching experience, teachers might face several challenges and difficulties. Thus, to enhance this experience, these challenges must be identified first and then several recommendations can be proposed accordingly. Therefore, the fourth research question is: *RQ4. What are the challenges that could be faced while teaching remotely learners with disabilities during COVID-19?*

6.2.2 *Experimental Procedure*

Forty-five participants participated in this experiment by answering an online survey. All these participants were first contacted via email to explain the study context. As shown in Fig. 6.1, these participants were from thirteen different countries in order to draw a wider picture, from several contexts, about the application of remote teaching in special education during crisis, especially under COVID-19. All these participants are working directly with learners with disabilities. For instance, some of them are pedagogues in special education schools, teachers of learners with disabilities. Educational associations focusing on learners with disabilities, and coordinators at the Ministry of Education.

Additionally, the learners' disabilities that the participants are working with were grouped into four categories, as shown in Fig. 6.2, after consulting the International Classification of Functioning, Disability, and Health (Perenboom and Chorus 2003). Specifically, Fig. 6.2 shows that sensory impairment is ranked as the top category where most of the learners have visual or hearing impairments, followed by emotional or attention-related disabilities, intellectual disability, and physical disabilities. It should be noted that several participants are working with more than one disability category.

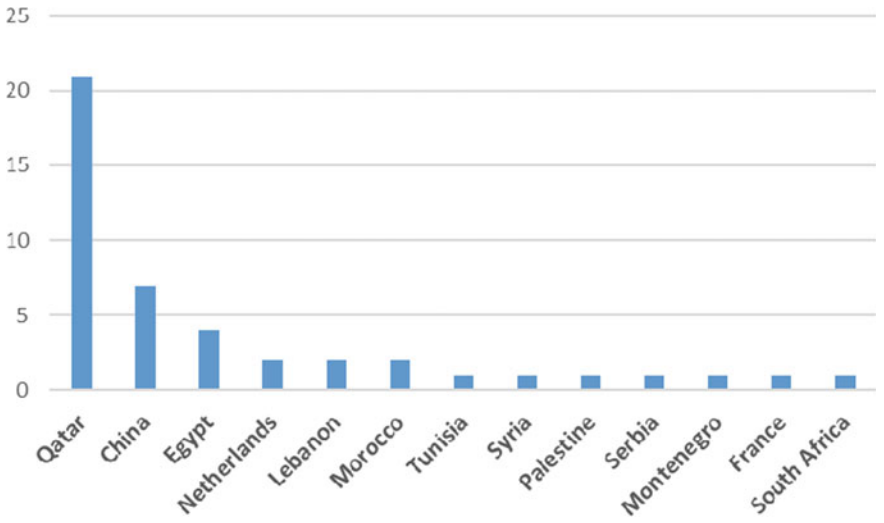

Fig. 6.1 Distribution of participants by country

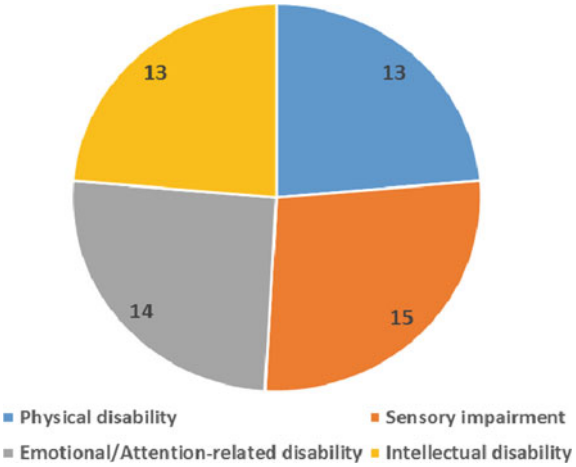

Fig. 6.2 Categorization of learners' disabilities during the remote teaching

6.2.3 Data Analysis

A qualitative analysis was conducted by applying open coding. In this context, the coders went through the participants' feedback several times to better understand all the given answers. They started then analyzing each research question separately and grouping similar repeated words/terms together. Particularly, in case the coding is different, agreement was reached through discussions. For instance, in the first research question, the coders grouped similar applied remote learning strategies together. As a result, five final strategies were identified, namely asynchronous learning, synchronous learning, telecourses, printed materials and assessments, and phone courses. Also, in the second research questions (and in the other research questions as well), the coders did the same thing and grouped the disabilities into five categories after consulting the International Classification of Functioning, Disability, and Health (Perenboom and Chorus 2003).

6.3 Results and Discussions

The obtained results are structured according to each research question.

6.3.1 How Learners with Disabilities Are Learning Remotely During COVID-19?

For students with disabilities, the question becomes how general education can be delivered most effectively through online tools. Based on the analysis of the participants' inputs, the following five remote teaching methods were provided during COVID-19.

- *Asynchronous learning* via different platforms, such as Moodle, Edmodo, and Weebly. Particularly, the learning materials (videos, pictures, etc.) were tailored to individual students or groups of students in accordance with the Individual Development Education Program (IROP). Additionally, several school portals have published specific guidelines and ideas that can support remote teaching adaptation. The parents were then required to assist their children during the learning process using these materials. In this context, several training videos were also prepared for parents to facilitate their task of helping their children learn. In this context, DAISY textbooks (https://www.resursnicentarpg.me/audio-biblioteka) were suggested to be used at home in Montenegro. They are a multimedia edition of a printed book, a combination of audio-visual text are intended for children with visual impairments, intellectual disabilities, reading difficulties, but all other children are found to find them useful, interesting, and fun. This method was for literate learners and with somewhat higher ability, such as mild intellectual disability and cerebral palsy. Also, the Qatari government during this pandemic developed *an inclusive Digital Education Portal* (https://mada.org.qa/services/inclusive-platforms/digital-inclusive-education/). This portal was developed in a short time to be accessible to support remote education as an initiative aimed at enabling the education sector to ensure the inclusiveness of education for all students in the State of Qatar and beyond, especially those with disabilities or functional limitations. The available resources are displayed on Mada's accessible educational platform to facilitate access to information for teachers and students on one platform designed to suit the needs of the current period The school portal "Milance" in Serbia (www.milance.edu.rs) has created an e-learning platform based on the Moodle learning management system (LMS) where users can get basic information about several subjects. The LMS is fully accessible to everyone using accessibility settings for Windows. The content is divided into different lessons so that each child can easily follow the teacher's instructions and/or find the appropriate content regardless of his/her age. The content is offered in various audio and video materials, according to the national program for primary and secondary schools, and is available in Serbian (Cyrillic).
- *Synchronous learning* via video conferencing tools, such as Zoom or Microsoft Teams, by making use of both audio and video to directly interact with the learners and explain some concepts. In this method, online learning groups can be made according to the learners' abilities and not by their types of disability. Figure 6.3 shows a heterogeneous learning class (i.e., learners with milder combined disabilities that include mild intellectual disabilities, visual impairment, and cerebral

Fig. 6.3 Student with disabilities following an online course

palsy) from the special school "Milan Petrovic" in Serbia are taking online courses via Zoom.

- *Telecourses* were also provided, such as the Ucidoma program in Montenegro, in order to help those learners who do not have internet access learn via the courses provided on TV.
- *Printed learning materials and assessments* were sent each week to the learners who do not have computers, where their parents have to help them learn these materials and solve the provided assessments. The parents need then to send back these assessments to be corrected by the teachers. This was done for instance, by the special school "Milan Petrovic" in Serbia.
- *Phones:* In "Milan Petrovic" school, for a very small number of students who could not attend online classes, teachers called parents at an agreed time (once or twice a week) and told them which textbook lessons to read to children (or with children) and which skills to practice or strengthen. During the conversation, they supported and taught parents how to work with children and how to make the content easy to follow.

Furthermore, to support the remote learning and teaching, the participants reported the following additional initiatives that were taken by their countries.

- *Providing accessible safety instructions against COVID-19*: To help protect learners with disabilities from the COVID-19 pandemic, several accessible safety instructions were released. For instance, the Arab League Educational, Cultural and Scientific Organization (ALECSO) issued a video in sign language to help deaf people protect themselves from the COVID-19.
- *Assessing accommodations*: Educators, parents, and individual students assess each student's situation and discuss adjustments needed for remote learning. Some examples include using alternatives to print, such as audio or other formats in instruction, as well as pictures, flexible scheduling and deadlines, and assistive technology. Mada Center in Qatar provided remote support through different channels to ensure the delivery of courses.
- *Modifying curricula and instructions*: By recommendations from the Ministry of Education and Higher Education in Qatar, the curriculum was adapted to online platforms such as Microsoft Teams because learning in a remote setting may differ from mainstream, classroom-based environments. This includes expectations for students and course methodology. Curricula must often be adjusted. For example, homework can be simplified, allowing students to dictate rather than type, and audio materials can be provided for reading assignments. Furthermore, it is seen that the participants from Serbia and Montenegro reported that several guidelines were posted by their governments or by some schools related to adjusting the learning content of the online environment. This was to facilitate the teacher's role, as many of them do not have previous experience in that.
- *Providing trainings*: As schools' transition to online learning during the COVID-19 crisis, it is important to provide teachers with guidance and relevant, evidence-based resources on how to deliver lessons in remote and online settings in special education. Here, through the Open Training Program of Mada (see Fig. 6.4), several online training was provided to teachers on how to use educational platforms and how to create accessible documents (https://mada.org.qa/capability-building/).
- *Providing family and caregiver support*: MADA center provided systemic approaches to help parents and caregivers with both their domestic responsibilities and students' education.

6.3.2 What Are the Methods to Remotely Assess Students' Learning Performance?

The participants mentioned several assessment methods that they used during this remote teaching experience. These assessment methods were ordered from the most mentioned method to the least mentioned method.

- *Real-time communication and interaction*: This was the most mentioned method where the participants stated that they assessed their students with disability daily, based on real-time communication with them, such as, via Zoom. For instance, the

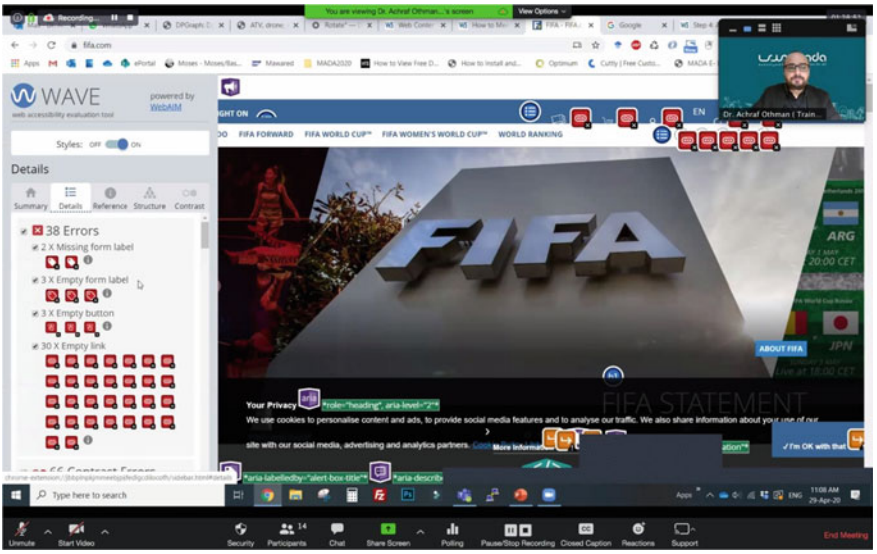

Fig. 6.4 An online training session how to create accessible content as part of the Mada Opening Training

teacher can ask questions and see how each student responds. Also, the participants mentioned that they also kept an eye on students' while working on the learning platform in order to see how they learn and behave, then provide more individual learning content accordingly.

- *Simple projects/assignments*: Teachers used WeChat parents group to assign homework for children (such as dressing, making bed, etc.). Parents were responsible on uploading videos of their children doing these assignments. Meanwhile, teachers gave encouragement or suggestions, so that children can continue learning during this special situation.
- *Quizzes*: Several teachers mentioned that they created simple quizzes via Kahoot application in order to provide interactive and easy learning experience to their students.
- *Open book exams*: Several teachers also use the open book exam method where assignments are provided online and the students can refer to their learning materials (e.g., courses) to find the answer. This method can make students more active and indirectly practice their literacy skills.

6.3.3 How Parents Can Contribute to the Remote Special Education During COVID-19?

Based on the participants' inputs, the following three parents' roles were identified during this remote learning experience.

- *Motivators of the learning process:* Parents can encourage their children to learn and help organize their learning schedule. This can make the children motivated to learn, even without face-to-face learning. In this context, Kang (2010) stated that students with disabilities have low capacity in regulating their motivation which is one of the important factors that affects the learning performance.
- *Facilitators of the learning process:* Since many children might lack assistive technologies at home to use their devices for learning remotely (Unicef and WHO 2015), their parents can be facilitators of the learning process by helping them access their devices or use the online tools to learn with the teachers.
- *Teachers of the learning process:* Since parents are in a direct contact with their children at home, they can also act as teachers, by downloading the learning materials sent by the school-teachers and using it during the learning process.

6.3.4 What Are the Challenges that Could Be Faced While Teaching Remotely Learners with Disabilities During COVID-19?

Based on the collected participants' feedback via the survey, the following challenges were identified during the remote teaching experience of learners with disabilities.

(1) *Learners with disabilities lack ICT skills*: It is seen that learners do not have the needed skills to work on digital devices, such navigating on the internet, accessing platforms and tools or even simply opening electronic learning materials. Therefore, the remote learning experience was challenging for most teachers.
(2) *Parents lack ICT skills*: Just like the previous challenge, parents did not also have the basic ICT skills to further assist their children during this remote learning experience.
(3) *Low family income*: most learners with disabilities are from poor families, therefore most of them do not have digital devices or assistive technologies at home (computers or mobile devices) which can help them learn remotely at home. Additionally, internet access and reliability is a big issue as well. For instance, one of the participants, who is working as a teacher for deaf learners, mentioned that due to low internet connection the video conferencing was not very clear, hence she could not understand her learners while using sign language to communicate.
(4) *Lack of accessible tools*: Several teachers reported that the online provided tools and platforms are not fully accessible for all learners with disabilities. Therefore, some of them could not be used to learn online.
(5) *Lack of accessible learning resources*: Several teachers highlighted that due to the unexpected critical situation of COVID-19 pandemic, most teachers did not have prepared learning resources to fit the remote learning. Additionally,

these teachers further mentioned that there is a very limited number of accessible learning resources online. Therefore, providing remote teaching was very challenging.

(6) *Absence of guidance and training for teachers*: Another challenge that was raised by the teachers during this remote educational experience is the absence of guidance and guidelines that can help them adapt their learning content to the online and remote teaching. This hindered teachers from easily adopting this remote teaching experience and delayed its starting date, as it was confusing to them.

(7) *Low learning motivation and self-regulation skills*: Several teachers mentioned that the learners are not always following the prepared learning schedule, hence they skipped several courses online. Additionally, several teachers mentioned that learners with disabilities have low self-regulation skills, therefore they need someone to keep an eye on them so they can learn.

(8) *Absence of engaging pedagogical approaches*: A pedagogue mentioned that one of the challenging tasks is how to deliver the learning content online in a very interactive way in order to keep learner motivated during the whole learning process. Additionally, the pedagogue mentioned that some hands-on classes (e.g., painting or gardening) were very hard to deliver online.

(9) *Home safety*: Several teachers mentioned that they were worried about the safety of their learners at home from the coronavirus (COVID-19), as they might not have enough information about how to protect themselves. Also, the teachers mentioned that the learners might stay safe by also doing some physical & social exercises that they usually do at school.

Figure 6.5 summarizes this section and presents a framework of challenges that could be faced during remote teaching/learning for students with disabilities. Specifically, this framework is composed of three layers. The first layer, considered as the backbone of remote special education, is related to policy makers as stakeholders and covers guidelines, guides, and policies that can directly affect (in a good or bad way) the work of other stakeholders, including parents and teachers, presented in the second layer, who work directly with students with disabilities. Finally, the third layer covers students with disabilities, which are represented as the core of this framework.

6.4 Discussions and Recommendations

Based on the obtained results, it is seen that digital divide has a negative impact on remote learning for learners with disabilities. Therefore, *cheap and affordable technologies, including assistive ones should be developed to facilitate students' educational process.* Additionally, *more policies should be initiated to equip families with special needs with these technologies at home, as well as some specific funds to further support their children with disabilities.*

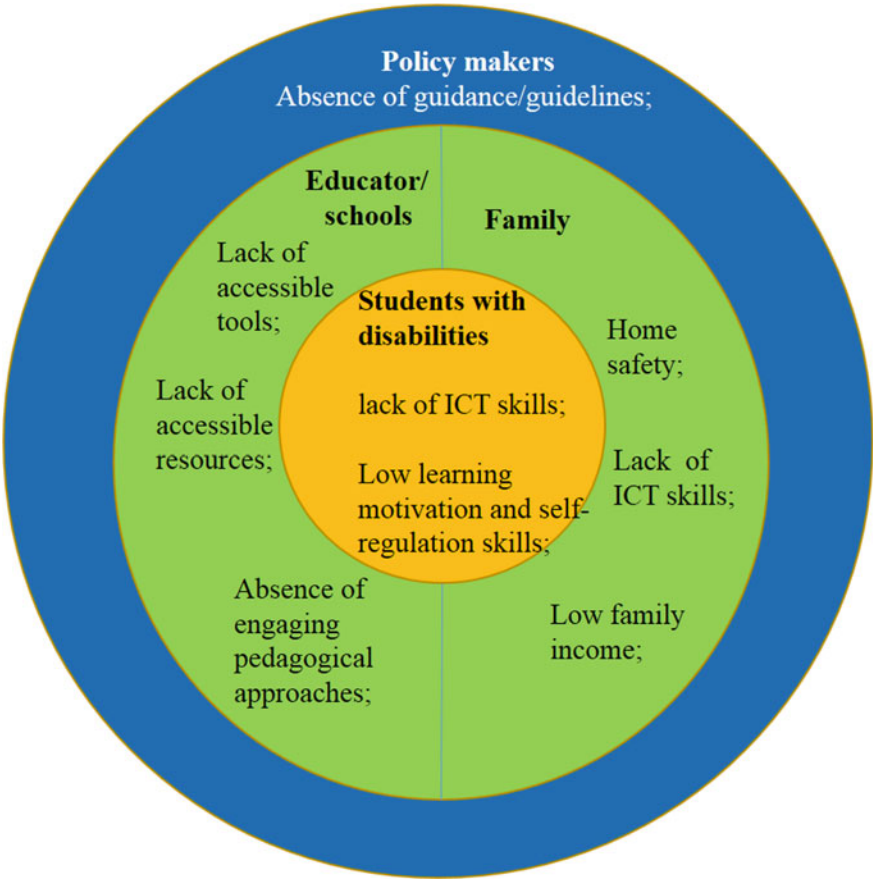

Fig. 6.5 Challenges framework of remote special education

Parents and students with disabilities lack ICT skills, therefore *more training should be designed to help them acquire the basic skills that can facilitate their learning process online.* Besides, it is seen that there is no sufficient accessible tools or resources that students with disabilities or their teacher can (re)use. Therefore, *it is important to raise awareness about using Open Educational Resources (OER)* since unlike commercially published materials, OER that are adapted to meet accessibility requirements can be retained and freely shared with communities, reducing duplicative work at and across institutions (Zhang et al., 2020). Additionally, permissions granted by an open license remove legal barriers to adapting and customizing OER, making it possible to create learning environments that are more flexible, accessible, and robust for all students. Furthermore, *researchers and practitioners should consider different accessibility guidelines (e.g., WCAG 2.0) while developing their platforms, tools, and devices.*

To overcome the pedagogical challenges as well as the low self-regulation skills within students with disabilities, *more guidelines should be provided to teachers on how to adapt their learning content and strategies to online learning environments, as well as pedagogical approaches to keep their students motivated.* Additionally, to help with low self-regulation, *schools must create detailed schedule that everyone can follow it in order to successfully finish their remote learning experience.*

Through the results of the survey and based on the shared remote teaching and learning experiences by the participants, the following recommendations can be identified to improve educational opportunities of students with disabilities during remote learning.

For students and parents:

- Provide parents' support and students' guideline and trainings on how to use online educational tools.

For teachers and tutors:

- Adopting the use of ICT and online tools in all areas of curriculum development. A key principle of addressing the learning needs of all students in curriculum design is universal design for learning.
- The inclusion of students with disabilities in online education classrooms ("mainstreaming" with appropriate supports when necessary).
- Collaborative or team teaching should be conducted in which one instructor is the content specialist and the other is trained in instructional methodologies for students with disabilities.
- The use of peer-mediated instruction (often peer tutoring).
- Instructional and curriculum adaptations, including instruction in learning skills and strategies and the use of advanced organizers.
- Adequately train and supervise children to protect them from exposure to risks pertaining to online activities (e.g. bullying).
- Create alternative indoor/house activities by planning a routine together emphasizing in everyday activities, such as learning opportunities for family members, age-appropriate TV/online programs, exploring new skills and sports/fitness regimen, etc.

For policy makers:

- Promote ICT competency development for teachers working with students with disabilities.
- Develop policies aimed at ethical, secure, and non-discriminative use of online tools in education.
- Support the evidence-based research and communities of practices on education of persons with disabilities by means of ICT.

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Chapter 7
Recommendations for Mandatory Online Assessment in Higher Education During the COVID-19 Pandemic

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Abstract COVID-19 pandemic has affected the final months of 2019/2020s semester of the higher education academic year. Even though traditional face-to-face lectures had to be moved online with no purposeful planning, the biggest challenge has been the online assessment of the learning process. The Group of Online Teaching Managers of the Public Universities of Castilla y León (Spain) has prepared a set of recommendations to help teachers, students and universities in this unique process.

Keywords Online assessment · Higher education · eLearning · Digital transformation · COVID-19 pandemic

7.1 Introduction

The year 2020 will go down in history as the global pandemic due to the SARS-CoV-2 virus, which causes COVID-19 disease. Millions of people had to be confined to their

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homes in an unprecedented situation. One of the first wide-ranging measures has been the closure of educational centres at all levels, which has affected 91.3% of the total number of students enrolled worldwide: over 1.5 billion people have been unable to attend their face-to-face lectures and tutorials, according to UNESCO (2020a).

In Spain, universities began to close before the establishment of the nationwide state of alert on 14 March 2020. Suspending face-to-face teaching activities at universities resulted in the immediate transfer of all teaching activities to an online format. It cannot be claimed that this urgent and supervening action is analogous in experience, planning and development to proposals that are designed explicitly from their conception to be delivered online (Hodges et al. 2020).

This step has had to be taken by teachers and students in the heat of the moment, that is to say, giving an emergency response without having time to carry out a fundamental redesign of some subjects that were thought to be taught and studied in a face-to-face way (or blended in at best) and without being able to plan or ensure that all the actors had the minimum technological means required, the necessary digital competencies and attitudes prone to change (García-Peñalvo et al. 2020).

Digitizing content, replacing an hour of classroom instruction with another hour of synchronous instruction in a virtual space with a video conferencing tool, or sending reading material, among other solutions, cannot be considered the best options for online education. The learning experience has to be wholly redesigned (García-Peñalvo and Seoane-Pardo 2015; Seoane-Pardo and García-Peñalvo 2014), both between teacher and students and among students themselves. It is necessary to remember that transferring something ('contents') from the analogical context to the digital one does not necessarily imply a real digital transformation (Llorens-Largo 2020), as has been shown in this crisis (Llorens-Largo and Fernández 2020). Leadership is required to lead the transformation and a strategy based on and driven by technology and aimed at people (García-Peñalvo 2020b).

Precisely, one of the significant problems faced by online teaching is assessment (Carstairs and Myors 2009; Friedman et al. 2016) in situations such as the need to know and guarantee the identity of the person examined, as well as to control the physical context in which the person is taking the exam. A possible solution to these problems comes from e-proctoring systems (González-González et al. 2020). However, it would be a mistake to consider that all online assessment is conditioned to these e-proctoring systems, among other reasons because the assessment is an extremely rich and creative process that goes beyond the exams traditionally developed in face-to-face teaching.

This chapter seeks, with a set of recommendations and scenarios, to help university teaching staff to organize the online assessment of their subjects in the context of this COVID-19 crisis. It is based on the joint work of the heads of online teaching in the four public universities of Castile and Leon (Spain) (Abella García et al. 2020).

7.2 Global Recommendations

It is essential to start from some general recommendations to face the assessment process in an online context due to the causes of the COVID-19. These recommendations should be taken into account before the faculty takes decisions for each subject based on all the premises and characteristics of the assessment system.

As a general rule and whenever possible, **subjects should be assessed continuously**, with the number of exams and assessment activities that each teacher considers appropriate and in coherence with the acquisition of competences in that subject (let us think in a minimum of three tests). This process should be coordinated among all the subjects of the global degree. The assessment methods should be diversified.

An assessment continuous system may give the **option of dispensing with the final examinations**. In any case, the weight in the final grade of the different assessment activities carried out should be distributed, so that the assessment is integral, considering the parts already evaluated previously. The aim is to lessen the effect of a single final examination with the consequent problem of guaranteeing authenticity, management of complains and possibility of re-examination.

When **general and final examinations are planned with a weight equal to or higher than 40% of the final grade** (or whose passing is essential for a favourable assessment of the subject as a whole), **the maximum level of student identification must be guaranteed**, so that depending on the degree or subject, different procedures can be chosen.

Alternatively, or also, **continuous assessment activities may be included by block or set of topics**, so that none of these examinations makes up 40% of the final total grade. These examinations—if they evaluate theoretical content employing objective tests—must have a large bank of questions or items that are selected at random and programmed in maximum short response time (these two conditions will minimize the risks that books/websites can be used to search for the answers and that the collection of test questions is shared among students). If the examination is a practice/exercise test, then there should be no problem for the student to have access to theoretical materials during the test. As a general rule, this type of test would only require a basic level of student identification as defined below.

Use technologies already available at the university and as similar as possible to those usually used to support face-to-face teaching. It is crucial that teachers and students feel as confident as possible in the new context of the online assessment.

Students may be asked **to submit papers, exercises, computer graphics and so on**, (documents doc, pdf, ppt, xls, etc.) in whose correction it would be advisable to use some plagiarism analysis tool (students should be informed in advance of the use of these plagiarism control software, as well as the impact on grading when unethical academic practices are detected; attention is also drawn to the proper analysis of reports resulting from these systems). It is also possible to request that these deliveries **be accompanied by auto-explanatory videos** (e.g., in mp4 or similar format) made by the students. Students should be told what percentage the score of these submissions will be in the overall grade of the course. It is recommended that the

teaching team defines assessment rubrics or rating scales and make them known to students beforehand (Cabero-Almenara and Rodríguez-Gallego 2013).

In large groups, it is also possible to request the delivery of tasks/jobs and **enable peer review systems**. In this case, the teacher must provide all students with an assessment rubric or rating scale that is as accurate and objective as possible. It will ease the teacher's correction task, and at the same time, it will encourage deeper learning by the students.

Individual or group **presentations or oral defences may be requested using video conferencing tools for a limited time** (this videoconference may be recorded and preserved as evidence of the defence). It is also advisable to use rubrics or rating scales.

Individual oral tests may be conducted using video conferencing tools (these tests may be recorded and retained as evidence of completion).

The processes of **presentation and defence of final degree theses** can be carried out involving **online juries** (if necessary, these academic acts could be recorded and kept as evidence of their completion). In those degrees where the number of juries is high, other measures can be evaluated (such as video-exhibitions of previously recorded works).

The casuistry of the students must be known and taken into account, which can be very varied, and therefore, positions and **assessment methods should be assumed that provide flexibility to ensure inclusion** (UNESCO 2020b). Therefore, for students with special educational needs or in situations requiring alternative measures, plans should be defined that are adapted to their circumstances. These plans, which would particularly affect synchronous measures, should be determined by the academic coordination committees for each degree and will respond to the situation and needs as flexibility as possible, within the instructions of the health authorities. In these cases, it is necessary to articulate procedures for the accredited collection of evidence of not being able to use the defined online assessment model. Each degree committees or commissions or other competent body (after hearing departments and professors) must publish and document changes made to accommodate student's assessment due to the effect of the state of alarm. This is to ensure the transparency of changes from the current face-to-face assessment to an emergency system of non-face-to-face assessment, its dissemination and equal opportunities for students (Castells Oliván and Pingarrón Carrazón 2020).

Finally, resort to **e-proctoring solutions, reserving this option for complex subjects with a large number of students**. This option requires planning, training and testing in each subject. An effective training system should be designed for teachers and students who are affected. Besides, a protocol should be established for dealing with incidents during the exam (e.g., the teacher should be accessible in case there are any questions/problems during the exam).

Once the online assessment method for a given subject has been designed, **the teaching staff must inform their students sufficiently in advance**, using the synchronous and asynchronous means considered appropriate. The faculty should pay particular attention to the type of questions, the way they are answered, the time needed to take the exam, the tools to be used, the auxiliary elements needed

to take the exam, the licensed consultation material, the documentation accrediting the identity that will be required, information on whether the exam will be recorded (audio and video or only audio), how to resolve doubts during the test, relevant regulations to be taken into account, etc. It is also essential to explain to the student the general indications for carrying out the tests. **The faculty should highlight the critical aspects of the online process:** the need to have the devices well configured and tested in order to carry out the tests, whether communication with others is allowed or not, the potential use of anti-plagiarism software, formats allowed if the delivery of files is requested (as well as the maximum size allowed), recommendations on timely delivery (time does not stop even if you leave the exam), recommendations on browsers, technical support documentation available, etc. As a general comment on this point, it is advisable to create a forum in the virtual campus to raise and resolve any doubts that may arise before the examinations are carried out.

7.3 Risks

Complementing this series of general recommendations above, a set of risks must be considered by teachers and government teams to define a global and comprehensive strategy for online assessment.

Students who enrolled in face-to-face studies do not necessarily have the technological infrastructure required to take the online assessment tests. Although technology penetration is broad, this is a reality to be taken into account. In this scenario, viable solutions should be proposed to these students (such as the temporary loan of, or access to, laptops, provided that this does not violate the rules of social confinement and distance; as well as the provision of Internet data cards and/or Wi-Fi routers).

Students with special educational needs will require specific plans for them. A mechanism/box for special requests to the committees/commissions for each degree should be implemented.

All universities must have **the exceptional policy that contemplates the different methods of online assessment**, without modifying the organization of teaching, but rather adapting it to forced online assessment, which implies changing the methods traditionally registered in teaching guides. These syllabi will have to be modified in order to register, in a general way, the methodological changes and the assessment system. The regulatory change must be made without prejudicing the rights and guarantees of the student body. These regulations must consider contingency procedures in the face of a non-attendance assessment test, whether general or specific (fall of the virtual classroom, the videoconference system, individual connectivity problems, etc.) and guidelines for action in such cases (Cordón et al. 2020).

Consideration should be given to **preventive actions to preserve academic integrity** and the use of available legal mechanisms (expulsion from the examination, failing grades or, where appropriate, the opening of disciplinary proceedings) in

the event of fraudulent examinations or works. **The right to review the grades** and to challenge them in the terms generally established must also be guaranteed. It is essential **to collect evidence from assessments made through systems that ensure compliance with data protection legislation and the digital rights of individuals**. Durability and accessibility of evidence must be guaranteed during the period of review and legal guardianship, in order to address possible student complaints, audits by quality agencies or regulatory compliance (Cordón et al. 2020).

If assessment activities are conducted through the virtual campus with a basic level of identification and with a time limit for completion, the probability that the system will not respond and students will not be able to take the full exam must be taken into account. **In order to avoid large confluences** in the virtual campus, the examination can be taken in groups, either by proposing equivalent but different assessment activities to each group or by having a large bank of randomly selected assessment questions. In either case, time should be reduced. It would be necessary to plan an examination schedule that includes all the degrees, once the situations have been studied with the supervising technicians of the virtual campus.

When the student group is small, proctoring tools can be replaced by asking students **to use their mobile devices for additional instrumental functions** such as including a second camera, so that the computer webcam focuses on the student and the mobile device webcam records the room. This allows for a close level of surveillance on the exam and that no other people are in the environment or books or other physical sources are being used. **This is a risky practice** (Martínez Martínez et al. 2020) that must be weighed up beforehand to ensure that, firstly, it is indeed a complementary device and not the student's primary device for doing the exam, but, furthermore, in no case does access to the device affect people's private sphere, for example, by asking that the control be done through a channel such as WhatsApp. Therefore, if this method is used, only duly licensed corporate applications should be used that are entirely transparent and inform both the uses and purposes and other mandatory terms under data protection regulations.

Update (if necessary) the academic thesis dissertation regulations, so that they can be carried out **online**.

7.4 Online Evaluation Scenarios

We will differentiate between specific scenarios related to the practical part of the subjects and general scenarios for the assessment of knowledge and activities; both types are complementary and are summarized in a conceptual map available at https://zenodo.org/record/3870550.

7.4.1 Typology of the Practical Component

Because of the suspension of classroom activities, most of the theoretical and problem-based teaching can be replaced by virtualization. The main problem arises from the traditionally called "practical classes", included within each subject (we are not referring to the different types of external practices), when these had to be developed as field work, clinical practice, laboratory practice or computer classrooms.

The assessment of this part of the subjects opens up a wide range of possibilities or scenarios.

7.4.1.1 Partially Completed or Completed Practical Classes

If the practical part of a given subject has already been completed, it could already be assessed, thus wholly closing this section.

If the practical classes are only partially completed, it remains to be seen whether the remaining part can be carried out, replaced, postponed in time or, in the worst case, cancelled. There are recommendations for external curricular internships in non-qualifying degrees that are carried out at least to a minimum percentage to be considered successful or to be replaced by other related academic activities that can be assessed (Castells Oliván and Pingarrón Carrazón 2020).

In any of these scenarios, as far as assessment is concerned, strategies similar to the evaluation of the theoretical components of the competencies could be proposed, which will be discussed in Sect. 7.2.

7.4.1.2 Practices not Performed, but with Options to Be Performed Virtually or Replaced by Other Activities

If the practices to be carried out can be virtualized—either using software licences, access to virtual laboratories, remote laboratories or simulators, remote desktops, study resolution of clinical cases, etc.—they should be carried out and then define how their evaluation will be performed.

It could also be the case that alternative approaches are sought to achieve the skills associated with the practice through the development of project-based learning, task delivery, etc. Similarly, methods and tools can be defined to assess the outputs of these activities, using the proposals in Sect. 7.2.

This approach could be supported by existing tutorials and videotutorials, such as open educational resources (Ramírez-Montoya et al. 2018; Wiley and Hilton 2018) or licensed for use by the institution, or immediately developed by the teaching teams of the subjects.

7.4.1.3 Unrealized and Difficult to Virtualize Practices

When the health situation and the conditions of social distance allow it, within the academic period defined for the current course, priority should be given to those practises that, not having been carried out or replaced, are challenging to carry out due to time and cost, with attention to those in the last academic year.

In the worst case (and except for the last year of the degree), it can be considered that the competencies that have not been acquired due to confinement can be practiced and evaluated in the following academic years. This decision will require specific instructional designs, at no economic cost to students, and with the endorsement of the departments, degree committees/commissions and competent teaching bodies.

7.4.2 Online Assessment of the Theoretical and Practical Parts of the Subjects

Online assessment does not only have to be based on e-proctoring systems, but there are also multiple possibilities, many of which could be based on continuous assessment approaches that limit the weight of traditional final exams in face-to-face teaching.

The ideal option would be to replace the final exams with a 100% continuous assessment model, in which more continuous assessment activities would be added to those previously defined, thus avoiding the final assessment examinations. If this is not feasible, at least the weight of the final examination would have to be minimized, to be considered as one of the continuous assessment activities.

In general, when using oral exams or written response exams, whether synchronous or asynchronous, it is recommended to avoid questions that require memorized answers or can be searched on the Internet. They should be replaced by reflective questions that assess understanding, discrimination or evaluation, or that require the application of some cognitive process, for example, by requiring them to do some preparatory work before issuing an answer.

The levels of student identification for the different online exams are summarized in:

- **Basic level**: Access to virtual platforms through personalized IDs and passwords is personal and non-transferable information, which de facto identifies the students. Inappropriate and fraudulent use of these identification keys can lead to legal consequences.
- **Medium level**: equivalent to a face-to-face assessment. In a videoconference, students are asked to show an identification card.
- **High level**: Biometric identity checks are performed. It requires a previous registration of the students, installation of complementary tools in their computers, and authorization to use webcams and contents of the desktop.

On the other hand, the online assessment scenarios of the different parts of a given subject can be classified into two initial categories: synchronous and asynchronous examinations.

7.4.2.1 Synchronous Assessments

These scenarios will be different if teachers need to know the identity of the examinee and control their environment or not. The synchronous examination will allow a single assessment activity to be given to a group of students (as a face-to-face situation).

There is a Medium to High Need to Know the Identity and Context of the Student

In this situation, the size of the group will be fundamental in establishing the assessment strategy.

For the **academic thesis dissertations**, it is recommended that videoconferences be held between the members of the jury and the student. These must be open to the rest of the student body. The defence sessions—if necessary—may be recorded and kept providing documentary support of the tests taken.

In other subjects, **practical work can be done in groups** (generally 2–4 people, but there may be situations where groups with more members are organized) and defence can be organized by videoconference (which ensures the identity of those doing the presentation). It is interesting to include in the assessment the teamwork competence (Conde et al. 2016; Fidalgo-Blanco et al. 2015).

If **the group of students is composed of a small number of persons** (approximately 5–15), it is feasible performing individualized an oral exam by videoconference.

If the **group is of intermediate size** (about 15–40), the option of individual oral examination may still be feasible, but the timing of this must be carefully controlled. Alternatively, an exam could be done on the virtual campus by dividing the whole group into groups of about 10 people and monitoring it through a videoconference with another device (mobile or tablet) that shows the work environment and identity of the student.

In the case of **large groups** of more than 40 students, a test on the virtual campus supported by a biometric control system (e-proctoring) should be used. It is also advisable to divide the entire group into several groups of fewer students. The number of students per group—mainly if the test is based on quizzes—depends on the size and configuration of the virtual campus and the way the questionnaire is designed: (a) number of questions per page (the configuration of one question per page is not recommended in the quick response questionnaires); (b) formulation of the questions (avoiding the misuse of images and videos); (c) duration of the test; (d) way of scaling the students' entry to the test; (e) randomness of the questions; etc.

Basic Need to Know the Identity of the Person Being Examined

When assessment examinations account for less than 40% of the weight in the final grade, students could be grouped into groups of the size supported by the virtual campus, and the questionnaire tool of the universities' virtual platforms would be used. The key to the better functioning of this option is to have a large bank of questions to be able to take tests, introducing the option of randomization of items (not only answers) and with the short response time. Using randomized questions minimizes the option of having this information filtered across exam groups (provided a large question bank is available). Students should be reminded that virtual campus passwords are sensitive, personal and non-transferable and that improper use may result in legal liability.

7.4.2.2 Asynchronous Assessments

In this case, the scenarios are differentiated according to whether it is an assessment of knowledge or activities (or skills). In these asynchronous assessments, the student will carry out the assessment activities within more or less extended periods. For some subjects, especially in the assessment of competencies, they will be even more impressive than synchronous situations.

Knowledge Assessment

The best option is to use the **self-assessment questionnaire tools** on the virtual campus without having a specific time slot to do so, but a specific period (days or weeks) can be established.

Assessment activities can also be defined offline, sent to students as files (pdf or images) or using third-party software (outside the virtual platform) given the peculiarities of a given subject. They are informed through tasks or forums on the virtual campus (they can be sent by email, but this option is not advisable except in exceptional cases). The student performs the examination offline and returns/delivers the result in a defined time window, within the controlled environment of the virtual platform.

Assessment of Activities

It is possible to assess the **delivery of assignments or tasks**, for which it is recommended to **define simple and clear rubrics or scales of assessment to be shared with students before delivery**. It is also recommended to make the hours of submission more flexible, for example, by setting a limit in the early morning.

These deliveries can be complemented with an individual or group video-defence to be made in a limited time (might be in live mode) or the faculty may ask to attach to the work a short video-selfie (2–3 min) with the speech of the defence.

Another alternative is to use the assignments but **correct them among students by anonymous peer review**. This tool is recommended when group size is vast; it also reinforces students' learning skills (Bernabé Valero and Blasco Magraner 2013). In this case, it may be interesting to include a meta-assessment of the process by the teaching team to control the quality of the peer review, in case of disparity. This is one of the best strategies for a large group of students. Two issues are vital in this assessment strategy: the anonymity of the work submitted and the design of the assessment rubric or scale. Besides, studies show that the grades obtained by this method do not differ significantly from those awarded by teachers when the process is designed correctly (Bouzidi and Jaillet 2009; Cho et al. 2006).

Another useful skill assessment tool, besides the deliveries, is the participation in the **debates defined in the forums** of the subject. They can open specific topics for discussion and ask for documented opinions on relevant issues of the subject; they can be asked to make novel contributions (which forces them to read the previous opinions) and to provide the sources on which they have based their contribution to the forum.

7.5 Discussion

The COVID-19 pandemic has led to an unprecedented situation in all areas of activity. The state of confinement has affected all levels of education. This article focuses on the specific case of university studies and more specifically on face-to-face universities that have had to make an emergency adaptation of face-to-face classes to a remote format which, in the best of cases, have been able to integrate some of the basic principles of quality online education.

What was initially proposed as a replacement for teaching activities has inevitably led to non-attendance assessment scenarios that have traditionally been considered the most complicated aspect of managing online university degrees.

If online teaching was already a challenge, in many cases a shock, for the university community, non-attendance assessment is the biggest obstacle to completing the academic year (García-Peñalvo 2020a).

In order to help teachers directly and students indirectly, this chapter contains a set of recommendations aimed at designing online assessment mechanisms and strategies that will lead to a fair assessment process for all. They are exactly that, recommendations, never impositions or absolute truths.

Every crisis leaves behind some positive elements in the form of lessons learned. COVID-19 should provoke a deep reflection in the design of education systems at all levels, with an impact on effective strategies to reduce the effect of the gaps affecting the use of technology in education. Precisely, in the specific case of the University, it should move from non-systemic digitalization to a real digital transformation of

all its missions in order to take better advantage of the coexistence of digital and face-to-face potentialities.

As a general reflection, the basis of the Asociación de Enseñantes Universitarios de la Informática (2020) Declaration represents a good lesson learned for education in crisis time expressed in five items: (1) flexibility must take precedence over excessive regulation; (2) the design of the teaching activity must be based on the available teaching staff, and this must have the necessary resources to carry out its activity; (3) teaching methodologies should be emphasized so that, with the support of technology, the emphasis is placed on the learning process; (4) training of teachers in pedagogical and technological aspects should be intensified; (5) social equity should be promoted.

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Chapter 8
Some Challenges for Universities, in a Post Crisis, as Covid-19

Ebba Ossiannilsson

Abstract As the COVID-19 pandemic continued to escalate, educators around the world had been encouraged to move to online and distance learning. Most governments around the world temporarily closed the educational institutions in their countries in the effort to contain the spread of the pandemic of COVID-19. The United Nations Educational Scientific and Cultural Organization (UNESCO) has estimated that the COVID-19 pandemic has brought unprecedented educational disruption with 1.2 billion students and youth across the planet affected by school closures. When education "moves home," what impact will it have on students, academics, administrators and senior educational managers, especially at universities? In this chapter, some challenges will be discussed, as well as the crucial implementation of the culture of open educational resources (OER) and issues of ethical sustainability, social justice and human rights to ensure the quality of accessible learning possibilities for all.

Keywords Challenges · Corona · COVID-19 · Opening open educational resources · Universities

8.1 Introduction

As the COVID-19 pandemic continued to escalate, educators around the world were encouraged to move to online and distance learning. The United Nations Educational Scientific and Cultural Organization (UNESCO) has estimated that the COVID-19 pandemic has brought unprecedented educational disruption with 1.2 billion students and youth across the planet affected by school closures. It has not only undermined confidence in the ability of public services such as education and health to respond to the crisis but has also raised more fundamental concerns about the possible erosion of human rights now and in the aftermath of the crisis. By respecting human rights in this time of crisis, more effective and comprehensive solutions for today's emergency

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and tomorrow's reconstruction will be created according to Gutteres from UNESCO (2020, 02 June).

Governments, University vice-chancellors, school principals and education policy makers around the world have struggled to make decisions about closing school buildings while maintaining the fair continuity of learning, which is a human right. Attempts have been made to create solutions to ensure the provision of active online learning, online student interaction and e-evaluation. These emergency practices in a crisis have led to a better understanding of the opportunities offered by online learning among university managers, teachers and learners. At this moment, educators are reflecting on the need to invest even more in creating solutions that will enable to offer high-quality and efficient digital education and to join forces to provide support for hundreds of thousands of university teachers. This chapter focuses primarily on higher education and its consequences in times of crisis. However, it must be emphasized that the consequences in primary school and kindergarten differ from higher education and are characterized in particular by strong social-emotional relationships, experiences, health issues, nutrition and fairness. For this group, this is maybe more important than professional and knowledge-related issues.

Although during the last 50 years there has been tremendous growth worldwide in the supply of education at all levels, COVID-19 became a catalyst to rethink education. This unprecedented situation will lead to innovation, sustainable changes and a paradigm shift in the coming months and years. The World Economic Forum (WEF) (2020a, 13 April) noted that the education system is in crisis and that our current education system is becoming irrelevant. Two weeks later, the WEF (2020b, April 29) stated that a crisis as this pandemic might be here to stay. The WEF argued for the need to update education by focusing on its relevance, job readiness, the ability to compete against smart machines and the creation of long-term economic value. The WEF emphasized that access, equity, inclusiveness, human rights (United Nations 1948) and quality must be improved to solve the global education crisis.

UNESCO is working with the Ministries of Education of affected countries to ensure that all children and young people continue to learn through alternative channels. UNESCO supports countries in mitigating the immediate impacts of school closures, especially on vulnerable and disadvantaged communities as well as in facilitating the continuity of education through distance learning (UNESCO 2020a). The Global Education Coalition initiative (UNESCO 2020b), aims to offer children and young people integrative learning opportunities during this sudden, unprecedented disruption of education. Investment in distance learning should both mitigate the disruption and provide approaches to developing open and flexible education systems both now and in the future. The response of UNESCO (2020a) is the campaign #LearningNeverStops. To minimize the impact of the crises even several other international recognized organizations have established partnerships, such as the Commonwealth of Learning (COL), and the World Bank. Their joint aim is to support education institutions around the world using open educational resources (OER) to smooth the transition to online learning during the pandemic.

This historic crisis has underlined the need to adapt educational systems to increase the flexibility of learning, to which UNESCO's Sustainability Goals for Education

(SDG4) has long been committed. In addition, their new initiative for the Futures of Education: Learning to Become (UNESCO 2020c) is based on the concept that education is a human right. Aligned with the SDG4 to ensure inclusive and equitable education and promote lifelong opportunities, the pandemic has highlighted the need for a crisis-resistant education system, which the European Commission has advocated since 2013 (EC 2013). Their aim is not only to meet the individual needs of students but also to strive for excellence and to increase competitiveness in the global context. Mishra (2020) argued that it is time for policy makers, educational administrators and educators around the world to reflect on the existing educational ecosystem. What kind of education system is needed not only to meet the SDG4 but also to achieve many of the other SDGs?

The combination of government transparency and public participation and oversight could help address three phases of the pandemic: open response, open recovery and open reform. Undoubtedly, the pandemic has encouraged us to think agilely, innovatively and creatively about what could be done differently in the context of not just these crises, but also for eventually future crisis. In the remainder of this chapter, these challenges, are elaborated, with particular regard to the SDG4, sustainability, human rights and social justice in ensuring the quality learning possibilities for all in a lifelong learning perspective.

8.2 Potential Future Scenarios

Many questions have arisen based on experience, research and practice due to the current crisis of the pandemic. Because of the pandemic and the urgent shift to emergency remote teaching (ERT), this academic school year has been unlike any other. Global organizations (e.g. COL, UNESCO, WEF and WHO), and recognized scholars have argued that online education will never be the same (Bates 2020; Bozkurt and Sharma 2020; Daniel 2020; Huang et al. 2020); Mishra 2020; Ossiannilsson 2020; Saavedra 2020; Wheeler 2020; Weller 2020). The year 2020 will likely be known as the year in which online education went mainstream. This unprecedented global change will forever be etched in the history of higher education (Brown 2020). History has taught that when there is a crisis or threat, especially an external one, no decisions or arguments are made to refuse change. Although, it is clear that there will be another narrative of emergency in remote learning and online learning (Bozkurt and Sharma 2020).

This pandemic has caused transformations in education, lifestyle, business, economies and society. This crisis has firmly positioned us in not only the fourth industrial revolution (Schwab 2016) but also the fourth educational curricula (Dervojeda 2020). In many countries, research is already being conducted to determine the consequences of the pandemic for society, learning and education.

In the coming months and beyond, the educational responses to COVID-19 will occur in three phases. There will be tension between emergency and survival modes and between planning ahead and mobilizing change. UNESCO's initiative, Futures

of Education: Learning to Become (2020c), is an example. This initiative is aimed to catalyze a global debate on how knowledge, education and learning need to be reimagined in a world that is becoming increasingly complex, uncertain and precarious. Before exploring the tensions, changes and lessons learned, in the following subsections, the three phases will be discussed, the stakeholders involved will be defined, and the actions to be taken at different levels will be described.

8.2.1 Three-Phase Response to COVID-19

Some headings in recent news around the globe have included the following: Universities: The future is here and it's online (Byrnes 2020); Academia in the time of COVID-19: Our chance to develop an ethics of care; University world news: Navigating uncertainty in the move to online learning (23 April 2020). Are we in a transformative moment in online learning? These headlines are signals, and we must respond to them.

Phase one is the current crisis and the response to the pandemic in moving to ERT and providing resources for universities to implement and expand online teaching and learning. In phase two, key issues could arise in returning to the post-pandemic new normality. Finally, in phase three, leaders will consolidate the achievements of the first two stages to integrate online education (which differs from emergency remote teaching) into the core values and organizational culture of schools, universities, communities and societies. There will be a need to co-create values, cultures and rules within new learning spaces to ensure fair, accessible, inclusive and equitable quality learning solutions that will make it possible to develop communities in a sustainable society. ERT should be considered as a temporary solution to the immediate problem (Bozkurt and Sharma 2020; Hodges et al 2020). According to Bozkurt and Sharma (2020, p. ii),

> [o]nline distance education involves more than simply uploading educational content; rather, it is a learning process that provides learners agency, responsibility, flexibility and choice. It is a complex process that requires careful planning, designing and determination of aims to create an effective learning ecology…. In other words, *online distance education* is one thing, and *emergency remote teaching* is another thing.

This distinction is crucial because the degree to which educators believe in distance education will play a significant role in its implementation in the post-COVID-19 world (Bozkurt et al. 2020). In considering distance learning online, it is necessary to go beyond the exchange of simple tools, tips and tricks, focusing instead on the changing needs of learners, the learning context and the availability and accessibility of tools. Recognized organizations and open education and online leaders have rightly argued that expanding online teaching and learning is no small undertaking (Bozkurt et al.; COL 2020; Coursera 2020; Daniel 2020; EADTU 2020; EDEN Contact Nord 2020; FutureLearn 2020; Hefferman et al. 2020; ICDE 2020; UNESCO 2020a).

Bates (9 March 2020) gave the following advice on how to move smoothly from campus education to online education: (i) seek professional advice before you start,

(ii) obtain the right technology, (iii) get organized, (iv) avoid long lectures, (v) watch the students' workload, (vi) avoid lectures altogether and (vii) do the best you can in the circumstances. Bellman (personal communication, 22 April 2020) recommended four objectives: plan, engage, acknowledge and involve. Ossiannilsson (2012), Ossiannilsson et al. (2015) and Kear et al. (2016) argued for the importance of information, security, mobility and collaboration in the digital transformation not only in urgent situations but also in the long run to ensure sustainability. Ossiannilsson et al. (2015) stressed that the ecosystem of technical, pedagogical, content, monitoring and evaluation was necessary to ensure an effective good transition to and implementation of online learning. In addition, online learning requires role changes, including focusing on learners' needs related to place, time, space, mode, path, mental and physical health and social context (Ossiannilsson 2020).

In the first phase, leadership and senior management are as important as pedagogy and technology. They will be even more important in the second and third phases. Online education and online learning are not the same as education on a physical campus, and they are not equivalent to emergency remote teaching. Leaders and governors must query the real role of higher education. Traditional higher education is aimed to educate people for a future we do not know anything about. No longer can we use traditional methods to educate people for an unpredictable future. In addition, assumptions regarding quality, excellence and competitiveness must be questioned, and new normality must be articulated.

Moving to the third phase will require that the shifting visions, missions and culture values in online learning be consolidated (Bozkurt et al. 2020). This process could be the most difficult because it will involve governance, leadership and management. Institutional leadership that plans and responds to the three phases could survive and even thrive beyond the current crisis (Bozkurt et al. 2020; Ice 2020; Ossiannilsson 2020). Expanding an institution to online teaching and online business requires serious resources and personnel (Bozkurt et al. 2020; Ossiannilsson 2020).

8.2.2 Levels in the Education Ecosystem

In building on an ecosystem and taking a holistic approach to quality and quality development in e-learning, open online education, and flexible distance education it is crucial to consider levels in the education ecosystem and how they are aligned. According to Kirkwood and Price (2016), and Ossiannilsson et al. (2015), the four levels are macro, meso, micro and nano. The macrolevel includes national and global general dimensions; the mesolevel refers to institutional matters; the microlevel refers to courses and modules; the nanolevel is the individual (Ossiannilsson 2017, 2018). In deciding to improve the quality of open online and flexible distance education, the choice of a quality model is influenced by these levels and their objectives.

8.2.3 In Whose Interest?

The quality concept in open online learning is complex and involves many stakeholders. Successful online learning requires teamwork, which is one of the differences between campus and online education. This may be the reason that some academics are hesitant in accepting online education, as they are used to power and control in the classroom.

Especially in the emergency stage, academics are advised to use the tools that are already available, be as responsive and transparent as possible, and if no institutional guidelines are available, ask for them and develop them. Daniel (2020) emphasized that giving full attention to reassuring students is more important than trying to quickly learn a new pedagogy or technology.

Executives, leaders and managers are advised to develop a straightforward institutional plan for defining the standard model, letting learners know what to expect, not overdoing the technical response, thinking pedagogy before technology, respecting and maintaining decent work and learning environments, and paying particular attention to health, satisfaction, and motivation. Furthermore, it is important to attend to learners who are vulnerable and already at risk. Administrators, librarians, instructional designers, information and communication staff, and so forth have new roles to play because of the need to support students in distance learning wherever they are. Moreover, in implementing open education, not only will there be changes for staff and students, but there will also be a need for long-term changes to curricula, 4.0, course design and resources (Dervojeda 2020; Inamorato dos Santos et al. 2016; Huang et al. 2020).

In the current emergency, when the campus goes online, the focus is on continuity and discontinuity. However, in the next stage, it will be necessary to revise and develop a design for the future of online learning in relation to current research. It is crucial to promote change, innovation and excellence in the ways people think and socially interact online. In addition, the benefits of flexible places, methods and ideas must be considered, and student support must be integrated into the system; therefore, all stakeholders must be involved. Ethics, empathy, self-confidence and social-emotional issues should be addressed through learning analytics, and all four forms descriptive, diagnostic, predictive and prescriptive should be used to ensure success (Uhomoibhii et al. 2019).

From the students' perspective, several factors are required in self-determined learning, such as presence, as defined by Bozkurt and Sharma (2020) teaching presence, cognitive presence and social presence. Furthermore, trust, self-confidence, interaction, clarity, transparence, flexibility in time, space, media, etc., motivation, accessibility, personal learning, humor and keeping it simple and safe are crucial (Ossiannilsson, 2020). The principals of interaction described by Moore in (1989) are still relevant: student–content interaction, instructor–student interaction and student–student interaction. Atkinson (2020) argued that interaction depends on involving and supporting students online, as each one has individual needs. He argued that online and distance learning are focused on engagement and support, while on-campus

learning focuses on support and engagement. This change in perspective is crucial. Bozkurt and Sharma (2020) advocated building support communities and sharing knowledge and experience to enable efficient and meaningful learning processes. These learning processes should be aimed at not only pure learning but also therapy, empathy and care. There should be commitments to support students and introducing teaching and learning based on a caring pedagogy, not just a didactic and insensitive pedagogy. Achieving this process includes extending participation and promoting social justice and equality, which should remain on the agenda. An empathetic approach will not be about how to successfully teach educational content but about how learners relate to this crisis.

8.3 OER as Change Agents

This global crisis caused by the pandemic has crystalized the need for policies that support universal access to learning resources (Creative Commons 2020; Huang et al. 2020)**.** Never before have so many high-quality, wide-ranging initiatives, software, tools, publications, recourses and ideas been shared by individuals, teachers, publishers, companies and organizations around the globe in communities and among networks. An obvious response is to recognize the value of openness (Huang et al. 2020). Hung et al., emphasized that new effective pedagogical approaches are needed to keep learners motivated and engaged during this long period of online learning. New teaching approaches are needed to meet the challenges. In this context, several researchers proposed the use of open pedagogical practices (OEP) and resources (OER) to provide an engaging and interactive experience. The judicious application of OER, in combination with appropriate pedagogical methodologies, well-designed learning objects and the diversity of learning activities, can provide a broader range of innovative pedagogical options to engage both educators and learners to become more active participants in educational processes and creators of content as members of diverse and inclusive knowledge societies. OERs have the potential to achieve inclusive education, which aims to ensure that learners with different needs and preferences have equal opportunities in accessing learning resources, services and experiences in general which is a human right.

Almost all international organizations, institutions and recognized scholars have established special initiatives, hubs and webpages to share resources, webinars, crash courses and support. Several articles and blogposts have confirmed that the speedy transition to the online format has shifted the focus from content delivery to student engagement, ethics and social-emotional relevance fostering the joy of learning together.

This crisis has undoubtedly revealed how critical the implications of openness are for society, social justice and human rights (Huang et al. 2020). Open education and open-access communities are uniquely positioned for immediate response and

resilience building. UNESCO's SDG4 advocates accessible equality, equity, inclusive quality education and lifelong learning for all, as do COL, EU and similar organizations. Mishra (2020) addressed the issue of equitable access to quality education for all at the time of crisis and asked how such systems could be created.

An important step toward quality education and universal access to information and resources was taken when UNESCO's general conference adopted the OER recommendations (UNESCO 2019). It has been highlighted as a milestone, and it contributes to the building of open and inclusive knowledge societies to achieve the UN SDG. The recommendation provided five objectives that should be focused on facilitation of OER adoption, namely:

- Building capacity of stakeholders to create access, re-use, adapt and redistribute OER
- Developing supportive policy
- Encouraging inclusive and equitable quality OER
- Nurturing the creation of sustainability models for OER; and
- Facilitating international cooperation.

The recommendation and their implementation strategies, monitoring and evaluation processes will support the development and sharing of open-licensed learning and teaching materials befitting students, teachers and researchers worldwide. OERs are learning, teaching and research materials in any format or medium that resides in the public domain or are under copyright and have been released under an open license, which permits no-cost access, re-use, re-purpose, adaptation and redistribution by others (UNESCO 2020d).

To achieve the SDG4 goals and to implement these recommendations, appropriate policies must be implemented. In opening up, moving to digital solutions, and scaling-up with empathy for learning and working environments, Inamorata dos Santos' (2016) recognized framework could serve as a guideline. This framework considers the holistic ecosystem required to open up education, and it extends OER and open access to include 10 dimensions of open education. The ecosystem of quality embraces management, leadership and strategies for curricula, course design, content, design and delivery and support for learners and staff (Kahn 2014; Ossiannilsson 2012; Ossiannilsson et al. 2015).

This crisis has forced everyone to set a new agenda. The digital transformation of education is no longer an option. When it was extended to everyone, introduced on a broad front, and moved to mainstream efficiency, quality improvement, creativity, incentives, strong leadership, infrastructure and innovation became visible. Extensive initiatives in opening up and using OERs and free software are now widely practiced by both academics and learners, which has led to a comprehensive culture of sharing.

8.4 Discussion and Conclusion

8.4.1 Lessons Learned

One lesson learned from this crisis is that the role of education is related to changes in socio-cultural, economic and political governance values in times of need. Caution is needed to prevent overshooting our initial response to the potential of online education in these challenging times. We could do a great disservice to our learners and their communities if we do not recognize that in the long term, designing good online education is complex, and it differs from emergency remote teaching. Söderholm (personal communication 28 April 2020) argued that because of COVID-19, individuals and societies around the globe have become more digitalized than ever before. Although the development and use of technology and digitalization are increasing rapidly, it has become obvious that the digital transformation in education concerns people more than technology because it is about cultural changes in attitudes, ethics and values, which are necessary for the acceptance of new applications, teamwork without borders or the limitations of time and space and societal changes. The pandemic has shown that educational institutions around the globe have had the courage, competence and volition to change rapidly, agilely and at scale. The transformation was implemented autonomously with innovation and creativity.

Another lesson learned is that transformation is possible, and it is of value to work with a sense of urgency. An additional lesson is the importance of agile approaches thinking globally, acting locally and striving for sustainability that is innovative and creative. The focus should be on the importance of widening the perspective on learning, lifelong learning, action learning and the merging of formal and informal learning. Even a lesson learned is that institutions that already have invested in a solid digital infrastructure, trained in new digital working methods, and introduced personal teaching are able to shift to remote learning more effectively than others.

When education and learning take place entirely online, both teachers and students need to adapt their time and working methods. It could be difficult at first to regulate social-emotional concerns, personal learning, study and work habits. Thus, it is important to create routines by dedicating time and places for work and study. It has already been proven that continuous online learning, especially in phases two and three, is different from temporary remote education (Bozkurt et al. 2020; Bozkurt and Sharma 2020; Ossiannilsson 2020).

It should not be assumed that online studies reproduce exactly what was done in the classroom or what was done during the urgent, temporary remote education stage. Unfortunately, in many situations, this assumption could hinder the move toward modern open online learning. Instead, in the twenty-first century, education should be aligned with the fourth industrial revolution (Schwab 2016, 2017), which has changed the ways we live, work, communicate, interrelate, communicate and learn. In the many futures of education, learning will be learning to become. Furthermore, there have been calls to adapt to the fourth pedagogical revolution and curriculum 4.0 (Dervojeda 2020). It is important to consider, encourage and facilitate the social,

ethical and emotional aspects of learning. Additionally, it is crucial that students discuss and learn from and through each other in collaborative learning and peer learning. Other aspects to consider are motivation, enjoyment and fun in learning.

To achieve successful organizational change, it is crucial to consider the ecosystem, organization, governance, leadership, infrastructure, pedagogy, technology, digital resources, preferably OERs, curriculum, course materials, assessments and exams. All staff and students must be involved, including those who are vulnerable (i.e. leave no one behind). In addition, trust, cooperation and solidarity are important for success.

When education moves home, it is important to take care of the working environment. It is important to maintain a regular routine and plan the day and week ahead, even break times, avoiding "holiday" mode. Maintaining social contacts are crucial, so prioritize video meetings with fellow students and colleagues, even if it is just to catch up and socialize.

The transition to distance learning became a rapid "crash course" for many stakeholders. Some of the most difficult challenges. The introduction of alternative teaching methods and digital solutions has accelerated, and it has encouraged teachers to develop digital competences. Digital learning environments had monitoring students' work, how they work and the decisions they make. Thus, the entire learning process has become visible. The teachers gained better insights into how students derive answers, which could be much more interesting than calculating the number of correct answers on a test, especially skills that cannot be measured by tests alone, such as problem-solving. However, a main question for many teachers concerned how to build a social presence from a distance. Nevertheless, it is crucial to focus on learning regardless of the modality. It is necessary to reconsider the educational system and concentrate on learning. The current annual format, which emphasizes examinations, does not encourage learning.

Dealing with the present pandemic has required rapid responses and deep strategic thinking. Rapid responses are needed to keep people safe and healthy and deep thinking is needed to implement appropriate systems and practices that cause the least damage and have positive implications for the future. In the current context, quick fixes to address learning needs have been woefully inadequate. Instead, there has been a great call for distance and online learning, which should be heeded by teachers and educational institutions. It is time for national governments to rethink their strategy, which is working now and will continue to work in the near future. Deep strategic reflection must focus on key issues that require collective responses to overcome the current crisis and build a new world order for education in the post-pandemic global context.

8.4.2 Conclusions

The COVID-19 pandemic has revealed the fault lines in education systems around the world. It has forced educators worldwide to consider the degree to depend on

personal education on many levels. It has also exposed the false perception of the quality of face-to-face education compared with online learning. It is time for policy makers, educational administrators and educators around the world to reflect on the existing educational ecosystem.

Higher education institutions in almost every country have become aware that this unprecedented situation will lead to a paradigm shift in the coming months and years. This experience will lead us to sustainable change. Top universities and research institutes are now offering their best expertise to respond to the pervasive need for innovation in higher education.

Following the pandemic, the new normality will be about change, reorientation, agility, quality and sustainability. This period of time has also prepared us to deal with and respond to other crises. Both studying and working lives have changed in only a few weeks, the digital transformation, and digital literacy and competences have become important for both individuals and organizations. There is no doubt that the opening and digital transformation of education primarily concerns people, their habits, behavior, adaptability, innovation, creativity, values and attitudes. This crisis has also explicitly demonstrated the role of education in building a growing healthy and sustainable society based on democracy, social justice and human rights.

Remote learners need to learn from anywhere and across time zones at any time. The technology and devices required to access online learning are not equally accessible to all; therefore, online learning is an additional challenge for some learners. It has become obvious that vulnerable learners have suffered during this emergency phase. There is a need to rethink issues of equity in times of crisis. A social safety net must be provided for the most vulnerable to ensure that they have easy access to education.

Although the forthcoming educational scenarios will include blended learning, they will be more likely to be agile and flexible in all means in the move to online education, which will be a strategic priority in achieving excellence and maintaining competitiveness in every institution. A sustainable, smart society will require not only the access to digital platforms but also the ability to adapt agilely, innovatively and quickly to new ways of communication. Such access and ability will enable us to prepare for the UN UNESCO initiative, Futures of Education: Learning to Become, which goes beyond sustainability goals, aiming at education in 2050.

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Part II
Teachers Support in Crisis

Chapter 9
From Classroom to Online Lessons: Adapted Methodology for Teachers

Alberto Corbi and Daniel Burgos

Abstract Any private teacher, school, college, or academic institution might suddenly be challenged to move from an onsite (face-to-face) methodology to an online one. This drastic, dramatic change can happen overnight, as proven by the response to the rapidly spreading Severe Acute Respiratory Syndrome Corona Virus 2 (SARS-CoV-2), commonly known as COVID-19. Between March and April 2020, around half of the world's educational institutions found themselves closing their doors and completely shutting down all conceivable classroom activities. Fortunately, educators found their way around this partial suspension by swiftly switching to an online format. This entailed moving their classes from the typical face-to-face setting over to the Internet, overnight. For the most part, teachers could count on the help and technical support of their home institutions. Sometimes, however, teachers felt somehow forced to figure out by themselves how to carry out such a colossal transition. Independently of the path taken, it is worth dissecting and analysing this type of contingency, the associated undertaken procedures, adopted strategies, and even the necessary stage tricks as well. In this article, we summarise the educational standards related to e-learning and review the theoretical background and research literature around online teaching. We also present the most recent advances in the aforementioned fields. It may seem that the methodologies associated with classroom and online teaching do not have much in common but, as we will show, there are plenty of overlapping areas and large bits of knowledge that can be transferred from the former to the latter. In the few cases where this is not possible, we also itemise the possible solutions.

Keywords Face-to-face education · Online learning · Confinement · LMS · Virtual classroom · Lab and group activities · Online exams

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9.1 A Shift in the Educational Paradigm

Let's face it: catastrophes have happened in the past and will undoubtedly happen in the future. Just like the COVID-19 disease outbreak (Huang et al. 2020) that has sadly shocked the entire world during the spring of 2020, other alterations in the *status quo* may also take place: wars, terrorist attacks, fuel or energy shortages, environmental disasters, regional famine, etc., just to name a few. Truth be told, this pandemic episode could have perfectly been the first episode ever having a tangible, simultaneous and worldwide impact in almost all educational systems.

As stated, these alterations may also affect the educational sphere and may entail a sudden change in the educational methodologies applied. The most foreseeable immediate adjustment would normally have to do with the temporary interruption of ordinary classroom activities. However, should the same contingency pursue for an indefinite length of time (*sine die*) and should digital communications, fortunately, still operate (e.g. cellular data networks, access to the Internet, etc.), educators may decide to execute a sudden transition from a face-to-face (F2F) or ordinary educational methodology to an online and home-based format. This decision may rest on the shoulders of the government of a country, a supranational decision-making body, the school system of a district, a specific academic institution, a subset of the teaching community, or a segregated group of concerned educators.

The academic institutions of China were the first to adopt this change in paradigm during the COVID-19 pandemic. With more detail, universities in the Chinese city of Wuhan, where the pandemic began, initially decided to simply postpone the re-opening of the different campuses. After a few weeks, it was clear that it would take months to provide a successful vaccine or an antiviral drug to fight against this elusive (and tragic) disease and its associated symptoms. Quarantining students for weeks or months would have had a severe impact on the campus economy—needless to say, on the lives of the students (and on the corresponding academic grades). According to Wang et al. (2020), most teachers had to resume their tasks using the so-called *information technologies* in combination with legacy broadcasting methods. As expected, this has raised very serious challenges:

- Professors need to precipitously engage in atypical teaching methods. This usually entails a steep learning curve for educators in an emeritus position, which may, in turn, have an impact on the quality of the learning experience.
- Learners in rural regions may not have decent access to the Internet and this may lead to inequalities and discrimination based on the geographical location and economic situation.
- Teachers/institutions providing recorded classes (now very easy, as we discussed in Sect. 9.2) may face legal problems if recordings are leaked outside the campus infrastructure.

Regarding pre-college academic tiers in Wuhan, the situation seems to have been comparatively easier. The Chinese Ministry of Education has estimated that over 220 million primary and secondary students are, at the time of this writing, home confined.

Remarkable efforts were carried out to deliver, in just a few days, the corresponding curriculum through ordinary television broadcasts, the Internet and Chinese-specific social online sites. In the case of this country, these social networking websites have proven to be helpful for informal education.

The second country in the list to establish similar directives was India, where its national government initially issued recommendations and personal behaviour guidelines related to social distancing among students. However, after a few weeks in which the situation reached an ungovernable turning point, the closure of all educational institutions was decided. With more chronological detail, a petition was signed online by more than 50,000 teachers asking for these types of measures, which the government originally considered too radical to undertake.

The cases of China and India are the first-ever, test-bed lab experiences regarding student confinement and *sudden transition to e-learning environments* (STeLE). However, at the time of this writing, almost all educational systems have followed a similar path. This is the first global STeLE event and it is worth analysing the current status of online classroom methods, reviewing the pros and cons of such an unexpected, mid-course change in the teaching and learning practices.

Historically, this type of transition has taken place before and these instances have been analysed accordingly (Nemanich et al. 2009). Past research efforts have carefully examined the differences between and the effectiveness of conventional classrooms and online learning environments. Spivey and McMillan (2014), for example, discussed the difference in the assessment methods between online and face-to-face education. Kemp and Grieve (2014) analysed the performance of tests carried out in both educational worlds. Xie et al. (2006) advocated for a blended learning setting in which class discussions and debates are later kept alive through online tools, such as online bulletin boards and web forums.

In contrast with those researchers who have seen the benefits of online education as a complement to their ordinary school activity, some experts have determined that *virtual learning methods* should be entirely avoided. For instance, Szpunar et al. (2013) suggested that students may tend to *procrastinate* or be driven by excessive mind-wandering when studying or working from home without the watchful eye of a teacher figure. On the other hand, teachers are also humans and can, therefore, also find themselves some lost in a STeLE turning point. In Willis and Cifuentes (2005), educators were advised and encouraged to receive previous training before fully switching to an online environment.

9.2 Anatomy of a F2F Classroom Lesson

To fully characterise and scrutinise a STeLE incident, we first must dissect the types of ordinary (F2F) classroom activities, the associated tools and the needed methodologies. The reader might be able to expand the following list, but to our knowledge, all school and college academic labours can be distilled into any of the following.

9.2.1 Lecture-Related Activities

These are the most common and easiest teaching actions to be ported to their online counterpart. Typically, a lecture session just requires either a set of slides or a timely, arranged, continuous set of blackboard sketches. The first ones are usually generated with presentation software such as Microsoft PowerPoint, OpenOffice Impress, or a similar software product. Despite the very decent and competent alternatives, we recommend using W3C-related standards, which were also suggested by Albinson (2016) and Thorogood (2016). At the very least, educational institutions should consider open-source alternatives.

Asides from discrete presentation materials, teachers can also beam the entireness of their computer screen and display a more realistic workflow. These visual materials are then usually projected to a wall or special canvas with the help of projectors and are accompanied by the appropriate light conditions. Blackboard sketches are the oldest of the two methods. Every classroom in the world is equipped with a black- or whiteboard drawable surface. As we will stress in Sect. 9.2, despite the simplicity and worldwide ubiquity of this elemental tool, it is still surprisingly difficult to capture the essence of blackboard teaching in online settings. Although there are some good hardware and software combinations that mimic the operation of a real blackboard, it has not been until very recently that manufacturers have achieved the necessary accuracy, level in the immersion experience and feeling of continuity in the *virtual stroke*. Blackboard sketches are more important than they are considered a priority. They add a kinematic, two-dimensional layer to the explanations being given by the lecturer.

More modern versions of the traditional blackboard canvas comprise *electronic whiteboards*. These systems are normally conceived as a mix of a slide projecting device and a regular dry-erase whiteboard, which also hosts the beamed computer screen.

9.2.2 Simultaneous Playback of Audiovisual Material

Sometimes teachers rely on videos, audio, or a combination of the two to deliver specific concepts and ideas. These audiovisual educational resources could have been created or edited by the teacher or by third parties (copyright issues may apply in the latter).

The educator may want to include a real-time voice-over that accompanies the video narration with extra comments and necessary explanations. It is therefore important for the teacher to be able to synchronise the recording and the footnotes that comprise the necessary adaptations. It might also be required to pause the video in order to embed detailed annotations or even radically halt it until a future class.

Although this type of activity can immediately be carried out in a classroom setting, it is more difficult to implement a similar experience through online learning

platforms. Strange as it may seem, only Adobe Connect is directly capable of such an important functionality.

9.2.3 Laboratory-Related Tasks

This category of activities comprises the real-time execution of some sort of practical exercise for the duration of the class. This exercise can be carried out individually or in groups. Regarding group work, we redirect the reader to Sect. 9.7. Of course, real lab-based activities can be very complex and varied and may require extra learning materials—from specific computer programs to medical supplies. In the context of this chapter, we will focus on those tasks that can be accomplished with the help of simple tools such as pen and paper or an personal computing infrastructure. That is, we leave behind laboratory experiences that require the use of complex to acquire equipment.

9.2.4 Discussion Panels

Discussion panels are a very nice educational tool because they promote critical thinking and help de-stress the classroom environment. They require no additional tools or preparation. The teacher just presents an idea to the classroom and students can freely interact and contribute with new opinions and counterarguments. Formal (gradable) group debates can also be established. The nature of class debates is, *a priory*, relatively easy to implement in online settings. However, as we will see in Sect. 9.4, practical issues can still take place.

Uplifting discussions can also occur (and even continue) in some sort of offline mode through, for example, an online bulletin service, an Internet forum, or the supervised chat tool in the school's LMS. In these sites, students can freely post new thoughts or expanded contributions in order to complement the positions previously defended in the F2F class. Not everything is so idealistic: some students find it difficult to engage-back in the discussion when this takes place asynchronously (e.g. a portion of it during the formal classroom time and another portion in an informal/online manner).

9.2.5 Exams or Evaluation Activities in a Defined Time

An important step in the learning process is the evaluation of the acquired knowledge and competences. In a F2F learning environment, this may correspond to ordinary real-time exams, oral exams and activities to be carried out within a defined schedule. These tasks usually need surveillance by the teacher or assistants while they are

being carried out to guarantee that students do not copy. Online domains suffer from a huge potential drawback here. A surveillance team can be easily built up with personnel from the faculty staff, but it is clearly impossible to keep an eye on the written exam of each student sheltered at home during a STeLE episode. Real-time oral exams could be, in principle, easier to monitor because faked or read-aloud answers (whose associated knowledge has not been fully internalised) are almost straightforward to discriminate by the examiner. The exam committee could even ask again or reformulate the question in case of doubts.

Written tests, when carried out from home, can become a clear (and uncontrollable) focus of plagiarism. For this reason, it is recommended that exams emphasise the check of competencies rather than the mere (and hasty) acquisition of knowledge. Similarly, the use of anti-plagiarism solutions is also recommended. These services are usually not free. Nevertheless, it is possible to connect with free online versions. For instance, the Measure Of Software Similarity, or MOSS (Bowyer and Hall 1999), is a tool freely offered by the University of Stanford that can help computer science teachers detect plagiarism events in computer code. Oral examinations may also entail the presentation session of a bachelor, master, or even a doctoral thesis.

9.2.6 Student Presentations

As tacked in Sect. 9.1, projected slides are frequently used in classrooms all over the world nowadays. In practice, they are mostly replacing the blackboard as the main system for presenting ideas to a common audience of attendees gathered in the same room. As also commented in the aforementioned section, both teachers and students can use the same projection devices and carry out their own presentations. As it might be easy to assume, almost every online learning tool (reviewed in Sect. 9.2) provides the necessary underpinnings to allow the uploading and display of slides.

9.2.7 Async Assignments and Tasks Performed in Groups

These tasks usually take place outside of classroom time. That is, they are taken care of asynchronously, but under the time given by a pre-established due date. These student async tasks (SAT) are nothing more than (and known as) *homework*. SATs are commonly appointed by the teacher and learners know how to fulfil them and how, where and when to submit them. In online campuses, these procedures normally take place through the intercession of an LMS.

Group work has turned out to be very important in education, as evinced by Haller et al. (2000). Besides, it can have a very tangible impact not only on children and teenagers (Corbi et al. 2018) but also in college-related degree programmes. Almost all the academic scenes listed above (e.g. presentations, debates, lab sessions, etc.) can be achieved in a group dynamic. In F2F teaching, the composition of groups can

be easily delineated. The physical boundaries of a group can also be effortlessly laid out. For instance, each group can sit down at the same table or leave a prearranged physical space empty. In online environments, it is also relatively easy to implement workgroups. Perhaps, the leading part in this area is the LMS (later reviewed in Sect. 9.1). Virtual Classroom Environments (tackled in Sect. 9.2) have fallen behind in this context and although they allow for the real intervention of students, they are not usually quite ready for group-based tasks and inter-group communications.

9.3 Methods Used in Online Learning

Online environments usually rely on two fundamental technologies: the online campus and the virtual classroom system, which we will review next. There may also exist several other tools *orbiting* around this *binary system*, but these two are the most relevant ones.

Before we continue, we should recall that online learning is not something new. It has been around since the inception of the Web.

9.3.1 Learning Management System

A Learning Management System (LMS) is server-side software responsible for deploying the online campus. It is aimed at providing the necessary digital environment for:

- Distributing assignments and submitting homework.
- Keeping track of school schedule and managing grades.
- Administering the class roaster.
- Allow the viewing of master classes and recorded classes.
- Being the image of the academic institution (and, in many cases, the entry point into the digital side of the academic institution).
- Delivering learning materials (e.g. documents, videos, etc.).
- Scheduling virtual classes and revision appointments.
- Displaying global or classroom-related announcements.

From the student perspective, the LMS is just a simple web page or, in its more modern conception, a *web application*. Besides, most LMS can display a mobile version, which makes it straightforward to deliver a so-called *app* that can even be hosted in one of the usual mobile application stores. From the institution viewpoint, the LMS is a web service or a set of web services that consume the information stored in a structured database (normally, also run in a service). These web services can operate from a dedicated computing infrastructure located at the academic institution's premises (*local hosting*) or, as it is trendy since recent years, from a *cloud* instance. LMS are nowadays very performant, as attested by Caminero et al. (2013)

and have frequently taken care of questions related to accessibility, usability and security. Learning management systems are even capable of massively scaling to host and provide service to thousands of students and for all purposes, the de facto are able to operate as MOOC instances.

Structurally, learning management systems can be very different from one another. Despite this fact, at the end of the day, they are quite similar in the achieved set of functionalities. It is even relatively effortless to switch from one LMS to another. Besides, information standards have been developed to allow the painless replication of educational content from one LMS to another. One of these standards is SCORM (Bohl et al. 2002). Certainly, this standard is nowadays in an abandoned state, but almost all LMS are still compatible with it. Finally, these LMS can deliver the content needed by complex activities, like virtual laboratories as evinced by the research works described in (Albiol et al. 2017; Corbi et al. 2019).

9.3.2 The Virtual Classroom Environment (VCE)

The virtual classroom environment (VCE) consists of the digital environment in which educators and students meet in real-time to foster the learning experience. This new setting is normally something radically different from the online campus environment. Together with the LMS (commented above in Sect. 9.1), most e-learning solutions rest on these two *digital legs*. A VCE can have many facets: a pure W3C standards-based page, a plugin/applet-enabled (Oracle Java, Adobe Flash, etc.) web site, a desktop app, or a mobile app.

In the last two scenarios in the previous list, the application will be routinely written using a native (or almost native) technology or programming language (e.g. C#, C++, Java, Swift, etc.). Nevertheless, these types of apps can also be developed with web standards (Jensen 2017). The facet of the associated software seen by the teacher can and will usually be different from that perceived by the students. For instance, the teacher may be using a native desktop app to present and share audio and video. In contrast, students may be required to attend the class through, for instance, an Adobe Flash-enabled web site.

The virtual (and real-time) classroom mainly relies on two technologies or communication standards as well. These two electronic (and regulated) standards respond only to the direction (from an engineering perspective) of the video stream. Normally, the teacher streams the lecture to the students, but technically, this is not a *multicast* emission—it is a *unicast* one. This one-to-one connection just takes place between two isolated endpoints: the teacher's computer and the chosen platform architecture (a specific server, a cloud provider, etc.). Behind the scenes, the lecturer's endpoint sends video packets using any of the following standard protocols: RTMP or UDT. Perhaps, the newest one is SRT, which offers the following advantages:

- High-quality protection against jitter and packet loss.
- It uses 128- or 256-bit AES encryption to protect content. This is very important in the case of educational environments.
- Open source. Although SRT was originally devised by Haivision, the protocol is now supervised by the SRTAlliance and the protocol is 100% open source. Haivision is a company that has already been involved in video streaming in the sphere of education, as tackled by Navratil and Ubik (2012).

Private video streaming protocols can also be exploited. The YouTube video streaming site is a good example of this (Pires and Simon 2015). Students, on the other side, operate in a video-on-demand (VOD) and multicast manner. Aside from the immediate possibility of attending a class from the comfort of their homes, VOD-based lectures have other advantages. Perhaps the most significant one is the ability to record the current video session and replay it whenever necessary. This viewing is mostly done through the well-known HTTP protocol and the HSL video delivery layer devised by Apple, Inc.

The level and quality of the participation of the students during a VCE meeting depends on the number of attendees during that meeting. Generally, students have access to a chat room that, in turn, makes use of a specific session initiation protocol (Johnston 2015). If the enrolment rate is reasonably low, the teacher (or another member of the institution staff acting with the role of *session admin*) may enable the video and audio input of all the students or a subset of them. As of today, most digital devices (personal computers, laptops, tablets, etc.) include a webcam, so it is reasonably possible to turn the VCE setting into a fully multiplexed videoconference one.

If the VCE setting is a web-based one, the video participation will usually be based on the recent WebRTC (Johnston and Burnett, 2012) standard. This electronic paradigm provides web browsers (even mobile-based ones) with the capability of executing real-time communications. Of course, this might entail a potential security breach, however, this has also been addressed by standard bodies (Burnett et al. 2015). The research work carried out by Karabulut and Correia (2008) depicts a good breakdown of the current web-based video conferencing systems for learning and teaching. Should the VCE be backgrounded by a native mobile or desktop application, the access to the camera and microphone will depend upon the rules established by the operative system of the device.

The main downside regarding the use of microphones by the students is that quality can be significantly different from one speaker (student) to another (or the teacher). Another disadvantage may emerge regarding the intervention of all students during, for instance, a simultaneous talk in a class debate (discussed in Sect. 9.4). As the reader can see, all options are mainly commercial products (though some of them offer free tiers, redeemable coupons, or are free of restrictions under special circumstances, like the COVID-19 outbreak). Despite this profit-making-oriented landscape, free and open-source efforts (mostly based on WebRTC) are also gaining momentum.

9.4 Current Online Methodologies

Until now, we have summarised the main (and most) used methods and tools around online learning. We will now expose some of the newest approaches related to this realm of education.

- Multi-camera setups for VCEs. Most e-learning virtual classroom tools are only capable of managing a single camera. However, some learning experts advocate for the use of several video streaming devices, each of them pointing at a specific area or surface. Multiple screens add dynamism, fluency and rhythm to the VCE session and contribute to the sensation of immersion.
- Learning management systems are currently transitioning from in-house deployed solutions to cloud versions. In this context, worldwide and reputed technology companies do offer free, free tiers (also known as *freemium* plans) for their solutions related to education (Alabbadi 2011). The two most relevant ones are Google (Ventayen et al. 2018) and Microsoft (Martin and Tapp 2019). The biggest advantage of using such services is the sensation of persistence (no longer necessary to *press Save*) and agility while collaborating with other classmates. Of course, not everything regarding the use of these cloud-based workflows is positive. Perhaps, the biggest downside is the tendency to keep all the student data centralised in the infrastructure belonging to a third-party actor (Apostu et al. 2013).
- Automatic correction or verification of the correctness of exercises (Corbi and Burgos 2015). Online campuses can integrate tools and services that perform full or partial (pre)correction of student homework.
- Real-time collaboration, that is, the ability to create and edit documents or work on projects jointly through, for example, Microsoft's Visual Studio Code (Strauss 2019).
- Complex lab experiences can be attained with rich simulation packages and thanks to the use of virtual containers (Corbi and Burgos 2017; Burgos and Corbi 2018).
- LMS enables the digital monitoring of learners. In turn, this can be achieved in many ways and protocols (Bakharia et al. 2016). Each learning platform is free to implement its own solution (Wan et al. 2017; Kadoić and Oreški 2018; Corbi and Burgos 2014). However, learner monitoring has been recently standardised by several federal agencies in the United States. These monitoring engines can even operate independently of the size of the enrolment rate (Pireva et al. 2015) and can also take place during VCE sessions (He 2013). The monitoring process itself should have a clear pedagogical goal and student intimacy should always be respected. Most LMS platforms can anonymously report this audit data.
- Once the path of a student has been examined, automatic recommendations about their curriculum, behaviour and status can be routinely issued by the online campus (Burgos and Corbi 2014; de-la-Fuente-Valentín et al. 2014) without the intervention of the teacher/tutor.
- LMSs are nowadays able to display a myriad of contents and experiences thanks, not only to web standards but also to modern agreements among electronic and computing industry actors. These contents are also more dynamic, more engaging,

and more immersive. The main connectivity standard behind this new era in e-learning is the Learning Tool Interoperability, or LTI (Severance et al. 2010). LTI allows the embedding of an external educational site (provider) inside the LMS (consumer). The student transparently interacts with this third-party element and all achieved scores/evaluations are securely sent back to the official grade engine (run by the LMS).

- The so-called *notebooks* enable the display and execution of complex assignments in a single interactive document. Notebook-based options available comprise the Jupyter project (Kluyver et al. 2016) and RMarkdown (Xie et al. 2018), to name a few. Besides, they can operate in cloud environments, alleviating the need to install intricated software packages. Good examples are MyBinder (Jupyter et al. 2018) and Observable.
- Most LMS have been designed interact with social networks (Deng and Tavares 2013), thus extending the learning experience through informal settings.

Digital campuses make it easy to host and post not only recorded VCEs, but also quick video and audio messages, which have demonstrated to have a huge prevalence these days (Abramova et al. 2020) among teenagers and young learners.

9.5 Summary and Final Recommendations

In Sect. 9.2, we listed the common didactic activities that are part of the academic life in schools, no matter the level. When transitioning to an online scenario, it is not always possible to establish a bidirectional link between the methods and *stage tricks* that teachers use in a F2F setting and those applicable in the latter.

Lecture-type classes (and presentations) are perhaps the easiest ones to implement and carry out in distant learning context. As also stated in Sect. 9.2, synced video streaming is, to our surprise, not so straightforward to see it working in most current implementations. From our point of view, this learning resource has been key in the education realm since the inception of consumer video playback devices (VHS, Beta, etc.), and we believe it is unfortunate that students and educators cannot benefit from it, independently of the platform used for VCEs and without requiring extra technical knowledge. Real-time discussions (between students and/or between the students and the teacher) can take place, but with some degree of difficulty due to technical restrictions. These obstacles can be avoided if vocal participation is replaced by polls and/or quizzes and occasional chat messages.

Group and lab work are also difficult to implement with the current strict technology schemas that academic institutions offer to the students. Our sincere (and humble) recommendation is to *outsource* the technical implementation of these type of activities to the taste and preferences of the students (or groups of students) themselves. One group might decide to talk on the phone, another might prefer to use chat applications, another may use videoconferencing software, etc.

Without the shadow of a doubt, the most complex and polemic task to transfer to online settings is real-time exams. Given the fact that the student is isolated at home and without surveillance, it is impossible to guarantee the absence of plagiarism. Our initial suggestion is, when possible, to carry out oral exams (through any videoconferencing software). An interview with a student not only can be used to test his/her competences, but also to guarantee an always welcome personalised attention and individual follow-up. If these videoconferencing-based examinations are not viable, written tests should be designed especially for each student. They should also be laid out in a way that encourages the learner to complete each task in a swift and lively way, and within a narrow span of time. By following both advices, the examiner can rest assured that his/her students will feel enough stress to even consider asking for outer help or posing questions in pre-organised chat groups.

9.6 Conclusions

In this chapter, we have initially discussed the possible reasons that could be behind a sudden transition from an ordinary classroom setting to an online one. Until now, the only event responsible for a global (and drastic) turning point has been the COVID-19 pandemic that has recently brought the world to its knees. This same incident has had a very tangible impact in the educational sphere and has been responsible for the aforementioned sudden change in learning practice.

We have subsequently reviewed the associated adversities and current needs by the most common face-to-face settings and how they can be satisfied in online environments. Finally, we have discussed the most novel approaches related to the practice of online teaching.

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Chapter 10
Crisis and Opportunity: Transforming Teachers From Curriculum Deliverers to Designers of Learning

Chee-Kit Looi, Shiau-Wei Chan, and Longkai Wu

Abstract Since the Covid-19 pandemic spread around the world, many educational institutions have been shut down temporarily to contain the virus. Home-based learning initiatives have been put in place by many countries to make sure that the learning goes undisrupted among students of various ages. Nevertheless, there are many challenges regarding the implementation of online learning in a crisis context, such as the dearth of technological devices, poor internet access, teachers' levels of readiness and experiences in online teaching, students' levels of focus and motivation, and so forth. By shifting from face-to-face teaching to online teaching, the role of the teachers needs to shift from that of curriculum delivery to include that of designers of learning. To design online instruction, the teachers have to bring to bear several considerations including lesson structure, content presentation, collaboration and interaction, timely feedback, motivation, relationships, and mental health. Since the effectiveness of online teaching is contingent on teachers' abilities and experience, it is crucial to execute professional development programmes to promote teachers' competencies in delivering online instruction.

Keywords Teachers · Designers of learning · Online learning · Face-to-face teaching · Education crisis

10.1 Introduction

Our current home stay work and learning arrangements have expedited digital transformations in many industries and areas of our work and lives. The compulsory online learning at home has caused us to re-visit many of our perspectives on online learning. Articles have emerged talking about the principles, the realities, and the practical challenges of home online learning (Huang et al. 2020a, b). The challenges of home-based learning encountered throughout the world include the poor internet

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connection, difficulty in getting the most suitable online resources, teachers' and students' lack of appropriate digital skills, students not having key learning capabilities, and teachers not savvy with important features of online learning (Huang et al. 2020a).

In this chapter, we like to look at the impact on teachers' practices. One of the key impacts is putting teachers into their roles of learning designers. They have to design online lessons faced with challenges such as doing it in an emergency situation and in a short time frame. To design online instruction, the teachers have to consider the lesson structure, content presentation, collaboration and interaction, and timely feedback (Lister 2014), as well as motivation, relationships, and mental health (Martin 2020). When there are lockdowns due to a crisis affecting education, learning outside of schools has to rely on the use of technologies. More possibilities about new learning experiences with or without technology are arising. The changes may not just be temporary, but long-lasting even after the Covid-19 crisis has eased off.

The current exercise has required teachers to reconfigure their teaching practices to fit the world. The context of learning was mostly in classroom space. Now the context has changed from classroom to home. Technologies that tries to bring back elements of the context like virtual or augmented realities are now brought to the fore. Teachers are more empowered to use different media to enable the lesson enactment.

The social dynamics of teacher collaboration will also have changed. The collaborative design process between teachers has also changed. Teachers still need evermore to meet in professional learning communities for online discussions for lesson planning and designing, considering the new context and content delivery. Northcote et al. (2011) proposed four main approaches for professional development to improve the online teaching skills of the teachers, namely placing pedagogy above technology, catering to different levels of development, allowing teachers to take the lead, and identifying emotional issues.

In this chapter, we share how the challenges of home-based learning can impact policy decisions and bottom-up classroom practices to spur teachers to go beyond what they traditionally do in the classroom and to facilitate online learning for students. Teachers have to take on new roles of designing lessons, assignments, and assessments using online means. In the next section, we will first narrate how different countries and regions have coped with home-based learning, in particular, how they have provided support for teachers in such new roles. We will share what we think the new normal should be, with regards to the role of teachers.

10.2 International Home-Based Learning Initiatives

To prevent the Covid-19 pandemic from spreading, the majority of the governments around the world have temporarily closed the educational institutions. Based on the data from UNESCO in April 2020, the school closure of 192 countries resulting in over 1.5 billion affected students enrolled at pre-primary, primary, lower-secondary,

and upper-secondary levels of education, as well as at tertiary education levels. Overall, 91% of the world's student population has been influenced by school closures (UNESCO 2020a). UNESCO Institute for Statistics database (2020) shows that at least 9 out of 10 students around the world have been interrupted by the covid-19 pandemic. This unprecedented disruption is also influencing 63 million primary and secondary teachers. To address this problem, each educational institution shifts into online education (Wasserman et al. 2020). Online learning becomes a potential method to allow for continuity of education during the short-term school closures. It also can lessen the interruption of education delivery and the influences on students and schools after the outbreak of covid-19.

Hence, many countries have rapidly set up virtual classrooms and collaboration platforms. They attempt to deal with core questions including choosing the appropriate learning platforms to be utilized, how to assist those with no or little internet access at home, how to help the teachers in conducting online learning, and how to evaluate and monitor students' learning outcomes (UNESCO 2020b).

Despite the efforts of many countries to conduct online learning, UNESCO Institute for Statistics database (2020) demonstrates that nearly half of all students encounter obstacles to online learning during school closures. 826 million (50%) of the students worldwide do not have a household computer and 706 million (43%) of the students do not have internet access at home. Huang et al. (2020a) pointed out several challenges faced by the global regarding the application of online learning amid the Covid-19 outbreak: (a) the internet connection becomes poor when all the students do their learning at the same time; (b) it is hard for the instructors to obtain the most appropriate online resources from the numerous available resources; (c) some instructors and students lack the suitable digital skills to educate and study online which resulting in uncomfortable experiences; (d) some students do not have key learning capabilities like self-regulation, independent study, motivation, and adaptation; (e) some instructors only employ direct instruction and ignore the crucial characteristics of online learning, for example, cognitive presence, social presence, and interactivity.

To contain the spread of Covid-19, Singapore schools have moved to full home-based learning since April 2020. During the home-based learning period, the Ministry of Education and the Ministry of Social and Family Development gave support and instruction for students and their parents or caregivers. The teachers and school personnel from the schools provide ongoing support and help the students who need internet access or digital devices (Straits Times 2020a). The recommendation is for primary, secondary, and junior college students to do home-based learning for four, five, and six hours per day respectively. The assignments and homework are given based on these learning hours (Straits Times 2020b). There are some challenges for home-based learning, for instance, the parents have to solve the technical problems like videos not playing smoothly or websites not loading. Some children are not independent students and have difficulties in focusing on learning without the presence of teachers, so the parents should be around to guide their children. Some parents even have to check their children's work before submitting it. It is challenging for

the parents who are working from home as they have their own work to do in their work-from-home situation (Straits Times 2020c).

In China, an initiative of "Disrupted classes, Undisrupted Learning" has been launched by the Ministry of Education. 270 million students are given flexible online learning from their homes. Six approaches of flexible online learning are including (a) infrastructure, (b) learning tools, (c) learning resources, (d) teaching and learning methods, (e) services for teachers and students, and (f) cooperation between schools, government, and enterprise (Huang et al. 2020a).

Challenges have appeared during the implementation of flexible online learning. One of them is to make sure all the students can access digital learning opportunities. There are remote areas that have the limitation of internet access, thus the Chine Education television is requested by the Ministry of Education to broadcast courses and resources via TV channels to assist the students in those areas (Huang et al. 2020a). Another one is the readiness of the teachers to plan and convey online lessons (UNESCO 2020c). Zhang et al. (2020) also declared some difficulties are still encountered despite careful arrangements and planning by the government including the restriction of the online infrastructure, low efficiency of the application of online teaching resources, teachers lack ability and experience in online teaching, the complex environment at home, the information gap, and others.

South Korea students start to log on to virtual classrooms since April 9. Their Ministry of Education has changed the school year by reducing the summer and winter vacations. An official, government-run Preparation and Monitoring Team has been established to assist the teachers to develop virtual classes and adjust their instruction (Kasulis 2020). Three modes of online learning can be used by the instructors, i.e. use video conferencing for interactive real-time learning, employ videos created by the school for content-based learning, and give the students reports or projects to do for assignment-based learning. However, there are several challenges for the execution of online learning including the technical problems such as the missing sound in pre-recorded video clips that cause the occurrence of interruption for lessons streaming on the state-run Educational Broadcasting System Online (Strait Times 2020d). Other challenges involve the lack of focus and motivation among the students to study at home as they are easily distracted (Kasulis 2020).

In Australia, as the New South Wales teacher union notified that they are unable to execute social distancing measures suggested by the government, dozens of the independent schools in Australia are closed and move to online learning. It is difficult to implement social distancing measures because there is a big community of students and staff. The design of the schools and the size of classrooms also do not allow them to do so. Another concern is inadequate resources to clean and sanitize to keep good hygiene. Since the start of the term, the teachers prepare for possible school closure and they are ready to deliver online instruction (McGowan 2020). Nonetheless, there are some challenges in online learning at home. One of the challenges is that many students do not have technological devices and internet connection. This is because one in six children lives in households under the poverty line (Duffy 2020). Another challenge is that school closure influences students with learning difficulties as well (Davey 2020).

For Italy, schools and universities in most of the influenced areas are closed at the end of February and are shut down countrywide on March 9. There are 12 million students who learn from home. Since then, the country has adopted distance learning, as a rule, to continue to realize the constitutional right to education for all. The Ministry of Education rapidly established a task force for educational emergencies to meet the needs of students.

Distance learning needs close cooperation between teachers and parents and teleworking or other duties are not always able to do this. Even though the digital register allows direct communication between schools and families, 10% of schools still do not have the essential equipment. Affordability and remoteness may compound the difficulties. Some regions have earmarked funds to enable poor families to purchase equipment needed for distance learning. For example, in Sicily, the students from low-income families are given laptops, tablets, and equipment allowances by each secondary school. 25% of households in Italy have a poor internet connection of 2–30 Mb, much lower than the speed required to download and stream educational content. Thus, the Ministry of Education and Rai sign an agreement to spread educational content in Rai Scuola and Rai Play as part of the campaign (D'Addio and Endrizzi 2020).

In Germany, higher education institutions and schools including kindergartens and nurseries have been shut down due to the Covid-19 pandemic since March 16. Although they will be officially closed until April 20, they can be extended for a longer period of time. Such a situation has resulted in universities and schools to change to distance learning as much as possible. However, a reliable and comprehensive technical infrastructure is still inadequate. Teachers also do not have enough essential skills for online instruction. Therefore, universities and schools are now rushing to organize e-learning courses to enable teachers to master new digital technologies (Ziener 2020).

School districts within the United States react differently to the Covid-19 pandemic. The majority of the districts produce mandates rapidly to deliver remote learning to the students and solved the problems of inequity. Some districts prohibit the teachers to conduct remote teaching due to the inequity issues. However, the students are provided internet access and devices in some regions (Mittal 2020).

The inequalities of low-income countries such as sub-Saharan Africa are extremely serious. 89% of the students lack household computers and 82% of them do not have internet access at their house. Almost half of the areas in sub-Saharan Africa are covered by mobile networks. This has caused around 56 million of the students who are unable to use a mobile phone to access information (UNESCO 2020d).

10.3 New Roles for Teachers

In face-to-face instruction as in classrooms, the teacher typically plays the role of an instructor and becomes the controller of the learning environment. He or she is thus prone to take on the role of transferring knowledge to the students as the main duty of their teaching (Ananga and Biney 2017). The role of the teacher has to change when he or she moves from face-to-face learning to online teaching (Major 2010) and particular teaching tasks are necessitated in the online teaching context (Carril et al. 2013). During online teaching, the teacher plays a role as a 'guide on the side' (Ananga and Biney 2017) and less control over the students' learning process. The teacher employs a more supporting technique as "designers and facilitators of learning" (Hlynka and Jacobsen 2009), or coaches in the learning process of their students (Alvarez et al. 2009). Unlike traditional teaching, online teachers have to adapt their own pedagogies (Baran 2011).

There were four major roles for online instructors to have successful online teaching as asserted by Berge (1995), namely managerial, pedagogical, technical, and social. Other researchers (e.g. Goodyear et al. 2001; Carril et al. 2013; Sanmamed et al. 2014) have defined other roles of the teachers related to online teaching, for instance, technologist, social role, manager or administrator, personal role, process facilitator, interpersonal communicator, adviser or counselor, assessor, leader, researcher, and so on. Ni She et al. (2019) provided a synthesis on the roles of online educators in the peer-reviewed publications from 2010 onwards, i.e. facilitator, content expert, managerial, pedagogical, social, technical, and assessor.

One of the important roles of the teacher is that of the designer who designs worthwhile online learning tasks, as well as provides instructional designs for interactive technologies (Ni She et al. 2019). In the classroom, while the teacher also designs his or her lesson plan or adapts some lesson plan to meet curricular goals, he or she may not require much adaptive expertise to execute the lesson. For online lessons, the teacher is confronted with a myriad of different conditions that can affect learning, such as technology support and connectivity to ensure the remote teaching can happen smoothly, and motivation and engagement of the students who are not in the physical social presence of the teachers. In such circumstances, the teacher needs to take on the perspective of the designer to create conditions to engage the learners and to be innovative to use technology tools in sound pedagogical ways. Thus, online learning provides opportunities as well as imperatives for moving teachers from being deliverers of the curriculum to being designers of learning.

Four main sub-themes need to be considered when designing online instruction, i.e. lesson structure, content presentation, collaboration and interaction, and timely feedback (Lister 2014). Concerning lesson structure, the most crucial aspects in the online instruction are the lesson announcements, instructor's reminder, lesson information (outlines, schedules, curriculum, grading method), as well as homework information and instructions to finish them. These aspects provide structure and assist the students to concentrate on a task (Ausburn 2004). The online instruction ought to be obvious, arranged, and well-organized, especially when the students are

learning difficult or new topics. It is more difficult to monitor the comprehension of the students in online instruction. If the lessons are not prepared well and too many subject matters are covered at one time, this may cause the students to become disengaged in their studies. (Martin 2020).

For content presentation, the teachers have to provide a diversity of activities that allow the students to select to meet their learning needs and interests (Ausburn 2004). The instructor has to choose the high-quality content that matches the students' level of skill and knowledge. If the contents are too hard and too soon, the students would be confused or overwhelmed during the learning process (Martin 2020). Further, the authentic tasks ought to be employed as they are meaningful and consistent to support students' learning (Gedik et al. 2013). The application of reflective activities such as use blog posts is effective in enhancing reflection systematically and instrumental in learning experiences (Teras and Herrington 2014). Self-assessments that able to give instant feedback are supportive in evaluating the content and developing higher order thinking (Domun and Badadur 2014).

Several researchers (e.g. Callahan et al. 2013; Dahalan et al 2013; Domun and Badadur 2014) highlighted the significance of designing opportunities for collaboration and interaction in an online environment. Collaboration occurs when the students are doing their class projects, communicating with varied classmates, interacting through chat and online discussion, and helping their classmates with group work. It is useful to the students' learning and their personal experiences and satisfaction with the lesson (Chen 2007).

Interaction can be facilitated by building instructor-to-student interactions and student-to-student interactions (Sher 2009) through email, chat, and discussion forums (Gedik et al. 2013). Feedback is considered as one kind of interaction between instructor and student (Lister 2014). Regular feedback is an essential element of online learning (Lee 2014). The instructor provides timely feedback to the students and promotes more involvement from the students (Wan Hussin et al. 2019), as well as maintain lesson satisfaction and motivation (Dahalan et al. 2013). The interactions between the students can be increased by dividing them into teams of five which allows them to support each other. The students are encouraged to ask their group members first when they have a question about the lesson. If they still do not satisfy with the answer, they can approach the teacher (Gewin 2020).

Loescher (2020) asserted that the communication structures should be enhanced to quickly disseminate the information via various media. Several communication practices can be considered including daily teacher meetings, ongoing student and parental updates, real-time communication text systems that can be monitored such as chat rooms, online meetings, office hours, and learning sessions.

To deliver online instruction amid the Covid-19 pandemic, Martin (2020) asserted that motivation, relationships, and mental health should be considered. In the online environment, it is vital to foster the students' motivation as the students are always distracted, ignore the school work, but play games and reply to emails and social messaging. To keep the students on track and engaged, the instructor needs to make sure the online content and instruction are high-quality.

There are several self-management approaches such as set more frequent deadlines for some works, use the hardcopy of school work instead of technology, and remove all the technological devices from bedrooms during bedtime. The students are also encouraged to set up a schoolwork timetable properly, as well as maintain the wake-up and sleep times which in line with the school day.

The relationships between the teacher-student and student-student are indispensable to learning in the online environment. The teacher can maintain contact with the students through several methods, such as online learning platforms, class chat groups, blogs, email, video, and so forth. Connective instruction is the approach that links teachers to students on three levels, i.e. interpersonal, substantive, and pedagogical. The interpersonal relationship is the relationship between the teacher and the students, while the substantive relationship is the relationship between the student and content, subject matter, and the nature of tasks in the online instruction. The pedagogical relationship is the relationship between the student and the instruction or teaching itself. This connective instruction refers to 'who' (interpersonal), 'what' (substantive), and 'how' (pedagogical) of the teacher-student connection. Hence, the students are engaged and motivated when they link to 'who' the teacher is, 'what' the teacher is saying and 'what' activities and tasks are being conducted, and 'how' the teacher administers these tasks and messages (Martin 2013).

Another crucial element of online learning is good mental health. In the online environment, it is difficult for the teachers and other support staff to help and guide the students who are struggling in the study in real-time. Therefore, it is urged that the schools should have closer contact with the students with further instructional needs (Gewin 2020), for instance, hyperactivity disorder, dyslexia, and so on. There is also possible to have students that will become worried during the outbreak of covid-19 as some of them may have friends and family members who are infected and lose their loved ones. As the schools notice about this, they must contact the students instantly and give them proper support and professional guide (Martin 2020).

A case study was done by Bao (2020) based on the observation of online teaching at Peking University. She proposed six instructional approaches to enhance the engagement and concentration among the students to accomplish a smooth shift to online learning. The first instructional approach is creating emergency preparedness plans for unexpected problems. The second instructional approach is splitting the teaching content into smaller units to assist students to concentrate. It is suggested to divide the teaching content into several small modules with each about 20–25 min. This is because the students are likely to have weak persistence during online learning which will affect the learning efficiency (Li et al. 2013).

Highlighting the usage of voice in the instruction is the third instructional approach. During the online teaching, there is a restriction of using facial expressions and body language through screens, only voice can be entirely worked. Therefore, the teachers have to slow down their speech when teaching the students, so that the students can catch up on the points of the main information (Bao 2020).

The fifth instructional approach is building up the active learning skills among the students. In online learning, the students tend to 'skip the class' and such a situation is hard to be controlled by the teachers. Thus, the teachers ought to employ

multiple techniques to enhance the students' active learning, for instance, adapt the requirements for reading and homework.

Incorporating offline self-learning and online learning effectively is regarded as the sixth instructional approach. The common situations in the traditional instruction in the classroom are inadequate pre-class study preparation, little involvement in-class discussion, and insufficient depth of discussion. Those situations cannot be ignored in online instruction.

10.3.1 Challenges and Opportunities for Teacher Growth

The online teaching quality is strongly associated with the professional development of the instructors in the virtual learning environment (Kibaru 2018). Thus, it is mandatory to implement professional development to assist educators in online pedagogies (Kilgour et al. 2018). The professional development programs ought to emphasize the abilities required for the most vital roles of the online instructors (Bawane and Spector 2009). The most crucial role of an online instructor is a pedagogical role, followed by professional, evaluator, social, and technologist roles (Bawane and Spector 2009). Hence, the training ought to be conducted by emphasizing the competencies related to the pedagogical role. The effectiveness of online teaching relies on teachers' abilities and experience.

However, there are still many teachers who lack experience in online teaching. The instructors that can teach well in traditional instruction might not effective in the online environment as many of them are subject experts instead of pedagogical experts (Bezuidenhout 2018). The instructors always struggle with online teaching due to their scarcity of understanding of learning theories and pedagogies in online education (Kibaru 2018). Northcote et al. (2015) also claimed that the instructors that have confidence in their face-to-face instruction may not transfer such confidence to online instruction.

Four major approaches for professional development to enhance the instructors' online teaching skills are put forth by Northcote et al. (2011). The first approach is placing pedagogy above technology. In the professional learning programme, pedagogical resources and references are integrated. The rationale for utilizing certain technology is introduced in all the instructions, workshops, discussions, and documents. The instructors are encouraged to discuss their insights about how technology can promote and decrease the teaching quality. Then, they are guided with chances to discover examples and references to good practice. They can also have an open discussion about the pitfalls and affordances of online learning based on the current research publications of e-learning.

The second approach is catering to different levels of development. Regular individual and group sessions are infused into the professional learning programme, thus the instructors can obtain help to improve their technical skills and also technical confidence. These sessions are held within a strong pedagogical framework. In this case, pedagogical principles promote technical guidance. The professional learning

programme must be flexible in nature which allows the new and returning staff to participate at any time during the semester regardless of their earlier knowledge of online teaching.

Allowing teachers to take the lead is considered as the third approach for effective professional development. The professional learning programme needs to provide multiple options for staff such as time, location, focus, format, and length in order to adapt to the requirement that they can take the lead in their own learning process. Compared with others, less confident employees will have the opportunity to get together or conduct one-on-one consultations. Employees with higher technical and online teaching skills are encouraged to share ideas and problem-solving methods with other employees, explore sample collections, and operate independently through the use of instruction manuals and brochures. Printed materials are given as supplementary to online materials.

The fourth approach is identifying emotional issues. The results of this study indicate that the faculty's emotional response to the development of their online teaching skills is indispensable. In addition to respecting the skills and knowledge employees already possess in general teaching and online environments, professional learning programs for academic staff also need to cater to the emotional shift experienced by teachers from face-to-face to paradigm shifts (Northcote et al. 2011).

10.4 Discussion and Conclusion

Never before do we need such a collaborative, coordinated, and collective global to respond to the best practice principles of online teaching! Herein there is an opportunity to share expertise and resources worldwide in the time of the global Covid-19 crisis to make sure the students can continue their education (Crawford et al. 2020). In such education crises, when face-to-face instructions are suspended, teaching needs to be conducted remotely. But numerous challenges remain unknown, for instance, do the teachers have enough internet bandwidth and technological devices for recording? Do the teachers have sufficient skills to design and deliver online instruction? What are the supports given to the teachers to cope with these challenges? The crisis of the Covid-19 pandemic is putting the teachers under stress to deliver high-quality learning with tools that may have no or little support or training (UNESCO 2020e).

The short-term training given during the spread of Covid-19 is not sufficient for the teachers. Hence, it is proposed to conduct systematic training for the teachers to equip them with relevant skills (Zhang et al. 2020). Moreover, support for the teachers' training to deliver online instruction is deficient, especially in low-income countries. For instance, in sub-Saharan Africa, only 64% of primary teachers and 50% of secondary teachers have obtained minimum training, but this normally does not involve ICT skills. These inequalities will affect the learning continuity during the spread of the Covid-19 pandemic.

The Covid-19 Global Education Coalition has been launched to address this matter and assist the teachers influenced by the pandemic. More than 90 public and private

sector partners have been brought together to develop equitable and universal solutions, as well as make the digital revolution inclusive. (UNESCO 2020d). The Teacher Task Force, an international union dedicated to teachers and teaching has issued a Call for Action on Teachers to warrant protection, support, and recognition of teachers throughout the crisis. Teachers' financial resources, material resources, and leadership skills are needed to ensure that high-quality teaching and learning can be continued during the crisis, and recovery is quick.

The Task Force calls on the government, education funders and providers (public and private) and all related partners to (a) retain employment and wages. This crisis cannot be an excuse to lower norms and standards or abandon labor rights. The wages and welfares of all teaching and educational support personnel should be retained; (b) prioritize the safety, health, and well-being of teachers and students. Teachers require socio-emotional support to cope with the additional pressure they exert to provide learning in times of crisis and support students in such anxious situations; (c) involve teachers in formulating COVID-19 education strategies. When schools are reopened, teachers will play a key role in the recovery phase. They have to be involved in all steps of education policy development and planning. (d) provide adequate professional support and training. Teachers are given little attention to have appropriate training on how to ensure continued learning. It is imperative to certify that teachers obtain essential professional support. (e) put equity at the core of educational responses. Teachers working in remote areas or low-income or minority communities will need greater flexibility and support to make sure that weak children are not left behind. (f) involve teachers in aid activities. The financial institutions are urged by the Teacher Task Force to assist the government supports the education system, especially the professional development of the teaching staff. This support is urgently needed in some poorest countries in the world, which are already struggling to meet educational needs due to a severe shortage of trained teachers (UNESCO 2020e).

In non-crisis times, the teaching done in the physical classroom tends to revert to routine practices that the teachers have always relied upon. With no necessity for change, teachers will always teach the way they have been doing. In crisis times, when students and teachers are not allowed to meet and interact in the same physical space, remote methods of teaching and interaction have to be relied upon. The teacher is required to design learning so that the activities and learning experiences can be engaging and motivating even at such educational distancing. At the same time, the teacher can tap on a range of pedagogical and learning methods using the tools, resources, and peer and expert help available online. The design element becomes more prominent for the teacher to practice adaptive expertise in designing learning activities and interactions using a repertoire of available software tools. Conclusively, we expect to see teacher education in the new normal preparing teachers to be designers of learning rather than being deliverers of curriculum, with both pedagogical and technological awareness and readiness.

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Chapter 11
Framework for Teacher Support During Remote Teaching in a Crisis: COVID-19, as a Case Study

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Abstract Due to the COVID-19 pandemic, many universities have decided to apply remote teaching in order to ensure the continuity of teaching and learning, as well as the safety of their students, teachers, and employees. However, not all teachers were prepared to go through this experience, and many of them have faced several challenges while teaching remotely. Therefore, this paper presents the most significant challenges that teachers may face during remote teaching and a number of proposed solutions for them. Two methods were used to identify these challenges as well as their proposed solutions, namely a comprehensive literature review and experts' feedback. Additionally, this paper presents a framework for teacher support during times of crisis. The proposed framework can be referred by universities and teachers to facilitate remote teaching in the future, especially in times of crisis.

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11.1 Introduction

UNESCO (2020) stated that the COVID-19 pandemic affected more than one billion students worldwide due to school closures and education disruptions. In response, different countries have adopted different methods of remote teaching and learning during this pandemic based on their own informatization development, ranging from hi-tech alternatives, such as real-time online classes, to lower-tech solutions, such as educational programming through radio and television. Hodges et al. (2020) defined remote teaching as "a temporary shift of instructional delivery to an alternate delivery mode due to crisis circumstances. It involves the use of fully remote teaching solutions for instruction or education that would otherwise be delivered face-to-face or as blended or hybrid courses and that will return to that format once the crisis or emergency has abated." For instance, in high-income countries, the coverage of radio, non-smartphones, and TV is close to 100% and the coverage of smartphones is already close to 60%. However, in low-income countries, the coverage of radio is highest, at close to 90%, but the coverage of TV, non-smartphones, and smartphones is only 45%, 40%, and 25%, respectively (Haßler et al. 2020).

While teachers worldwide are stepping out of their comfort zones to effectively provide new remote teaching experiences during this pandemic, they might face several challenges that hinder this experience, especially in crisis times, where everything is unpredictable. In fact, during recent years, large-scale outbreaks of pandemics or natural disasters took place across the globe, affecting not only humans' health, but also the education sector. Such outbreaks included SARS (at the end of 2002), the H1N1 flu (in 2009), and COVID-19 (2019). Though we cannot beat "mother nature," we need to be prepared for her, so this study aims to provide a framework for teacher support during remote teaching during times of crisis. Specifically, this framework highlights the potential challenges that teachers might face while remotely teaching, as well as the supports needed to help them overcome these challenges. The findings of this study could help several stakeholders, including policy makers, educators, and trainers, take several measures and implement several solutions that would allow teachers to be ready in the future in times of crisis.

The rest of the paper is structured as follows: Sect. 11.2 presents the research methods followed. Sections 11.3 and 11.4 present potential remote teaching challenges as well as their associated solutions. Finally, Sect. 11.5 concludes the paper and presents the limitations of this study and suggestions for future directions for research.

11.2 Methods

Two methods were used to collect the potential challenges of remote teaching and their solutions in this study, namely a comprehensive literature review and experts' feedback. Therefore, as a first step, a comprehensive literature review was conducted in different electronic databases, such as ScienceDirect, IEEE, Arxiv.org, and EdITLib, using different search keywords, including "challenges of remote teaching," "challenges of distance education," "online teaching challenges," "online teaching technical challenges," and "psychological challenges of online learning," to identify these challenges and their associated solutions.

As a second step, the challenges and their solutions identified in the first step were sent to 20 teachers from different countries to review and to add any new items (challenges and solutions) from their own perspective. The teachers voluntarily participated in this experiment, and their answers were collected via e-mail. The obtained results are discussed in the next two sections. Additionally, all these teachers were from different countries (including both low-income and high-income countries) and from different areas (urban and remote areas) in order to cover all potential challenges from different perspectives.

11.3 Potential Challenges of Remote Teaching

Given the circumstances of the COVID-19 pandemic, and in order to ensure the continuity of teaching and learning, many universities around the world have decided to apply remote teaching. While online and distance education is not a new trend, several challenges have arisen regarding teachers' use of remote teaching in this critical situation. These challenges can be categorized into four categories, namely technical, psychological and emotional, social, and pedagogical.

11.3.1 Technical Challenges

The first technical challenge is that teachers who are not familiar with online learning environments may find difficulties in creating online courses (Sheridan 2006). In this context, Mandernach et al. (2013) found that online teachers may spend 37 h per week completing instructional tasks, including instructional content development. Hodges et al. (2020) stated that teachers cannot suddenly become experts in online teaching and learning in this crisis situation. Therefore, it is important to provide technical support to help beginner teachers in creating online courses. Additionally, one of the most prominent technical problems that teachers may face is the use of Information and Communications Technologies (ICT). It is known that effective use of ICT can help teachers in providing distance courses (Gherbi 2015). In this context,

many researchers have highlighted gaps in teachers' ICT skills (Dlamini and Mbatha 2018). For instance, in Algeria, teachers' ICT skills are limited to basic information, such as Windows-based software, e-mail, and the Internet (Gherbi 2015); hence, they do not have any experience in using the Internet for teaching or knowledge about classroom applications. Fan (2019) claimed that the majority of teachers around the world, particularly those not specializing in computer science, did not have the ability to use ICT in teaching. There are a variety of reasons why teachers have difficulty using ICT in the classroom. For example, there is often "insufficient technological equipment" or Internet access in schools. Some teachers also do not see the value in using such technology. However, in the current crisis conditions, many teachers have seen the importance of ICT skills for teaching.

11.3.2 Psychological and Emotional Challenges

The COVID-19 pandemic may also cause some psychological and emotional problems for workers, including teachers. According to the World Health Organization (2019), people affected by crises will experience psychological distress (pressure), which, for most people, will improve over time. However, depression and anxiety become more common as people get older; hence, teachers are more likely to be affected by these negative feelings. Teachers experience depression, post-traumatic stress disorder, anxiety due to a lack of information about how to obtain basic services, behavioral regression or aggression, poor concentration, or loss of confidence (Kidman and Chang 2020), especially those who have lost family members in this crisis. The estimated degree of impact is generally related to personal factors, such as physical and emotional proximity (Bureau 2016). In addition, psychological researchers have claimed that the anxieties experienced by teachers can be transmitted to students and affect their learning (Chick 2013). Therefore, it is very important to take this problem into consideration, especially in crisis situations, in which teachers are more vulnerable to these psychological and emotional challenges.

11.3.3 Social Challenges

Over thirteen countries have completely closed their schools to contain the spread of coronavirus (UNESCO 2020). Consequently, teachers were found to be teaching remotely. In this context, Bolliger et al. (2010) stated that online learning, unlike face-to-face interaction in classrooms, can reduce social interaction, which can make both teachers and students feel isolated. In addition, many researchers have claimed that feelings of social isolation and disconnectedness are the main factors resulting in attrition in online courses (Ali and Smith 2015; Schaeffer and Konetes 2010). Similarly, Huang et al. (2020a) mentioned that one of the challenges identified in the Chinese experience during the COVID-19 pandemic is learner and teacher isolation,

since the learning process, unlike in conventional contexts (face-to-face or blended learning), is conducted remotely for a long period.

11.3.4 Pedagogical Challenges

Pedagogical challenges are very important and can disturb teachers while teaching remotely. Given the current critical situation, remote teaching may stay the norm for a long period; hence, teachers should have basic knowledge of the pedagogical approaches that could be applied to create an effective remote learning experience that keeps students motivated and engaged during this long period. Additionally, teachers may lack basic knowledge about how to create appropriate online quizzes and exams. In this context, Hodges et al. (2020) stated that providing effective teaching pedagogies can influence the effectiveness of remote learning experiences during a crisis. Furthermore, with the unexpected break in face-to-face teaching, teachers have become obligated to prepare learning content that is adaptable to online learning in a short time. This crisis is changing the education situation, and teachers are being forced to rethink their way of teaching (Tosato and Bodi 2011). This process, however, needs a lot of effort and time. So, how can a teacher be creative if he/she has to work until late in the evening just to prepare the materials to be used during classes (Nonaka and Takeuchi 1995)?

Moreover, given the large number of students enrolled in remote learning, it is difficult for teachers to monitor students' performance and provide them with feedback and Personalized content. For instance, Mandernach et al. (2013) found that teachers may spend 36.93% of their weekly time on grading assignments in online classrooms, which is too much. Students also have different learning styles, personalities, knowledge, etc. Hence, teachers should provide them with Personalized content and feedback based on their needs to enhance their learning experiences (Denden et al. 2018). Finally, within remote learning, students also take tests and exams online, and teachers are not able to control and evaluate them during examinations. In such conditions, students could potentially cheat in exams and even have someone else take exams on their behalf. Kanchan (2020) identified the five techniques that students used the most to cheat in online exams: (1) sharing their screen with a friend to provide him or her with answers; (2) using devices to cheat, such as calculators or hi-tech devices; (3) using mobile phones to store answers; (4) using auto-coding software in programming tests; and (5) having someone else take the exam on their behalf.

In order to solve the (technical, psychological and emotional, and social and pedagogical) challenges presented above, several solutions were proposed in the literature and further enhanced by the experts, as discussed in the next section.

11.4 Solutions for Remote Teaching Challenges

11.4.1 Technical Support

As a means of providing technical support for teachers, particularly to deal with course creation difficulties, authoring tools were proposed in order to facilitate the task of creating multimedia content within online courses (Gorman et al. 2003). Authoring tools are programs that can be used by people who may have not programming experience to create multimedia content (Gorman et al. 2003). They can include authoring software, images, word banks, sound effects, definition banks, optical character recognition software, and more (Millman et al. 2008). The input of an authoring tool is a file (a text file or other type of file) which will then be transformed into an electronic file that includes music, sound, etc. Millman et al. (2008) stated that the transformation of the file is based on matching words in the input file with pronunciations and definitions to create multimedia content. Many authoring tools were proposed in the literature to help teachers create their online courses. Taconis et al. (2018), for example, developed an authoring tool to aid primary school teachers in creating "Design-Based Learning" course content. The results of this study showed that the proposed tool fulfilled teachers' expectations and helped them in creating their online course content. In addition, Cubillo et al. (2015) developed an authoring tool for augmented reality learning environments. Specifically, the developed tool aims to help teachers to add virtual content into educational resources. Results showed that the proposed tool could incorporate different multimedia resources easily.

Additionally, to ensure learning continuity and quality during the COVID-19 pandemic, it is important to overcome challenges related to ICT use. Therefore, one rapid solution that may be proposed in such conditions is to provide online ICT training for teachers. Since teachers have different ICT knowledge levels, it is important to provide them with Personalized training based on their needs. In this context, Hamdy (2007) proposed three levels of ICT training as follows:

- *Basic ICT training*: basic operations, Windows-based software, e-mail, and the Internet.
- *Intermediate training*: classroom applications, the Internet for teaching, and e-mail as a medium for communication and collaboration.
- *Advanced training*: development and creation of educational software, online classes, telecommunication, e-mail, development of interactive Web sites, production of multimedia presentations, and producing creative work.

Providing different ICT training levels may help teachers to receive the type of training that will help them the most to teach remotely. Dlaminia and Mbatha (2018) found in their study that 80% of the participating teachers expressed their need for ICT training.

11.4.2 Psychological and Emotional Support

Teachers may need psychological support to overcome problems related to their psychology and emotions during crisis. This solution was proposed by many organizations and faculties to help people manage their stress, worries, and emotions in times of crisis (BBC n.d.). For instance, a psychological support service was proposed to assist Australian workers who have experienced work-related psychological problems during the COVID-19 crisis. Specifically, the psychological and emotional supports would be composed of a team of mental health professionals, who would provide their professional care for people's needs. Hence, social interactions with professionals can positively affect teachers' mental health and emotions (Cohut 2018). This strategy was also proposed for other types of crises that can cause people to suffer from mental health problems, such as wars (UNHCR n.d.). In particular, the COVID-19 crisis has put us in conditions that are similar to wars in that many victims are taken every day, and we cannot leave our homes and go to work. Therefore, following such a strategy to manage teachers' psychological problems may be a good solution.

11.4.3 Social Support

In regard to teachers' social problems, communication and collaboration may be the best solutions to relieve teachers from isolation and to help them feel connected. Therefore, providing forums and groups in social networks for teachers may decrease their feelings of isolation in this crisis, as well as their desires to drop out of classes. In a study conducted by Kelly and Antonio (2016), online teachers expressed their need for online social support. Specifically, this support was provided via groups in social networks like Facebook. These types of support can be useful sources of pragmatic advice for beginner teachers in online learning, and they allow teachers to discuss their teaching practices. In this way, teachers may be more motivated to teach remotely and are less likely to feel hindered by any problems they face while teaching. Through forums and groups in social networks, a teacher may receive different forms of support from other teachers, such as feedback about practice, modeling of practice, socialization, or relationships (Clarke et al. 2014).

11.4.4 Pedagogical Support

Many solutions to pedagogical problems have been proposed in the literature. Particularly, to find pedagogical approaches that could be applied to create an effective remote experience that motivates and engages students, many researchers have highlighted the importance of providing teachers with course design training on how to

create appropriate content, exams, modules, and methods of teaching online (Bezukladnikov and Kruze 2012). For instance, Bezukladnikov and Kruze (2012) proposed a training course for ESP Russian teachers in order to help them to be able to: (1) design materials; (2) choose the appropriate teaching strategy; (3) analyze the social, psychological, and educational context in which teaching and learning take place; (4) plan, implement, and evaluate appropriate learning experiences; and (5) evaluate students' learning. The Teaching Center at Washington University in St. Louis (2009) also claimed that teachers could receive social support from other colleagues who have taught the same courses to learn from their experiences (including strategies used and students' impressions).

To help teachers overcome the problem of limited time for preparing learning materials, teachers can (re)use the open educational resources (OER) published on several well-known OER repositories. According to a recent declaration by UNESCO, OER are defined as "learning, teaching, and research materials in any format and medium that reside in the public domain are under copyright that has been released under an open license that permits no-cost access, [reuse], [repurpose], adaptation, and redistribution by others" (UNESCO 2019). Wenk (2010) claimed that the use of OER could greatly reduce the amount of work required to develop educational resources; hence, it can save teachers' time in preparing learning resources. In addition, to enhance the quality of learning and engage students, teachers can use the open educational practices (OEP) guidelines, which include open pedagogy, open collaboration, and open assessment (Huang et al. 2020a). The open educational quality initiative (OPAL) defined OEP as "practices which support the (re)use and production of OER through institutional policies, promote innovative pedagogical models, and respect and empower learners as co-producers on their lifelong learning path" (OPAL 2011).

To overcome the supervision problem of the large number of students enrolled in remote learning, teachers should employ automatic monitoring of students. This implies that the teacher needs an intelligent system with adaptive abilities to facilitate his/her role in supervision. Researchers have suggested using learning analytics (LA) for representing important information about student's online (Denden et al. 2019). According to Siemens (2010), LA is defined as "the use of intelligent data, learner-produced data, and analysis models to discover information and social connections, and to predict and advise on learning." This type of automatic monitoring is based on collecting traces of students while they are learning online. For instance, the results of the analyses of these traces can be presented as a dashboard, so the teacher can supervise the students' progress and performance and provide them personalized feedback and recommendations based on their learning needs. In this context, Tlili et al. (2018, 2019) presented an LA framework of challenges that should be considered from both data preparation and use perspectives.

Many devices and systems for overcoming challenges related to examinations were proposed in the literature. For instance, to counter the use of cheating devices, such as mobile phones and calculators, and to ensure students' presence in front of their computers during examinations, teachers should use proctoring technologies to record the students' eye, head, and keystroke movements (Zhenming et al. 2003).

These technologies can also record audio and detect and differentiate between the candidate's voice and any other voice (Kanchan 2020). Additionally, to prevent screen sharing/monitoring, teachers should use secure browsers to conduct exams. Furthermore, to thwart the use of auto-coding software in programming tests, teachers should use plagiarism software to detect any similarities to code available on the Internet. For the authentication problem, several online biometric authentication systems were proposed in the literature in order to detect fake candidates. Bal and Acharya (2011), for instance, proposed a biometric authentication and tracking system to help teachers to authenticate the student and track him/her during an examination.

Table 11.1 summarizes both Sects. 11.3 and 11.4 and presents the identified challenges as well as their associated solutions.

Furthermore, based on Table 11.1, Fig. 11.1 presents a framework for supporting teachers during a crisis to ensure an effective teaching/learning experience. Particularly, as shown in this framework, the different support services can one influence each other. For instance, providing ICT training (technical support) might make teachers more confident in providing remote and online teaching and hence feel less stressed and frustrated (psychological support). This training can also help teachers to be more innovative in their courses (pedagogical support). Additionally, social networks (social support) can be used to create groups where teachers share their feelings and get help from each other (psychological support). Social networks can also be used as a new way of learning to help make students more active and motivated, as well as a place to exchange educational and pedagogical solutions, such as ResearchGate (pedagogical support).

11.5 Conclusion

Most countries have banned face-to-face activities to contain the COVID-19 pandemic, including classroom teaching, causing more than one billion students to not be able to go to school. In response, several countries started the "Disrupted Education, Undisrupted Learning" initiative by providing flexible and remote teaching to students from their homes (Huang et al. 2020b). However, teachers have faced several challenges during this unexpected period of remote teaching since they have had to quickly adopt this form of learning to maintain the learning process and succeed in the remainder of the current academic year. Therefore, this study aimed to first identify these challenges and then present a framework of support for teachers during a crisis that all stakeholders can refer to in their specific context to facilitate remote teaching in the future, especially in crises.

It should be noted that this study has several limitations that should be acknowledged. For instance, the number of teachers participating in this experiment was limited due to time (teachers are generally overloaded during the crisis) and context (pandemic) constraints. Despite this limitation, this study presented a solid groundwork for supporting teachers during a crisis. Future research could focus on collecting

Table 11.1 Matching challenges with their proposed solutions

Categories	Challenges	Solutions
Technical challenges	Creating online learning content may be a difficult task for teachers, especially those who work in areas other than computer science.	*Authoring tools* to facilitate the task of creating multimedia content.
	Teachers may have difficulties in using ICT.	*Training* teachers about the use and applications of technology.
Psychological and emotional challenges	Crises or emergencies may cause disturbances to many teachers, resulting in negative feelings.	*Psychological and emotional support services* composed of teams of mental health professionals and psychologists to help with depression, anxiety, stress, confidence, leadership, etc.
Social challenges	Since the outbreak of the coronavirus crisis, teachers have been found to be teaching remotely; hence, they can feel isolated and left behind.	*Forums and groups in social networks* to decrease feelings of isolation and increase confidence and social interaction.
Pedagogical challenges	Teachers may lack basic knowledge of the pedagogical approaches that could be applied to create an effective remote experience that motivates and engages students.	*Course design training* about content, modules, and methods of teaching online.
	With the unexpected break in face-to-face teaching, teachers have become obligated to prepare learning content that is adaptable to online learning in a short time.	*OER/OEP* can help teachers to reduce the amount of work, enhance the quality of learning, and reduce preparation time.
	Given the large number of students enrolled in remote learning, it is difficult for teachers to supervise students' performance and to provide them with feedback and Personalized content.	*Automatic monitoring of students* (dashboards, recommendation systems, and Personalized content).
	Within remote learning, students take exams online; hence, teachers are not able to control and evaluate them during examinations to prevent cheating and the use of impersonators to write exams on their behalf.	*Proctoring technologies* to detect the use of any device. *Plagiarism software* to detect similarities to existing content. *Online biometric authentication systems* to prevent fake candidates.

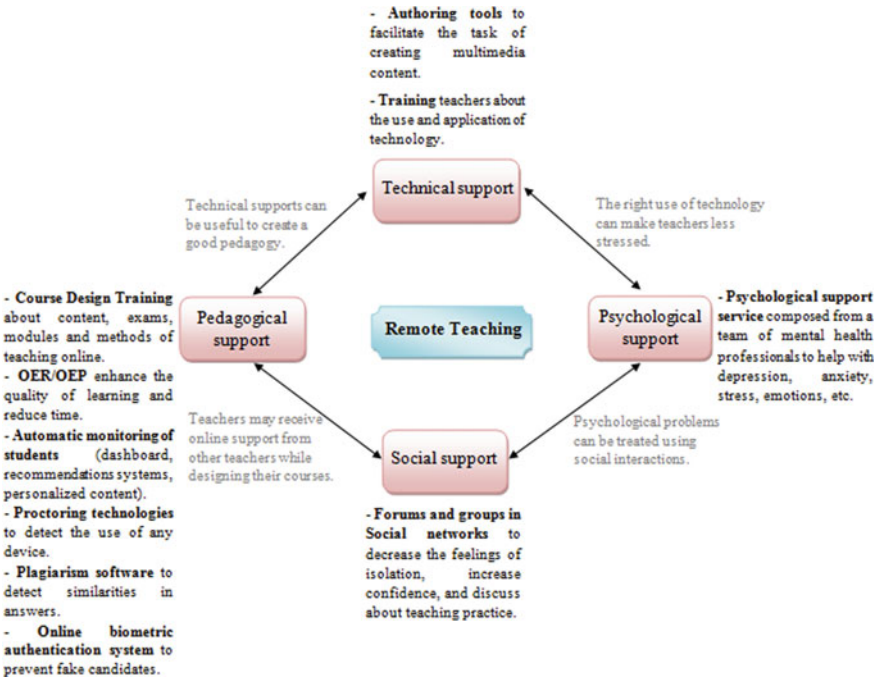

Fig. 11.1 Teacher support framework during a crisis

and comparing the different emergency policies and strategies taken by each country during the COVID-19 pandemic to create universal education response policies in crises and emergencies.

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Chapter 12
Teaching the Teachers

Tony John Mays

Abstract The immediate response to closure of campuses is to try to move learning online. This gives rise to questions about teacher preparedness for such a move. This chapter draws upon recent experience in supporting teacher development in open, distance and online learning to suggest what might be done to support teacher's ongoing professional development as education systems increasingly migrate to new forms of provision. Teachers remain central to learning provision, even in the online environment, but they need appropriate training and support to develop strategies not confined by the limitations of working only in the physical classroom.

Keywords Online · Teacher · Teacher development · Open learning · Distance learning

12.1 Introduction

Kanwar (2020) reported in mid-April 2020 that 1.5 billion learners had been affected by the closure of school and university campuses due to COVID-19. The immediate response to the closure of campuses was a decision by most education authorities to try to move learning online. The trend to digitization in education is considered inevitable, both as a means potentially to improve quality, through increased individualization and engagement, but also to address the inability of traditional classroom-based provision to respond easily to burgeoning numbers due to population growth and/or the drive toward achieving Sustainable Development Goal 4 (as in much of sub-Saharan Africa and Asia) or to other challenges which disrupt campus provision such as the impact of climate change (e.g., in the Pacific and the Caribbean). However, this requires that we revisit the education environment systemically to ensure that it is optimized for learning. Teachers remain central to schooling even in

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the online environment but most teachers will need appropriate additional training and support to develop the dispositions, knowledge and competences to move beyond experiences shaped by the limitations of working only in the physical classroom.

Across different contexts, the most common response to the recent pandemic was to share OER, both in the form of curriculum resources and in the form of guidelines and short courses in various forms of technology-enabled learning for teachers. However, challenges such as unequal access to reliable power, affordable internet and appropriate devices were quickly experienced leading to concerns that only a privileged sub-section of the school population was being reached, and the already marginalized were potentially becoming more so (Antononis 2020).

12.2 Discussion

12.2.1 Revisiting Campus-Based Provision

There has been a growing realization over many years that there is need to revisit the ways in which educational opportunities are made available, both to address the growing gap between the industrial schooling model and the changing needs of a changing society as well as to make appropriate use of appropriate technology to improve learning and to prepare learners for a technology-based workplace (Aceto et al. 2010; Laurillard 2002, 2012; The World Bank 2018).

No one is quite sure when things will "get back to normal" after campuses re-open, or even whether they should, and speculation ranges from business as normal to business abnormal in future, or somewhere in between (Maloney and Kim 2020; SNHU 2020). As Frost (2020) observes, re-opening schools while also trying to observe social distancing guidelines presents its own challenges. However, it does seem likely that a general trend toward greater use of technology will continue and there is some evidence available about what practices add value (McAleavy et al. 2020) and it seems likely that some form of blend of campus-based and online learning will be required. However, it is important to be able to weigh the pros and cons (Nyzova 2020) because as Bishop (2020) observes, a key challenge for the future is "how technology can make digital learning safe, accessible and equal for all."

12.2.2 Revisiting Systemic Assumptions

Of course, it is not just about the teachers, as others have correctly noted (Burr and Tindale 2020; Mukeredzi et al. 2020; *The Economist* 2020) there are equity issues about highly unequal internet, device and software access, consequences for parents unable to work from home to supervise their children when not at school,

and interrupted provision of school meals for children from low-income families, which are all legitimate concerns, and particularly in developing countries already under stress for other reasons.

The current short-term challenge provides us with an opportunity to rethink how we offer schooling more generally to maximize meaningful learning (The World Bank 2018) so that all children can access schooling and all children can enjoy some measure of success and not only those privileged to attend the best of schools.

Hülsmann and Shabalala (2016) have noted the apparent contradiction between traditional distance education concerns with high enrolment programmes leading to economies of scale, and the ways in which digital technology and online learning support cooperation and collaboration for relatively small group sizes. Nonetheless, there is growing use of distance education and online learning methods in formerly contact-only higher education institutions in Africa for example (Kanwar et al. 2018) and also an increasing shift online in open schooling (NIOS 2020).

It is important to recognize that the move online opens up new pedagogic possibilities (Beetham and Sharpe 2013; Peters 2001; Salmon 2019). In fact, the move toward digitization and online learning opens up the possibility of a multitude of different pedagogic models and practices within the same institution, as different programmes seek to meet the needs of different target audiences in different contexts for different learning purposes, in as flexible a way as possible (Amory et al. 2018; Glennie and Mays 2013; Moore and Kearsley 2012; Naidu 2017).

So, although a common initial response to campus closures is to curate content available as OER, the provision of curriculum-related content is a necessary but insufficient response. There is still need for teachers to scaffold engagement with that content for most learners.

12.2.3 Revisiting Teaching

In the traditional school setting, learners are compelled to attend during certain hours; the timetable tells them where they must be, at what times and for what lessons, and their teachers tell them what to do during each lesson. In contrast, in distance and online settings, teachers can provide guidelines for when and how to study but the learners need to manage their own learning to a much greater extent.

The importance of learners' active engagement with content in a distance education setting was a key finding of an earlier meta-study (Bernard et al. 2005). While another meta-study found that the two most quantitatively significant impacts on learner achievement were self-motivation and teacher feedback (Hattie 2009). Papers by Balaban-Sali (2008) and Logan et al. (2017) usefully, but independently, suggest a link between the findings of the two meta-studies, by indicating not only that students must be actively engaged but also that they need to be motivated to do so. Activities designed by teachers and feedback provided by teachers need to grab and hold students' attention by addressing perceived learning gaps, being relevant to their learning needs and goals, inspiring confidence and creating a feeling of satisfaction

on completion, but students must also be able to develop and employ self-regulatory strategies appropriate to their cultural context (Keller 1999; Keller et al. 2018).

While in North America, the notions of distance education and online learning have been largely conflated, with online learning often seen as a subset of distance education (Simonson et al. 2015), in the developing economies of sub-Saharan Africa where there are still challenges regarding access to resources, connectivity and reliable electrical power, online learning has been seen as supportive of both contact and distance education provision and a lot of distance learning still happens offline (Glennie and Mays 2013).

It has been argued, however, that the advent of a connected society allowing both unprecedented access to information and multiple channels for communicating information requires a new theory which recognizes that for some years now much learning happens outside the walls of the classroom, in multiple spaces and in multiple ways (Ally 2004; Downes 2005; Siemens 2004). Students increasingly access information online. However, engaging with information in ways that transform information into knowledge usually requires active mediation with support from more capable others (Vygotsky 1978). These more capable others may not necessarily be a student's teachers—they might well be other students, other teachers or even people outside of the academic environment and/or using the emerging "affordances" of technology. For example, scaffolded engagement with blogs may represent one new mechanism to help students find their own voice and engage with others (Garcia et al. 2014); while a gaming approach represents another (Hwang and Chen 2016).

It is important to note that underpinning assumptions about teaching and learning affect how media and technology are used *(*Meyer et al. 2014), rather than the other way round: it requires specific pedagogically informed design decisions to use media and technology to achieve specific educational purposes. Thus, for example, while opportunities for online discussion between students are characteristic of most online programmes, it should be noted that unless carefully scaffolded, the exchanges that ensue can remain between particular individuals rather than generating communities of practice as may have been intended (Barcellini et al. 2014). It seems clear that new media and technology can easily be used simply to replicate, at scale, traditional teaching and learning roles and approaches to knowledge rather than offering new approaches (Bates 2015; Bates and Sangrà 2011; Hardman 2005; Hardman and Amory 2015). Teachers therefore need to be open to new possibilities offered as well as tracking what works or does not work in practice and making the necessary changes (Scanlon et al. 2015).

Morris (2017), arguing from a critical pedagogy perspective, emphasizes student agency and the process of becoming in the development of a critical consciousness. From an instructional or learning design perspective, it is then not about how to use the new tools to replicate what has always done but rather how to rethink what is both desirable and possible in an online environment. When teachers design learning opportunities and learning pathways, they make assumptions about how they think their students will engage (Al-Samarraie et al. 2013), and as Mukala et al. (2017) observe from their work in the open source software environment, it is important to collect and analyze data about actual learning behaviors in order to verify these

assumptions and/or to inform changes in the ways in which the learning experience has been designed. However, the fact that we "can" access such data does not necessarily mean that we "should", and there needs to be clarity on who has access to what data and for what purpose, and whether truly informed consent has been given (Slade and Prinsloo 2013).

Writing in the context of postgraduate medical e-learning, de Leeuw et al. (2016) argue that making the best use of the potential of e- and online learning requires that attention be paid to identifying an appropriate learning theory, identifying appropriate standards, and then addressing these two dimensions through key quality issues. In similar vein, from their own studies in the schooling context, Hong et al. (2017) and Sarkar et al. (2017) note the complex interplay of appropriate learning theory, student motivation and confidence, appropriate tools and teacher training, coaching and mentoring within a professional culture of collaboration. There is need for clarity on the underpinning pedagogic approach and learning model (Capacho 2014), because otherwise a typical learning management system may be used simply to transmit content rather than to foster engagement and collaboration and all students will be required to follow the same learning pathway in the same sequence within the same timeframe (Hoic-Bozic et al. 2016). In contrast, developing concept hierarchies and classifying the nature of supporting resources during the design and development phase of an online course can help to create opportunities for more personalized learning pathways (Rani et al. 2016). In the design process, it is suggested that teachers need to give conscious attention to how to provide appropriate motivation, capture and hold attention, encourage interaction, consciously develop metacognition and thinking skills and provide evidence of improved understanding (Al-Samarraie et al. 2013). A very useful illustrative example of an online platform that selects content, activities and learning pathways adaptively based on individual student needs is the Khan Academy (see https://www.khanacademy.org/) which the author used some years ago to support not-in-employment and not-in-education or training young people who had enrolled with the non-profit social enterprise organization Harambee (see http://harambee.co.za/). The young people involved had been unable to access entry level jobs that were available because they had been unable to pass standard industry numeracy tests. The Khan Academy mathematics resources were used to help the young people revise their knowledge and skills, with each individual learner following their own learning pathway in their own time, motivated by a real-time digital progress chart and the accumulation of various digital badges.

Digital learning platforms, like the Khan Academy mentioned above, typically collect massive amounts of data about how learners engage in terms of time on task, time to complete activities, number of tasks completed correctly and in relation to course goals, other learners and/or personal goals. This raises questions about who has access to all this data and for what purposes and the extent to which the learners and teachers can access this data in meaningful ways in order to make appropriate interventions and to correct and improve the platform. Bull and Kay (2016) observe a trend toward greater openness in this regard and provide examples of open learner models and how they can be evaluated. Xu et al. (2014) note that if the teacher espouses the theory that each individual constructs his/her own understanding, then

it is logical to make full use of the possibilities of technology to help create more personalized learning journeys. Their empirical study suggested that the personalization of the learning journey had a significant impact on the achievement of their own students, and they illustrate key functions and architecture for an appropriate learning model.

However, while advocating openness and student autonomy, teachers still need to make informed professional decisions. In a recent study exploring a flipped classroom approach in a first-year pre-calculus course, Chen et al. (2016) caution that the online assessment strategy is critical and should be geared toward meeting student learning needs that the classroom-based component should be carefully designed to make best use of the time and resources available (not simply to deliver more content) and that there may be gender differences in the achievement of learning outcomes and the ways in which the course is perceived.

Moreover, if the teacher's underpinning pedagogy is deliberately heutagogic in nature (Blaschke 2012; Hase and Kenyon 2000), typically making use of strategies such as project-based learning, problem-based learning and/or inquiry-based learning and/or action research and personal reflection, then the teachers need to design a more sophisticated model which will allow students to make choices about what to learn, when and how as discussed by Rahimi et al. (2014). Designing multiple learning pathways like this requires a massive investment of time before the virtual classes can start.

It should be noted, however, that an approach based on self-directed learning already assumes a high level of self-efficacy on the part of students. There is reason to question whether traditional schooling typically prepares students for such autonomy and self-regulation, and there may well be need for specific support consciously to develop such dispositions and skills at the start of the student's learning journey (Yang 2006). In this respect, Lee et al. (2014) suggest the possible need for teachers to explore self-directed learning and collaborative learning, both with and without technology in a typical classroom setting and only then to work with technology alone. In addition, there may well be need for a transition from face-to-face instruction, toward more self-directed and collaborative learning using an appropriate mix of face-to-face and technology-enhanced learning approaches, before moving fully online.

In some contexts, a blend of approaches may be the most effective intervention (Olelewe and Agomuo 2016). In addition, it seems clear that there is no simple formula which dictates how much teacher intervention and scaffolding should be provided—some studies suggest that a high teacher presence correlates with greater learning interaction, learner cognition and achievement, while other studies suggest the opposite (Zhao and Sullivan 2015). In similar vein, the use of e-learning approaches can have both advantages and disadvantages depending on context (Arkorful and Abaidoo 2015). It would seem then that there is need for teachers to engage in a coordinated curriculum design process to ensure an appropriate fit between student needs and expectations, disciplinary needs and expectations, and institutional expectations and capabilities, to evolve an appropriate learning model (Capacho 2014). Key factors in such a process are likely to include "coordination and structuring of

teaching and assessment, integration of content development, working with technologies, balancing specialities and core knowledge, and managing induction and expectations" (Fitzgerald et al. 2013, p. 1230). However, as observed by Lai et al. (2013), students increasingly come to the classroom with some useful knowledge and skills already gained informally through different kinds of mobile tools, which they classify as tools for collaboration (such as Google Apps), tools for coordination (such as Twitter) and tools for communication (such as Skype and Facebook), and teachers must make the connection between this informal learning and the formal learning of the classroom. In addition, it may be appropriate for some learning contexts to make use of gaming design approaches (Hwang and Chen 2016) in which the students increasingly control their own learning journey.

After a review of the literature, Sorgenfrei and Smolnik (2016, p. 158) identify five common dimensions in which students using e-learning approaches (whether off or online) typically have greater control: time, place, technology, interaction and space (resources and content). The researchers went through a rigorous process to select 54 articles exploring issues of structural analysis, conceptualization of learner control and examination of direct and/or indirect effects of learner control in multidisciplinary fields using e-learning to conclude:

> Most studies in our sample confirm that in the context of learning processes and outcomes, there is a positive correlation between control over time and pace and between control over navigation and design. The effect of control over content and task selection is, however, ambiguous, which suggests that this form of control should be used with caution. (Sorgenfrei and Smolnik 2016, p. 173)

There are some important suggestions from research on distance and online learning, which could be summarized as follows:

1. Teachers cannot simply provide content—there is need to mediate student engagement with that content and probably for teachers to do at least the initial selection of content to be used.
2. Teachers must supply or suggest appropriate tools and motivation for students to complete meaningful learning activities.
3. Teachers, students, and other support persons all engage in the process with different motivations and understandings of what needs to be done, so there is need for clarity on purpose as well as space for negotiation of meaning.
4. Teachers must recognize that supportive feedback is critical to learning success.
5. So, teachers remain critical, but their methods need to change.

As noted earlier, a common initial response to moving online as a way of mitigating the closure of institutional campuses is to share content in the form of OER and to provide "tips for teachers" in the form of guidelines and some short online courses. However, any intervention seeking to influence and support long-term changes in the way teachers teach needs to be informed by an understanding of how teachers become teachers in the first place. A teacher who probably spent at least four years getting to probationary teacher status, then at least another year of probationary school-based learning to get to qualified teacher status, and who may then have

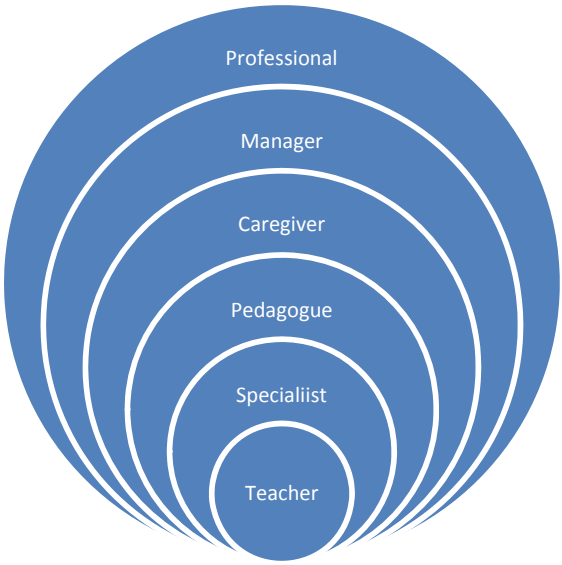

Fig. 12.1 Facets of a teacher's identity

gone on to teach for several years in a classroom, using chalk, a chalkboard, and a prescribed textbook as their key resources, needs to work out how to enable learning to continue without direct physical contact with their learners when campuses are closed. Supporting effective fully online learning requires a new set of capabilities on the part of teachers (Gasevic 2020). How does this teacher reimagine his/her role?

There are several facets that make up the teacher's role. Several of these are illustrated in Fig. 12.1.

Teachers as professionals need spaces for the sharing of professional experiences, especially positive experiences of teaching with technology in professional learning communities (Admiraal et al. 2019) or perhaps wisdom communities (Gunawardena 2020), but they must also be places to share their concerns and frustrations (Moshman 2020).

Teachers are also managers of people, resources, time and reporting, among other things. Over the course of their careers, they will have developed a range of strategies based on physical presence and need support to develop new strategies for a virtual environment (Wolpert-Gawron 2017).

Teachers act as caregivers *in loco parentis* in the physical classroom setting. Teachers need guidance in how to fulfil this role in a virtual environment, for example, on how to pre-empt and address cyber-bullying and to help learners navigate the online space safely based on an understanding of their current use (Livingstone et al. 2015).

Teachers develop a range of pedagogic practices over the course of their careers. While there may be some shared underpinning theoretical assumptions, working with eighty children in an under-resourced classroom in a developing country in a rural area presents different challenges from working with three hundred first-year students

at a university in a connected urban setting. Reimaging and experimenting with alternative strategies for a virtual environment requires time and support (Contact North 2020).

Teachers are also phase or subject specialists. There is need for targeted support in addition to more cross-cutting support. For example, how does the early childhood development teacher support emergent literacy through educational play in the virtual environment? How can the senior secondary physical sciences teacher support practical experimentation at a distance?

Teacher identity is formed over years of experience from being a learner in school, then as a student teacher in college and then as a classroom teacher in a school. For most teachers currently in service, these experiences were all framed by engagement in a physical space. Most teachers will need time to move into the virtual space, probably initially through technology-enabled learning and then blended learning approaches. Teachers also need reassurance and support in this journey. They know their learners and can draw upon their experience pre-emptively to address challenges.

There is growing recognition that teachers and educational authorities need to be realistic about what can be achieved in the short term and what requires a more extended engagement (CDE 2020; Teachonline.ca 2020).

12.3 Conclusion

Looking ahead beyond the current challenge, if we believe in universal access to education for all and recognize the need for lifelong learning in a rapidly changing world, then we need to be looking at more appropriate funding (United Nations 2016) and ensuring that all learners and teachers can access the wealth of resources that is available freely online. However, access to appropriate content is a necessary but insufficient condition and there is need to provide teachers with practical guidelines and examples for alternative forms of provision. This would mean exploring issues such as what can be done online/offline independently; how teachers can best enable interaction and engagement to foster more sophisticated and nuanced understandings; and to what extent, they can use universal design for learning principles and appropriate assistive technologies to help them to reach all learners. There is abundant evidence that there are ways in which we can facilitate quality learning for all kinds of learners without necessarily requiring teachers and learners always to be in the same place at the same time in ideal conditions.

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Chapter 13
Transitioning to Online Teaching

Shuai Wang, Neet Priya Bajwa, Richard Tong, and Hannah Kelly

Abstract Given the effects of natural and social crises that disrupt face-to-face education, such as the COVID-19 pandemic, many teachers have been forced to use online tools to provide their students with distance learning. Luckily, with expanding access to online learning technologies, this transition is more possible than it ever has been before. There are many considerations that schools and teachers need to consider when they redesign face-to-face instruction to meet the needs of distance or online learning. This chapter outlines some of the elements of the online learning environment that teachers must address in order to be successful, such as technical professional development, online resources for teacher collaboration, recognition of time and skill constraints, or the "new normal" for education during the coronavirus pandemic, and the role that teacher perceptions and beliefs around technology plays in the classroom.

Keywords Online teaching · Student participation · Professional development · Teacher beliefs and perceptions · Course design

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13.1 Introduction and Background

The process of teaching and learning is rather complex. For teachers, the process typically begins with a consideration of learning objectives, course structure, tools, and modes of inquiry and engagement to meet the course goals. For example, a teacher needs to consider whether discussions and discourse are central and necessary to meet course learning goals whether the course content objectives can be met through memorization of facts and mastery of a fixed set of procedures or algorithms or whether the course requires a mix of both. In addition to teaching methods, teachers must carefully consider the timing and types of assessments they deliver to students. Other considerations include, but are not limited to, considering the format of the course and whether it will be synchronous, asynchronous, or hybrid. Designing a course can take anywhere from a semester to a year or longer, and often results in a syllabus that captures the essence of the course goals, its targeted content, and the expectations and roles of the teacher and the students.

But what happens when forces outside of one's control require one to employ a method completely different from what was so carefully planned? Given natural and social crises that affect traditional classroom teaching, including the COVID-19 pandemic, this question is one that all teachers have needed to address as they adjust to online teaching. Teaching online, however, is not as straightforward as translating the methods, assignments, and formats of an in-person course online (Diaz and Entonado 2009).

There are several tenets of teaching effectively online (Barrett 2010; Savenye et al. 2001). They include designing the course with the learning goals and interaction among students and teachers in mind. When transitioning to online teaching, teachers must reassess these two components. A third factor that plays a crucial role in the success of online teaching and learning that is often given less attention is teacher preparedness and support in the face of the new online environment.

13.2 Teacher Training and Support

Teacher training and support are essential factors that impact teaching (and consequent student learning) in online courses. Below, we outline three factors that can hinder or facilitate effective teaching:

(a) Technical professional development.
(b) Online shared repository for support and resources.
(c) Acknowledgement of constraints due to the novel environment.

While there are other factors that may play a role in effective online teaching, we highlight these factors as the most important ones to address when teachers are transitioning to online teaching under time and resource constraints with minimal to no prior experience teaching in this new format.

13.2.1 Technical Professional Development

Researchers have found that teachers who received professional support and technical training were able to adapt their teaching strategies and skills to online environments more effectively (Schrum et al. 2005). Unfortunately, many teachers take to online teaching for the first time with little hands-on technical training. Furthermore, it does not suffice to receive appropriate professional training before teaching online. To improve teachers' effectiveness, they need to receive support beyond initial training as well as professional development relevant to teaching a subject online using specific tools and technology (Derbel 2017; Herman 2012; Lao and Gonzales 2005). A lack of training and ongoing support around the technology can negatively impact teaching effectiveness; for example, teachers may run into time-consuming and counterproductive issues related to technological problems. Instead of focusing on teaching and learning in their online classrooms, these technological issues force teachers to halt the learning process and instead try to address problems that they may not be prepared to handle. It is essential, at the minimum, that teachers be well-equipped to handle any upgrades to the technology they use and that they know how to seek immediate help if they run into any issues. This kind of support should involve a live contact person as opposed to a read-through help page.

13.2.2 Online Shared Repository for Support and Resources

Forming online communities for online teachers can be a way to collect resources, user-start-up guides, helpful links to videos, and other tools that teachers have found to be useful. Such communities can become virtual communities of practice that offer teachers support and resources for their continued professional development and learning. These communities of practice can form based on mutual interests or made open to for teachers to join. In addition to a repository for resources, these online spaces can integrate forums for teachers to share challenges and learn from each other's practices, thereby facilitating more effective instruction.

13.2.3 Acknowledging Constraints

While technical training, professional development and ongoing support are essential to teaching successfully online, they each require an investment of time and resources on the part teachers and schools that may not always be available. Unexpected natural and social disruptions, such as the COVID-19 pandemic of 2020, require teachers to not only plan for alternatives to face-to-face teaching but also to create accelerated plans for online technical training and support. In many situations, the possibility of meeting students virtually is limited or unfeasible. While teachers may address new

challenges to teaching and learning early in the process of transitioning face-to-face courses online, they should also acknowledge a set of immovable factors to which they must adapt: school, student, technological, and time constraints in the face of the new online environment. These new constraints require teachers to adjust the expectations and goals for their courses (see Moore-Adams et al. 2016).

Given that teaching online requires some skills and tools that are different from face-to-face instruction, it is no surprise that transitioning from in-person to online teaching would require a deliberate reconsideration of the course, the materials, modes of delivery, communication, and assessment (Barrett 2010; Mortera-Gutierrez 2006). All these require time, but where does one start? We propose the following three steps as starting points; the intention of these steps is to offer a priority list of resources to make the transition seem less daunting:

(a) Teachers should start by creating a list of the minimal resources they and their students may need. This includes physical resources needed for teaching (e.g., webcam, headset, marker, sticky white boards or alternatives to writing synchronously or share written notes asynchronously in the form of slides or handouts) and virtual resources (e.g., online tools, learning guides, and any applications to support teaching and learning).
(b) Once teachers have created this list of resources, they should streamline the list to include only what is absolutely needed to support teaching and learning and eliminate what in the list are non-essential items or have a better (e.g., more cost-effective, more accessible or more easily available) alternative. The materials that one teacher needs may have already been tested and reviewed by another teacher. Oftentimes, one can find alternatives to classroom materials that someone else reviewed or shared on a blog.
(c) Teachers should research online tools and apps to meet specific teaching and learning goals. When identifying apps, it is best to select those that have video tutorials to go along with "how-tos" on the various features the app offers. This allows teachers to save time and avoid a lengthy trial-and-error process to determine whether the technology is suitable for their intended use. We recommend avoiding newly launched applications unless there is enough information on set-up and support for common "bugs" that come with any new application. Overall, it is much easier for teachers and students to learn how to use their education technology tools effectively and efficiently if they are able to access virtual support such as video tutorials (e.g., on YouTube or the application's website) that teach them how to optimally use the tool or app. It is also important to budget time for researching applications and tools before committing to a specific platform (especially standalone applications or tools that are not paid for by a school or institution). This step is essential because in addition to finding the technology or application that best meets a course's learning goals, teachers still need to spend time revising their lesson plans to be appropriate for online teaching.

13.3 The Design of the Course

Teachers should design their online courses in such a way that they meet the needs of students with diverse backgrounds, abilities and various levels of comfort with online tools. However, in a quick transition, such as during an unexpected crisis, it is important for teachers to use the simplest and most accessible tools. Students should be introduced to new tools or apps one at a time with appropriate orientations (either a help page, a short video, or a short step-by-step guide) to familiarize them with the new tool. In order to effectively introduce students to a new online tool, teachers themselves should also know how to use the tool, and ideally receive ongoing support from their school and the technology itself as they learn to use it. As schools and teachers identify which online tools best meet the needs of their courses and students, they should consider the following factors to help guide their decisions: whether the class will be asynchronous, synchronous, include live video sessions, recorded video lessons, presentation slides, survey forms (e.g., Google forms) or a mix of these.

It is worth considering what topics and end goals lend themselves best to which types of tools in online teaching. Additionally, it might be best to have a single repository (e.g., a webpage, a single email with links/list of all tools) that the teacher and the students use to access the menu of classroom tools. Toward this end, many institutions have a learning management system (LMS) that aggregates all the relevant learning tools for students and offer variable features that may be relevant to an online course, such as online access to coursework, grades and more (Koszalka and Ganesan 2004). However, unless teachers and students are familiar with them, these LMSs should be treated as new tools for which both the teacher and students need support. If such a system does not exist at an institution or learning facility, there are some readily accessible options available through sites and software with which most teachers and students are familiar (e.g., Microsoft Teams, Google Suite, etc.).

We want to add a caveat about relying on online tools and LMS: The success and efficacy of an online tool or management system depend on access to the internet. And before settling on any tool, it is important for the institute and the teacher to explore the bandwidth necessary to run the system when multiple users, perhaps hundreds or thousands of them, use it at the same time. If the goal of using these applications is to save time and offer easier access to online learning for students, nothing would feel more unproductive than setting up an entire week's lessons in a system that is inaccessible for some students or to find out later that an application does not support more than a few users at one time-point.

No matter how efficient an app is, teachers are not afforded the time to learn about and tinker with an app when they face a mid-semester course transition. When considering tools, it is best to avoid those that have too many steps to set up and sign-in, because multiple steps for signing-in can itself become a barrier to the task or activity the tool is supposed to facilitate. The goal is for students to get online to view their coursework and assignments as quickly and easily as possible, so teachers should choose online tools that facilitate easy access.

Ideally, teachers should integrate multiple methods and tools for exploration into online courses so that students receive content in a variety of formats (Liu et al. 2010). These formats can include slides, video lectures, and different modes of communication to share the content. However, with last-minute transitions to online learning, such as those necessitated by school closures due to social or natural crises, teachers, institutions and learning facilities have limited time to adjust to the learning curve that transitioning the format of an entire course requires. When reconsidering the course goals in the new context of online teaching, teachers should include opportunities for students to engage informally and formally with their peers and teachers in order to reap some of the social learning benefits that face-to-face learning provides (please see the section on student participation in online classrooms for more details).

13.4 Teacher Belief and Perception

With the development of new technologies, teachers possess various new tools to integrate into their teaching. However, such integration does not always happen easily. Teacher belief and perception play a crucial role in promoting effective teaching using technology. The belief in and perception of the applied new learning technologies are generally summarized under the concept of "technology acceptance." Teachers' technology acceptance results from a combination of both external conditions such as school environment and internal teacher characteristics such as teaching engagement and self-efficacy.

The Technology Acceptance Model (TAM), first introduced by Davis (1986) and deeply rooted in the Theory of Reasoned Action and Theory of Planned Behavior, combines both external and internal factors and provides views on the relationships among external variables, attitudes, and perceptions, behavioral intention to use technology, and the actual use of technology (see Fig. 13.1).

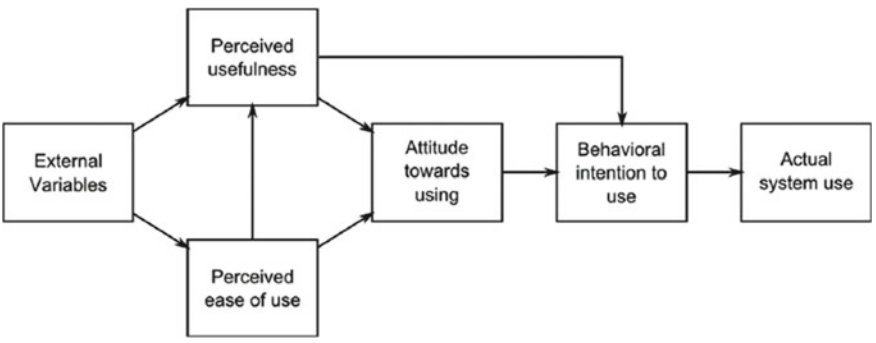

Fig. 13.1 The technology acceptance model (TAM) from Davis et al. (1989) study

"Perceived usefulness (PU)" and "perceived ease of use (PEU)" are two factors considered essential in their contributions to attitudes towards using technology. Davis et al. (1989) defined "perceived usefulness" as "the prospective user's subject probability that using a specific application system will increase his or her job performance within an organizational setting." Davis (1986) used ten 7-likert-scale survey items to measure PU. For instance, the study asked respondents to rate to what extent "Using [product] improves the quality of the work I do," "Using [product] allows me to accomplish more work than would otherwise be possible," and "Overall, I find [product] useful in my job." PEU is defined as "the degree to which the prospective user expects the target system to be free of effort," and was measured, similarly, using ten 7-likert-scale surveys items, including "I find [product] cumbersome to use," "It is easy for me to remember how to perform tasks using [product]," and "Overall, I find [product] easy to use" (Davis 1986). Importantly, although PU and PEU are two factors highly correlated with each other, prior studies have consistently found that PU and PEU are two distinct measures (e.g., Swanson 1987), and PEU has an effect on PU (Davis et al. 1989). In particular, under the context of social and natural crises that result in educational disruption, PU and PEU are critical measures to assess because it is crucial that teachers and students can use *useful* education technology interventions that are *easy* to use given the short notice and sudden transition.

Since its inception, TAM has been widely appropriated in education, and has been particularly useful in understanding teacher belief and perception about technology and their actual use of technology. Interestingly, despite the amount of effort dedicated to this topic, researchers have yet to come to a substantive conclusion regarding the relationships specified in TAM. For example, a number of studies have found that, in educational contexts, teachers' PU has a significant relationship with behavioral intention (BI), which is their intention to use technology (e.g., Bertram and Waldrip 2013; Teo 2009). However, other researchers have identified a quite weak relationship between the two factors (e.g., Chen 2010). As another example, Ritter (2017) concluded a significant relationship between Attitudes Towards Technology (ATT) and BI; Schepers and Wetzels (2007), through a meta-analysis, found a weak relationship between the two factors.

The relationships also differ across regions. For instance, Luan and Teo (2011) examined Malaysian student teachers' intentions to use technology products and found that student teachers' PEU significantly predicted PU, and PU and PEU significantly affected student teachers' attitudes towards using technology. Teo and Noyes (2011) found similar significant relationships in the Singapore sample of pre-service teachers, but those identified in the UK sample were much weaker.

Importantly, a substantial amount of research has also examined teacher characteristics mediating the acceptance of technology. For example, some researchers have found that subjective norm, the possible influence of external expectations from colleagues/classmates, friends, teachers, and other people (e.g., "People who are important to me think that I should use [product] in my future teacher"), is a significant predictor for BI (Venkatesh and Davis 2000); Ma et al. (2005), on the contrary, pointed out that subjective norm was not a significant predictor for PU or

intention to use technology, suggesting that it was the individual teacher who made decisions regarding technology integration.

A recent meta-analysis conducted by Scherer et al. (2020) attempted to provide an explanation for the discrepancies identified in technology acceptance research. Through a meta-analytic confirmatory factor analysis, they found that the one-factor model, which "represents technology acceptance as a unidimensional construct assuming there is no common factor underlying all technology acceptance measures," is a better representation of the data compared to multi-factor models. This suggests that the "the technology acceptance measures are substantially intercorrelated and indeed measure a common trait which could be interpreted as technology acceptance," which is consistent with prior findings (Nistor 2014).

Another study (Teo and Noyes 2011) provided an alternative explanation. They found measurement invariance for the TAM across two culturally diverse technology user groups in Singapore and the UK. However, the strengths of the relationships for the TAM substantially differed between cultural samples, indicating that the TAM relationships could differ due to the contexts of the studies.

Nevertheless, despite the development of different TAM versions—with or without external variables, and with or without BI as an mediator—the core variables in the TAM model remain the same: PEU, PU, and ATT (Venkatesh and Bala 2008), and these variables are critical in understanding teachers' perceptions about and actual use of online teaching tools.

13.5 Student Participation in Online Classrooms

Though online classrooms are inherently different from face-to-face classrooms, these two learning spaces have a few characteristics in common. Similar to their mode of operation in face-to-face classrooms, teachers' ability to develop a successful interactive online environment must be rooted in the learning goals, and in connecting the tasks, activities, and assessments with the learning goals of the course (Berge 2002). Teaching effectively in online classrooms requires considering how students participate, engage in productive struggle, and generate meaningful discourse. Research on the online teaching points to evidence that interaction between students and the teacher, as well as among students themselves, can significantly impact student retention (King and Doerfert 1996). However, unlike face-to-face classrooms where students can talk to their peers on a regular basis, online classrooms can impose a sense of isolation. Thus, for effective teaching and learning to occur, it is important to integrate planned formal and informal student interactions to offer opportunities to students to learn with and from their peers. These opportunities to engage in formal and informal conversations among the students could be separate from or inclusive of platforms for formal and informal conversations with the teacher. Being able to interact with peers and teachers both formally and in some informal capacity allows students to feel connected to the culture of the classroom (Wagner

1997), which in turn can positively affect learning and retention. Informal conversations can be asynchronously, so students can participate on their own time (e.g., forums, virtual conference rooms, etc.). Initially, the teacher might need to provide a lead topic or a question each week (or twice a week, depending on the needs of the course) so students participate with the intention of getting to know each other. With time, these opportunities for informal social interaction can be left open-ended or become student-driven. They can also take the form of a discussion or question and answer, where students can post questions or thought-provoking topics to discuss with peers while providing and receiving support. For formal collaborative interactions, planned assignments (e.g., group projects, chat rooms, focused interactions on content in separate forums or threads, study groups, etc.) can be designed and assigned. If in a traditional face-to-face classroom, students sit at tables and collaborate, teachers can incorporate alternatives to this authentic collaboration in their online set-up. For example, some online applications allow the teachers and students to post student work and so that other students in the class can view and engage with posted content. The success of such tools, which looks like authentic discussion and engagement, requires planned activities and clearly outlined expectations for what is expected of students as they engage with the tool, post their content and respond to other students' and teacher content. Lastly, providing forums for students requires teachers to remain involved in the online forums in order to mediate student contributions and, at least for formal forums, ensure that discussion stays on topic.

The role of teacher voice and face-to-face interaction in the effectiveness of online teaching cannot be underestimated. Synchronous or asynchronous facetime, where the teacher can meet with students virtually at least a few times through video or voice communication such as an audio message, is considered among one of the best practices in teaching effectively online (Bain 2004). This form of contact is particularly crucial when teachers transition a face-to-face synchronous course to an online course in the middle of a semester. Virtual interaction between and among teachers and students through video (or audio messages when a video is not possible) can add to a sense of culture and community which can have a ripple effect on student engagement with other aspects of the course. Research indicates that students perceive classes with synchronous components to positively affect their learning and to be of better quality when compared with courses that only offer asynchronous communication (Ward et al. 2010).

13.6 Discussion and Conclusions

Teachers need to consider that though online courses can offer an effective teaching experience, they differ in a number of significant ways from face-to-face courses, and it is imperative to set student expectations and remind them of the resources they have at hand. Unlike a face-to-face class session, where students come to a physical classroom, interact with teachers and peers and have access to other resources (e.g.,

library, office hours, etc.), features of a traditional classroom might not be available or might be available in a different format in an online environment. In order to minimize the potential sense of isolation, the online teacher needs to consider ways to incorporate formal and informal methods of engagement both during class time (if synchronous) and outside of class time. Creating online forums and encouraging students to use them as a mode of communication might be beneficial for creating a sense of community, in addition to providing a space where the teacher can respond to queries or post-challenge problems from time to time. Peer interaction and synchronous teaching both have positive effects on student engagement, which is important for students who may otherwise become disengaged during online learning. Another way to ensure students stay consistently engaged throughout the course to have tasks and activities that students work on incrementally, as opposed to only a big project deliverable at the end.

Finally, modern technologies continue to provide new approaches to assist online teaching. Looking ahead, teachers should consider alternative methods for effective teaching and learning and schools should provide proper professional development to train and support teachers in making the most of the technological tools at their disposal to aid in effective teaching. As an example, adaptive learning systems (e.g., Carnegie Learning and Squirrel AI Learning) personalize instruction to students' characteristics and abilities using a variety of adaptive methods including Artificial Intelligence and Machine Learning approaches. Prior efficacy studies have shown that such systems can be very useful across countries and contexts (e.g. Pane et al. 2017; Wang et al. 2019). Future teaching should not only incorporate traditional materials into online modality, but also include other educational technology components and methodologies in a meaningful way.

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Part III
Learners Support in Crisis

Chapter 14
From the Paper Textbook to the Online Screen: A Smart Strategy to Survive as an Online Learner

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Abstract During the COVID-19 pandemic, the effort by most educational institutions (EI) over the world was necessary to ensure the pedagogical continuity during school closures so that schools could fulfill their role. In this chapter, we will describe how EI have switched in record time from traditional teaching using textbooks and face-to-face learning to one-way teaching that in most cases is based on the online screen. We will discuss the situation of distance learning and how stakeholders have prepared to face this pandemic. We will also highlight some challenges of the digital transformation in education during the past decade. An overview of the situation of the disruptive school will be presented, focusing on the main impacts on our society. Then, a brief description of the requirements for remote education in the crisis period will be presented, and adopted solutions will be discussed knowing that most of them were based on the use of online screen solutions. Finally, lessons learned from the

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COVID-19 pandemic will help all stakeholders to start thinking and designing the future of education.

Keywords Distance education · e-learning · Online screen learning · COVID-19 · Education crisis

14.1 Introduction

Education is a human right (United Nations 1948), it must be ensured in usual times of stability as in times of crisis, such as natural disaster, zones of conflict and wars, emergency period, large scale outbreaks of epidemic disease, and others that take place in the Worldwide. Indeed, in those situations, sustainable and effective learning and teaching are at risk. This contribution presents how to ensure educational continuity and to maintain learning undisrupted when universities are closed during crisis times. The coronavirus pandemic caused an abrupt and complete switching to distance teaching/learning during the lockdown. For many countries in the world, this was a great leap into the unknown.

The pedagogical process in higher education assumes from all stakeholders (students, teachers, and administrations) a series of actions scheduled overtime, progressing in terms of knowledge acquisition and generally taking into account the physical presence of the student within the institution. Our entire pedagogical approach is mainly based on the physical presence of students and teachers (and/or tutors) in the classrooms and the proximity of the administration's daily management for the success of the educational process (Moore 2006). Besides successful models in e-learning and the growing development of information and communication technology (ICT) and educational technologies in the digital age, the interaction between humans and machines remains quite challenging; especially when the teaching process needs to be fully addressed online. Therefore, certain higher education establishments faced some dysfunctions or rather issues of non-standardization regarding the management of educational continuity in certain higher education establishments on the fringes of the COVID-19 crisis. However, in record time, educational institutions (EI) have supplied educational platforms with, for the most part, digital educational resources. There are still some concerns about whether students are receiving a quality education, and having equal access to all the resources.

Now, our society is more connected than ever. To keep up with this unstoppable digital revolution, which reached almost every part of our society, many higher education institutions introduced various formats of teaching and became producers of specified-in-context online courses. As an example, in Morocco, we are increasingly becoming consumers of the Internet, be it fixed or mobile. The National Telecommunications Regulatory Agency in Morocco published on its Web site (https://anrt.ma/publications/rapport-annuel) that the number of subscribers increased from 1.8 million subscribers in 2010 to more than 21 million subscribers in 2017. The data shows Moroccans seem to prefer smartphones over computers, as smartphone

ownership growth rates far exceed computer ownership rates, 74.2% of Moroccans access the Internet from their phones. Mobile devices are used in many learning applications, they enable learning anytime and anywhere (Kaliisa and Michelle 2019). In this case, an online course, a device, and Internet access are the major three ingredients of the e-learning formula in our context/study. Before discussing, later in this chapter, the various approaches, and solutions that have been deployed to deal with this unprecedented situation, we will first look at one crucial question, namely how prepared teachers and students were to face this crisis.

14.2 Were We Ready for Distance Learning?

This situation of distance education is even more alarming because students, whatever their level, have not been prepared for it, or only to a limited extent. It is undeniable that learning on a largely autonomous platform, although guided or tutored in some cases, calls for digital and methodological skills that the student must apply; otherwise, he or she will lose motivation and drop out quickly. For his part, the teacher must mobilize his techno-pedagogical and didactic skills, and often innovate, to adapt his teaching.

14.2.1 Prerequisite Skills for Teachers

Overnight, teachers find themselves responsible for creating distance learning courses, depositing teaching resources, and devising challenging tasks and activities for their students. The teachers also managed formative evaluations, organized synchronous videoconferencing sessions, and verified the participation of each student, providing personalized support in some cases.

14.2.1.1 Resources and Activities on Platforms

Faced with the current pandemic, teachers responded rapidly in putting their teaching resources online. Indeed, one week after the start of the lockdown, each faculty made available on its Learning Management System platform the pdf version of course manuals, and sometimes also presentations and videos of recorded lectures. Teachers could benefit from reusing open educational resources (OERs) already available. Morocco is nevertheless among the most active southern Mediterranean countries in open education (Zaatri et al. 2020). There, the interest in training teachers to produce and reuse OERs is obvious.

14.2.1.2 The Evaluation Issues

Given that only assessed or assessable learning has didactic value, it is necessary to evaluate the tasks proposed to learners. On an LMS, this evaluation can take several forms: case study, essay, oral examination, multiple-choice questions, portfolio, podcast, or even open book examination where students are allowed to have access to books and online content. Therefore, the focus can move away from memorization to solving problems (Gonzalez et al. 2020). A teacher's experience in providing face-to-face assessments is not always helpful when it comes to online assessments. It is often necessary to assess the high-level skills of Bloom's taxonomy, such as analysis or critical thinking. This obviously requires techno-pedagogical skills when designing online assessments.

14.2.2 Student Skills and Prerequisites

Insofar as distance education is no longer a complement to, but takes the place of face-to-face teaching, the way students learn must itself adapt to this new paradigm (Bates 2015).

14.2.2.1 Technical Prerequisites

In a previous study (Machwate et al. 2020), we pointed out that in Africa, the number of views of academic podcasts from smartphones exceeds the number of views from computers, whereas, in some developed countries, computers are used more. Mobility is certainly an advantage in favor of the use of smartphones, but the main reason is that a significant proportion of African students do not have a personal or family computer, which is an indispensable tool for distance learning. Add to this the difficulties of access to the Internet and the cost of data, especially for students in rural areas.

14.2.2.2 Self-Directed Learning Competencies

Distance learning requires that students use digital technologies to support this self-directed process. The student has to plan, monitor, and reflect on his or her learning. It is quite clear that such skills should be learned face-to-face before the lockdown. It would be an illusion to hope that the student, overnight, will acquire them simply because he or she needs them. The student's autonomy is particularly important for the acquisition of procedural skills for which he or she must learn to link several knowledge areas and put them into practice. Concretely, this happens when the student has to find the solution to a problem or use a simulation to clarify concepts in practical activities.

14.2.2.3 Communication and Collaboration

The student in the COVID-19 outbreak must avoid the harmful effects of isolation and loneliness that lead to demotivation. Students must engage in collaborations with peers and teachers to share knowledge. The teacher should indeed play the role of initiator and facilitator of these exchanges (Huang et al. 2019). To the well understand the situation of the disruptive school during the COVID-19 crisis and how to face it, we will first give an overview of the diversity and complexity of teaching in the digital age.

14.3 Teaching in the Digital Age

This section aims to present an overview of the educational technologies that equip the landscape of digital education, those educational technologies that allowed and supported the transition from the paper textbook to the learning on the online screen. However, integrating technology into teaching and learning is a transformative process with the potential to create a meaningful educational experience to increase learners' learning performance (Goh et al. 2020). The twenty-first century is called the "information age" and brought along an era in which computer technologies develop rapidly and become widespread among all levels of the community (Isman 2006). Considering how technology is proliferating in all spheres of life, educators and researchers have always been intrigued by the potential of technology to help transform education and improve learners' learning (Hew and Brush 2007). Indeed, it is becoming pivotal to use ICT in teaching and learning processes in today's information age classrooms by implementing digital learning tools, such as computers, laptops, tablets, and mobiles, to expand course curricula, to make teaching and learning more meaningful and fun, to build twenty-first century skills, and to enhance learners' active participation in the learning process (Jaiswal 2020).

The logic of Massive open online courses (MOOCs), e-learning, and m-learning, among other forms of teaching and learning strategies, shows us the central role of the technological device in the new conceptions of education. The presence of these devices, both in basic and higher education, does not respond, in any way, to a fashion (Zabala 2019). According to Alexander and McKenzie (1998), the use of ICT in higher education has the following benefits for learners:

- Improved quality of learning
- Improved productivity of learning
- Improved access to learning
- Improved learner attitude to learning

One of the more noticeable changes to tertiary teaching over the past decade has been the widespread adoption of digital technologies (O'Brien and Verma 2019), especially MOOCs (Hew and Cheung 2014; Yuan and Powell 2013), e-learning, and m-learning (Abachi and Ghulam 2014; Ozuorcun and Tabak 2012). As well,

the introduction of OER, and the encouragement of their integration and use, to ensure quality education for learners. The use of those educational technologies in the teaching and learning process and the preparation in advance for digital transformation allow switching to online education to guarantee educational continuity in this period of crisis.

14.4 Facing the Disruptive School During the Covid-19 Crisis

Coronavirus disease (COVID-19) is an infectious disease caused by a newly discovered coronavirus. It spreads from person to person through droplets of bodily fluids when an infected person coughs or sneezes (World Health Organization [WHO] 2020a). The WHO declared the COVID-19 outbreak to be a pandemic on March 12, 2020 (WHO 2020b). To contain the spread of COVID-19, most governments around the world have temporarily closed EI. Over 166 countries implemented national school closures, affecting over 87% of the world's students' population (UNESCO 2020c).

14.4.1 Digital Impact

In response to the pandemic, institutions all over the world switched from traditional face-to-face delivery of education to online delivery. Welcome to the digital era in education. It is quite challenging for governments and institutions to change the proportion of content delivered online; in this time of crisis, they provided suggestions, platforms, guidance, and additional resources for students of all ages.

A lot of educators do not have the necessary competences to assist students online and to create a supportive and inclusive virtual learning environment since they are used to the classroom atmosphere and face-to-face delivery. Higher education had been increasing online learning opportunities even before the pandemic (Chitkushev et al. 2014). As classes move online, teachers are giving lessons through videos on social media such as Facebook and video conferences on Zoom or by guiding students to educational YouTube videos (Carver 2020). But this raises the question, what about students without the Internet or computers? Digital inequality is evident now more than ever; we cannot guarantee that every student has access to the Internet and will not fall behind. According to the 2019 report of the International Telecommunication Union (ITU), only 53.6% of the population around the world has access to the Internet (ITU 2020b). To fill this gap, public television stations in some parts of the world provide academic programs and TV broadcasts, to stimulate learning and give mass education opportunities.

14.4.2 Family Impact

It is quite challenging to transform a home into a virtual learning environment, particularly for families with children of different ages, each with their regulations. In times of crisis, children need structured educational support at home. Parents are required to teach them, to supervise their homework submissions, and to remind them to participate in virtual hangouts. And sometimes, they have to be strategic in sharing devices and space when multiple classes are going on simultaneously. Some parents are more informed than others about navigation in platforms, registrations, password entry, and more complex tasks. Their ability to provide technical support can differ, and teachers can see that in the performance of their students (Wang et al. 2020).

14.4.3 Psychosocial Impact

As COVID-19 forces school closure, 1.38 billion learners are out of school. With communities placed under stress by health and economic burdens, this disruption raises concerns about the safety of children (Usher et al. 2020). This pandemic is exposing children to an increased risk of violence and sexual exploitation, especially those living in a dysfunctional or violent family (UNICEF 2020). UNESCO reported that increased dropout rates will affect mainly adolescent girls, based on what happened in the Ebola crisis (adolescent pregnancy increased by 65%) (UNESCO 2020b).

14.4.4 Impact on Higher Education

COVID-19 is shaping the higher education sector, institutions, and agencies around the world, and many studies and surveys are conducted to understand how this epidemic is affecting academic communities around the world. There was also some discriminatory behavior towards individuals from countries affected by the COVID-19 outbreak (Erasmus Student Network 2020). QS Quacquarelli Symonds launched a survey to measure students' intent to study abroad; 46% of respondents stated that the coronavirus had impacted their plans to study abroad, 47% of them had decided to defer their entry until next year, 13% now intend to study in a different country, and 8% no longer want to study abroad (Quacquarelli Symonds 2020). The HolonIQ survey measures global education expectations. The HolonIQ Global Executive Panel comprises over 2000 ministers, presidents, vice-chancellors, CEOs, senior executives, and investors across the full spectrum of public and private institutions and firms, from Pre K to Lifelong Learning. More than 50% of the global

sample expected things to get worst for their institutions in the short term and to get slightly better with time (HolonIQ 2020).

14.5 Adopted Solutions in Times of Crisis

During the COVID-19 crisis, restrictive measures have been taken worldwide to limit the spread of the virus. These measures have a huge impact on almost every aspect of daily life, and among the activities that saw a big impact was the educational system. Everywhere around the world, schools and universities have been closed, and students and lecturers were forced to stay at home and carry on their teaching and learning activities remotely.

14.5.1 Requirements for Remote Education

It seems that today we are entering a new phase in the evolution of the academic world and higher education, the education that will create the 4th generation of universities that can be called "online and digital universities." This is largely due to the COVID-19 pandemic, which has launched a digital revolution in academia and higher education (Strielkowski 2020). In order to succeed in this evolution, many requirements need to be met.

14.5.1.1 Digital Awareness

Before the COVID-19 crisis, most universities had implemented online platforms of digital education. Although the quality of the content and the quality of experience were closely monitored, many students and lecturers were reluctant to use these new platforms. In the case of the USA, according to the Pew Research Center's report on digital readiness gaps (Horrigan 2016), a slight majority (52%) of adults are relatively hesitant to digital skills, and 40% generally need assistance setting up or using new devices, thus needing more time to get trained and accommodated in using new tools and techniques.

14.5.1.2 Access to Internet Connectivity

In order to achieve learning activities remotely, countries should have a developed Internet network, with widespread coverage and acceptable quality and speed. Unfortunately, not all countries have managed to enhance the coverage of fixed or mobile networks, thus making it difficult for students to carry on with their learning activities remotely (ITU 2019) (Fig. 14.1).

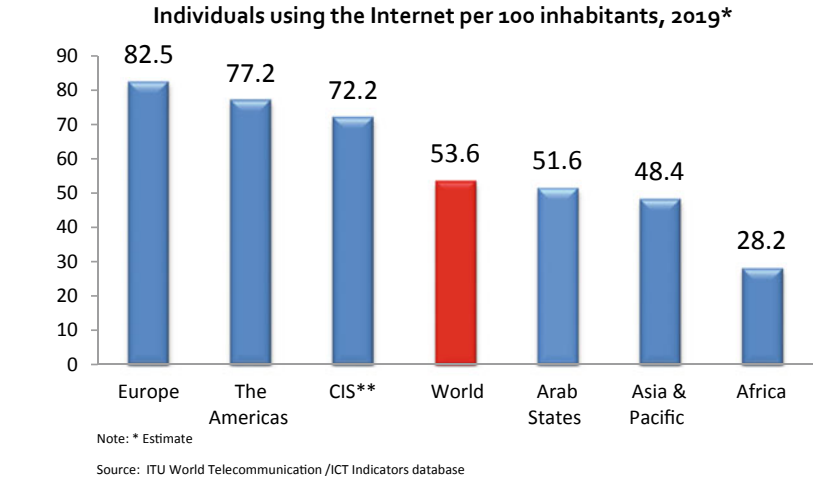

Fig. 14.1 Individuals using the Internet per 100 inhabitants

Even though the continuous growth in Internet users worldwide (Fig. 14.2) would encourage distance education, low-income families may still find it difficult to access the Internet. And even when they do not, they are more likely to rely on smartphones for Internet access, and students in those households may not be able to use more sophisticated learning software that requires a tablet or computer (ITU 2019).

On the other hand, the cost of accessing the Internet is becoming a burden during this crisis, with most economies at a low point and many people losing their income. Some countries have made access to learning platforms free of charge as per the

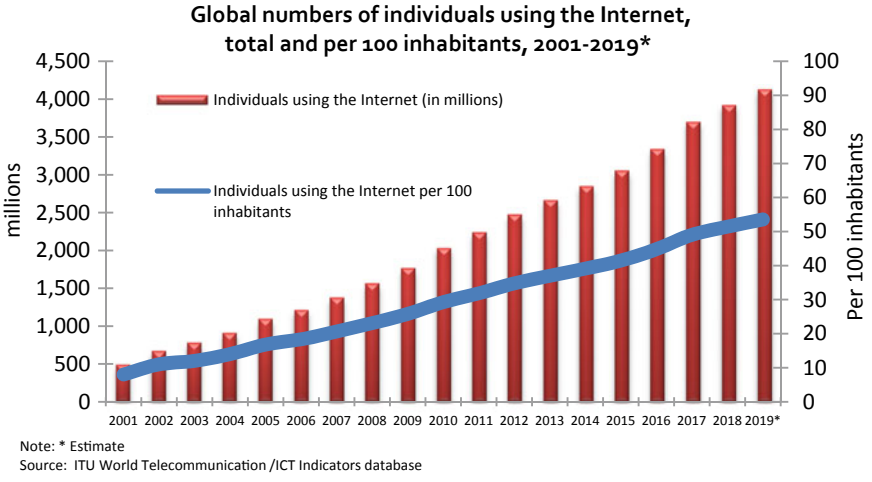

Fig. 14.2 Individuals using the Internet

UNESCO recommendations for promoting open science and reinforced cooperation in the face of COVID-19 (UNESCO 2020), and some countries have even forced network operators to allow network users to access these platforms even though they do not have credit.

14.5.2 Adopted Solutions to Remote Learning

There are many options when it comes to educational applications, platforms, and resources that aim to help parents, teachers, schools, and school administrators facilitate student learning and provide social care and interaction during periods of school closure. Most of the solutions curated are free, and many cater to multiple languages. They respond to different categories of distance learning needs, but most of them offer functionalities across multiple categories.

14.5.2.1 Asynchronous Online Learning Solutions

As a result of the strengthening of ICT in education, digital learning resources, such as MOOCs, small private online courses (SPOCs), online video micro-courses, e-books, simulations, graphics, animations, quizzes, and games, make learning easier, more interesting, and more context-sensitive. However, the selection of appropriate digital learning resources for learners must be made when designing e-learning activities (Bozkurt et al. 2020; Huang et al. 2020).

These solutions should contain activities composed of resources that are of different types to help provide a comprehensive learning platform (forums, glossaries, wikis, assignments, quizzes, choices [polls], Sharable Content Object Reference Model (SCORM) players, databases, etc.) (Bozkurt et al. 2020). The main power of these activity-based solutions comes from combining the activities into sequences and groups, which can help guide students through learning paths. Thus, each activity can build on the outcomes of previous ones. Each of these resources must meet the following five basic conditions:

- The content is of interest to the learner or necessary to enable him/her to solve problems.
- The content is of moderate difficulty and appropriate breadth so that there is no cognitive "overload."
- The structure of the contents is simple and clear, which will reduce the cognitive load of the learners.
- The content is well designed to avoid visual constraints.
- The navigational presentation is clear and of moderate depth so that learners do not get lost while navigating through a given learning system.

14.5.2.2 Synchronous Online Learning Solutions

Synchronous learning is a more structured learning strategy, with the courses scheduled at specific times and in live virtual classroom settings. In this way, students benefit from real-time interactions, hence getting instant messaging and feedback when needed. These solutions aim at bringing remote groups of people together to communicate and collaborate; they provide different features such as voice calls, video calls, online document sharing, and editing, and recording for reply later. Some of the famous tools are Zoom, Microsoft Teams, Google Hangout, and several social media (Facebook, WhatsApp, etc.) (The World Bank 2020).

A reliable network management infrastructure capable of managing multiple users simultaneously is essential for ensuring a smooth and non-disruptive e-learning experience (Huang et al. 2020):

- Providing synchronous e-learning via video conferencing
- Using (watching, downloading, uploading) interactive learning resources (videos, games, etc.)
- Collaborating with peers through social platforms

The most effective distance learning for higher education students should be almost entirely online. Usually, it is facilitated by a learning management system and synchronous video conferencing systems (The World Bank Education Global Practice 2020a).

14.5.2.3 Video Conferencing and Audiovisual Broadcasting

The most intuitive choice for replacing a face-to-face course is undoubtedly video conferencing (Adobe Connect, Big Blue Button, Teams, etc.). It allows synchronous interactivity in both directions and even gives the possibility of checking the presence of each student (Jena 2020). This is the solution adopted by the majority of private universities and colleges, with virtual classes of 20 to 30 students, all of them having computers with a good connection. Videoconferencing platforms can almost replicate face-to-face interactions by activating the auditory and visual senses and that could lead to a greater commitment (Marhefka et al. 2020).

For public universities, this solution is not suitable for sections with a huge number of students, who are generally under-equipped and cannot afford the daily cost of an Internet connection. It is then preferable to record the lectures and broadcast them on YouTube. However, a live broadcast is not necessary, as it adds technical constraints without any real beneficial impact on learning. However, it is inconceivable that teachers could, in a hurry, record all their lectures (Shen et al. 2009).

As a pre-conclusion of this paragraph, even though most of the adopted solutions to face the COVID-19 crisis were around the use of online screens in closed universities, previous research has shown that it is difficult to read from a screen (Myrberg and Wiberg 2015), so this solution seems to be unique for students in disruptive

classrooms. In another research survey, 61% of learners had a preference for using print books, while 39% preferred electronic ones (Waters et al. 2014).

14.6 Conclusion and Perspectives

It is known that a university is a universal space for the creation and dissemination of knowledge and must continue its eternal mission and demonstrate its leadership in terms of creativity and utility. However, facing a pandemic crisis, it was forced to propose solutions that could ensure the continuity of the educational operation, taking into account the different requirements of the situation. As predicted by UNESCO during the United Nations General Assembly in New York (UNESCO 2019), the future of education should "reimagine how knowledge and learning can shape the futures of humanity in a context of increasing complexity, uncertainty, and precarity during a high-level event." The COVID-19 pandemic has cast a cloud of uncertainty over higher education. All measures described previously are only a small sample of the digital solutions available in these times of crisis, but they will certainly help students around the world to continue their education during this extremely difficult time (ITU 2020a). This is an opportunity for some countries to rethink education. More than that, it is a call to build a more resilient and inclusive education system, taking into account the essential role of teachers and parents and the availability of learning resources (UNESCO 2020a). Now, lessons learned from the pandemic crisis should bring answers to the future of education and respond to the challenges of global education and related opportunities, as well as how to maintain quality higher education during university closures.

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Chapter 15
Supporting Learners in a Crisis Context with Smart Self-Assessment

Zacharoula Papamitsiou, Martin Lunde, Jakob Westermoen, and Michail N. Giannakos

Abstract Sustaining learning in the times of a global crisis is complex. It is beyond the previously employed online learning and teaching approaches: this new setting brings on the same page the challenge to support learners not to lose their motivation and interest in learning, and the opportunity for new learning and teaching formats to emerge and be developed. It also makes space for reconsidering autonomous learning as a choice for maintaining the inherent need for self-determination. This study presents how students' motivation is affecting the usage of an online self-assessment service—enhanced with analytics—and the different perspectives of more vs. less motivated learners to continue their learning, despite the contextual shift due to the Covid-19 crisis.

Keywords Self-assessment · Motivation · Case study

15.1 Introduction

The Covid-19 pandemic is a crisis that has caused the disruption of normal educational processes and has raised new challenges about the way we learn. In such conditions, it is important to keep in mind that education is linked to crises in three main

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stages (Ruben et al. 2016): in the prevention of a crisis (e.g., familiarize with alternative teaching formats), during a crisis (e.g., sustaining online teaching/learning formats) and in post-crisis (e.g., safe reopening of schools). Previous research on educational technologies had already developed and practically demonstrated methods and tools for carrying out and supporting online teaching and learning formats [e.g., 2012 was announced as the "*year of the Massive Open Online Course (MOOC)*" (Pappano 2012)]. However, in practice, it is shown during the Covid-19 crisis that the "real" world was not prepared to switch to fully online education; as emphasized by UNESCO's Assistant Director-General for Education (Huang et al. 2020, p. 4): "We need to come together not only to address the immediate educational consequences of this unprecedented crisis, but to build up the longer-term resilience of education systems." In a sense, education in time of crises requires seizing opportunities for creating spaces to rethink, pay attention and reflect on the sustainability of alternative approaches (i.e., "address the immediate educational consequences"), as well as for novel methods and tools to be coupled with the use of modern technologies (i.e., "build up the longer-term resilience of education systems"). Ensuring that we learn from and fully exploit existing learning and teaching practices shifts from a *nice-to-have* to a *must-have*.

When disruptions happen, we often speak of restoring a sense of educational "normality" for everybody. It is necessary to devise special methods of education delivery for all who have come through the crisis; there is an opportunity here, so new technologies can play a pivotal role in continuing educating everybody in the aftermath of a global crisis, by investing on individuals' motivation to learn and their autonomous learning capabilities.

We present the results from a study that was conducted during the Covid-19 pandemic in Norway—the first part of the study was completed the day the lock-down was announced, and the second part was conducted during the lock-down. The study aimed to explore students' motivation to use an online self-assessment service and the perspectives of more versus less motivated learners to continue their learning, despite the contextual shift due to crisis.

15.2 Background and Related Work

15.2.1 Learning in a Crisis Context: An Autonomous Learning Perspective

The outbreak of Covid-19 led the governments worldwide to take drastic measures and impose restrictions to deal with and control the spread of the virus; 107 countries had closed national schools and universities by March 18, 2020, and switched to online education (Viner, et al. 2020). However, in order the learning to be efficient in online conditions, strong self-regulated learning (SRL) skills are required (e.g., Broadbent 2017; Wong 2019). SRL is conceptualized as an "active, constructive

process whereby learners set goals for their learning and then attempt to monitor, regulate and control their cognition, motivation and behavior, guided and constrained by their goals and the contextual features in the environment" (Pintrich 2000, p. 453). Self-regulated learners are guided by their motivation to learn, are aware of their learning processes and adjust their behavior to keep themselves on track toward their desired outcomes (Pintrich 2000; Reeve et al. 2008). Research indicated that students with strong SRL skills were more likely to be successful in online learning (Broadbent 2017). In fact, SRL is dependent on self-assessment—via self-monitoring and self-evaluation—to support student learning (Butler and Winne 1995; Zimmerman and Moylan 2009). A recent meta-analysis pointed to the importance of self-assessment interventions to promote students' use of SRL strategies and its effect on students' motivation (Panadero et al. 2017). Based on prior results, it is necessary to develop adequate self-assessment tools to guarantee good performance in e-learning environments (Özyurt and Özyurt 2015; Sharma et al. 2019).

Practising SRL has been proposed to develop learning autonomy (Papamitsiou and Economides 2019). Learning autonomy is experienced as an implicit need "to take charge of one's learning […] the responsibility for all the decisions concerning all aspects of this learning […]" (Holec 1981, p. 3). This definition implies accepting responsibility over all spectrum of the learning process, regardless of the learning environment specifications; autonomy places the learners at the outset of the learning tasks: it is always the learners who choose and control when, what, where, how and how much to learn. Learners' responsible self-initiative is prioritized, allowing them to determine what will be learned and to critically reflect on the selected learning tasks (Candy 1991): the autonomous learners are able to unravel their learning issues and to define what needs to be learned and how. It has been argued that the capacity to control learning (i.e., autonomy) embraces learners' desire (motivation), ability (skills to plan, monitor, evaluate learning) and freedom (permission to control) to do so (Huang and Benson 2013). As core dimension of learning autonomy, learners' motivation and its regulation need to be further strengthen in times of crisis and educational disruptions, in order to be sustained, and the learners need to be supported so that they do not procrastinate or lose their interest in learning. Empirical research conducted during the Covid-19 outbreak showed that students' learning motivation was highly correlated with autonomous learning (Zhou and Li 2020).

15.2.2 On Continuous Adaptive Self-Assessment

As already mentioned, autonomous and self-regulated learning are closely related to learners' motivation and require that learners periodically engage themselves in self-assessment. Building upon the previews finding from a meta-analysis review, self-assessment has a very strong effect on learners' motivation ($d = 0.73$) (Panadero et al. 2017), and thus, additional efforts should be placed to provide high quality self-assessment services. In fact, self-assessment is a metacognitive skill and motivation

to actively conduct self-monitoring is essential (Sitzmann et al. 2010). Moreover, iterative self-assessment leads students to a greater awareness, by training them to self-regulate their motivation and behavior, as well as by fostering reflection on their own progress in knowledge or skills, and finally, to understanding themselves as learners (Nicol and Macfarlane-Dick 2006). Students practising self-assessment often outperform students in conditions such as restudying or filler activities (Adesope et al. 2017). Retrieval practice (i.e., calling information to mind rather than rereading it or hearing it, to trigger "*an effort from within*" to induce retention) is better at reinforcing knowledge than restudying, and testing is a good way to activate this retrieval process (Carpenter 2009). Research provided evidence that multiple-choice tests stabilize access to marginal knowledge, highlighting how relatively simple it is to reactivate and consolidate knowledge (Cantor et al. 2015).

To further support individuals to maintain their learning motivation, the activities need to be tailored to fit learners' mastery levels, and feedback can support their personalized needs, i.e., introduce adaptivity in the learning and assessment settings. In adaptive contexts, the underlying learners' motivation is amplified and encouraged via adaptation: the connection between motivation and on-task engagement is catalyzed by the personalization of the learning experience and the provided feedback. The adaptive activities aim to encourage learners to stay motivated, i.e., to feed their autonomous desire to learn. By deriving suitable adaptation mechanisms, the learning process is controlled in a way that meets learners' motivation, i.e., an impetus for engagement in learning (Martin et al. 2017). Indeed, motivation and theories of goal orientation can help to explain the reasons for students' engagement in a task (Pintrich 2000). Goals are considered a facet of motivation given that they provide a purpose or focus for the task and thus, influence learning behaviors.

15.2.3 Motivation of the Research and Research Question

Synopsizing the above, it becomes apparent that the educational disruption due to crisis like the Covid-19 pandemic may result in demotivating learners with overall unwanted consequences for their learning. It has been found that students with strong SRL skills, i.e., students capable of regulating their motivation, can continue learning in an efficient way, even in fully online set-up. Maintaining and supporting learners' motivation is critical. To achieve that objective, periodically practising adaptive self-assessment test is a promising approach. This study is motivated exactly by that idea, and the research question (RQ) is:

> **RQ:** *What are students' dispositions to use an online adaptive self-assessment service enhanced with analytics and how it affects their motivation to continue learning during a crisis?*

For addressing the RQ, we conducted a study at a Norwegian University, using an adaptive self-assessment service. The service is enhanced with analytics that utilize students' data and build visual representations of their progress and provide

feedback in different reports (Bodily et al. 2018; Papamitsiou et al. 2019). The study was conducted in two phases: the first, i.e., the pilot usage of the service, was completed the day the lock-down was announced, and the second, i.e., the participants' interviews about their motivation to use the service, was conducted during the lock-down.

15.3 Brief Introduction to SmartU

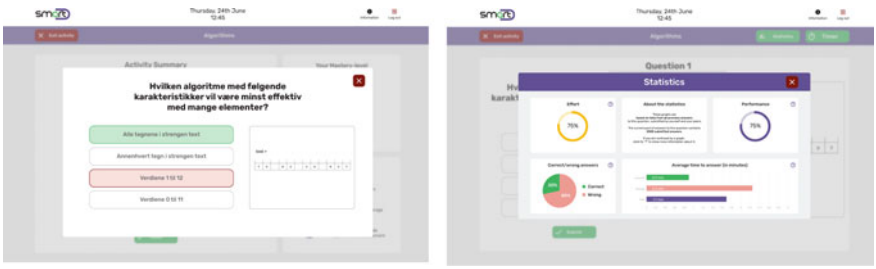
Students' self-assessment data were collected with SmartU (**S**elf-assessment **M**easured with **A**nalytics on **R**un-**T**ime for YO**U**), a dedicated online adaptive self-assessment service, consisting of a dashboard, an adaptation mechanism, and a database storing information about students, questions and interactions. SmartU is a revised version of a previous service (Papamitsiou et al. 2019). The main interface consists of a dashboard that displays the available activities (i.e., the different self-assessment tests for the different courses); the learner can select one of those activities and perform it multiple times ("attempts").

The learner can see descriptive information about her progress in the activity, the results from previous attempts, the progression on overall response times, analytics about her self-regulation (e.g., average time spent, overall effort) for building her self-awareness, and relevant announcements (Fig. 15.1a); descriptive information in comparison to peers is also available (Fig. 15.1a).

When a learner selects to take a self-assessment test, the questions are delivered to her one by one according to the underlying adaptation mechanism: the next most appropriate question to deliver is selected according to the correctness of the student's response to the previous question and the discrimination ability of the remaining questions, so that the student's mastery level can be estimated by administering the minimum number of questions. The questions have up-to four possible answers, but only one is the correct. Every time the student submits an answer to a question, her mastery class is revised accordingly, and the next question is delivered to her. The selection of the next question is based on entropy, a maximum information

(a) **(b)**

Fig. 15.1 **a**. SmartU—Selected activity. **b.** SmartU—Peer comparison



(a) (b)

Fig. 15.2 **a** Question with correct answer, **b** Analytics about the question

gain strategy from information theory; the goal is to select the question that has the greatest expected reduction in entropy, i.e., that better fits the learner's mastery class, based on the answers she provided on the previous questions. For adapting the self-assessment, the measurement decision theory (MDT) (Rudner 2003) was employed to classify the students in three mastery classes based on their item responses, a priori item information, and a priori population classification proportions. The core of the methodology in use is the estimation of the students' mastery class every time they submit an answer. This estimation is reached by knowing prior probabilities and Bayes Theorem: $P(m_k|z) = c{\cdot}P(z|m_k){\cdot}P(m_k)$, with $z = (z_1,z_2,...,z_n)$ being a student's response vector with $z_i \in \{0,1\}$, and: (a) $P(m_k|z)$ is the probability that the student belongs to mastery class m_k given z, (b) $P(z|m_k)$ is the probability of responses z given the student's mastery class, (c) $P(m_k)$ is the probability of a randomly selected student belonging to mastery class m_k, and (d) c is a standardization constant so that $P(m_1|z) + P(m_2|z) + P(m_3|z) = 1$. For more details, please see (Sharma et al. 2019).

Figure 15.2a shows a wrongly answered question. The correct answer is shown upon request. Task-related visual analytics per question (Papamitsiou et al. 2019) (Fig. 15.2b) are also available. The task-related information provided to the learner was determined so as this knowledge to activate learner's monitoring, reflection and judgment (i.e., metacognition) about the questions, with an ultimate goal to help the learner to meet the requirements of each question, i.e., the actual difficulty, the actual effort needed to deal with each question and the time required to allocate on each question. Using properly this information is expected to support learner's efficient self-regulation and motivation, i.e., to improve her effort allocation, time-management and help seeking skills, and metacognitive inference-making based on her own learning goals (Lonn et al. 2015). Previous research showed that visualization of aggregated temporal indexes increases teachers' awareness on students' progress and helps them revise their considerations about the actual requirements of assessment tasks (Papamitsiou and Economides 2015).

15.4 Mixed-Methods Explanatory Study

15.4.1 Participants and Study Design

Thirty-five participants volunteered initially to take the self-assessment tests and were scheduled, but due to the outbreak of the Covid-19, finally 27 could be conducted prior to the lock-down of the University (55% males, 41% females and 4% non-binary gender, aged 19–27 years old [$M = 22.4$, SD $= 2.0$]). The sample consisted of students spread across different years of study ($M = 3.4$ years, SD $= 1.5$), with most students being enrolled in a programming-related study program (77%), and the rest (23%) being enrolled in other programs (e.g., chemistry or biology). For the needs of the study, the educational material from the Introduction to programming course was utilized. The item-bank consisted of 120 multiple-choice questions.

The study followed a static group comparison design (Cobb et al. 2003). The participants were split randomly into two groups, with 12 being in the group with access to task-related visual analytics (the experimental group) and 15 not having access to this information (the control group). None of the participants had previous experience with the SmartU service. Maximum two participants were taking a self-assessment test at the same time, with both participants belonging to the same group, to ensure a controlled setting. Each session lasted for a max of 45 min, and due to the Covid-19 outbreak, all devices used in each session were cleansed thoroughly with antibacterial wipes. The study was conducted in two phases. The first phase took place in laboratory conditions in three steps and was completed on the day that the lock-down was announced; the second was conducted in one step during the lock-down.

Step 1: Briefing

All participants signed an informed consent form prior to their participation, explaining them the procedure and giving the right to researchers to use the data collected for research purposes. Next, the participants were briefly introduced to SmartU through a printout providing step-by-step explanations. Participants in the experimental group were also introduced to the visual analytics and its use. The printouts were available throughout the procedure.

Step 2: Test-taking procedure

After getting familiar with the service, the participants were prompted to imagine using the service from home to practice their programming skills and knowledge, aiming to create the feeling of studying fully online from home. The participants were asked to complete two or three self-assessment activities, depending on how much time was spent on each attempt. Each attempt contained approximately 10–12 questions. The questions were delivered to the students according to the adaptation mechanism described in the previous section. Only one answer could be submitted to a question, and the students could not return to a previous question or change an

answer once submitted, due to the adaptation mechanism. It was also clarified that their achieved scores would have no participation to the final course grade.

Step 3: Debriefing

Next, the participants had to fill in a post-assessment questionnaire that measures their motivation to use the service and their opinions about its usability and usefulness. They responded to the questionnaire individually, right after completing the tests. Upon finishing the questionnaire, all participants received a gift card as reward of voluntarily contributing their time and data to the research.

Step 4: Interviews

The final step—i.e., the second phase—included a follow-up interview and was conducted three to four days after the first phase. Ten participants were randomly selected from the two groups (five participants from each group). Due to the Covid-19 outbreak and the university closing the campus, the interviews had to be conducted online. Although web-cameras were used during the interviews, the videos were not recorded. All interviews were conducted in Norwegian, as it is the native language of all interviewees.

15.4.2 Data Collection

15.4.2.1 Questionnaires

The questionnaire captures participants' dispositions to the use of the service and the different elements (e.g., visualizations), as well as their attitudes and motivation to use the service. The items utilized were questions on a 5-point Likert-like Scale (1 = "Strongly Disagree," 5 = "Strongly Agree") (Oppenheim 2000).

In Table 15.1, the *Overall evaluation of the usability of SmartU (OEUS)*, contained questions about the usability of the service, created to assess whether the system met the definition of usability as described in ISO 9241-210:2019: *extent to which a system, product or service can be used by specified users to achieve specified goals with effectiveness, efficiency and satisfaction in a specified context of use.* The two next categories, i.e., *Attitude toward Graphs and Visualizations (AGV)* and *Usability of Graphs and Visualizations (UGV)*, included questions about participant's attitudes toward the graphs and visualization dashboards implemented in the service, and the perceived usability of these elements. The constructs were adapted from previous studies, to fit the context and the service in this study (Lee 2010; Roca et al. 2006).

The last category, i.e., *Graphs and Visualizations in an Assessment (GVA)*, contained questions about the visual analytics available during the self-assessment. This category covered participants' perceived usage and usefulness, and their attitude toward such analytics. The constructs used in this category were also adapted from previous relevant studies (Lee 2010; Roca et al. 2006).

Table 15.1 Overall categories in the questionnaire and their constructs

Category	Acronym	Constructs
Overall evaluation of the usability of SmartU	OEUS	General usability
Attitude toward graphs and visualizations	AGV	Usage
		Motivation
		Usefulness
		Positive and negative emotions
		Intent for further use
Usability of graphs and visualizations	UGV	Usability of features
		Intuitiveness
		Usefulness
Graphs and visualizations in an assessment	GVA	Usability of features
		Usage
		Usefulness
		Intuitiveness
		Usefulness
		Motivation
		Intent for further use
		Positive and negative emotions

15.4.2.2 Interviews

During the second phase of the study, to gain additional understanding of the participants' motivation to use the service, semi-structured interviews (Wilson 2014) were conducted, according to a guide created beforehand. This guide contained a set of situations requiring extra attention by the interviewer and a set of prepared questions, created based on interesting overall trends found in the answers from the questionnaire. However, these questions were just used as conversation starters, to be able to let the interviewee tell about her experiences, feelings and thoughts and thus allowing the interviewer to probe with appropriate follow-up questions (Oates 2005). Examples of the prepared questions can be found in the bullet-point list below.

- Do you think that the service would improve your motivation of studying? If you do, why would it do that?
- Would you use the system again? If so, what encourages you to do so?
- Could you mention some features which were easy or hard to understand?
- Did you feel like the statistics helped you understand the scope of the question? How did the statistics help you?

15.4.3 Data Analysis

15.4.3.1 Quantitative Analysis

To explore the differences in participants' attitudes and motivation to use the service, descriptive statistics, correlation analysis and independent samples t-test between the control and the experimental groups were applied using IBM's SPSS.

15.4.3.2 Qualitative Analysis

The online interviews were conducted using the free online conference room software whereby. To record the interviews audio, Open Broadcaster, a free and open source software for recording and live streaming was used. The interviews had to be transcribed before analyzed. For the analysis itself, Nvivo was used to code the interviews into categories, initially based on a deductive approach, using theories based on information from the literature review (Oates 2005). Due to iterative coding, new categories were formed during transcribing and during the interviews, following an inductive approach (Oates 2005). Clusters of similar or connected content were split into two, more granular, categories, having their original category as parent. Similarly, smaller categories were merged with other categories. Thus, a "tree-like" structure was established, providing a detailed separation of the interviews content: the "tree-like" hierarchy contained seven *nodes* at the top layer; four of them contained other nodes and no content in the statements; the remaining ones contained statements and no nodes.

When working with qualitative data, the actual interviewees' quotes need to be intact and not altered. Thus, when an answer to a question or a quote was ambiguous, the correct context for the quote was added, followed by "*red. anm.*," an abbreviation for *redaksjonell anmerkning*, meaning *editorial/writers remarks* in English. These remarks were clearly marked with parentheses.

15.5 Results

15.5.1 Questionnaire Mean Variables

Table 15.2 shows the descriptive statistics for the questionnaire constructs. Overall, there is an above average (i.e., positive) attitude toward SmartU's use of visualizations and graphs for both AGV and UGV indexes. However, there is a lower minimum score toward OEUS, indicating that the overall usability is fluctuating from user to user. There are also broad opinions and attitudes toward the usefulness of GVA, considering the standard deviation.

Table 15.2 Questionnaire mean variables of categories

	N	Min	Max	Mean	Std. Dev
Overall evaluation of the usability of SmartU	27	2.67	4.89	4.26	0.49
Attitude toward graphs and visualizations	27	3.29	5.00	4.39	0.43
Usability of graphs and visualizations	27	3.20	5.00	4.33	0.51
Graphs and visualizations in an assessment	12	2.53	4.47	3.50	0.55

Table 15.3 Questionnaire mean variables between groups

	Control group ($N = 15$)				Experimental group ($N = 12$)			
	Min	Max	Mean	Std. Dev	Min	Max	Mean	Std. Dev
Overall evaluation of the usability of SmartU	3.56	4.89	4.33	0.38	2.67	4.89	4.17	0.60
Attitude toward graphs and visualizations	3.29	5.00	4.45	0.46	3.59	4.88	4.32	0.41
Usability of graphs and visualizations	3.20	5.00	4.37	0.55	3.60	5.00	4.27	0.46
Graphs and visualizations in an assessment					2.53	4.47	3.50	0.55

Furthermore, there are some key differences in the descriptives of each group separately Table 15.3. Compared to the experimental group, the control group's OEUS, mean and minimum suggest that the overall usability is better than when task-related visual analytics are introduced. This indicates that those metacognitive statistics might introduce a new level of difficulty to the service, increasing the required effort to understand the visualizations.

15.5.2 Correlations

Correlation analysis between the questionnaire categories (OEUS, AGV, UGV and GVA) revealed some strong positive relations between AGV and OEUS ($r = 0.746$, $n = 27$, $p = 0.000$), UGV and OEUS ($r = 0.732$, $n = 27$, $p = 0.000$) and UGV and AGV ($r = 0.758$, $n = 27$, $p = 0.000$). These correlations indicate that there is a continuous level of motivation and attitude toward visualizations, graphs and usefulness throughout the whole SmartU service.

Table 15.4 Independent samples t-test for the differences of perceived use and motivation to use with and without statistics

	t	df	Sig	Mean difference	Std. error difference
Overall evaluation of the usability of SmartU	−0.882	25	0.386	−0.117	0.189
Attitude toward graphs and visualizations	−0.785	25	0.440	−0.133	0.169
Usability of graphs and visualizations	−0.538	25	0.595	−0.107	0.198

*$p < 0.05$

15.5.3 Independent Samples T-test

Table 15.4 shows the independent samples t-test result. No statistically significant differences were detected on the perceptions regarding the usability of and motivation to use SmartU between the two groups.

15.5.4 Results from the Interviews

This section presents the results from the 10 conducted interviews. Here, we present an English translation of the original Norwegian statements.

15.5.4.1 Insights Toward Motivation to Use

The first noticeable category of statements concerned participants' motivation. Here, the word *motivation* reflects the participants feeling more or less motivated to use the service for educational purposes and whether there was an increase in the motivation to study in general. This indicates participants stating either being motivated or demotivated, or simply stating that there was no change in their motivation. There was also a separate node containing all references to the statistics, overlapping with the other motivation categories mentioned. Overall, all ten interviewees had statements regarding their motivation being positively impacted while using the SmartU service. Most of the answers were related to comparing results, either against themselves or against their peers. One statement highlighted this:

> … when you receive information about how others are doing, it becomes very natural that there will be some kind of competition present. Which allows you to quickly set goals like: «I will be this good compared to everyone else or in comparison to yourself.» So you can compete both against yourself and against others, and that helps my motivation, instead of doing everything on your own.

The element of competition and comparison to others was the most frequent topic and was further reflected on the following statement:

> What Motivates Me is, Again, that I Can See Myself and My Level of Knowledge, and Especially that You Can See the Rest of the Users of the System and Their Level.

The comparison with one's own previous performance was also emphasized:

> … if I were to use this, it would give me more motivation if I see a steady growth (in the performance graph, red. anm.), or if I see a decline I might think «I haven't focused long enough, or not focused enough» if it goes on for a longer period…it becomes easier to be self-critical and analytical when you look at your own work.

Despite all participants having some positive feedback toward the system, there were also negative statements regarding their motivation. Comparing one's results to one's previous performance and peers was a key example of this, as it also negatively influenced motivation. One participant stated:

> I might have taken it a little personally if I had been placed very low and I saw that others were placed very high and that the curriculum was easy for them. So, if this was voluntary and had no impact on the grade, I might have just studied by myself and thought it probably was sufficient.

15.5.4.2 Insights Toward Usefulness and Intention to Use

When asking the participants if SmartU was an interesting system, and what made it so, some replies concerned aspects of digitized learning. Two of the participants found the system interesting because it had game-like features. The first of the participants stated that:

> I Think It Was Interesting Because It Sort of Resembles a Game, Which is a Very Different Approach Than the System I Have Been Using in Relation to ITGK.

The second participant pointed at the mastery-level feature, stating that:

> … the Little «ranking-System» in the Middle of the Page, Where It Says «High» or «Medium» or Creating a Separation of Sorts, and the Fact that You Get a Little Medal, in My Eyes, Creates a Cooler… Yeah …

When asking the participants whether they would use the service again, and if so why they would use it, the responses were focused on how SmartU could be used as a tool for enhancing learning. One of the participants stated:

> I am a big fan of using things like this instead of for instance just sitting in reading a book. So, this makes it a little fun. After all, it is a slightly different way of learning, to just be served questions and answers, rather than just sitting and reading. It's a slightly more effective way to do exam sets, perhaps.

A second participant took a broader and more summarizing approach:

> I would definitely use the system, if possible, in most subjects I could use it for really. It gave a very concrete right/wrong and progression and… You could look at aspects you couldn't aggregate yourself, like response time. You can interpret from the mastery level, not only if you were right, but also if you were right on difficult questions. Or if you just have a superficial understanding, in that you are right on a lot of questions, but there have been easy questions so you are fooling yourself into thinking you know more than you really do. And it had a pretty nice user interface with visualizations that was easy to understand by just looking at them for two seconds, and then just moving on.

15.6 Discussion and Conclusions

15.6.1 Factors Affecting Attitude and Motivation

Sustaining learners' motivation in online learning settings is a challenging task. Previous work has associated motivation with learners' need to experience autonomy (Papamitsiou and Economides 2019; Reeve et al. 2008), which in turn, has been related to practising SRL skills. It has also been proposed in literature that self-assessment tests can be an efficient way to strengthen learners' self-reflection and improve their self-regulation capabilities (Nicol and Macfarlane-Dick 2006; Papamitsiou et al. 2019). Even more when the self-assessment tests are adaptive, the tailored content can further promote learners' motivation to remain engaged in their learning (Martin et al. 2017). However, in times of global crisis, such as the one we are experiencing due to the Covid-19 outbreak, and given the closure of the schools and universities and the subsequent fully online teaching and learning, the need to support learners' motivation in their learning is more urgent than ever before (Huang et al. 2020). The RQ that guided the study was: " *What are students' dispositions to use an online adaptive self-assessment service enhanced with analytics and how it affects their motivation to continue learning during a crisis?*".

Furthermore, from the interviews, it became explicit that the participants had more statements regarding potential positive influences in their motivation than negative. Most of these statements concerned participants comparing results, either comparing against their own previous results or against their peers. The peer comparison feature particularly was deemed the most useful feature in the system, as mentioned in Sect. 15.5.4.1. This feature was also particularly interesting regarding the attitude and motivation of the participants and can be connected to the correlation between the AGV and UGV-variables. From the interviews, statements claiming that by receiving information of how the average of other participants were doing and one's own previous performances, a competition emerges naturally. The creation of goals of being better than the average participants or beating one's own high score is a natural reaction to this. Thus, the results from the interviews could indicate that the graphs and visualizations displaying one's score and the peer comparison feature were contributing to the positive influence in motivation.

However, as explained in (Jivet et al. 2018), peer comparison should be used cautiously, as different types of learners perceive it differently. Their research found a connection between academic performance and the perception of social comparisons. Based on the interviews conducted in this study, one can see similarities to the findings of (Jivet et al. 2018) as the participants state that their motivation would change based on their positioning in the peer comparison. Some stated that being ahead of the average curve in the peer comparison would influence their motivation positively, as it was perceived as a confidence boost. Others, however, claimed their motivation would be bigger if position slightly behind the average curve, as it was a way of improving your own skills more than the others. What recurred in most interviews was that most participants would feel demotivated if positioned too far behind the average curve. This was especially the case in specific contexts, like when using the system for practicing for a course in a school context and the exam date is approaching.

15.6.2 Covid-19 and Its Implications—Limitations

While conducting the study, the outbreak of Covid-19 reached Norway and ultimately forced the university to shut down the campus. This had an impact on various aspects of this study and how it was conducted.

The most notable limitation was that students and staff were not allowed to stay on campus. This occurred on the second day of the study and implied that the remainder of the tests had to be canceled. Furthermore, the days before the study, some participants canceled their scheduled session due to fear of the high infection risk of Covid-19. Overall, the impact on the sample size was big, as the total number of participants went from 35 to 27. The low sample size decreased the statistical power of the analysis. Therefore, the results from Pearson correlations and the independent samples t-tests should be carefully considered, as there is a possibility that they do not reflect a true effect. It is also likely that other true effects within the results were not discovered.

Furthermore, as the study was conducted in a controlled environment, requiring physical attendance for taking the self-assessment tests, another implication of Covid-19 was the strict demands for disinfection and general hygiene. As stated, all laptops and other equipment used throughout the study were thoroughly cleansed with antibacterial wipes between every conducted test. Furthermore, the table and chairs used for were also cleaned between tests. This was a time-consuming routine and caused delays in the study as the day progressed, due to a tight schedule, not made with disinfection of equipment in mind.

Mostly, as the infected population increased rapidly during the study, the uncertainty about what was going to happen was also a factor that had side-effects on the study. Although it was not possible to be measured, the mood and atmosphere during the study was a bit pressed, most likely due to the Covid-19. From the observation notes, all participants seemed concentrated and were quiet, however some

expressed concern for being infected at campus during small talk after completing the self-assessment tests.

Finally, as explained in Sect. 15.4.2.2, semi-structured interviews were conducted with selected participants. However, due to the Covid-19 pandemic, and the consequent closure of the university, it was not possible to conduct these interviews in a face-to-face setting. Thus, whereby and discord was used to conduct the interviews. On the one hand, this allowed for the easier recording of the conversation. However, some of the aspects of a face-to-face interview, such as the ability to observe the body language and the fine-tuned facial mimics, were not possible to capture. Furthermore, as all participants had to stay in their homes while being interviewed due to the campus being closed, the setting and ambiance of the interview were also changed. In a sense, the mindset and concentration of the participants was most likely also influenced by the situation and the implications it had for the participants on a personal level.

15.6.3 Conclusions

As extensively explained, the need to support and sustain learners' motivation in their learning during global crises is a priority. Furthermore, investing on developing intuitive and efficient adaptive self-assessment services to facilitate this objective has been considered a meaningful and promising step. Although the sample size of the present study could not satisfy statistical power for the quantitative analysis, the qualitative analysis of the interviews revealed the potential that the SmartU service has to promote autonomous and self-regulated learning in fully online settings. From the results, it becomes apparent that dedicated services such as SmartU have the capacity to motivate learners to remain engaged in regularly practising their knowledge through self-assessment quizzes. The core characteristic of such services is that they tailor the content to the personalized learning mastery of each individual. Furthermore, the intuitive dashboard offers a variety of learning analytics and gamification elements that turn the learning experience into a playful and fruitful learning gain.

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Chapter 16
Tawasol Symbols: Alternative Augmented Communication Pictograms to Support the Inclusion During Pandemics

Achraf Othman and Aisha Al-Sinani

Abstract Since December 2019, we lived in unique times as a result of the COVID-19 virus in the entire world. Effective communication is always essential for everyone including persons with disabilities and in particular persons with communication impairment. Thanks to Information and Communication Technologies (ICT), access to information became easier for everyone. Everyone in the world needs to understand what is happening during natural disasters and pandemic in particular. All of them need to be able to express needs, to learn, and, to access important information, in particular, for persons with communication difficulties. For them, using pictograms, called also symbols, is a way to communicate regardless of the person's language or literacy skills (writing and reading). Therefore, they may benefit from using pictograms to communicate, express their needs, and to access education and culture domains. This paper presents an overview of Mada's experience on how to train the Alternative Augmented Communication pictograms during the pandemic and natural disasters using Tawasol Symbols (AAC), and to highlight the key findings of the initiative. In addition, the implementation of several platforms to support persons with disabilities will be showcased toward enabling their inclusion in society.

Keywords Accessibility · Alternative augmented communication · AAC · Communication difficulties · Tawasol symbols · Pandemic · Natural disaster · COVID-19 · SDG4

16.1 introduction

News about the Coronavirus Disease 2019 (COVID-19) outbreak has been coming fast and furious starting from December 2019 (WHO 2020). There's been a lot to

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process—some fatalities, hundreds sickened across the world, and many changes to everyday life. People are working from home, keeping their distance from others, and not being able to attend schools and universities to learn and to participate in cultural activities and entertainment. This impacts negatively to reach the Sustainable Development Goal 4 that aims to ensure inclusive and equitable quality education and promote lifelong learning opportunities for all (Goal 4 2020). All this, government officials in most countries say, is to try to lessen the spread of the new coronavirus. In order to be updated on the current situation and to take care of ourselves in such natural disasters or pandemic in the new century, people used to access the internet and online documents to get information through published guides from officials' resources to deal with the pandemic. Here, accessibility plays an important role for persons with disabilities, because it is a key element to make the information available for everyone without exception. But, for persons with communication impairments, this may difficult to learn, understand, and even interact with others as they use Alternative Augmented Communication pictograms (AAC pictograms) to communicate. These individuals who require AAC tools and support from family, therapists, and caregivers, such as these, are (Beukelman and Pat 1998):

- Developmental disabilities (autism spectrum disorder, cerebral palsy, Down syndrome, intellectual developmental disabilities);
- Acquired conditions (traumatic brain injury, spinal cord injury);
- Degenerative conditions (osteoarthritis, osteoporosis, dementia);
- Temporary conditions such as intubation to support breathing as a result of COVID-19, or other causes;
- Accidental conditions (stroke, surgery, or other causes).

Various types of AAC systems can aid and assist people with disabilities who particularly have speech and language impairments (communication difficulties) by providing alternative means of communication using pictograms, called also symbols. This will contribute to improving their quality of life and ensure their education inclusion. During pandemics and natural disasters, such as COVID-19, several institutions and organizations published online guidelines on how to protect ourselves from the virus using AAC pictograms and photos (Fig. 16.1) (Washing

Fig. 16.1 "Washing Hands With Core Words: Adapted Visual Schedule" guide

Hands With Core Words: Adapted Visual Schedule 2020).

Nevertheless, there are ongoing obstacles facing the Arab region as the result of minimal numbers of Arabic symbols available and the dependency on already developed symbols from the other regions, particularly Europe and America. Therefore, endorsement and the positive effect of using AAC have been inadequate in the practice. The Tawasol Symbols project aimed at this challenge with an open-source free selection of symbols that is culturally, socially, religiously and linguistically acceptable (Tawasol Symbols 2020; Griffiths et al. 2019). Mada Center, Qatar, made available free of charge bilingual Arabic/English symbol dictionary of commonly used words in spoken and written communication embodied by pictures and pictograms. Tawasol Symbols were based on the Arasaac Symbols Collection (Cabello and Bertola 2015). Symbols can be modified to meet the needs of other languages, communities, and needs. Tawasol symbols and later devolved Tawasol App cater to people who are non-verbal or minimally verbal, particularly children with autism who require an alternative communication solution. Through natural speech and the capacity to build sentences in Arabic using a large set of symbols, the Tawasol AAC App provides an excellent assistive technology solution for people with disabilities in Qatar and the Arab region that can be used remotely.

The following paper presents the methodology on how to train remotely the AAC pictograms from the Tawasol Symbols dictionary during pandemics and natural disasters such as the COVID-19 pandemic. The next section is a definition and explanation of the term pictograms used by persons with communication difficulties followed by an overview of a background related to this paper in Sect. 16.3. In Sect. 16.4, we will present an overview of the project Tawasol Symbol. Section 16.5 will highlight our initiative of developing new pictograms related to COVID-19 that can be used in guides and user manuals. Section 16.6 is dedicated to showcasing the MADA Digital inclusive education portal containing all necessary information on how to learn remotely during natural disasters and pandemic for persons with disabilities. We conclude with discussions and key findings in Sects. 16.7 and 16.8.

16.2 What Are AAC Pictograms

Pictograms (refering to AAC pictograms and also called symbols) are used widely in everyday life as a kind of visual-language, such as transportation venue signs (airport, rail station, etc.), road signs, care symbols on clothing, or direction symbols (Tijus et al. 2007). This shows how symbols can communicate information quickly and effectively. Fundamentally, symbols can be read, regardless of the person's language or literacy skills. Therefore, people with communication difficulties may benefit from using symbols to understand what other people are saying, as well as to express what they want to say (Fig. 16.2) (Share and Believe, A Symbolic Journey 2016).

There are many sets of pictograms available online or in the market as printed cards, some of them are free, and, some must be purchased. Pictograms sets can be considered in several ways including how pictorial, how guessable, how flexible, how

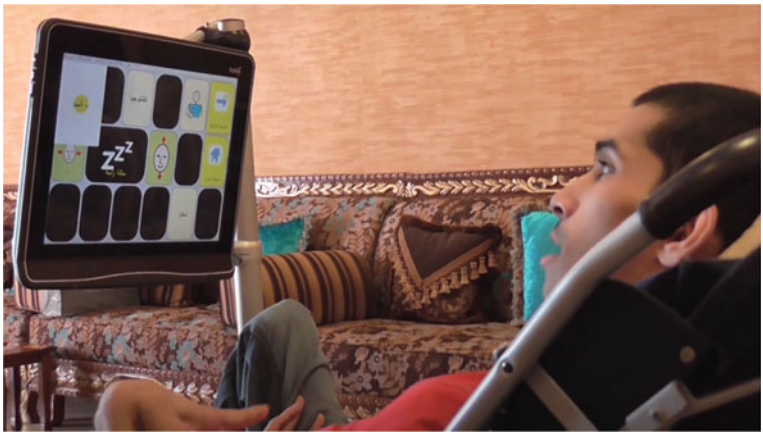


Fig. 16.2 A person with communication difficulties using pictograms (From Tawasol Symbols project) to communicate with family members through an eye-gaze device

consistent, and how visually complex. Each symbol set has strengths and weaknesses and the choice of a symbol set should be based on the needs and abilities of the person using AAC.

Selecting pictograms for the communication environment is also important, this will include language and culture. Practical issues such as how the symbols are to be used are software available to produce printed materials, or which are available for a particular AAC device, will also influence any choice. Pictograms or symbols are mostly available as collections or sets. Most present the symbol together with the word or phrase it stands for. Typically, the word is printed above the symbol if the focus is on communication as communication partners need to be able to see the words because they may not know what all the symbols mean. Where the focus is on literacy, the reader may need to be able to see the symbols to help decode the written word and as emerging readers often point to words as they read, the symbol is printed above the word.

16.3 Background

In the Arab World, there is a growing number of individuals who can benefit from using symbols on AAC to aid communication and literacy skills. Learning disabilities are the most common primary disability in the Arab region where 34% of those with another disability also have a learning disability (Zetterström 2012). Their needs are being met using externally developed AAC symbols systems and Assistive Technology devices. There are several linguistic issues for Arabic AAC, such as lack of Arabic core vocabularies, diglossic nature of Arabic (many dialects across Arab region (Qatari, MSA, Egyptian, Lebanese, Moroccan, etc.)), bilingual situation,

communication charts and devices based on English linguistic rules and Westernised concepts/imagery, and Arabic morpho-syntactic structure that affects symbol to text translation. Here the main major challenges that we face:

- Culturally and Linguistically inappropriate symbols for the region:
  - Inappropriate symbols send mixed messages;
  - AAC users can't relate to foreign symbols;
  - Arabic linguistic rules occasionally disregarded.
- The need for an English & Arabic Symbol Dictionary:
  - Therapists speak English = Therapy in English;
  - Expats make up 86% of Qatar;
  - Nannies/drivers speak English.

16.4 Overview of Tawasol Symbols Project

Symbol sets can be considered in several ways including how pictorial, how guessable, how flexible, how consistent, and how visually complex. Each symbol set has strengths and weaknesses and the choice of a symbol set should be based on the needs and abilities of the person using AAC. Selecting symbols for the communication environment is also important, this will include language and culture preferences. Practical issues such as how the symbols are to be used are software available to produce printed materials, or which are available for a particular AAC device, will also influence any choice. Selecting a symbol set is predominantly based on meeting individual needs within a particular setting. For example, considering acceptable symbol design and communication environment. AAC users ideally can benefit from choices of globalized, localized, and personalized symbols.

The Tawasol Symbols project aim was to develop a freely available Arabic Symbol Dictionary suitable for use by individuals who have a wide range of communication and language difficulties and to develop a set of symbols that are culturally, linguistically, and environmentally appropriate for AAC users in Qatar and the Arab countries (Tawasol Symbols 2020) (Fig. 16.3).

There are many reasons for having to introduce a new set of localized symbols in the Arab World such as the wide differences in linguistic structures between the Arabic and English languages which can be confusing and generate fragmented sentences as illustrated in Fig. 16.4.

Moreover, there are always requests by teachers, therapists, and other researchers in the field for symbols not available in other languages i.e. English, for example, Islamic and culture-related symbols. Non-symbolic, as well as symbolic forms of communication, are culturally dependent. Hence, it is essential to customize AAC resources to meet the Arabic characteristic rubric written system and to address the presence of diglossia and the lack of culturally appropriate vocabulary.

Fig. 16.3 Home page of the Tawasol Symbols project (madaportal.org/tawasol)

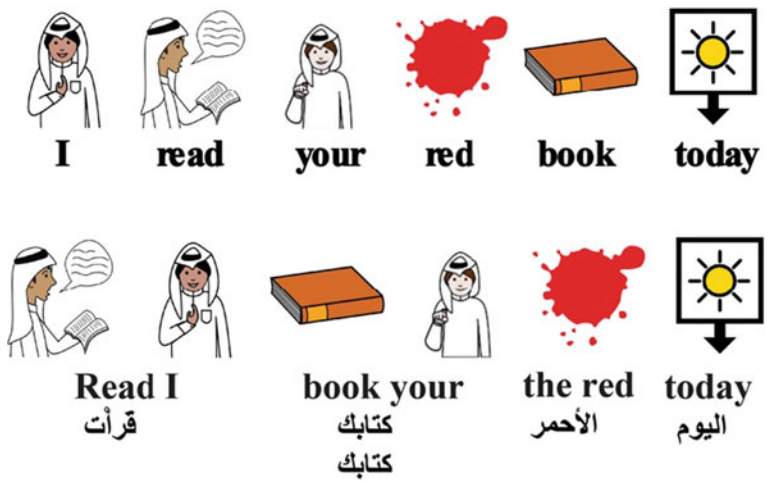


Fig. 16.4 Differences in structure between Arabic and English languages

16.5 COVID-19 Symbols Initiative

Mada Center, Qatar, has and continues to collaborate with strategic partners within the Education sector to build capacity for supporting relevant students with learning and communication disabilities. This is achieved by building capacity in relevant institutions by providing AAC solutions utilizing the Tawasol Symbol set and training educationalists on strategic implementation of the solution to gain effective outcomes. The enhancement of the Tawasol Symbols set is a continuous endeavor by focusing on the expansion of the vocabulary set and improving its availability in various platforms (like (Clicker 7 Arabic 2020), (Tawasol AAC App 2020)).

Recently, a series of symbols have been created to educate children using AAC symbols about the COVID-19 pandemic and steps to safeguard from it. This is part of Mada's continuous effort to keep the Tawasol Symbols relevant and up to date for providing the latest inclusive educational content. The key milestone of the project until the designing of COVID-19 guide are:

- *Key milestone 1—Tawasol Symbols development kick-off*: In 2013 Mada had embarked on a project to develop an Augmentative and Alternative Communication (AAC) symbol-set called Tawasol that focused on the Qatari Arabic language. The project was launched in collaboration with the University of South Hampton and under support funding from Qatar National Research Fund (QNRF). The project aimed at the creation of a suitable set of symbols that is culturally and contextually appropriate towards the local society.
- *Key milestone 2—online platform*: A dedicated online platform was been developed in 2017 to make the Tawasol symbols available for teachers, therapists, parents, and developers (Tawasol Symbols 2020). The platform allows users and relevant professionals to download the symbol set for use within their environment (for example home and school) along with the associated training resources to utilize it.
- *Key milestone 3—Application Programming Interface (API)*: The Tawasol Symbols online platform is further extended to offer an Application Programming Interface (API) in 2018 for developers to be able to integrate the symbol set into any applications being developed. The API can be used to develop new AAC Apps using Tawasol symbols for android and iOS.
- *Key milestone 4—Tawasol AAC App*: To maximize the impact on Arabic AAC users in Qatar and the region, Mada has introduced the first fully functional Arabic AAC app using the Tawasol Symbols. The Tawasol AAC App is one of the innovative solutions supported by Mada through the Mada Innovation Program. It has been developed in 2018 by following the international guidelines governing AAC methods, as well as transforming speech models into alternative and enhanced communication by following the principles of verbal behavior and the analysis of applied behavior.
- *Key milestone 5—COVID-19 Illustrations*: In 2020, considering the COVID-19 pandemic outbreak, a set of about 30 symbols have been designed to represent a COVID-19 guide interpreting the basic hygiene and safety measures to be followed—including a depiction of the typical COVID-19 symptoms, proper handwashing procedures, respiratory hygiene, and calling for medical help were the main focus of the illustrations (see Table 16.1).

To ensure the efficiency of symbols and their quality, the designed symbols, as per the process of validating new illustrations, must be reviewed by at least four therapists and experts during a voting session. The voting session went through all proposed symbols and rate them following several criteria:

- Criteria 1: “What is the feeling about the symbol as a whole?”;
- Criteria 2: “Does it represent the word of the phrase?”;
- Criteria 3 “Is the color contrast, and, cultural sensitivity accepted?”.

Due to the social distance measurement during a pandemic, the voting session members are not able to attend sessions face-to-face. So, we refer to online communication tools by creating a group to discuss and approve symbols. This gives us

Table 16.1 A set of COVID-19 Tawasol Symbols

Action/Term	Symbol	Action/Term	Symbol
Wear a medical mask		When sneezing or coughing, use the elbow by bending the arm	
Difficulties breathing		Persistent dry cough with pain	
Nasal congestion/runny nose		Tired	

(continued)

Table 16.1 (continued)

Action/Term	Symbol	Action/Term	Symbol
Sore throat		Aches and pains	
I have a fever		Dry cough	
I don't touch animals		I don't shake hands	

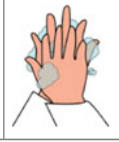
(continued)

Table 16.1 (continued)

Action/Term	Symbol	Action/Term	Symbol
Put soap overhand		Handwashing with soap and water	
I dry my hands أجفف يداي		I rub the right hand in a circular motion	
Rub the palms of the hand		Rub the thumb with the palm of the hand with frequent movement	
Rub the thumb with the palm of the hand		I place the fingers of the right hand with the palm of the left hand and rub the back of the fingers	

(continued)

Table 16.1 (continued)

Action/Term	Symbol	Action/Term	Symbol
Rub the palm of the hands with the fingertip		Virus covid-19	

more flexibility to invite more members from caregivers and parents to rate proposed illustrations too.

16.6 Mada Digital Inclusive Education Portal

To support the COVID-19 Tawasol Symbols initiatives, Mada launched an initiative aimed at empowering the education sector to ensure inclusive education for all students, especially for students with disabilities Using ICT Accessible Solutions and Assistive Technologies (Mada's Inclusive Digital Education Platform 2020). Through this initiative, Mada ensured the following:

- Provide inclusive digital learning resources open to all students and all abilities including students with functional limitation;
- Introducing global best practices for inclusive and accessible digital education;
- Exchange of experiences and educational resources among teachers in terms of the sources of inclusive digital education and online learning;
- Provide guidance for fully accessible technology solutions that contribute to the education of students with disabilities;
- Encourage the culture of collaborative and participatory work, and empower the building capability and development of distance/online learning;
- Building a digital contents repository that is accessible to teachers and specialists.

The platform was shared with all educational entities in Qatar and beyond to support and empower the remote learning for students with disabilities in particular. In addition, several online training was provided to therapists, caregivers, and teachers on how to use the Tawasol Symbols and also on how to use several online tools for remote teachings (Fig. 16.5).

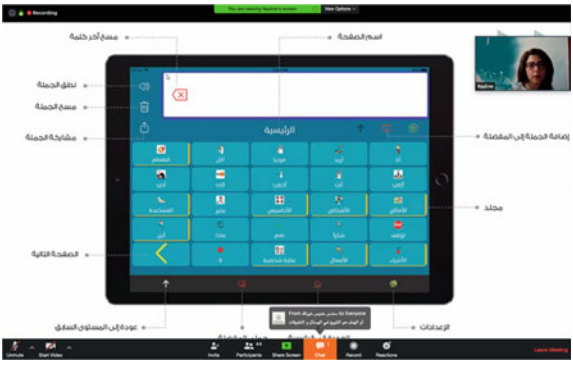


Fig. 16.5 Example of a remote-training for teachers, therapists, caregivers on Tawasol Symbols Project and AAC App with the presence of 44 participants

16.7 Discussion

Providing a new experience to train new illustrations of Tawasol Symbols related to COVID-19 remotely was not a simple mission for teachers, parents, and caregivers. It gave us new opportunities to develop new best practices and guidelines to follow even after the pandemic ends. The main key findings and output cover several points:

- Good preparation in advance as follow for trainers and therapists:
  - Prepare a health summary notes in advance that includes all critical health information which will be very useful for the trainer (therapist/caregiver) to know more details about the person with communication difficulties.
  - Prepare instructions using pictograms (mainly using Tawasol Symbols), photos, and videos.
  - Invite a medical staff to join the training/assessment session if needed.
- Supporting understanding of COVID-19 for persons with complex communication needs:
  - Use short/brief sentences to explain the situation and speak slowly.
  - Use familiar vocabulary and concrete terms.
  - Use visual supports to assist with understanding.
  - Use gestures or demonstrate instructions as you speak.
  - Write down keywords as you speak to support understanding.
  - Use a social story to explain what will happen (as an example, use Tawasol Symbols to tell a story of what will happen when the individual goes for a COVID-19 test).
  - Repeat information regularly as required to support understanding and learning.
- Supporting expressive communication for persons who use AAC devices and solutions:
  - Establish clear yes/no answers and signals.
  - Prepare personalized low-tech nonelectronic communication supports (depending on the individual's needs and skills).
  - Practice using these in advance so that they are familiar.

16.8 Conclusion

Tawasol Symbols project developed and localized 1110 symbols, however, there are still areas of improvement such and the knowledge around users' priorities and core and fringe vocabulary. More research is encouraged to develop more Arabic symbols and to look into suitable interactive technology devices that use AAC in a bilingual setting. This project opens the door for more research opportunities to develop a more effective localized and personalized communication system.

Tawasol AAC offers native and natural Arabic communication with options to choose between male and female voices, in addition to the option to use Text-to-Speech (TTS) capabilities. The solution allows the addition of symbols and the recording of associated sounds for existing and new symbols. Communication boards in Tawasol can be shared and exported for printing. Messages can be shared on message platforms enabled devices.

During COVID-19, and applied to pandemics and natural disaster that can happen, the need for using remote/online tools and platforms was a must which affects the communication channels for persons with communication difficulties. The COVID-19 Tawasol Symbols initiative was a key element to make the information accessible for them through the development of new illustrations, putting in place educational platforms and building capabilities of teachers, therapists, caregivers, and students with disabilities.

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Part IV
Case Studies

Chapter 17
Chinese Experience of Providing Remote and Flexible Learning During COVID-19 Pandemic: A Case Study of Maintaining Education in Crisis Contexts

Muhua Zhang, Ahmed Tlili, Rongxia Zhuang, Junfeng Yang, Ting-Wen Chang, Huanhuan Wang, and Ronghuai Huang

Abstract This study aims to introduce the Chinese experience of providing remote and flexible learning during the COVID-19 pandemic to provide implications for maintaining undisrupted learning worldwide in crisis contexts. Focus group interview and Web survey were used to collect data, and rigid thematic analysis was conducted in this study. The results of this study indicate that there are seven key enablers of implementing flexible learning during COVID-19 pandemic, namely (a) infrastructure, (b) learning tools, (c) learning resources, (d) teaching approaches, (e) learning strategies, (f) supports and services for teachers and students, and (g) cooperation among different stakeholders.

Keywords Chinese experience · Flexible learning · Online learning · Implementing strategies · COVID-19

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17.1 Introduction

The large-scale outbreaks of crisis, such as severe contagious disease (e.g., SARS, Ebola, COVID-19), natural disasters (e.g., Indian Ocean Tsunami, WenChuan earthquake, Haiti earthquake), and armed conflicts (e.g., Afghanistan War, Iraq War, Syrian War), have seriously endangered human life and health, negatively impeded the way of human working, living and learning. In 2020, the outbreak of the COVID-19 occurred in many countries and regions across the world, such as China, the U.S., and Italy. Up to April 2020, more than one billion learners were not able to return to schools, accounting for 70.6% of the total learners worldwide (UNESCO 2020).

To prevent the spread of COVID-19, the Chinese government has banned most face-to-face activities, including classroom teaching at the beginning of 2020. The Chinese Ministry of Education has launched an initiative entitled "Disrupted Classes, Undisrupted Learning" to provide flexible online learning to over 270 million students from their homes. While remote teaching in China via TV and radios is not a new thing and started since the 1960s (Ting et al. 2018), however, several challenges were faced especially during this unexpected critical situation of the COVID-19 (Huang et al. 2020c). For instance, the teachers did not have time to prepare their learning content to fit online learning. Additionally, isolation between teachers and learners can negatively affect the learning process, hence increase the dropout rates of learners. Therefore, new learning solutions are needed to overcome these challenges and ensure flexible learning.

Flexible learning is a set of educational approaches and systems concerned with providing learners with increased choice, convenience, and personalization to suit their needs (Lee and McLoughlin 2010). First, "flexibility" is defined as offering choices in the educational environment, as well as customizing a given course to meet the needs of individual learners. Therefore, providing the possibility of making learning choices to learners is crucial. These learning choices can cover class times, course content, instructional approach, learning resources and location, technology use, the requirements for entry/completion dates, and communication medium (Collis et al. 1997; Goode et al. 2007).

Learner-centered philosophy serves as an underpinning theory for this flexibility dominated educational practices (Lewis and Spenser 1986). In flexible learning environments, barriers that might prevent students from attending a given educational context (e.g., classrooms) are removed. With the further development of technologies, flexible delivery is considered a critical component (Lundin 1999), which usually empowers learners and instructors to exchange information in a two-way manner. Later, the scope of flexible learning has been further extended beyond the dimension of delivery to cover flexible pedagogy (Gordon 2014; Ryan and Tilbury 2013). Gordon (2014) and Ryan and Tilbury (2013) believed that flexibility is not only an attribute of students but also a feature of educational strategies at the institution level. Currently, the priority of institutions is resuming learning and teaching by implementing flexible learning.

In general, flexible learning has the following three characteristics. First, it offers learners rich learning choices from multiple dimensions of study (Goode et al. 2007). Second, it applies a learner-centered constructivism approach, which is indicated by a shift from the teacher taking learning responsibilities to the learner taking these responsibilities as well (Lewis and Spencer 1986; Goode et al. 2007). Last, learners are granted a variety of choices and take more responsibilities for their own learning. Therefore, flexible learning requires learners to be more skilled at self-regulation in terms of goal setting, self-monitoring and make adjustments, and instructors to promote active learning so that learning in such situations can be engaging and effective (Collis 1998). Obviously, implementing flexible learning brings many challenges for teachers, learners, and institutions to maintain teaching and learning during the COVID-19 outbreak.

Therefore, the present study aims to answer the following two research questions:

- How to implement flexible learning at the institution level to maintain teaching and learning during the COVID-19 pandemic?
- What challenges do teachers, learners, and institutions faced in implementing flexible learning during the COVID-19 pandemic?

17.2 Method

17.2.1 Participants and Methodology

This study adopted a focus group interview method (Kitzinger 1995), which explicitly use group interaction as part of the method instead of the researcher asking each person to respond to a question in turn. In the focus group interview, people are encouraged to talk to one another: asking questions, exchanging anecdotes, and commenting on experiences and points of view of each other (Kitzinger 1994). Given the emergency situation, focus group interviews were the best way to generate data and find potential solutions. In this study, we carried out the focus group interview once a week by webinar and kept doing this for about five months. Finally, 20 focus groups were invited to participant in our study. The interview mainly focused on how to implement flexible learning at the institution level to maintain teaching and learning during the crisis contexts, including the institution policies, teachers' practices and dilemmas, learners' experience and perceptions.

Through convenience sampling, experts in the field of education, principals, teachers, parents from all levels of schools were all invited to participate in the focus group interview. Considering the differences in ICT infrastructure between different schools and regions of China, we did not only invite teachers from cities but also from rural areas, especially from impoverished mountainous regions. Besides, some university students, high school students, and parents of children in k-12 education were also invited to participate in our interview. In each focus group interview, at least one expert in the field of education was invited. Considering the consistency of

the topic, teachers and students from the same region and the same educational level were also invited to join in the same focus group. Finally, there were 15 experts in the field of education, 60 teachers, more than 100 students, and 10 parents participated in our study.

17.2.2 Data Collection and Analysis

During the time of crisis, we conducted a focus group interview by group video conferencing system (e.g., ZOOM) and obtained the raw materials during the pandemic of COVID 19 through webinars. In light of the limited sample of focus group and the widespread of the crisis, the study also collected data through searching for information on the Web sites of some famous institutions and authority organizations in China (e.g., the Chinese Ministry of Education, the China Education Newspaper, the People's Daily) to obtain more representative cases in implementing flexible learning. Overall, there are two sources of data in the study: the data generated from the focus group interviews and the data from information searching.

Thematic analysis (Braun and Clarke 2006) was used to analyze the raw data and extracted the key themes of implementing online education on a huge scale during the pandemic of COVID-19. To establish the trustworthiness of thematic analysis, this study conducted a rigid thematic analysis according to the six phases required by Nowell et al. (2017).

17.3 Results

The obtained results are structured according to the two research questions.

17.3.1 How to Implement Flexible Learning at the Institution Level to Maintain Teaching and Learning During the COVID-19 Pandemic?

Seven key enablers of implementing effective remote and flexible learning in crisis have been identified according to the thematic analysis.

Infrastructure. In times of crisis, the infrastructure was required to be more reliable as it need to cater to the demands of millions of teachers and students who taught/learned simultaneously. For instance, to increase Internet reliability, several Chinese companies—including China Mobile, China Unicom, and China Telecom as well as Alibaba, Baidu, and Huawei—focused on enhancing the provided connectivity services and increasing the Internet bandwidth to ensure that 50 million learners

can access the cloud learning platform simultaneously and acquire new information without any interruptions. On February 17, 2020, CMCC successfully ensured the smooth launch of the "National Network Cloud Platform for Primary and Secondary School," which served 180 million primary and secondary school students in China to study at home and provided 50 million students with online access at the same time (Huang et al. 2020a).

Learning tools. In crisis contexts, maintaining learning and teaching by various tools has become the only alternative for the whole education system. However, there are so many tools for teaching and learning emerging with the development and application of ICT in education, which challenges the teachers so much. In order to facilitate teachers at all levels to quickly select various learning tools for smooth online teaching, a basic guide on how to select suitable learning tools to maintain learning and teaching during the period of the crisis were provided in the handbook of Huang et al. (2020a). Besides, the convenience of tools should also be taken into consideration when choosing and applying them to different learning scenarios. No matter for what purpose, teachers should select friendly learning tools that learners are already familiar with to avoid heavy cognitive load for them. They should also avoid overloading learners by asking them to use too many tools, resulting in inconvenient learning practices for them (Huang et al. 2020b).

Learning resources. Providing adequate learning resources for students to keep on learning during the crisis is more critical than ever before. With the development of ICT in education, digital learning resources like Massively Open Online Courses (MOOCs), Small Private Online Courses (SPOCs), online video micro-courses, e-books, simulations, models, graphics, animations, quizzes, games, and e-notes are making learning more accessible, engaging, and contextualized. However, learning occurs only when the resources meet learners' specific learning needs. Therefore, to meet the need of different groups of learners in times of crisis, the Chinese government provided appropriate learning resources on the National Public Service Platform for Educational Resources (NPSPER) (https://www.eduyun.cn/) for teachers and learners at all school level. During the COVID-19 pandemic, 10 topics were added to NPSPER in time to meet the students' learning demands in this special period, such as epidemic prevention education, life and safety education, mental health education.

Teaching and learning strategies/approaches. During the time of crisis, traditional classroom teaching is unable to meet the demands of teaching and learning. Some innovative teaching and learning approaches were encouraged to maintain the undisrupted teaching and learning, such as flexible learning (Lee and McLoughlin 2010). Focusing on the flexibility of teaching and learning at the institution level, as shown in Fig. 17.1, we identified the following eight key flexibility dimensions from the Chinese experience in maintaining undisrupted learning.

The first flexibility dimension concerns when and where the learning occurs. It means that the time of participating in a course, starting and finishing a course, the pace of study can be flexible. The second dimension of flexibility concerns what and how students will learn. It means that students are allowed to determine the sections and the sequence of content according to their desire, pathways

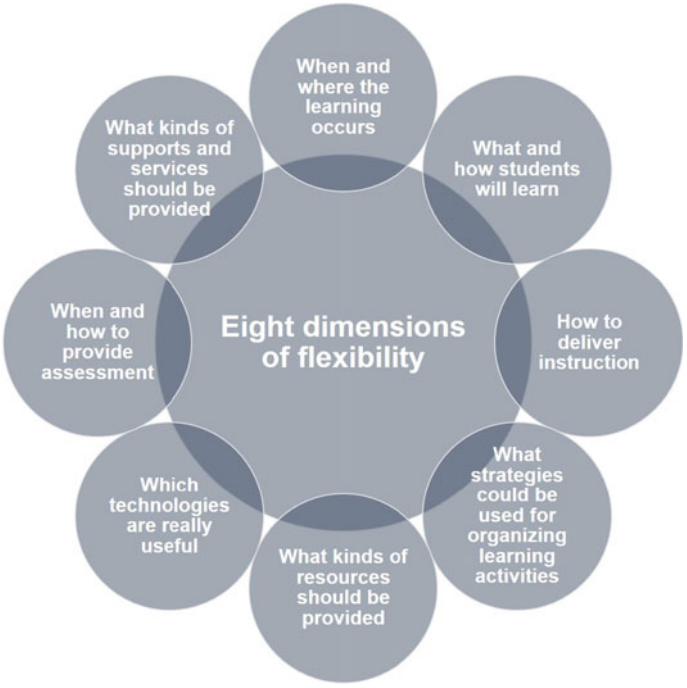

Fig. 17.1 Eight key flexibility dimensions related to teaching/learning process

of learning, forms of course orientation, size, and scope of the course. The third dimension of flexibility concerns how to deliver instruction. Flexible delivery offers a suitable range of how and where students can access learning materials, such as Web-based learning, Augmented Reality (AR)-based learning, and experiencing combining work with study in employer-based learning. The fourth dimension of flexibility concerns what strategies could be used for organizing learning activities. According to Gordon (2014), the learner's choices can be offered using several instructional strategies, such as lectures with tutorials, independent study, discussion, seminar groups, debates, student-led discovery approaches, and educational gamification. MOOCs-based blended learning, social media-based social learning, and video-based one-on-one tutoring have been adopted to achieve flexible learning in China during the time of crisis.

The fifth flexibility dimension concerns what types of learning resources we should provide to students. The flexibility can be indicated by the source of the resources and their forms. The content created by instructors, the resource created by learners, libraries, even high-quality resources from the Web can also be the potential choices. With regard to the forms of the resources, podcasts, narrated screen capture, the full video of lectures and software are all acceptable. In addition, Open Educational Resources (OER) can also provide flexibility in the way of using learning resources since they are under an open license. The sixth flexibility

dimension concerns which technologies are really useful for learning, teaching, and administration. It means that using technologies to enhance teaching and learning (Gordon 2014) and help instructors and departments to process administrative work within institutions (Casey and Wilson 2005) can be flexible. To address the challenges that students cannot go to campus to study in a regular way during the COVID-19 period, in China, different types of tools and platforms were used in an integrated way to support learning and teaching at home (Huang et al. 2020a).

The seventh dimension of flexibility concerns when and how to provide assessment and evaluation. The flexibility can be indicated by the methods of assessments, by the timing and delivery channel of assessment, and by applying learning analytics approaches. E-portfolio, computer-based test, human-managed assessment, real-time assessments based on dashboards are fine choices to conduct flexibility assessment and evaluation. The eighth flexibility dimension concerns what kind of supports and services should be provided for students and instructors. It means that both the time and place to obtain support and the methods of support can be flexible. Besides, allowing learners to specify the language used on learning materials or communication is also an important support, especially for international students.

Support and services for teachers and students. During the COVID-19 pandemic, the Chinese government provided great supports and services to ensure quality online education by collaborating with different stakeholders, such as enterprises, higher education institutions, families, social organizations, and so on. The support and services of online education are twofold. As to support for teachers' online teaching, efforts have been spent on improving teachers' online teaching ability, such as providing online teaching strategies, tips for applying information technology. For example, to make more teachers skilled in using Rain-Classroom (a smart learning platform), the Teacher Development Center of Tsinghua University, together with the Xuetang Online, conducted a series of live training on how to use Rain-Classroom to carry out online teaching for teachers all over the country in the spring semester of 2020 (Huang et al. 2020a). With regard to supports for student learning, AI were applied to enhance individualized learning in China. For example, with the technical support from education enterprise, such as Squirrel AI, many schools used AI teachers to create personalized learning system for students (Huang et al. 2020a).

Cooperation between enterprises, government agents, and schools (E-G-S). To address the needs of online education during the COVID-19 epidemic and the further development of online learning, the Chinese government played multiple roles in policy guidance, overall coordination, and effective supervision. The government coordinated different stakeholders to build smooth communication platforms, select suitable learning resources, provide convenient learning tools, encourage diverse learning methods and support flexible teaching methods. Adequate support services for online education were provided through the close cooperation of multiple parties.

17.3.2 What Challenges Do Teachers, Learners, and Institutions Faced in Implementing Flexible Learning During the COVID-19 Pandemic?

Several challenges during the implementation of flexible learning were also identified according to the thematic analysis. First of all, although much efforts were devoted to ensure the reliability of the infrastructure, Internet connection are not always reliable if there are thousands of learners learning simultaneously. Besides, the reliability of the infrastructure is hard to guarantee in some rural area. Secondly, due to the diversity and intersections of disciplines, digital resources in some emerging interdisciplinary in post-secondary education are scarce. Instructors had to make much efforts to rush to prepare the online learning materials, which brought them heavy burden and weakened their teaching efficiency.

In addition, several instructors replied that they did not have adequate digital skills to teach online. They simply used direct instruction without considering important features of online learning, such as interactivity, social presence, and cognitive presence, resulting in passive learning experiences. Several learners also replied that they lacked crucial learning strategies, such as adaptation, independent study, self-regulation, and motivation, which are key factors for successful online learning. These challenges can make the online teaching/learning experience inconvenient and frustrating for teachers and learners. Finally, full online teaching and learning activities brought great challenges to institutions in terms of the management of teachers and students, monitoring of teaching and learning activities, and the assessment of student learning outcomes.

17.4 Conclusions

Based on the Chinese practices to maintain undisrupted learning during COVID-19, the following experiences are identified to maintain education by implementing flexible online learning in crisis contexts.

- Ensuring reliable network infrastructure, which can handle millions of users simultaneously, is crucial to support smooth online learning experience without interruption when: (a) providing synchronous online teaching using video conferencing; (b) using (watching, downloading, uploading) interactive learning resources (videos, games, etc.); and, (c) collaborating with peers via social platforms.
- Using friendly learning tools is beneficial to learners keep learning during the situation of crisis. It is also vital that instructors avoid overloading learners and parents by asking them to use too many applications or platforms. In this context, schools should coordinate between all the instructors to use consistent learning tools or platforms.

- Providing suitable interactive digital learning resources, such as online video micro-courses, e-books, simulations, animations, quizzes, and games. The criteria for selecting digital learning resources should include licensing, accuracy, interactivity, ease of adaptability, cultural relevance & sensitivity, and also the suitability of content, difficulty, structure, media, and organization.
- Guiding learners to apply effective learning methods can be used individually or in groups. Specifically, the online instructional practice should involve using online communities, via social networks, to ensure regular human interactions and to address potential online challenges, such as learners' perceived loneliness or helplessness.
- Promoting effective methods to organize instruction by adopting a range of teaching strategies, such as case studies, open debate and discussions, learners-led discovery, experiential learning, etc.
- Providing instant support services for teachers and learners on learning about urgent policies issued by school and governmental, using effective learning technologies, tools, and resources and collaborating between the government, schools, enterprises, families, society, etc.
- Empowering the partnership between governments, enterprises, and schools. Specifically, the governments should coordinate different stakeholders to build smooth communication platforms to spread urgent notices and to keep everyone safe.

From this Chinese experience, some limitations were also noted that should be considered in the future. For instance, providing telecourses and offline digital learning resources is a reliable way to offer learning experiences for those in remote and backward areas without Internet or without cable TV. Moreover, researchers and practitioners should consider different accessibility guidelines (e.g., WCAG 2.0) while developing their digital learning resources platforms, tools, and devices to ensure e-inclusion in educational settings (Zhang et al. 2020). Finally, more inclusive authoring tools that work with different functional diversities should be developed so that educators can use them to create accessible digital learning resources.

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Chapter 18
How Online Solutions Help Beat the Lockdown in Higher Education: A Central Asia Case Study

Maria Giulia Ballatore, Farhod Abdullayev, Igor Simone Stievano, and Anita Tabacco

Abstract This chapter is aimed at summarizing the recent initiatives put in action for solving the problems in delivering the educational services in the Turin Polytechnic University in Tashkent, TTPU, after the lockdown, and the stringent measures taken by the Uzbek government in March 2020, for the pandemic explosion of the COVID-19 virus. The long-lasting connection between Politecnico di Torino, a European University, and this Central Asia Institution has been proven to be extremely effective, maximizing the benefits of TTPU in promptly offering online solutions for remote lectures, and the preparation of the technical substrate for both the exams and admission test which will be delivered after the completion of the second semester lectures. A summary of the IT tools adopted, with compact highlights of their features, as well as the qualitative feedback collected from the first courses offered with a reshaped structure suitable for online classes are thoroughly discussed in this work.

Keywords Engineering education · International connections · Online learning · Remote teaching · COVID-19

18.1 Introduction

Uzbekistan was established after the collapse of socialism, and its national academia received a strong footprint of the Soviet Union, where the scientific interactions with Western countries were limited (Çokgezen and Çokgezen 2014). In the following years, different reform packages related to the education sector were implemented, like, for example, the new Act on Education and the National Program on Personnel Training (Kirtchik 2012). In particular, while students' curriculum and assessments

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have been reorganized, the higher education has been decentralized, and the privatization allowed (Eshchanov et al. 2011). This has favored the creation of universities and research institutions in partnership with foreign institutions and financed by international NGOs, foundations, and local governments. In a very short time, the academic interaction with the Western Countries is raised with a shift to the Western-style education, usually in English, and more incentives and opportunities for research (Pleskovic et al. 2002).

Despite the high percentage of young people in Central Asia, very few continue into higher education studies. For example, Uzbekistan has 41.46% of citizens between 0 and 24 years old, of which 23.61% is under 14 years old. It needs to be considered that the school life expectancy, that is the average number of years of education they receive, is set at 12 years for Uzbekistan (Index Mundi 2019). This data highlights the problem of limited access to higher education. The major reason for the limited number of undergraduate students is a shortage of physical space and large fees both in public and private universities. Recently, under the direction of the Ministry of Education, the number of enrolled students has increased but the success rate is only 25%, i.e., one is admitted for every four students taking the test.

Similar processes occurred in the industrial sector; in particular, in the automotive one in which some factories have opened their local branch in Uzbekistan. This implied an increase in the demand of technical human resources able to supply the new labor market offers.

In this contest, the industrial sector and foreign universities created different private universities. In particular, the Turin Polytechnic University in Tashkent (TTPU) has been the first national example of Bachelor internationalization in the area of Engineering with its foundation in April 2009. In this case, the actors of the joint venture were Uzavtosanoat SC and General Motors Corporation, for the industrial side, and Politecnico di Torrino (PoliTo), an Italian technical University, for the educational one. Nowadays, with its catalog of differentiated curricula, TTPU trains experts for automotive, construction and architecture, mechanical engineering, and information technologies.

On the educational side, the local staff is directly supported through training and exchange periods by PoliTo. Moreover, the courses are taught in collaboration with PoliTo and TTPU professors. In the end, students receive the diploma of both institutions for all programs (Bachelor, Master and Ph.D.). However, due to the large number of involved students, here, we concentrate mostly on Bachelor level. The study plan is four years long with the first year, called preparatory year (PY), managed entirely by Uzbekistan lecturers and a triennium (First, Second, Third level) delivered by PoliTo professors assisted by local collaborators. All local lecturers are identified by TTPU and evaluated by PoliTo.

The number of bachelor's admissible students has grown each academic year (a.y) starting from about 200 students in a.y. 2009/10 to 500 students in the a.y. 2019/20 with 1600 students that applied for admission. The selection is done through a computer-based admission test, the Test in Laib (TTL), similar to that carried out at PoliTo main campus in Italy which cover maths, physics, comprehension, and logical topics (Ballatore et al. 2018). The enrolled students, based on their ranking position,

can choose among one of the three active study courses: 200 places for Mechanical Engineering, 100 for Information Technology and Automation Systems in Industry, and 50 for Industrial and Civil Engineering and Architecture.

This case study aims to present the online solutions adopted due to the COVID-19 emergency by TTPU thanks to the remote support of PoliTo. In Sect. 18.2, the adopted platform and the different integrated blocks for online education are presented; followed by their implementation in Sect. 18.3. The discussion of the emergency approach and of the final remarks concludes the chapter, in Sect. 18.4.

18.2 Teaching Platform with Adds-On for Remote Lectures and Exams

Since its establishment, TTPU has been promoted by the Uzbek government as one of the flagship Universities in the country. The adoption of the European standard in the curriculum plan and the experimentation of new tools and methods in the academic management of the institute created a pilot providing an immediate feedback about benefits and allowing to quantify the efforts in setting up the adopted solutions, thus paving the way to the implementation of some of the ideas in national Universities.

The two most important examples are represented by the yearly admission test for enrollment and by the digital management system for students' career management. The admission test implements the so-called Test in Laboratory (TIL) idea. It is fully managed via a digital-based portal for data collection of applicants for the pre-enrollment, and it is delivered through client PCs, and a digital interface in a laboratory equipped with more than 150 PCs. In addition, since early 2018, TTPU is temporarily piloting an in-house system developed by PoliTo in which the career management is integrated with the study plans and the teaching materials. The introduction of this new method has improved the performance of students' management. All the student's information is available anytime through the dedicated interface and can be easily consulted online after a simple login. The same works for students; they can enter the system and find information about their study plan, the exams, and what is more important the teaching material associated to each course in their career.

During the COVID-19 emergency, the above mentioned teaching portal has been strengthened with the full integration of two additional features. On one side, the open source "BigBlueButton" (BBB) solution (BigBlueButton developer community 2020) is chosen for integrating real-time collaboration, enabling remote, either recorded or real-time, lectures. It offers all the typical characteristics such as the sharing of audio, slides, chat, video, and desktop with students. Screen sharing allows selecting the best possible tool for lectures and delivering a specific class (e.g., a programming environment for teaching coding and algorithms or MATLAB or similar tools for numerical or symbolic computations in basic and applied courses).

On the other hand, another brick is plugged into the system. It is a proctoring tool allowing the delivery of exams which are carried out remotely by the students. Among the different options made available in the market, "Respondus" is now being tried (Respondus developer community 2020). It offers a LockDown Browser aimed at preventing cheating and allowing students using a single web page in which the exam is delivered, without the possibility to open additional software.

In addition, it is important to point out that online exams and tests have already been used in the past years. In both institutions, the admission test and some exams, including some math courses and some specializing ones involving programming, have been organized in the University laboratories by means of the quiz activity feature of the Open Source Moodle project (Moodle developer community 2020) or dedicated client/server programming environments. However, the mentioned online exams have always been organized in laboratories with a supervised activity of lecturers and staff and now, matched with the proctoring tool Respondus; they have also been used for delivering tests to students located in their homes due to the recent measures taken all around the world for limiting the COVID-19 diffusion. In both Italy and Uzbekistan, people cannot move far from their home, and both public and private transportation are also dramatically downsized. At the current date, in June 2020, all the University institutions are still closed for students. Therefore, the assessments are performed by online remote exam.

Summarizing, the current tools and IT infrastructure providing the floor for the remote education which is being adopted in both Universities are:

- *Teaching portal*: dedicated webpages for the academic management of students (developed by Politecnico di Torino since many years and now available at TTPU since 2018).
- *BBB*: integrated into the teaching portal and allowing the online interaction between lecturers and students (new feature, March 2020).
- *Quiz Activity in Moodle*, for exam preparation, delivery, and grading (intensively used in some courses and for the admission test).
- *Respondus*: proctoring system based on a dedicated browser locking the PC into the Moodle exam page, allowing to process a possibly large number of students (new feature, March 2020).

Further details and more practical information to support online teaching (lessons and exams) for lecturers and students can be found in the official webpages of PoliTo (Politecnico di Torino 2020).

18.3 Current Actions, Lecturers' Experience, and Students' Feedback

As briefly mentioned in the previous section, the transition from classical in-class education to an alternative way of teaching has already been initiated before this

emergency. In a wider perspective, which is not limited to online solutions only, the so-called TTPU-GYM PoliTo call was launched in 2019. It supported the redefinition of teaching methodologies and course contents in TTPU bachelor programs (Ballatore et al. 2019). Even if the focus was mainly on more specializing courses, as required by the role of the undergraduate education in Uzbekistan, this was a chance leading to some good ideas towards online tools and methods. An important example consists of a Virtual Laboratory in the Automatic Control course where a physical laboratory is located in Italy, and the students in Tashkent, Uzbekistan, which are located more than 5000 km far can use the instruments and drive the experiments via a web-based interface allowing them to collect and process real-time data. Another example, which came later due to the initiative of a group of IT professors, is a system of virtual machines for laboratory and exam sessions in programming courses (initial experimentation was related to Computer Networks and Operating Systems).

The previous examples contributed to set the floor for a faster transition which has been forced starting from March 2020, thus facilitating the move from face-to-face to the online teaching, with support of PoliTo staff to Uzbek lecturers.

An abrupt change is hence observed during the COVID-19 spread, when all the courses currently offered at TTPU have been forced moving online. At that time, only half of the first teaching period of second semester (i.e., the so-called period 2.1) was completed, and the remaining part was done by recording lectures and practice sessions and by organizing dedicated online sessions with students. Recently, the last period 2.2 started in late April 2020, and all the additional courses are now being carried out completely online via remote education. At the end of the semester, in June, also the exam session is expected to be organized via a massive use of online tools.

In order to provide a feedback on how the incorporation of the remote education was successful in TTPU two 10 credits subjects were chosen for analysis: Applied Mechanics in the program of Mechanical Engineering and Applied Electronics and Measurements in the program of Information Technology. The following criteria were considered to understand the full picture: (i) total number of hours of video lectures/tutorials provided by both PoliTo and TTPU professors, (ii) total number of students registered for the course, and (iii) number of downloads of teaching material.

In Applied Mechanics over 40 h of video lessons have been recorded, while for Applied Electronics and Measurements 20 h are available. The involved students are 263 and 129, respectively. The number of total downloads made by the students turns out to be very high, on the order of thousands.

To understand the quality of teaching material and the availability of educational platforms, a survey among students was also conducted by the Dean's Office of TTPU. Overall, the student's responses were very positive; the majority of them were able not only to download teaching resources but also to participate in online interaction with professors via virtual classroom and other remote channels. This is the first important step for TTPU towards online education. The next step is to use these platforms to conduct remote admission test and exams for all courses taught in the second semester.

18.4 Discussion and Conclusion

In this chapter, we briefly summarized the very recent ongoing experience of the Turin Polytechnic University in Tashkent, Uzbekistan, for addressing the COVID-19 emergency in the higher education in Uzbekistan. The strong relation between this Central Asia institution and Politecnico di Torino, an Italian University, allowed to be ready in reacting to the needs of offering remote teaching solutions (lectures and exams). The mutual knowledge gained in more than ten years, together with a common technological substrate, have facilitated the task, as previously detailed. During the second semester of the current academic year, most efforts have been spent on the delivery of remote lectures and on the preparation of the procedure for remote online exams to be delivered in the summer session, in June/July 2020.

A possible obstacle could be the Internet availability and quality for the students. Considering the World Bank data referring to 2018, Uzbekistan has a 55.2% of individuals using Internet with a 71.52% of mobile cellular subscription and a 12.7% of fixed broadband Internet subscribers. However, after the first weeks of exams, the 90% of TTPU students were able to easily connect to the exam platform with a robust connection.

What is collected in this work can be considered a first step because the process is not simply a translation of the face-to-face content in an online environment. The COVID-19 emergency is the driver for a deeper rethinking of the teaching approach in each subject (Bates 2019). Considering the nowadays situation, we believe that the next academic year will also keep the teaching online.

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Chapter 19
A Key Action Plan for EDUCATION in a Global Crisis

Vicente Soriano, Pablo Cardona, and Manuel Corpas

Abstract Wars and natural disasters cause profound disturbances in human lives and social services. Historically, large pandemics have hit communities triggering rapid transformation of societies. The global COVID-19 outbreak has definitively challenged the world in an unprecedented way. Despite disruption of industry, trade, education, and social services due to prolonged home confinements, online activities have experienced an extraordinary revival. Lockdowns and social distancing have strongly penalized education programs based on classrooms face-to-face learning. Most schools and universities were abruptly forced to stop in-person classes and defer exams, experiencing great disturbance. Upon the first weeks of silence, expectation, and chaos, creative and innovative solutions were unfolded. They partially mitigated and fixed many of the most important challenges risen by COVID-19 shutdowns and home confinement. Engagement with e-teaching rapidly adapted to diverse student needs. On the other site, home confinement awakened a huge interest for e-learning. Online education has been pushed to be first in line. Once consolidated, it will stay for the long run, replacing traditional face-to-face education and expanding it to a much wider student population, ready to enjoy its flexibility and convenience. However, other teaching and learning benefits derived from direct personal interactions could experience downsides and result in the lost of very valuable skills, including those linked to body language, emotional intelligence, and deep feelings. Planning actions to confront these new threats are urgently needed.

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19.1 Introduction

At the end of 2019, China reported to the World Health Organization (WHO) a large outbreak of atypical pneumonia in Wuhan, a large city in Central China. During the next weeks the etiological agent was identified and named SARS-CoV-2, a new coronavirus that resembled the one that had caused the SARS pandemic in 2002, with roughly 8000 cases and nearly 800 deaths (Wu et al. 2020). This time, the new virus rapidly propagated within China and to neighborhood countries. By March 2020, the WHO declared the outbreak as global, recognizing it as a pandemic.

Roughly 35 million confirmed cases and 1 million deaths had been reported worldwide by October 1st 2020. These figures, however, underestimate the real numbers, as the shortage of diagnostics tests was frequent during initial outbreaks in most countries and a large proportion of deaths occurred in the elderly population, with frequent co-morbidities, making difficult to uncertain the direct cause of mortality (Rosenbaum 2020). Figure 19.1 shows the flow of the first wave of COVID-19 infections across the globe. In the absence of a vaccine, other waves may follow after summer.

The large number of deaths at nursing homes for the elderly in Europe and North America have often occurred in association with shortages of staff, given that many healthcare workers became sick or were on quarantine leaving. So, suboptimal care at geriatric long-term facilities largely contributed to the high death toll during the first wave of COVID-19 (McMichael et al. 2020; Soriano and Barreiro 2020).

Children, adolescents, and young healthy adults are infected with SARS-CoV-2 as easily as older patients, but **symptoms are generally mild** or absent in them (Wu et al. 2020; Rajgor et al. 2020). For instance, 60% of 600 young sailors from an

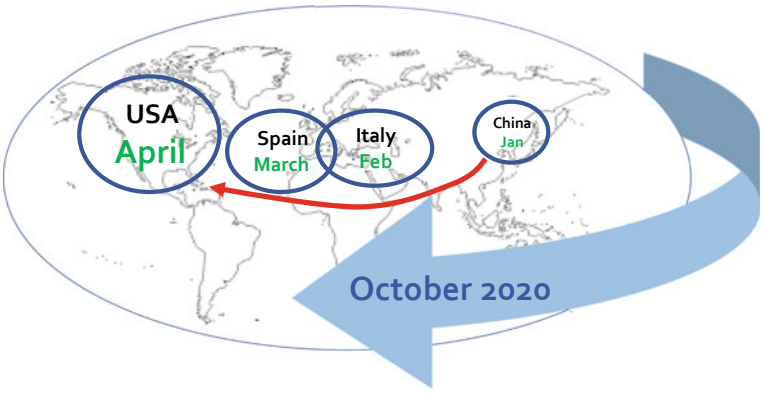

Fig. 19.1 Global COVID-19 spreading

aircraft ship that became infected on April 2020 reported no symptoms at all. In contrast, more than 80% of the 712 older retired population that became infected while enjoying a recreational cruise, experienced symptoms and 7 died (Rajgor et al. 2020).

With neither antivirals nor vaccines available to confront COVID-19, **home isolation and social distancing** were implemented almost worldwide to contain and mitigate the pandemic at different time points since January–May 2020. Lockdown of almost all businesses and services, including closing schools, universities, factories, shops, transports, etc., was mandatory during 6 weeks in most affected countries. This unprecedented action has averted more than 80% of new infections and halted the pandemic in most developed countries (Hsiang et al. 2020).

In Spain, a sharp increase in the number of cases and deaths occurred during the second half of March and first half of April 2020 (Soriano and Barreiro 2020). Despite concerns about the news from Italy, where COVID-19 already had triggered a huge outbreak on February, the emergency alert was not declared in Spain until March 8th, with strict lockdown for the whole country.

Sadly, healthcare workers and older people, mostly at **nursing homes**, were particularly affected during the following weeks. At hospitals, there was a shortage of personal protective equipment and many doctors and nurses became sick or were put on quarantine, further contributing to the unprecedented collapse at emergency departments, overwhelmed by large flows of ill people. Some long-term facilities for the elderly or disabled persons were nearly abandoned, discontinuing residents their regular care and medications (insulin, anticoagulants, etc.) (Soriano and Barreiro 2020).

A revival of the altruistic nature of medicine occurred. It resembled what had been seen in the eighties with AIDS (Soriano et al. 2018, 2020) or following the 11/9 NYC terrorist attacks. For weeks, there were expressions of gratitude to doctors and nurses every night at 8.00 pm with loud clapping from open windows in towns and villages across the country. No doubt the pandemic relieved the burnout experienced by many doctors due to forcing dependence of electronic health records and payment per medical act, imposed by financial health reformers (Hartzband and Groopman 2020). In other words, COVID-19 catalyzed a revival of the true essence of the **medical profession** (Noseworthy 2019; Del Río et al. 2020).

Given the unique behavior of COVID-19, in which isolation and social distancing were critical for halting coronavirus spreading, **telemedicine** became a major tool during the pandemic. Phone calls, videocalls, e-mails, whatapps, etc., have all been very helpful for accompanying and guiding health care during those days (Bloem et al. 2020; Hollander and Carr 2020).

A last consideration drawn from the COVID-19 pandemic regards the strong feeling of **vulnerability** awaken, notably among scientists and researchers. At a time in history when we proudly entertained the idea that regenerative medicine and gene editing could allow to almost attain immortality (Soriano 2019), the abrupt call to reality presented by COVID-19 has been shocking to many of us. These circumstances may well result in a unique opportunity for reflection about our civilization and human nature.

The near future remains uncertain, but most likely preventive measures (social distancing, outdoor activities, isolation of new cases, and quarantine of contacts) will become part of the 'new normal' (Berwick 2020) and integrated in our lives, reducing transmissions and viral pathogenicity, and ultimately adding SARS-CoV-2 to the list of winter seasonal coronaviruses that cause cold.

Being COVID-19 a unique phenomenon, it is expected that will not last beyond the next couple of months. Therefore, rapid adaptation to online education should keep open plans to resume in-person activities at due time with their unique extra values. It is likely that antivirals and vaccines will be available in the mid-term, hopefully within 1–2 years. Until then, social distancing and isolation of new diagnosed persons should be consolidated. Only with this behavior, low viral load exposure, fewer infections, and less disease severity will mitigate the COVID-19 pandemic burden (Guallar et al. 2020).

19.2 The Impact of COVID-19 on Teaching and Learning

The global health crisis represented by the COVID-19 pandemic has distorted and reduced human activities to an unprecedent level in recent history. The suspension of in-person classes at schools and universities was abrupt and put in action within a matter of days in most affected countries. It proceed implacably at different time points, as the first wave of the pandemic tsunamic advanced worldwide.

After the initial disruption, remote technologies and applications allowed to restore most teaching and learning activities with reasonable satisfaction in many but not all sites. Not surprisingly, the lack of preparedness to confront the educational disruption produced by COVID-19 has been more evident in developing countries and in schools and universities of Western countries with limited funding.

Three major observations have emerged, however, from this period of forced virtual education. First, the value of **asynchronicity** in virtual education, as it provides the advantage of allowing a better flexibility of the personal time, and the ability to allocate hours for either teaching and/or learning at one's own convenience. Second, Internet and **virtual resources** offer an untapped amount of possibilities for accessing contents and information, representing a real treasure of knowledge available on demand. Third, the pressing need to having access to **good connectivity** and laptops or similar tools has become a critical issue. As result, inequity may easily surge for individuals or communities where connectivity is unstable and poor.

The medical, social, and economic consequences of COVID-19 are indeed unprecedented in contemporary society. Severely restrictive measures may still be necessary for a while to bring the current pandemic under control. Keeping social distancing, outdoor activities and limiting social gatherings will largely contribute to slowdown coronavirus transmissions and disease severity, even in the absence of antivirals and vaccines. In the absence of vaccine, these actions will extend further for several months.

19.3 Experience at UNIR, An Online University

In an attempt to minimize the economic impact of massive confinement of people and the closing of shops for a few months, enterprises that could provide a certain amount of services online tried to keep their activity as much as possible. Education was not an exception to this guiding principle, since millions of students are engaged with it. We would like to share our experience at UNIR, the largest worldwide online university in the Spanish language, with facilities in Spain and Latin America, and roughly 47,000 students.

After the second week of March 2020, protection measures, such as the closure of schools and universities, as well as banning of mass events, were implemented in Madrid, Spain. These actions were aimed at reducing contagions and ameliorate the overburdening at hospitals due to rapid escalation of cases in need for beds and intensive care (Soriano and Barreiro 2020).

19.3.1 COVID-19 Management and Outcomes for UNIR Personnel

From the first week of March, an emergency committee was established at UNIR, convening on a daily basis to feed relevant news to stakeholders and to develop adaptative strategies. In an attempt to minimize the chances of viral exposure and disease risk severity, all employees working at the distinct facilities were contacted and those belonging to high-risk groups were invited to stay home with immediate effect (Soriano and Corral 2020). The latest were symptomatic people, potential contacts, and persons with underline co-morbidities.

The remaining employees were stratified into four categories and advised to act accordingly. Personnel performing critical tasks considered to require their presence at headquarters were split out into three groups. First, a few were considered as indispensable managers. Second, a subset was enabled to come upon request for specific tasks. Third, a group would perform their regular job on a rotational basis. All the remaining employees were sent home, from where they continued to work on their allocated duties.

Laptops and Internet connections were provided to all those needing to work from home without the appropriate equipment. A direct 24 h $\times$ 7 days week contact (phone, whatsapp, and e-mail) with the UNIR Medical Center staff was offered to all employees. They could ask medical questions, advice, or psychological support anytime they needed it. At our largest university facilities in Logroño and Madrid, in less than two days, the number of people coming to headquarters went down from roughly 500 each to less than 20, respectively.

For three months, classes and exams are operated at full capacity, with just some occasional troubles mostly due to the overload of external online system platforms. Overall all the expected levels of service and support for students were maintained.

Fig. 19.2 End of crowded student classrooms. Online education has become closer ('screen') and is no longer 'distance' education

Paradoxically, online education provided by 'remote' universities became closer than regular teaching at classical university facilities, that were left empty and became a real 'distance university' (Fig. 19.2).

Nationwide lockdown was rigorously implemented as the Spanish health system became critically overwhelmed (Soriano and Barreiro 2020). Thankfully within 6 weeks the incidence of COVID-19 cases reached a plateau and begun to decline as the number of people actively infected rapidly felt down. Furthermore, the proportion of people susceptible to the new SARS-CoV-2 infection went down as increasing numbers became infected and recovered with protective immunity (Kissler et al. 2020; Soriano et al. 2020).

Our approach at UNIR for keeping university job duties active as much as possible away-from-desk was successful. Given that prolonged job disruptions may be disastrous, the stratification categories by university employees we performed might help other scaling up returns once the COVID-19 pandemic steadily goes down. Otherwise, massive return to working places might result in rebounds of COVID-19 cases.

19.3.2 COVID-19 Management and Outcomes at UNIR Graduate and Postgraduate Programs

As explained before, the preparation of UNIR during the first ten days of March was critical to continue the academic operations once the lockdown was announced on March 14th. Although the university's 1500 professors already operated online, more than 1000 employees were working at the university offices in Logroño and Madrid. They worked in marketing, computer service, content design, tutoring,

human resources, finance, and other management tasks. In a matter of days, all these employees were able to work functionally from home.

The most important problem from the academic side was to move of exams from offline to online format. The Spanish ministry of education granted universities the possibility to organize online exams for their official programs, but this meant for us to reorganize the dates and content of the exams already planned. We also needed to create a system of online signatures and data protection procedures. The team of technical facilities worked extra hours to get the changes done. We implemented the changes within a few weeks, just before the final exams for many of our programs.

On the sales side, the call centers moved to teleworking mode. Our call operators continued their service, responding to thousands of calls, from their homes. Initially, during the second half of March, there was decrease in the number of interested candidates, probably because of the shock in society with the virus. Through the month of April, though, the interest on our online courses picked up to a normal pace. We expect that, as people think about education in the postcoronavirus society, they will look more and more into the online options.

We can already see a radical change in society with respect to online education. In the last month, we have been invited to speak at major radios and newspapers of the country about the benefits of the online education. Many schools (from primary school to university) have sped up the selection of online solutions, trying to deliver some of their classes through Skype, ZOOM, Meet, Webex, or some other solutions at hand. Many companies have offered free webinars to their clients, and people have learned how to find YouTube educational resources (Bloem et al. 2020).

We believe that these experiences acquired through online education, even though they were not always perfect and well structured, may definitely transform the mindset of many stakeholders about the effectiveness of the online education. And, when the situation will go back to normal, people may try to look for the educational institutions that really have the experience, the faculty, and the resources to deliver quality online education.

The above consideration may be specially the case at the higher education level. Not all traditional universities (probably only a few) will be able to make the change from off to on-line. If not doing so, they might loss protagonism. Indeed, the old university model was designed for a few people that committed all his time to the education task, but universities in the postcoronavirus era will need to deliver education to an increasing number of students that share their time with other duties, including job schedules.

19.4 Experience from a Cambridge University Perspective

The peak number of infections in the UK happened several weeks after that in Spain. One of us is a lecturer at one of the expert programs at UNIR living in England. Because of that, singular teaching challenges appeared. This means that some stalling of the main duties supposed to deliver were affected by a slowing down of activity

in Spain. It also coincided with the initial weeks of chaos described above, before the period of adaptation to full online teaching and learning.

From the point of view of business, the main challenge was to access publications and Internet speed from home. In addition, the Institute for Continuing Education at the University of Cambridge was significantly affected. The university actively considered a range of contingency plans. As of May 6th, staff were informed to proceed with the following arrangements for courses for the 2020–2021 academic year:

1. All Undergraduate Certificates, Undergraduate Diplomas, and the Undergraduate Advanced Diploma to be delivered entirely remotely for the full academic year.
2. All Postgraduate Certificates, Postgraduate Diplomas, and MSt programs to be delivered remotely in Michaelmas term (up to Christmas time), returning to face to face when the situation becomes viable.

While the impact on face-to-face teaching has been noticeable at the University of Cambridge, it has not been as remarkable within online activities at UNIR, except during the first weeks of closing down in Spain. The current circumstances have nevertheless precipitated the development of working habits from home by collaborators and people involved, and remote activities via UNIR have been particularly developed and enhanced.

19.5 Discussion and Conclusion

Forcing in a short time frame, the transformation of university activities to virtual teaching and learning from in-person classrooms has been challenging for many. Creative and innovative ideas have emerged, including some rethinking of the major goals of universities. However, it is important to highlight that high-level education should remain both a community of explorers of knowledge, truth, beauty and good. At the same time, it must be the trigger of an innovation-based economic development and fair social fabric. The unique COVID-19 crisis has demonstrated that virtual tools can expand the ways to achieve these goals for the benefit of teachers, students, and ultimately the whole society.

The speed and scale of the disruption in education caused by COVID-19—which now affects 290 million students worldwide, according to the United Nations—has little parallelisms in modern history with any other event, as some educators and economists contend. Schools provide structure and support for families, communities, and entire economies. The effect of closing them down for two months may have untold repercussions for students and societies at large.

Whereas the flexibility of individual remote interaction and access to anyone and to anywhere is an advantage, several benefits on students and teachers derived from face-to-face interpersonal relationships may be lost under virtual conditions. Teaching and learning benefits derived from direct personal interactions and social living exposure could experience downsides and result in the lost of very valuable skills, including

those linked to body language, emotional intelligence, and deep feelings. The social dimension of the human nature is essential for proper development and attainment of maturity. Planning actions to confront these new threats is urgently needed.

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Chapter 20
How School Has Changed for 3–14-year-Old Students: An Italian Case Study

Paola Banchio, Carla Cervella, Cristina Galaverna, and Anna Maria Giordano

Abstract This chapter summarizes the actions implemented by the Comprehensive Institute 'Cuneo Oltrestura' during the COVID-19 emergency. This Italian school includes kindergarten, primary, and secondary schools. The Institute had already in place a variety of technological tools well integrated into the daily lessons. This has favoured the mandatory shift from a face to face methodology to a distance learning that the lockdown situation has forced. The characteristics of the new learning environment for each school type are summarized as well as, the experience of "adopting schools" to support other schools in implementing distance learning.

Keywords Distance learning · Learning environment · Early education · COVID-19 emergency

20.1 Introduction

The Comprehensive Institute 'Cuneo Oltrestura' (from now on 'Cuneo Oltrestura') is an Italian school with more than 1000 students from 3 to 14 years old composed of three kindergartens, five primary schools and one secondary school. In particular, the schools are located in the suburbs of Cuneo, a northern provincial capital, covering a countryside area of 7 hamlets.

The territory is mainly residential, with some agricultural production activities, mechanical industries, transport, and logistics companies. A good percentage of

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Table 20.1 Composition and feature of IC Cuneo Oltrestura during the school year 2019/2020

Type of school	Students' age	Hour per week	# schools	# students	# special need students	# teachers
Kindergarten	3–6	25 h/40 h	3	135	25	20
Primary school	6–11	27 h/40 h	5	554	119	58
Secondary school	11–14	30 h	1	350	79	35
Total				1039	223	113

students' families are willing to cooperate and participate with their skills in the educational offer of the school. Also, the local authority is particularly sensitive to the issue of inclusion. The school represents an important gathering place as the main cultural institutions (library, museum, theatre, exhibitions) are located in the city centre and cannot be reached autonomously by the students.

In 2012, the Minister of education gave the "National indications for the skills target" (Ministero dell'Istruzione e della Ricerca 2012), that state that every school can, in their autonomy, organize their curriculum. It is not possible to change the total number of school hours or the subjects, but it can be adapted as a form of flexibility in the organization.

Table 20.1 indicates the general characteristics of the comprehensive school during the school year 2019/20 divided by school orders. In kindergarten, each class has two teachers and an average of 23 pupils, and the curriculum is organized in five fields of experience. In the primary schools, families can choose the weekly timetable between a full time (40 h) and a normal time (27 h). In the first case, there are two teachers per class while in the second case, there are more teachers, specialized in different subjects, who alternate. Secondary classes have an average of 24 pupils per class, although some of them are very numerous (up to 29 pupils).

While kindergarten and primary teachers have a degree in science education, secondary teachers have different degrees depending on the subjects they teach. Considering the teachers' composition, the majority is more than 45 years old. In particular, 47% are between 45 and 54 years old and 26% are more than 55 years old) (I.C. Cuneo OltreStura 2019).

20.2 Context

Since 2008, Cuneo Oltrestura has adhered to the digital innovation actions proposed by the Italian ministry and to the National Plan for the Digital School (Ministero della Pubblica Istruzione 2015), these foreseen actions on the different areas can be summarized in tools, skills, and training.

The aim is to support the use of technology and digital innovations inside the traditional lecturers and not to implement an "any time, any place" typical of e-learning (García-Peñalvo and Seoane-Pardo 2015; Noesgaard and Ørngreen 2015).

Considering the tools, Cuneo Oltrestura has (i) structured cabling of the network devices that guarantee 100% WiFi coverage in all the offices, (ii) Access Point management system centralized, (iii) user management system, (iv) web filtering and content filtering system, and (v) technologically equipped classrooms and functional aids for coding and educational robotics in all schools. Moreover, to counteract technological obsolescence, the institute has recently prepared a plan to purchase interactive monitors that will gradually replace the old IWBs. These tools were funded by public money, private foundations, local associations or private donations.

Regarding the skills actions, they involve both students and families thanks to some projects aiming to raise awareness on the proper use of technology and to prevent the cyberbullying. Moreover, students receive indirect training thanks to a revised methodological approach that involves the use of technology.

To achieve this goal a huge effort has been made on teachers and staff training. The school has a team of teachers responsible for this action. This has ensured the implementation of different methodologies to shift from face to face learning to an active one. In addition, teachers are reinforcing their methodological skills in coding and computational thinking.

The school makes use of an electronic register, Argo DidUp. This allows communication and recording homework, topics, assessments, and report cards at primary and secondary school; while at the kindergarten, its usage is limited to the sign-in sheet both for teachers and students.

Starting from the s.y. 2019/20, Cuneo Oltrestura has been using "GSuite for Education", that is, a set of applications made available by Google for educational institutions. This ensures greater process efficiency and the circulation of internal and external information, communications, and documentation. From a strictly didactic point of view, the tools facilitate, support, and motivate learning through new technologies.

Therefore, the accounts for the school staff, the students of the secondary school and the fourth and fifth grades pupils of primary school have been activated.

Registration on the Platform allows:

- the creation of a Gmail e-mail box with a personal and protected @iccuneooltrestura domain (also in terms of Privacy legislation);
- the use of unlimited Cloud storage through Google Drive;
- the creation, sharing, and use of files both during teaching activities and homework through Google Docs. Each student can access their own files or those shared with the groups they belong to wherever there is an Internet connection;
- enrollment in the Google Classroom, a secure cloud environment, designed to facilitate learning by providing study supports and allowing flipped classroom.
- the use of dedicated and developed apps to support the various school subjects.

In addition, the Institute has joined the "Riconnessioni" project proposed and financed by a banking foundation that foresees investments in equipment and training for secondary school.

In this context, the imprint given by this mix of actions has managed to involve part of the school community, even if the training has not been integrated into a systematic

and pervasive way. Therefore, before the arrival of the Covid-19 emergency, strong differences in educational offer remained linked to the choices of individual teachers or teams.

20.3 Actions Implemented During the Emergency

After the first week of stop due to the Covid-19 emergency, the DPCM that was issued on 4 March, extended the suspension of didactic activities until the peak of emergency is over. At that point, it was realized that distance learning activities were likely to continue for a long time. Therefore, the headmaster of Cuneo Oltrestura provided the document "Oltrestura Connessa" in which operating procedures and tools were detailed in order to face the emergency properly (I.C. Cuneo Oltrestura 2020). The document reminds the fundamental tasks related to each member of the school community: (i) teachers are called to give continuity in learning paths, through didactic proposals online and remote; (ii) students have the opportunity to access materials made available by teachers, share in groups, create digital products, submit them to teachers for evaluation; (iii) families should be able to follow their children and their progress, sharing the didactic path even if carried out remotely without losing contact with the school.

In addition, regarding the tools, it reports the instruments already available and currently in use in Cuneo Oltrestura with some specifications on the workload and on the timing.

Obviously, the integration of the Gsuite platform and Argo DidUp in non-emergency teaching have made that the school could start remote teaching activities immediately, especially in secondary school. At the same time, the document underlines the need for particular attention towards pupils who had limited connection by providing alternative forms of learning instruments. This is a key factor of a well-implemented Emergency Remote Teaching (Hodges et al. 2020).

This local guideline was fully in accordance with the first ministerial indications (Bruschi, 17 marzo 2020); in fact, the national document recalls the fundamental need to create a "learning environment": that is, to keep alive and central the relationship pupil/teacher although in a different way compared to the traditional lesson. Moreover, the indication specified the uselessness of just sending materials or homework, which are not preceded by an explanation or which do not provide for subsequent clarification or comments by the teacher. Another aspect reported represents the need to find a balance between learning activities and moments of rest. This guarantees to children not to spend too much time in front of screens. Finally, it dedicates a specific section to pupils with disabilities or specific learning disabilities, specifying that the inclusion process cannot be interrupted.

In the light of these national indications, a survey on the students' connectivity has been performed. This has allowed to provide support to families who were unable to connect due to a lack of devices or connectivity. Thanks to ministerial funding and a private donation, in order to respond to the difficulties encountered, the school has

purchased and allocated: 50 devices on free loan for use to as many families. Each device includes a SIM card with a prepaid 50 Gb subscription for 3 months. This has made it possible to reach almost all families ensuring the creation of the distance "learning environment".

In addition, Cuneo OltreStura took part in the "One school adopts another school" project for the implementation and dissemination of distance teaching practices. The "adopting schools" obviously should already have established consolidated and remote teaching practices, good hardware and software equipment, and online platforms in use. In particular, Cuneo OltreStura has "adopted" two local institutes: IC Cervasca and IC Cuneo Via Sobrero. As part of the project actions, "digital coffees between colleagues" were created: 2 h webinars in which the most common issues were discussed with reference to the Gsuite platform and its related apps. Specific didactic materials were also prepared and made available to support the distance shift of the other schools.

Some details of the teaching reorganization due to the emergency in the different school orders are reported in the following subsections.

20.3.1 Kindergarten

Talking about distance education in kindergarten immediately seemed like a big contradiction. Kindergarten requires an educational approach in which relationship, care, and learning are closely connected. Cuneo Oltrestura has chosen to offer a common educational project, in which the teachers of the three kindergartens could collaborate.

Since the beginning, it has been considered essential to make the children and families feel their teachers' closeness through the so-called "Teaching for presence"; this means, the development of two actions that keep each child's experiential and personal path alive.

The first action developed was to bring some elements of the kindergarten routines to the home environment and in which the children could recognize each other (e.i songs, stories). The creation and updating of the padlet (available at https://padlet.com/cristina_galaverna/zp2gxk3n50zt) have been carried out by a working group made up of a teacher for each kindergarten, who constantly confronts colleagues on the choices of material to be loaded.

In the beginning, the proposed material was chosen from the resources already existing online. Gradually the teachers have become familiar with the technology and started producing videos in which they read books, sang songs, made tutorials of manual activities to do with easily available material. This allows to partially bridge the distance as children can see and hear their teachers' voice. In the proposals, teachers ask children for feedback, through a drawing or a photo of something significant which is then published on the padlet. Recently some educational games have been created through Wordwall, Learningapps, and Kahoot and added to the padlet.

The second action developed is through the videoconference meeting on HangoutsMeet between the small children and their teachers. The first meetings were full of emotions because they have met again after about a month of distance and the parents' role has been very important. There was the need to evolve the virtual encounters into meetings of mutual narration, to give children the opportunity to resume this important aspect of school life.

Two months after the start of this emergency mode, a meeting was held to verify the educational project with the room parents. This evaluation moment has been positive and will allow to further improve the distance relationship in the coming months.

20.3.2 Primary School

Right from the start the primary school used as school/family communication different tools: (i) the electronic register, (ii) Classroom (already active in the fourth and fifth classes), and (iii) Padlet. Furthermore, to support families who, for various reasons, were not yet used to consulting the virtual platforms on a daily basis, WhatsApp was exceptionally used.

Drawing on personal skills and asking for help and support from colleagues better prepared in the use of technological tools, different resources have been created to share with students: from the recorded reading of stories to the use of gamification for the review of the topics already studied, to the recording of short lessons introducing new contents using different support (PowerPoint, PowToon, YouTube videos, digital resources offered by the textbooks in use). The effectiveness of the proposals has been checked thanks to the fact that the children have sent written assignments, completed quizzes, recorded audio, and prepared presentations.

Aware that in Primary School teaching and learning are above all practical, playful, experimental, cooperative, teachers have tried to make sure that the proposals were as interdisciplinary as possible. Moreover, the lessons tried to involve children on an emotional level, making each student feel an active and indispensable part of the class group, despite the distance. For this, the activities have used the home environment and sometimes they have involved the entire family, for example, "treasure hunt", map drawings, orientation competitions, the creative use of furnishings, the creation of simple artefacts with materials found at home (origami, models, lapbooks on study subjects). At the end of some homework, the children were able to share their work with the entire class.

Once a week a video call on the HangoutsMeet platform has been organized for each class. During the virtual meeting, each pupil has had the opportunity to give voice to personal experiences, but also to participate in simple school activities led by teachers such as collective reading, short workshops, and games.

Despite the number of strategies implemented, it took a few weeks to get all the pupils involved who, given their age, do not yet have personal digital tools and, left alone, could not access the platforms or participate in the connections. Thanks to the

relationship with families, which has gradually strengthened, however, it has been possible to reach everyone.

20.3.3 Secondary School

At the secondary school, Gsuite was already integrated into the traditional lessons and this made easier the creation of a distance learning environment. Nonetheless, the obstacles that teachers had to face were either of psychological and technical nature. Indeed, for the pre-adolescence age (11–14 years old) the lockdown has represented a mix of emotions. At the beginning, they felt on holidays and it was hard to catch their attention; after some weeks, they started to miss friends and freedom perceiving the school time as the way to "escape" from home. Then, the teachers acquired a new responsibility empowering their educational relationship with the students: try to support them in facing these conflicting emotions. This challenge has put teachers to the test and offered them the opportunity to show that technology is not only a trend or a source of risk, but it can represent a precious opportunity.

At the same time, secondary school is characterized by around 10 different subjects each one with a different teacher. This required a complex reorganization of the timesheet in order to reshape the workload. Each professor has created an online Classroom for each physical class in which she/he can (i) produce and share teaching materials, (ii) give and evaluate assignment and homework, (iii) record streaming lessons, and only recently (iv) directly perform an online call through HangoutsMeet.

A positive aspect is the greater usability by students of this variety of contents. Indeed, on the contrary to the static face-to-face lesson, the students can listen to the lessons several times and consult the materials in a more dynamic way. In addition, the optimal management of Classroom allows teachers to greatly customize the educational activities and make them more inclusive.

Finally, the problem of evaluation arose creating a lively debate within the school. Evaluation is a necessity both for the teachers and for the students because it allows verifying how much a specific topic has been understood and reworked. Clearly, with this new remote mode, it is not possible to apply the same evaluation methods that were used in the physical classroom. Various evaluation methods, which include both the cognitive aspects and the new skills acquired, are therefore being tested. However, for the secondary school, the evaluation remains an open question.

20.4 Conclusion

It is clear that the pandemic emergency has highlighted the importance of the educational relationship in school. At the same time, the different needs that characterize each order of school and the key role that each family plays in the educational mission have clearly come to light.

Dealing with the emergency, the risk is excessive attention to the tools compared to the methodology. Cuneo Oltrestura has started from an advantageous condition as it already had in place numerous technological tools well integrated into daily teaching. However, it had to face the methodological problem, that is, the limit represented by replicating the contents only with different support, more technological, neglecting active participation and the acquisition of transversal skills. The challenge of distance learning requires each teacher to get involved, to train and review their own approach. For this reason, for Cuneo Oltrestura, it was essential to strengthen the dialogue between colleagues by making personal skills available to each other. It can be said that this emergency has favoured the creation of a peer to peer network that has gone beyond the boundaries of the institute, also thanks to the adoption of the neighbouring schools. The teacher training has thus received new inputs that will certainly leave their mark. It is unthinkable to transform the school, especially early education, purely into distance learning, but surely the post-emergency school will be able to count on a stronger synergy among teachers and on a rediscovery of the role of the educational relationship regardless of the "learning environment".

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Chapter 21
Online Learning in K-12 Schools Amid Covid-19 in South Korea: Challenges and Opportunities

Hyunjin Cha and Hyo-Jeong So

Abstract In this chapter, we discuss how to respond and mitigate the educational crisis through remote teaching and learning. Taking the COVID-19 pandemic as an example of the educational crisis, we first present the educational policies taken by the Korean government with some examples of distance learning strategies. The Korean Ministry of Education provided schools with the guidance to adopt three types of online classes for remote teaching and learning: (a) real-time interaction, (b) content-based online class, and (c) assignments-based online class. Some measures were taken to ensure equal access to learning platforms for all students with a zero-rating policy, the device loan service, and the emergency classroom service. We then discuss unique issues and challenges at three levels of the educational system, namely the macro-, meso-, and micro-level factors to highlight the necessity of the multilayered approach in mitigating the education disruption nationwide. The chapter concludes with the opportunities concerning how the lessons learned from this large real-life experiment can shape the shift toward the future of education.

Keywords COVID-19 · Education crisis · Online learning

21.1 Introduction

In history, education disruption or school closure is not a new phenomenon. Schools were closed due to natural disasters or armed conflict (Winthrop 2020). The COVID-19 school closure, however, is rather different from the previous cases. While the nature of school closure in the past was local and affected a single country or small

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regional areas, the extent of COVID-19's impact on education is global and massive. According to the UNESCO statistics in April 2020, 188 countries closed schools nationwide due to the COVID-19 pandemic, affecting approximately 91 percent of students who were enrolled in schools (UNESCO 2020a). Indeed, the COVID-19 pandemic forced many countries to experiment and test their educational systems to cope with this unprecedented crisis.

For most countries, leveraging technological platforms was a common strategy for supporting the continuity of education during prolonged school closure. Technology has been positioned as an essential tool to extend educational opportunities by lowering the boundaries in time and space. Existing literature has demonstrated that technology-integrated solutions can extend learning opportunities for those who could not go to school for various reasons. For instance, mobile learning provided girls and women who could not access basic education with opportunities to learn essential skills such as literacy, numeracy, and life skills (Kukulska-Hulme 2010; UNESCO 2015). Beyond the access to basic education, a recent case shows that Massive Open Online Courses (MOOCs) can be utilized to provide refugees with the opportunity to access or continue higher education (Reinhardt et al. 2018).

While pockets of successful cases such as the above studies do exist to prove the potential of technology to enhance access to education, little is known about how technology can be utilized to mitigate a large-scale education crisis such as the COVID-19 school closure that impacts the whole society as well as educational systems. Countries with some levels of readiness were better able to cope with this challenge. A recent article, however, implies that the pandemic situation caused and even widened the potential learning gap between high-income and low-income countries. Low-income countries were less able to provide their students with opportunities to continue learning via distance technology (Vegas 2020). Educational systems that have already some acceptable levels of readiness in distance or remote learning could better deal with the sudden challenges faced by the COVID-19 school closure.

Conditions for effective distance learning requires four types of readiness, namely (a) technological readiness (e.g., digital learning platforms, digital devices, Internet connection), (b) content readiness (e.g., access to teaching and learning materials), (c) pedagogical and home-based learning support readiness (e.g., facilitating daily home learning, caregivers' availability), and (d) monitoring and evaluation readiness (e.g., tracking the access to courses, engagement, and learning outcomes) (UNESCO 2020b). Both technological readiness and content readiness are essential to support the continuity of education. Examining the level of each area of readiness is also critical for choosing a mainstream solution for distance learning.

To guide countries' planning and implementation of distance or remote learning during COVID-19, international organizations such as UNESCO (see Table 21.1) and World Bank published some guidelines. UNESCO provides 10 general recommendations to plan distance learning solutions, whereas World Bank provides more detailed guidelines respective to each stage such as planning, implementing, and sustaining. These guidelines commonly highlight the need to leverage the existing resources, to ensure the inclusion of all students, and to develop sustainable solutions.

Table 21.1 Guidelines for distance (remote) learning during COVID-19

UNESCO (2020b)—COVID-19: 10 Recommendations to plan distance learning solutions
1. Examine the readiness and choose the most relevant tools
2. Ensure inclusion of the distance learning programs
3. Protect data privacy and data security
4. Prioritize solutions to address psychosocial challenges before teaching
5. Plan the study schedule of the distance learning programs
6. Provide support to teachers and parents on the use of digital tools
7. Blend appropriate approaches and limit the number of applications and platforms
8. Develop distance learning rules and monitor students' learning process
9. Define the duration of distance learning units based on students' self-regulation skills
10. Create communities and enhance connection

While these guidelines are useful, they tend to be general and abstract, which makes it difficult to translate them into action. In this chapter, we attempt to illustrate a concrete case of the Korean experience concerning how the country responded and mitigated the educational crisis during the COVID-19 pandemic. We first present the educational policies taken by the Korean government with some examples of distance learning strategies. We then discuss unique issues and challenges at three levels of the educational system, namely the macro-, meso-, and micro-level factors to highlight the necessity of the multilayered approach in mitigating the education disruption nationwide. The chapter concludes with the opportunities concerning how the lessons learned from this large real-life experiment can shape the shift toward the future of education.

21.2 Educational Policies Amid Covid-19 in South Korea

Korean government defined online learning or online class as a method of teaching and learning activities conducted in different places and times. In this section, we illustrate how the Korean government has taken measures to meet the educational needs for teaching and learning amid the COVID-19 pandemic.

21.2.1 Guidance for Three Types of Online Class

Online learning approaches in K-12 schools are not new. Many researchers and teachers have adopted online learning strategies in K-12 classroom contexts worldwide (Bryans-Bongey and Graziano 2016). However, except for specialized virtual schools for students with special needs, most online learning has been utilized as a supplementary tool to formal learning or as a space for informal learning. The Korean government has implemented various types of supports for online learning as a means to supplement the regular curricula (KERIS 2018). The COVID-19 outbreak, however, required the Korean government to reshape educational guidance for the regular classes through online learning. Leveraging the existing online learning resources and infrastructure, the Korean Ministry of Education provided schools with the guidance to adopt three types of online classes for remote teaching and learning (see Fig. 21.1): (a) real-time interaction, (b) content-based online class, and (c) assignments-based online class (The Korea Times 2020b).

The first type is to provide classes through real-time interaction where teachers communicate with students through video conferencing tools or SNSs (social network services). This type helps teachers to check student attendance and absence simultaneously.

The second type is a content-based online class where the content provided to students is developed by teachers or teachers can utilize various contents from the national e-learning platforms. In addition, teachers can utilize the learning management system (LMS) to check students' learning progress and to provide students with asynchronous interactions.

The third type is an assignment-based online class. In this type, teachers assign projects and homework for students to submit via LMS. While this type might not require teachers' special capabilities for content creation and well-equipped infrastructure, it requires students' self-directed learning skills for completing assignments. In addition, since teachers have restrictions from communicating directly with students, learning is likely to focus on the delivery of knowledge and assignments.

Since the three types of online classes have both advantages and disadvantages, the Korean Ministry of Education (2020a) proposed schools to adopt the best solution according to the school environments and community contexts. While the beginning was not perfect, school community members were adapting the way that best suited their situation.

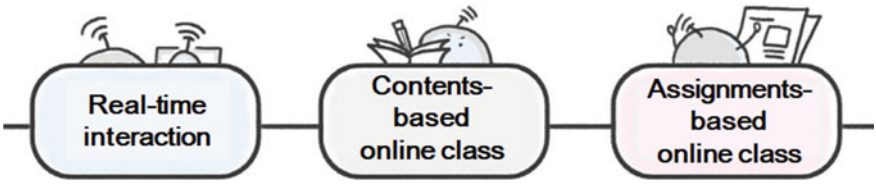

Fig. 21.1 Three types of online classes guided by the Korean Ministry of Education (2020a)

21.2.2 Guidance for Disadvantaged Students

While starting a new semester with remote learning was an inevitable decision, the most important issue was to alleviate the digital divide (The Korea times 2020a). There was a public concern that the start of the new school term through online learning might lead to widening the educational gap across the regions and students. The Korean government, hence, had to prepare several measures to include disadvantaged students in online learning environments.

First of all, the Korean government applied a zero-rating policy on some educational websites officially utilized by teachers for the online class (The Government of the Republic of Korea 2020). Zero-rating means that students do not pay for the Internet network service charge. Zero-rating policy was only applied to specific learning platforms and websites mentioned above. With zero-rating, students can access online classes on such websites through their smartphone or any mobile device with free of data charges. Second, for the first and second grades of elementary school, online classes were taught through both TV and the Internet. Therefore, students can select either TV or the Internet for their mode of online classes. IPTV or cable TV providers helped to provide EBS online content on their channels. Third, the Korean government distributed tablet devices to students from low-income families. In addition, households with many children who need to take online classes at the same time could loan mobile devices from their school. The donation of smart devices from Samsung Electronics and LG Electronics contributed significantly to the implementation of this policy. Finally, for students whose parents could not support home-based learning or those in rural or island regions who had problems with IT infrastructures, local schools offered the day-care service to accommodate them in emergency classrooms (Korean Ministry of Education 2020b). On the whole, the Korean government took several immediate measures to ensure equal access to education and to minimize the digital divide by establishing a collaborative and cooperative structure with the private companies and relevant organizations.

21.3 Considerations and Issues

In this section, we discuss some factors and issues that Korea was facing while implementing the new educational policies and system in response to the pandemic crisis. An educational crisis like the COVID-19 school closure is a complex issue that necessitates understanding the interrelations between individuals and structures (Boeren 2019). Hence, we analyze the considerations and issues at three levels in systemic change: (a) macro-level perspective (e.g., individual students, teachers, parents), (b) meso-level perspective (e.g., research institutions, training organizations, IT companies), and (c) micro-level (e.g., ministries, policymakers).

The macro-level involves the Korean Ministry of Education and policymakers to plan and implement new educational actions in this respect. Korean Ministry of

Education announced that "Online Class Preparation and Monitoring Team under the New School Year Preparation Task Force" was formed to proactively prepare for and support online classes (Korean Ministry of Education 2020b). One of the most urgent and crucial issues about implementing online classes was to develop acceptable guidelines for the school community members in collaboration with the metropolitan and provincial offices of education to ensure the continuity of education amid COVID-19. In addition, potential challenges and issues were monitored by running online pilot schools. Based on such pilot tests, the team developed a plan to troubleshoot on-site unprecedented issues that may arise with online learning. Flexible operation of online classes and student attendance was also important for all the members to bridge the digital divide and to relieve teachers' burden. Three types of online classes explained above can be an example of the flexible approaches to relieve teachers' burden. In particular, the Ministry of Education established both mid-term and long-term plans based on the collaborative work structure with the relevant ministries and organizations.

The meso-level involves public organizations associated with the Ministry of Education (e.g., KERIS, EBS) and private IT or edtech companies. These organizations should respond promptly to support the government's plans and implementations. However, most public educational platforms and content that were already utilized before the COVID-19 outbreak in Korea were developed and maintained for the purpose of supplementary education or informal learning. It means that the existing platforms and support for online learning should be redesigned to support regular classes with massive users in formal educational contexts. KERIS and EBS, which are the most relevant public organizations in charge of online content and systems in Korea, redesigned and revised their online learning platforms and e-learning content to help students to take online classes more effectively and easily. KERIS and EBS expanded their infrastructure to provide stable access to teachers and students across the nation. For instance, EBS opened the space for teachers to broadcast real-time lectures and provided online content in video format. KERIS redesigned cyberlearning platforms such as Wedorang and e-Hakseupteo in a format where teachers can easily set up online classes, content, and assignments (World Bank 2020). Furthermore, as discussed in the previous section, the IT network operators and electronics contributed to help eliminate the digital divide by providing the zero-rating educational service or free mobile devices. Edtech companies in the software-focused industry also contributed to establishing better learning environments for teachers and students by offering online learning platforms or communication tools (Korean Ministry of Education 2020c).

The micro-level includes teachers, parents, and students. Teachers are the ones who have the greatest burden on the implementation of online learning. Many teachers do not have relevant experiences in developing online content and operating online classes. In fact, teachers who were interviewed by the media expressed an unprecedented burden on the new ways of teaching and concerns about their capabilities to adapt to the change in a new teaching and learning mode (Ock 2020). The positive sign, however, was the growth of teacher communities where teachers across the county were collaborating with their peers and some experienced teachers were

sharing their content and expertise to help novice teachers (Korean Ministry of Education 2020d). The Ministry of Education found that teachers' voluntary communities were activated, experienced teachers provided training courses for novice teachers, and teachers were studying together about how to develop online content during the preparation of online classes. The government also provided online seminars and training courses on online content development and teaching strategies.

Parents were also expressing concerns about online learning, particularly for young children who are likely to have difficulties in concentrating on learning at home. Moreover, while families with several children could loan digital devices from schools, they were also worried about devices being broken. Some parents even thought that their children's learning and assignments would become theirs to take care of (The Korea Herald 2020). The burden was much greater for working parents or single parent. An alternative measure that the Korean government took was to provide a special emergency care service for such parents.

From students' perspectives, it was critical to adapt to a new way of learning. Online learning might have an advantage for students who prefer to take classes flexibility through a synchronous live class or asynchronous lectures. Online learning also has some drawbacks (Yang 2020). For instance, students might feel difficulties in interacting with teachers or peers with the lack of social presence of being together and need self-regulated learning skills to take online classes in a more efficient and timely way.

Against this backdrop, Table 21.2 summarizes the considerations and issues that bodies in the three-layered structure took into account during the COVID-19 pandemic crisis in terms of online education. The key message is that while the macro-level plays an important role in planning and implementing an innovative learning approach in consideration of the national contexts (Korean Ministry of Education 2020b), concerted efforts from the relevant organization and teachers who devote themselves to offer quality education for their students are essential factors to succeed in such a new form of education amid the educational crisis. More importantly, parents in special situations and disadvantaged students should be considered to ensure the inclusion of all students with the principle of "do not harm" that no actions should cause any negative impacts (Winthrop 2020).

21.4 Opportunities for Future Education

Due to the COVID-19 pandemic across the world, Koreans experienced an unprecedented educational experiment for the nationwide implementation of online learning as formal education. While many issues and obstacles were revealed, Korea might find new opportunities from this massive experiment (Yang 2020). This section discusses positive opportunities as a new way of formal education amid the national crisis concerning the three-layered structure in systemic change.

Table 21.2 Considerations and issues at three-layered levels

Level	Bodies	Considerations and Issues
Macro	Government Ministry of Education Policymakers	– Set up the new team and structure to plan and implement educational policies – Operation of pilot tests to deal with potential challenges and unexpected issues – Flexible approaches and operation of online classes and student's attendance records – Dealing with the digital divide between regions and social classes
Meso	Public organization	– Redesign and revise the national online platforms and services, including e-learning content
	IT companies	– Support for network problems and devices
	Edtech software companies	– Establishing better learning environments for teachers and students by offering online learning platforms or communication tools
Micro	Teachers	– Capacity building on developing online content and operating online classes – Sharing knowledge and collaborating with peer teachers
	Parents	– Guiding their children's online learning – Working parents, single-parent and parents with many children: Caring issues on online home-based learning
	Students	– Advantage: Efficient learning anywhere and anytime – Drawbacks: Lack of interaction with teachers and students, lack of self-regulated learning skills

From the macro-level perspective, the Korean Ministry of Education and policymakers could prepare and revise detailed guidelines for online education in preparation for such a crisis in the future. This unexpected crisis by the spread of the pandemic virus showed the government how to prepare and deal with such a crisis. For instance, it is necessary to develop detailed guidelines on the scope and methods of online learning to be recognized as regular education amid the national crisis. In addition, based on the accumulated data from this experiment, systematic policies should be developed to support online learning for disadvantaged students such as creating online content for students with disabilities to realize universal design for learning (Rose and Meyer 2002).

At the meso-level, public organizations associated with the Korean Ministry of Education might accumulate relevant knowledge and experience of coping with massive online access for formal education in responding to the national crisis. The media reported that national online platforms operated without major technical problems by collaborating with IT companies and IT experts and by devising

a new approach to online learning in terms of both hardware and software (The Korea Herald, 2020). Of course, some schools and students still had connection problems and complaint about usability issues with these platforms. Fortunately, teacher communities collected ideas concerning how to improve the usability problems on the platforms. In the future, public organizations should analyze relevant data of this unexpected experiment and develop more informed-decisions on innovative approaches to online learning, particularly making an effort to minimize the digital divide between regions and social classes (The Korea Times 2020b).

At the micro-level, teachers should embrace innovative teaching and learning methods through online education and seek ways to realize learner-centered pedagogical approaches. This experiment proved that knowledge-centered learning can be done through online learning. It means that teacher's role should shift from a knowledge transmitter to a facilitator of new knowledge creation. In addition, since this event proved how important the interactions between teachers and students or students and students are for the school life, it also informs teachers of the new era of school life and curriculum by exploring alternatives in teaching and learning online. Teachers should attempt to build their own capacity to prepare for such new educational needs. On a brighter note, the number of teacher-created content increased gradually and some teacher communities were responding cooperatively to support new teaching methods. For parents, it is necessary to shift a negative perception toward online learning and to help to create a positive learning culture to maximize the merits of online home-based learning. More importantly, students need to identify their weaknesses with online learning in terms of self-regulation skills and digital literacy.

21.5 Conclusion

This paper illustrates how the Korean government responded and mitigated the educational crisis during the COVID-19 pandemic as a concrete case. The following Table 21.3 summarizes the educational policies taken by the Korean government.

Indeed, the COVID-19 school closure around the world was an unprecedented challenge. There are some predictions about the possible changes in teaching and learning after COVID-19. The predications include the wide adoption of blended learning, the move toward more flexible learning structures, and the increased emphasis on teachers' technological literacy and students' self-directed learning skills, and the increased parent engagement in education (Cox 2020; Winthrop 2020). While it is not easy to predict whether the shift to these changes in education will happen eventually, the positive side is that there are some lessons learned from this unprecedented situation.

Table 21.3 Summary of the educational policies taken by the Korean government

Area	Actions	Bodies
Preparation	– Creation of new collaborative work structure	– Ministry of Education (MoE)
	– Operation of pilot schools	– MoE
Guidance	– Guidance on the flexible operation of online classes and student attendance: Three types	– MoE
Network	– Zero-rating on some educational websites officially utilized by teachers for the online class	– MoE with the support of private companies
Media	– Provision of online classes through both TV and the Internet for the 1st and 2nd graders	– MoE with the support of private companies
Infra-structure	– Distribution of tablet devices to students from low-income families. I	– MoE with the support of private companies
	– loan digital devices from schools	– MoE
	– Expanded their infrastructure	– Public organizations associated with MoE
Software	– Redesigned and revised their online learning platforms and e-learning content	– Public organizations associated with MoE
	– Opened the space for teachers	– Public organizations associated with MoE
Contents	– Provided online contents	– Public organizations associated with MoE

To conclude, this chapter presented the Korean experience for mitigating the education crisis during COVID-19, particularly the challenges and opportunities from micro-, meso-, and macro-level perspectives. While it is too early to predict the impact of such experiences on the future of education, we believe that this chapter provides some ideas concerning how to better prepare for future education crises to ensure the quality of education for all students.

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Chapter 22
A Flexible Educational Model to Support University in Times of Crisis: The Open Spaces Educational Framework (OSEF)

Marta Higueras, Jalal Tounsi, and Daniel Burgos

Abstract Morocco is currently at a sweet spot for generating change and new activity models. Specially now, in VUCA environments (characterised by volatility, uncertainty, complexity and ambiguity), the academic community can pay a key role to the world in reshaping Higher Education with a flexible framework that accounts for learning in contexts of crisis. The country, as well as the whole African continent, demands high-quality online university instruction to prepare its extensive young population for the new professions of the twenty-first century, as a means for a sustainable society, including integration of formal, non-formal and informal learning, as well as online and blended settings, with a flexible approach, all suitable for education in crisis contexts. This chapter presents a socio-constructivist model, supported by active and inclusive education where students become the main actors in their own instruction. It shows the basics on the model and how it is useful for online and blended settings that combine formal and informal contexts, like the one out of the pandemic The Open Spaces Educational Framework (OSEF) is a case study implemented in Morocco and consists of active policies interwoven with business to guarantee the formation of creative leaders with a sustainable vision, practical implementation, and social responsibility.

Keywords Educational model · Competency framework · Active learning · Inclusive education

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22.1 Introduction: Reasons for a New Model

This article presents the Open Spaces Educational Framework (OSEF) methodology, which enables innovation in higher education in all the countries where it is adopted, whether in Africa or on other continents. This framework becomes especially relevant in times of crisis like with natural disasters or pandemics when face-to-face lessons have to migrate to flexible online or blended settings.

22.1.1 Project Innovations

The Open Spaces University (OSU) project intends to continue the improvement of higher education through innovation and excellence, arising from a student-based approach that responds to university students' actual training needs as they prepare to enter the workforce in the twenty-first century (Rychen and Salganik 2003). It emerges from the need to adopt an approach that connects the market and professional skills with university education. It is also born of a thorough analysis of the most sought after professions in the future in the global and the African work markets (WEF 2017a, b).

The project's innovation is evident in various areas:

- Design of the OSEF educational model (Sect. 22.3) can be summarised as follows:
  - Active methodologies (Prince 2004), applied in the Finnish system, Bologna Process, Jesuit MENA project, etc. Fernandez March (2006) highlights the following aspects: placing the student at the centre of the learning process, emphasising their autonomy, competency-based approach, and a procedural, formative approach to assessment.
  - Interdisciplinary focus is based on entrepreneurship, as also proposed by Mondragon University (García et al. 2017) and the Monterrey Institute of Technology (Tecnológico de Monterrey 2018).
  - Cross-disciplinary competencies across different degrees, e.g. digital, linguistic, and intercultural skills, teamwork, Design Thinking, creativity (as advocated by the Creative Schools project), etc.
  - Interaction between companies and universities, enabling "appropriate, sustainable, efficient, and effective growth of a society" Gutierrez-Solana's (2018) and a new concept of internships. The goal is to integrate companies into the training process to reduce the existing gap between what is learned at universities and the skills required by the companies, as expressed by the 2018 World Economic Forum report (WEF 2018a).
  - Flexibility of learning pathways and modalities, which enables the university's commitment to the success of all their students, with a clear focus on functional diversity and support to everyone's needs in a personalised way (zero dropout).

  - A variety of learning activities, both in classroom courses and through the online campus.
  - Teaching staff trained in the new methodology and with various functions: faculty heads, professors, and tutors.

- Education aligned with the demands of the work market. Preparing students for a sustainable society, through the professions of the future in five knowledge areas: engineering, business administration, sports management, digital humanities, and urbanity management.
- Architectural design of open spaces (López 2018), enabling interaction between students of different levels in labs, project incubators, etc.
- International mobility through international internships and online internships with companies that have adopted teleworking (Sect. 22.2).
- Open to an international public and with the aim of global learning: instruction provided in various languages, allowing exchanges among students from different countries and promoting diversity.

22.1.2 Technological Innovation

Technology is a pillar of OSEF and consists of technological infrastructure, an online campus, and blockchain certification (a pioneer project in Africa). All students work in the four learning modalities: classroom, blended, online, and dual, in the international internships. In this way, all the advantages of each modality are leveraged, each student's needs are effectively met, and they are prepared for a globalised, digital work environment. The goal is to provide technological tools before students start their studies (through preparatory or initial courses), during their studies (by tailoring their learning and eliminating dropouts), and once they graduate and access the work market (by offering specialisation programs, on-going training, and counselling for graduates).

22.1.3 Adapting OSEF in Contexts of Crisis

Although OSEF defends a blended approach, with the aid of ICT, it can be effectively adapted to a 100% online scenario, in which:

- Teachers follow training courses online and create an electronic portfolio to reflect on the process of development and the extent to which their goals are achieved.
- Learners develop projects and collaborate in small groups with the guidance of Educators, via synchronous meetings and asynchronous forums in the online campus.
- Tutors mentor learners and assess their learning.

The functions of OSEF's digital elements are quite broad: on one hand, they help to guarantee class use, adapt to students' different levels, enable flexibility, and reach a zero dropout rate, through tutors' tailored suggestions. Training experience is designed and available on the OSU campus platform under different digital formats: webinars, initial courses, SPOC, content connectors permitting the review of each subject's essential knowledge, etc. On the other hand, synchronous meetings with international experts are held, allowing students to interact, broaden their skills, and obtain international views of the profession. This sustainable model allows for professors collaborating in the project from their countries, which decreases international travelling or National commuting.

Among the digital tools used by OSEF students and professors, the electronic portfolio occupies a prominent place. It enables collecting evidence of learning and fosters autonomy. Educators also prepare an electronic portfolio during training in OSEF methodology. This socio-constructivist practice is framed in a realistic teacher training approach (Korthagen 2001); i.e. the perspective of deductive learning is exceeded (from theory to practice), and learning by trial and error (centred only on practice) and realistic learning is adopted, connecting practice with theory. This approach is more in tune with reality and based on learning and socio-constructivism (Korthagen 2001; Schön 1983; Esteve et al. 2006), where practical knowledge must be created by the individual and is not something that can be transmitted to students by professors or trainers. The professor's portfolio will also be the guiding thread of subsequent training to promote professional development (Higueras y Verdía 2019).

22.2 Morocco as the Centre of the Active and Inclusive Model. Case Study

Morocco is an ideal place to launch OSEF, due to its stability and the following macroeconomic, competitive, and demographic data from the 2019 IRES report. Certain information stands out:

- Morocco ranks 69th among 190 countries in convenience afforded for business, as classified by Doing Business (WBG 2019) and ranks the 75th place in the Global Competitiveness Index 4.0 Ranking WEF (2018b), out of the 140 economies analysed. It ranks first in Africa and ninth among countries in the geographic area of the Middle East and North Africa (Fig. 22.1).
- Morocco has high macroeconomic stability, good life expectancy, and excellent infrastructure, the best in Africa. Furthermore, the lowest indicators correspond to ICT incorporation and innovation, and to worker skills, i.e. both education and job training. Therefore, an innovative, flexible and technological methodological approach, such as OSEF would help improve them. In the actual global context, population is periodically threatened by crisis, like the COVID-19 pandemic, that prevents the individual's free movement and attendance to face-to-face lessons,

Fig. 22.1 Global Competitiveness Index 4.0 Ranking

and the closure of universities and schools might leave behind students from developing countries. Further, online learning and teaching can shape a new horizon. Morocco needs to go a step further and it is prepared to lead this evolution in Africa and the Mediterranean region. Innovative approaches such as OSEF are a pillar in this process.

- The sectors generating employment are automotive, aeronautics, electronics, ICT, wind energy, tourism, logistics, fishing, handcrafts, and agriculture. The fields proposed in the OSU correspond to these areas and will contribute to greater growth.
- As of 2019, the Moroccan population exceeds 36 million; 51.3% of the population is under 30 and there is a high concentration between the ages of 15 and 30 which generates a high demand for training in this country. Despite the under-25 population decreasing across the planet (UN 2017), the African continent has the highest concentration of young people in the world.

In addition to these economic and demographic factors, Morocco presents great potential for applying OSEF because the country:

- Has great prestige within the African continent, as shown by the fact it welcomes 20,410 university students from abroad; further, many Moroccan students (50,164) study abroad and could be interested in pursuing these innovative studies in their own country (UNESCO n.d.) (updated in May 2020);
- Has experienced huge growth in private and semi-private university enrolment in recent decades;
- Has demonstrated growing interest in adapting to the European system of ECTS accreditation, through the Jumelage Project;
- Is linguistically prepared for instruction in various languages and has recently increased degrees in foreign languages.

22.3 Definition of the Model

This article focuses on only one aspect of the conceptual level: the pedagogic basis of socio-constructivism (3.1), and on two aspects of the executive level: the role of internships (3.2) and methodological principles (3.3).

22.3.1 Socio-constructivism in the OSEF Model

The educational model proposed by the OSEF model seeks educational change and innovation for *knowmads*, or knowledge nomads (Moravec and Moravec 2013), so their skills respond to the needs of current and future labour markets, but especially so that they become efficient, flexible, and creative professionals and citizens, and the research undertaken is reflected as an improvement for the world.

That objective of change is achieved through an innovative educational project based on socio-constructivist principles embodied in the methodology of experiential learning, teaching practical learning (Dewey 1975; Kolb 1984). We share the core values of the Finnish educational system (FNAE 2017): quality, efficiency, internationalisation, and equality (for which there is a broad scholarship system).

From a socio-constructivist perspective, learning is viewed as a dynamic and interactive process of constructing meaning, not a display of innate knowledge or a copy of existing knowledge from the external world. This social concept of learning (Serrano and Pons 2011) emerges after having overcome behaviourism (interest in the search for answers) and other approaches that prioritise mere accumulation of knowledge. The fundamental notions shared by different socio-constructivist approaches, according to Fernandez-March (2006) are:

- A network concept of knowledge structuring;
- Knowledge is a social construct;
- Contextualised learning based on genuine tasks, suitable for the online campus;
- The teacher's role in scaffolding; and
- Transferring the burden of learning from the teacher to the student.

Socio-constructivism is the educational approach best adapted to the processes of building competency, as indicated by the DESECO project of the OCDE (Rychen and Salganik 2003), and encompassing Vigotsky's socio-cultural theory (Vigotsky 1979), which captures the evolution of preceding theories. The suitability of this approach is substantiated because what societies demand are not only people with skills, but rather competent individuals who can practise a profession and act autonomously to resolve a problem in a given situation. For this reason, the OSEF prioritises authentic projects –using active methodologies- to develop students' competencies, which can be assessed online. Knowledge, both conceptual (know-that) and procedural (know-how), is important and necessary, but not enough.

The elements of this socio-constructivist approach are depicted as follows: A prominent position is given to interactions with professors, tutors, context, materials and tools, other students, and companies hosting internships. All these interactions can take place face to face or online. Located in the centre is the didactic triangle, inspired by Coll and Solé (2005–2009), who suggest a diagram of the education process born of the interaction between three elements: on one side, the educational activities of professors and tutors (design and assessment of learning units); on another, the activities performed by students; and, on the third, the development of competencies. Since learning is conceived as the development of competencies new online techniques are developed to assess learning, beyond testing the memorisation of knowledge.

Other distinguishing features of OSEF are fostering students' entrepreneurial spirits and boosting active attitudes without fear of change and with great flexibility, while providing inclusive, interdisciplinary, and broad education enabling positive leadership of their own lives and self-regulation of emotions and behaviours. They are all found in OSEF, including: the importance of individual learning paths; their customisation, and their ubiquity; meaning that seamless learning is produced everywhere, with blurred edges, providing the name "open spaces" to the educational framework.

22.3.2 Internships

The role of companies is essential within this new framework, especially those teleworking that can ensure online internships for students who cannot travel due to different reasons. They are the context from which off-campus learning departs and arrives, and both business and university benefit from the collaboration (CCE 2015). Internships also constitute a distinguishing feature of OSEF that improves students' employability, as evidenced with Erasmus students in Europe (EC 2014). We agree with Gutierrez-Solana's (2018) affirmation that "the coordinated university-business partnership is the structure, the frame, which enables the appropriate, sustainable, effective, and efficient growth of society". This author states that universities' task is to create and transfer knowledge, while companies receive it and make it productive, which can only be achieved through innovation and entrepreneurship. In the long

term, the intent is to create interdisciplinary, international, and diverse teams that improve society with a more plural vision (Fundación Diversiad n.d.).

The characteristics of OSU internships are: they are performed from the first year and in different countries (especially those teleworking); they include collecting proof of learning that is reflected in the electronic portfolio; they are assessable; they pursue distinct objectives and are sequenced so the student gains autonomy and develops cross-competencies. Lastly, they also leverage the eight essential skills in Design Thinking methodology, which allow the application of Stanford University's innovative problem-solving approach.

22.4 Ten Principles

The following principles—some inspired by the ten issues of the *Horizonte 2020* programme—are key pillars of OSEF and will serve as guidelines to design the different academic programs and learning units:

1. The main objective is the students' learning and comprehensive growth: to develop their competencies, discover their talents, empower them, and apply them to a real project that promotes employment in the workforce and contributes to the development of their environment.
2. Due to various learning modalities and an ecological model, learning is inclusive, flexible and customised with a new concept of space, methodology, assessment, and professors' and students' roles. There is a great variety of learning activities, most of them are digital and they imply an active role from the student.
3. A competency model where knowledge has a place but is not the only priority. Active methodologies are applied (cooperative learning, project focus, problems-based, case studies, mock-ups, etc.), and share other common denominators including training in entrepreneurship, teamwork, online work, and ICT use.
4. Interdisciplinary flexibility between degrees, enabling further commitment to every student's success.
5. Innovation, creativity, use of critical thinking and tools to develop skills to boost students' self-confidence while fostering their autonomy, enhancing their ability to face problems in the future.
6. Formative assessment of learning _ not only the product but the process. An essential objective is to foster reflection, autonomy (perceived as cognitive and emotional self-regulation), self-criticism, and self-evaluation as paths to improvement.
7. Interconnection of theory and practice: beyond an internship, what is offered is the preparation of professionals demanded by the market, and companies help students achieve their goals and perform their projects, with the bottom-line of a sustainable market and society.

8. Multi-linguism and international scope: online internships foster intercultural communication in other contexts, as well as establish partnerships and enable business and research projects with international, interdisciplinary, and diverse teams (diverse in terms of cultural context, gender, and age).
9. Cyclic learning model. It always considers context, drawing from students' experience, which is reflected on when arriving at action. Assessment covers learning, products, and processes, and a new cycle begins.
10. Process-based organisation committed to quality management and continuous improvement. There is a highly motivated staff and a business culture, as evidenced by the competencies required and leveraged in this educational venture.

22.5 Conclusion

Experiences learned from implementing education in times of crisis (e.g. the COVID-19 pandemic) are valuable for designing new flexible educational programmes. The model presents the foundations for a proper implementation in crisis contexts. It is properly adapted to online and blended settings that combine formal and informal contexts, like the post-first-wave pandemic situation. OSEF guarantees online training for teachers, integrated ways of learning and social interaction through ICT; flexible pathways to support students and to achieve a zero dropout; and collaboration with partner universities to provide international learning in a globalised online connected world. Adopting such an approach, universities may respond to students' actual training needs reducing the gap between theory and the practical skills needed for the professions of the future in areas such as engineering or business administration. The innovative and flexible OSEF model defends active and inclusive higher education learning based on socio-constructivism. Its pillars are the interconnection of theory and practice, a wide system of internships, training in entrepreneurship, competency-based approach, experiential, significant and strategic learning, and a focus on interdisciplinary cross-competencies.

Further, this chapter presents the project's innovation and its pedagogical basis, the methodology principles, and the way international internships contribute to the development of the students' competencies.

On the one hand, regarding innovation and to enable flexibility and zero dropout, technology is central to the model. Some elements highlighted are technological infrastructure, online campus, blockchain certification, four learning modalities within every degree (classroom, blended, online, and dual) and a strong focus on online learning; all of them looking for a personalised learning support to every student, irrespective of their functional diversity. Electronic portfolio pays as well a crucial role, both for professors and students.

On the other, the new educational model proposed in OSEF inherits the advantages and well-proven success of Finnish experiential learning (Learning by doing),

a socio-constructivist perspective, and a balanced approach between theory and practice. It also prioritises authentic projects in an ecologic vision of the campus, where learning is generated everywhere in an open space ecosystem, mainly online if needed, and through the interaction with many agents and factors. This innovative and inclusive model is suitable for a total online approach and is summarised in the ten guidelines which close the article and gives internships an essential role, as companies provide the real context to develop cross-competencies and design thinking skills.

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Chapter 23
Insight: A Cancelled Future. What's Next for Universities and Colleges?

Stephen Murgatroyd

Abstract What are the implications for the future of universities, colleges and polytechnics resulting from the impact of the COVID-19 pandemic? Will higher education systems change significantly as a result of the social, economic and political impact of the changes which the response to the pandemic will lead to? This futures question is explored in the context of emerging patterns of response by governments across the world.

Keywords Higher education · Pandemics · University model

Universities and colleges experienced a sudden system shock when they were locked-down as a result of COVID-19. They responded by shifting to remote teaching, leveraging both their significant experience of online learning and their access to available skills, resources and technologies. They responded by rethinking key roles in the institution—putting students at the heart of their operation—and adopting compassionate assessment, recognizing the challenges which students on lock-down faced. The response was quick, impressive and showed a real determination of institutions to meet the immediate needs of their learners, knowing too that many would struggles with issues of access, affordability and self-management.

But after COVID-19 and beyond the immediacy of 2020, what will the higher education landscape look like? What will change and what will be the new normal? What are the opportunities for thinking differently about the work of a higher education institution? How do the policy makers and leaders responsible for colleges, polytechnics and universities need to think about the possible futures?

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23.1 The Wider Context: Understanding the Operating Environment for Higher Education

Before we look at the specific implications for colleges, polytechnics and universities, it is important to understand context: what will the society in which these institutions operate in will look like once the world begins to return to some form of new 'normal'.

COVID-19 has transformed the economic and employment landscape. Not all who had work before the lock-down will have work when the lock-down ends. In the service sector, which accounts for 65% of global GDP, significant long-term impacts will be felt. Retail, hospitality and tourism, airlines and many others will not return to the level of employment that existed before the lock-down, with some 40% of retailers and 50–60% of restaurants, for example, are now expected to file for bankruptcy (Chronicle Herald 2020). By April 2020, 10% of all restaurants in Canada had permanently closed—this is an industry that employs 1.2 million people, some 7% of the Canadian workforce (Murray 2020; Sagan 2020). Similar consequences will be seen in other jurisdictions around the world, especially in 'fragile' low growth economies (Eater 2020).

Most business around the world are small or medium sized. All are impacted by the lock-down and only a few of them in a positive way. Many will be permanently changed by the impact the lock-down has had on their cash flows, employees and debt. It was already the case before COVID-19 that 40% of small and medium enterprises would not survive a full five years in most developed economies in the world and 60% would fail in emerging economies. We are now likely to see the highest level of small bankruptcies in around the world in history (Tooze 2020).

A recession or even a great depression is likely, shown in part by the emerging unemployment numbers now appearing globally, but also by the decline in economic activity and growth (ILO 2020). Current economic models indicate that China has experienced a devastating blow to its economy, which drives much of global trade activity. The China International Capital Corporation (CICC) has cut China's growth forecast from its January number of 6.1% to a new low of 2.6%—a major Chinese recession would follow in the world's second largest economy, with Chinese exports falling by 18% or more (Wang 2020). Merrill Lynch is more pessimistic, suggesting that GDP growth in China may be as low as 1.5% for the balance of this year (Merrill 2020).

The US economy will also take a hit, according to Goldman Sachs, with GDP shrinking 34% in the second quarter and unemployment reaching an all-time modern high of 15–20%, with many of those who lost their jobs being unable to find new ones (Winck 2020). The World Economic Forum is predicting that the US and the Eurozone could take up to three years to return to pre-COVID-19 levels of economic activity, with some sectors within these major economies taking much longer (Oliver 2020).

All governments at all levels of government will have significant financial challenges, having used debt financing to support workers, healthcare and essential

services during the pandemic. Prior to the lock-down, global debts (corporate, government and personal) were very high. In September 2019, global debt from all sources stood at app. US$253 trillion, according to the Institute of International Finance (Amaro 2020). Such a debt level is 353 times larger than global GDP. In addition, there are a significant number of unfunded pension liabilities which governments had before the COVID-19 pandemic. According to the Swiss Re Institute, these real liabilities will reach $400 trillion by 2050 (up from $70 trillion in 2015) unless action is taken (Swiss Re 2019).

With bail-outs, guaranteed income supports and other measures, the US government deficit will have risen dramatically to over US$3.8 trillion and a debt of US$23.5 trillion (Condon and Merrill 2020)—increasing the debt to GDP ratio from 79% in 2019 to 117% by 2025. In the UK net debt is now £1.95 tn–up £173 billion in a single year, challenging all economic strategies and assumptions about inward investments, including in education. Across the EU, member states will experience a range of challenges, some of which will compound existing socio-economic challenges which impact communities and the institutions within them (Symonds 2020). It has moved quickly to create a special funds of between €1.5 tn and €2 tn to support already struggling economies. Given that central banks have lowered interest rates, returned to quantitative easing and are actively buying government and provincial bonds on the bond market, debt servicing should not pose a significant problem for governments. However, this does not mean that budgets approved prior to the pandemic will be honoured.

23.2 The Impact of COVID-19 on Higher Education

All governments will need to revisit their operational plans, fiscal plans and staffing levels. New priorities and strategies will emerge that will change the dynamics of state, regional, municipal and agency financing. To avoid going into deep debt, reductions in service or new approaches to funding will need to be developed. Colleges, polytechnics and universities will be in the same situation—having to rethink operations, financing, staffing and their role in rebuilding communities. It will not be easy.

Some had already begun to do so, seeking to rationalize what they saw as overly complex, duplicative higher education systems with too many institutions offering the same service in too many places. They look to New Zealand which had merged sixteen polytechnics into one (Smyth 2019) and to New South Wales which had done something similar in merging ten institutions (Shreeve and Palser 2018). Other systems, such as some in Canada (Government of Alberta 2020), were already exploring system rationalization.

Some universities and colleges are already closing permanently, especially small liberal arts colleges in the US and small private universities around the world. In the US, 30% of publicly funded universities and 30% of private universities were

running deficits before COVID-19 (McCauley 2020). In the UK, 25% of universities and 30% of publicly funded colleges were also in financial difficulty before the pandemic (Adams 2019), some with operating deficits higher than 10% of revenue. As demand for higher education, in particular from international students, is anticipated to fall significantly, then the business and financial models on which these institutions are based become inappropriate and new ways of financing and planning essential. To reinforce this, Moody's Investor Services (2020) has outlined severe impacts, especially for US, Canada, UK, Australia, Singapore and Mexico which rely heavily on a marketized model of higher education, which gives high value to international student enrolment—now likely to shrink dramatically.

23.3 The Future for Universities and Colleges

Predictions as to what the future business and planning models are for higher education are now beginning to appear. Behind some of these is the idea that there will a system shift from a 'supply side' view of the work of colleges and universities ('offer it and they will come') to a demand-led market (Marginson 2020; Government of Australia 2019) by individual, local community, regional and national needs ('I/We need this learning now..'). Programmes will be commissioned and developed differently in response to need—something colleges and polytechnics have been used to do doing (De Courcey and Marsh 2019)—and government or industry budget allocations will be the commissioning vehicle.

This shift from supply to demand-led reinforces the growing government view that there needs to be a realignment of what the higher education system does so that it is more closely aligned with the skills demanded by emerging industries and social need: narrowing the skill gap has been a mantra across OECD governments for some time (OECD 2014).

But there are more specific predictions now beginning to appear:

1. **A likely dramatic drop in the number of international students studying at colleges and universities** as the world shifts from a globalized view of education to a more local or regional view, with dramatic impacts on the financing of institutions. Many Chinese students, for example, may be required to study within country rather than elsewhere in the world and many will face travel restrictions, possibly for some considerable time. Competition for international students will intensify, especially since the overall number of such students world-wide will shrink. More opportunities will be created to offer national qualifications around the world through online learning (Marginson 2020).
2. **A dramatic growth of quality, blended learning.** While not all experiences of remote teaching were positive, many faculty and students now better understand and appreciate the value of asynchronous (D2L, Canvas, Blackboard, Moodle) learning management systems and synchronous tools for collaborative group work (Zoom, FaceTime, Hangouts). We will see more 'flipped classrooms' in

the future than we did in the past and there will be a new focus on engaged, blended learning (Tucker 2020).

3. Coupled with the growth of blended learning will be the **strategic priority afforded to online learning at every college and university**. Many had placed online learning in their strategic plans by 2019, but not all have pursued them with ad vigour and determination. Now they will. They will also have realized how an investment in faculty development and training is for the successful implementation of quality online learning as well as the need for a robust technology infrastructure. Not all will be happy about this (Alphonso 2020; Hall and Batty 2020), but an expansion of flexible online learning appears likely (Naqvi 2020).
4. **A growth in demand for short courses**. High levels of unemployment across a range of sectors will lead many to seek new skills and capabilities to help insulate them from the economic and personal 'after-shocks' of the lock-down. Demand for skills-based learning will grow, but this may look very different from past demand. A focus on short courses, micro-credentials, experiential learning and work-based learning accreditation focusing on demonstrable competencies will replace the demand for long programmes, such as degrees and diplomas (McCauley 2020). Employers will also demand evidence of skill and competence—more than a transcript (Bennet 2006).The traditional three or four year programme model will be replaced by more modular, stackable learning (Bailey 2017).
5. **A rebalancing of full time tenure track positions and sessional positions**. Universities and colleges are largely staffed by individuals on fixed term contracts and temporary sessional teaching staff. In Canada, for example, academic rank salaries as a percentage of total expenditures has steadily declined from 34% in 1973 to 23% in 2017 (CAUBO 2020). This ratio of permanent to sessional staff is common world-wide. Around the world COVID-19 has already led to the loss of part-time, sessional academics with Australia (Head 2020) and the UK (Batty 2020) holding the dubious distinction of being the first to do so.
6. **A refocusing of programmes**. Some programmes may now be deemed more important than others—healthcare, artificial intelligence, food and supply chain management, for example, may be more important than programmes in international finance or marketing. But more significantly, all programmes will need to give more emphasis to the 'soft' skills of collaboration, teamwork, critical thinking, adaptability, wellbeing and resilience. This balancing of content with personal qualities requires a re-evaluation of both what and how we teach based on the need to strengthen the skills and capabilities that were realized as critical at the time of the pandemic (Young 2020).
7. **A commitment to ending the digital divide**. The shift to remote learning, amongst other realizations, brought home the fact that not all can access high quality broadband from home. In the US, for example, this is true for 6% of the population. Globally, almost half of the world's population has no direct access to the Internet (Broom 2020) It is also clear that a larger number of students than anticipated did not have access to reliable and useful devices (laptops, tablets, desktops, video systems, audio systems) needed to be effective online learners.

Many faculty and students lacked the technological 'savvy' to fully leverage the platforms and services they did have access to.

8. There will be mergers, acquisitions and joint ventures (Azziz et al. 2019). One feature of the present moment is that there is strength in collaborative efforts and activities—combining and sharing resources to meet social and economic needs through collaborative programmes, shared services or mergers may help rationalize higher education within a region.

These observations are very 'northern hemisphere' based. In the global south the situation will be far more complex and dramatic. In Africa, for example, only 24% of the population are able to reliably access the Internet, though some who can access it are not able to afford to do so. Yet half of the fastest growing economies in the world pre-COVID-19 were in Africa, with the creative industries and technology leading this growth. Post-pandemic many African institutions will be forced to contract, merge or rethink their role. Many of the private institutions, dependent on student fees, will exit the market or be acquired. If unemployment is high for some time, as is likely in the face of a global recession, many established institutions will need to downsize.

In India, which has close to 51,700 colleges and universities serving 37 million students, there will also be significant challenges, especially for private and small institutions. Government funding in some States has been reduced as funds are moved from higher education to health care and security. India also has a growing number of international students—mainly from Nepal, Afghanistan, Bangladesh, Sudan, Bhutan, Nigeria, the United States, Yemen, Sri Lanka and Iran—and now expects these numbers to fall significantly. Already a leader in distance and online learning in the global south, Indian institutions will expand their virtual offerings and are already developing 'international education at home' focus for several innovative programmes.

In China, which has some 3,070 colleges and universities supporting over 26 million students, it is anticipated that the government will act to support its institutions by restricting the number of students it permits to study abroad, focusing college and university programmes on social enterprise and needed skills for economic recovery massively expanding online and virtual learning. The Chinese government has already signalled that they expect higher education to play a central role in its economic recovery.

23.4 The Challenge for College and University Leaders

Given these kinds of predictions and the degree of uncertainty about future finance, future markets and future student behaviour, leaders face a difficult challenge. How to plan for the future?

Peter Drucker, the management thought-leader of the last century, always said 'never let a good crisis go to waste'. There will be so many challenges that it will be

difficult to find a pathway forward. What is certain is that a return to the pre-COVID-19 state will be very difficult to achieve. What is needed is a 'plan ahead team' whose task is to think beyond the immediate return and to focus on the next 3–5 years.

23.5 Start from an Unvarnished View of the Current State

All good future-focused thinking begins with a clear, unvarnished and realistic view of the current state of the organization. What are the 5–7 key descriptors of the current state in terms of: (a) financial position; (b) market position; (c) technology position; (d) staffing position; and (e) risks and failures. Seek alignment within the plan ahead team on this understanding. The core of this work is using data and evidence, not speculation.

It will also be useful at this stage to 'read' the changing thinking of funders, especially government for public colleges, polytechnics and universities: are they likely to use the precarity of the current moment to change the systems, structures, funding and roles within the higher education ecosystem over which they have leverage? Will they use the power of agency to reshape and reconfigure the system and its work?

23.6 Understand Purpose

McKinsey, in its advice to organizations (Gast et al. 2020), has reminded organizational leadership teams that they need to deeply understand purpose before making significant changes. Asking the question: what is the core reason for the existence and work of the college, polytechnic or university and what impact does its work intend for the community in which it functions—where its people live, work and play?

This means more than looking at the mission and vision statement and asking 'does this need tweaking?'. It means asking the question: what does it mean right now and for the foreseeable future to be the institution we are. What does the world expect of us?

23.7 Think Back from the Future

The danger is that the institution chooses a single path forward, only to be thwarted by new developments—a shift of government policy, new financing rules, a change in market conditions, a bold move by a competitor, new entrants into the market, the arrival of powerful AI-enabled learning technologies, new challenges not anticipated when the plan was developed.

A better approach is to develop three or four different scenarios of the future for the institution. The work here is not to choose a single preferred scenario, but to understand what would happen under each scenario and develop appropriate responses. This work is based on the long history of effective strategic foresight (Miller and Sandford 2019; Michael 2017; OECD 2018).

There are some key methods which can be explored in constructing future-focused scenarios, but two dimensions will help to focus this work. One is finance ('how much or little will we receive from all sources?') and the other technology ('to what extent do we want to leverage technology enabled learning as key to our future?'). These questions need to be answered in the context of thinking about the long term (10–20 years from now) not just the near term. They should also be addressed in the context of purpose. As Tully and Murgatroyd (2013) made clear, it is not appropriate that all institutions shift to online learning if it is not aligned with their understanding of their purpose or their strategic intentions: doing something to secure revenue which goes against strategy and purpose will destroy the culture and performance of the organization.

We show what some scenarios may look like in the figure below, which uses the financial and technology dimensions: (Fig. 23.1)

The focus on finance should be obvious—governments, students and stakeholders will seek to re-evaluate all expenditures and all investments. Some governments have already dramatically reduced expenditure on higher education and others may follow. The technology dimension has emerged as a component of strategy, based on the extensive use of synchronous and asynchronous technologies for teaching and learning. While some may seek cost savings associated with the use of technology, these can only be realized when an institution changes assumptions about key roles and seeks to get to scale (Cini and Prineas 2016). The institutional challenge will be determining the role of technology in shaping teaching and learning and the place it has in blended or online delivery.

Behind each of these scenarios are assumptions about staffing requirements, needed investments in technology infrastructure and staff development, likely market

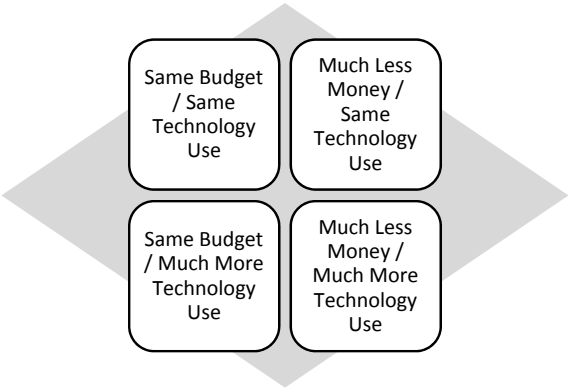

Fig. 23.1 Four scenarios for the future using income and technology as drivers

responses and the need for learner supports. Some of these scenarios suggest the need for joint ventures and shared services.

The plan ahead team should elaborate each of the scenarios they define, no matter how unpalatable they are. For each, the team needs to identify: (a) the signals which would suggest that a specific scenario is emerging as the primary candidate for action; and (b) what 'no regret' moves the institution can make both now and later which will not preclude a shift to a different scenario when the future scenario becomes clear. For example, when face-to-face classes return to a resemblance of normal in 2021 or 2022, will the universities online learning strategy change or remain the same?

23.8 Identify the Direction of Travel

Once the direction of travel—where the institution intends to go—becomes clear, bearing in mind that a return to the 'exact past' state of the college or university is both unlikely and will take time, the plan ahead team needs to identify 'the shape of the journey'—what the travel experience will be like. Questions such as 'how soon will we know the impact of government decisions on our journey?'; 'what will be the impact of the moves made by other institutions in our own ecosystem be?'; 'will moves made by global players (e.g., MOOC providers, large international institutions) have on our journey?'; 'what will happen if we lose key people from our organization?'; 'will students and faculty accept the changes we are proposing—what will it take to secure 'buy-in'? all need to be asked.

The task here is to determine which of the scenarios the team have developed is a preferred scenario, given what is known about the external conditions. Key here will be the decisions made by government and by international students and their governments. A changed financial picture for colleges and universities and challenged governments required to find new sources of revenue and spend significant sums stimulating moribund economies is certain. New public:private financial models may emerge or need to be considered.

One specific focus for this work will be capital expenditure. Has the lock-down suggested a need to rethink the use of capital assets and budgets away from buildings and structure towards technology? Does the capital plan that existed in January 2020 still make sense, given the changed conditions we are now experiencing? Do we need to strengthen the technology backbone and resource levels to enable strategy? Already, many capital spending plans for 2020–2023 have been discarded.

23.9 Identify 3–5 Strategic Moves that Will Be 'Enablers', no Matter Which Scenario Emerges

Before the lock-down, all colleges and universities had initiatives and plans. These need to be reviewed against the known uncertainties and risks of the present time. It is also helpful to look at each of the scenarios the plan ahead team develops and asks what initiatives are needed for each of the scenarios and then look across the lists to find commonalities.

As part of this work, the team should identify moves that would protect the institution from downside risks. For example: strengthening its technology backbone infrastructure; thinking carefully about staffing; looking at the balance between fixed term, short term and tenured faculty; identifying potential shared services; creating joint ventures with other colleges, polytechnics, universities, professions, social enterprises or for-profit firms; looking at new ways of delivering new programmes needed for social and economic revitalization.

One thing that has become clear with the experience of remote teaching is that students and teachers are looking for more ways to strengthen the sense of presence—the ability to find authentic and genuine connections between students and their teachers. One strategic move might focus on investments in the professional development of staff to improve and enhance technology enabled learning and to deepen their understanding of the ideas behind the community of inquiry (Garrison et al. 2000), whether in a blended environment or through online learning.

23.10 Look for Identifiable Triggers

The emerging situation will change rapidly. The plan ahead and leadership teams will need to be adaptive, resilient and fast. They need to gain first mover advantage, 'knowing where the puck is going rather than where it has been', to use the famous ice-hockey player Wayne Gretzky's statement. When should the college or university trigger joint venture talks, purchase of technology, staffing changes, new programme offers, rapid expansion of micro-credentials, new partnership with industry? Identifying the triggers and being ready to act quickly will be key in the fast changing world emerging before us.

Colleges, polytechnics and universities will also need to find new ways of collaborating and sharing. The pos-COVID-19 challenges speak to the need to look seriously at shared services and the opportunity of leveraging existing collaborative organizations, networks and related vehicles. For example, could a shared skills validation service, such as that recently launched by the Future Skills Centre (2020) in Canada, be used to transform apprenticeship and training for skilled trades?

23.11 Be Ahead of the Challenge

Being overwhelmed by the coming challenges and change is not an option. Leadership teams and the plan ahead team need to understand just what options are available to them and be ready to act on them rapidly. Being proactive is a better position to be in than being overly reactive or to be caught off-guard.

A challenge here is that current budgets are no longer meaningful and that a new budget framework is almost impossible to create—you do not have enough information to plan. New approaches to resource allocation—based on sprints and agile processes as stages of a plan—are now needed. There is a significant discipline of agile and lean processes here which it would be helpful for institutions to adopt (Denning 2016; Medinilla 2012).

The plan ahead team needs to create an action plan based on signals and triggers so that the college, polytechnic or university is moving and ahead of the game before others make their moves. The key is to check and check again that the signals being responded to are clear and correct and that action that is taken has been thought for both intended and unintended consequences. A failure to act or to act in time will have consequences. A failure to consider likely outcomes and impacts will have even more (Senge 1990). Effective agile project management (Edge 2018) and outcome dashboards (Chiang 2011; Smith 2013) showing where the institution is on its journey are helpful.

23.12 The Role of Technology in a Different Future for Higher Education

One key lesson of the lock-down is that technology can be helpful in enabling some forms of interaction between teachers and students and students with each other, but they key to effective learning is a well-designed learning experience and an effective teacher. While many technology companies made product offerings during the lock-down—Zoom, Proctor-U, Top-Hat—what turned out to be key was not technology but design.

23.13 Design as the Driver

Instructional design—the deliberate creation of learning experiences intended to engage, involve and enable learning (Hodell 2016; Clark and Mayer 2016)—is not a skill common amongst all who teach in colleges and universities, especially where this involves teaching students who are not physically present in a classroom. Many struggled with doing more than 'lecture' or 'present' online and with the options for creating engaging activities. In part this was because of the 'rush' to get up

and running, but in part because of our lack of investment in the professional and collaborative development of pedagogy. Where colleges and universities have made investments in such development, it appears to have paid off. It may be time to consider a requirement that all who teach in universities and colleges need to qualify to do so. Holding a Ph.D. has rarely qualified anyone in pedagogy.

23.14 Technology as an Enabler

Technology—whether synchronous technologies for audio or video conferencing or asynchronous technologies for anywhere, anytime learning—can support the work of teachers in enabling learning. Those who claim that technology can replace teachers, especially those that see artificial intelligence as being able to do so, misunderstand both the purpose and practice of teaching and learning in higher education (Bok 2013).

During the lock-down the focus across the entire higher education ecosystem was on the effort to discover new ways that professors can provide more connection, more support, and more presence for their students, not less (Garrison et al. 2000; Zubascu 2020).

Many technology 'solutions' are developed by individuals and teams who have not and do not teach. Now we need new coalitions between educators and technology companies to enable the big leap to high touch, well-designed, engaging technology enabled learning (Weller 2020). Artificial Intelligence has a key role in this—enabling 24×7 advising and support on issues related to content, gathering relevant resources, advising student advisors and faculty member when a student appears to be struggling or not making due progress (Fadel et al. 2019). The combination of a highly skilled teacher, good design and AI-enabled technology systems and a systematic approach to innovative assessment (Conrad and Openo 2018) will permit some significant gains in retention and completion rates, as has already been seen in the limited deployment of these technologies to date.

23.15 System Wide Change Potential

Other significant changes are possible as we begin to imagine a different future for higher education. Seven in particular are worth focusing on given the suggestion that the market will shift from a supply driven system to a demand-driven system:

1. **More start dates**. One question that is being asked increasingly in a demand-led market for learning is why do colleges and universities have so few start dates for courses and programmes? Why are they not more opportunities for learning 'on demand'? Some institutions offer undergraduate and related courses with twelve or more start dates, while others restrict these to three or four. The Open

Polytechnic of New Zealand is now working towards 365 start dates for high demand courses.

2. **More modular, stackable learning.** A related question is why are courses twelve or sixteen weeks long? Could there not be a more modular, unit like approach to learning with modules available more often through either face-to-face or online options, with opportunities to stack modules into 3 or 6 credit bundles for qualifications or transfer?
3. **More micro-credentials**. Linked to the modularization of learning will be the growth in demand for short, quick learning to enable skill development. In a high unemployment market where nuanced skills will increasingly be of value, being able to demonstrate competence through competence-based credentials will be critical in terms of securing employment. Rather than degrees and certificate and diplomas, employers will seek evidence of capability—and micro-credentials provide one way of providing this.
4. **Blurring the boundaries between continuing education and credit**. Historically, the operations of continuing education and faculties have been separate in most institutions. Continuing education divisions have been tasked with creating learning activities which generated revenue. But increasingly, the boundaries between continuing education and credit programmes has been blurring. Non-credit certificates earned through continuing education are now being recognized for elective credit in undergraduate and graduate level programmes at a number of different institutions. This is a trend which will blossom in the post-COVID-19 world.
5. **Glocal Programmes**. The new landscape for certificates, diplomas and degrees is a global one. In 2019 the providers of Massive Open Online Courses (MOOCs) offered a total of 50 degrees, with the UK-based FutureLearn leading the offering with 23 degrees (Class Central 2019). All intend to expand these offerings. What is important to note here is that the degrees are provided by established institutions—in the case of FutureLearn these include Coventry (UK), Deakin (Australia), Murdoch (Australia), Glasgow (Scotland), Open University (UK) and Anglia Ruskin (UK)—anytime anywhere. The expectation is that the number of accredited programmes offered on such platforms will grow significantly.
6. **More Work-Based Learning Accreditation**. Many will be reluctant to leave work, even on day release, to study. Having a job and keeping it will be highly valued in the immediate aftermath of COVID-19. What has happened elsewhere in the world, especially in the UK and Europe, is a growth of college or university recognized credit for completing work-based learning or professional development. Just as blurring continuing education and credit will accelerate, so too will the offer of work-based qualifications, degreed apprenticeships and other work-related competency based learning (Raelin 2008).
7. **More learner mobility**. Why is it that not all courses taken in the higher education ecosystem are easily and readily transferable between institutions or across national and international borders? Basic systems of transfer credit have emerged in the last twenty-five years in several provinces, with some reciprocity between these systems—but it is still cumbersome and time consuming. A student needs

to know that a course taken at a certain level in college A is accepted in any university at a certain level without question. To use 'quality' as an excuse for not doing so is to misunderstand both what quality is and to encourage protectionism. Learner mobility, especially in a highly volatile and rapidly changing labour market, is a key policy driver—something the European Union recognized some time ago (European Council 2019).

In a demand-driven education system, these seven developments are very likely to be accelerated—many were emergent patterns from the last two to three years.

23.16 The Cancelled Future

All plans developed before COVID-19 were based on assumptions that may no longer apply. A tectonic shift has occurred in both the global and local economies of the world that will lead to different futures (Beradi 2011). New models of finance, governance and student support could be in place quickly. New strategies for higher education, some elements of which were already in the works, will follow. Leadership teams in colleges and universities need to be proactive and focused in their anticipatory work for a different future.

It is a challenging time, but one replete with opportunities for innovation, change and development. President Charles de Gaulle of France had it right: '*Faced with crisis, the man of character falls back on himself. He imposes his own stamp of action, takes responsibility for it, makes it his own.*'

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