DigiTel Pro IO1

Citation for published version (APA):

Brouns, F. M. R., Wopereis, I. G. J. H., Klemke, R., Albert, S., Wahls, N., Pieters, M., & Riccò, I. (2022). *DigiTel Pro IO1: Building for digital education responding to the needs of universities during the Corona crisis and beyond*. European Association of Distance Teaching Universities. https://digitelpro.eadtu.eu/outcomes

Document status and date:
Published: 16/05/2022

Document Version:
Publisher's PDF, also known as Version of record

Document license:
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IO1: Building a strategic partnership for digital education responding to the needs of universities during the Corona crisis and beyond

Document details

Document title	Report on mapping (post-)COVID-19 needs in universities
WP (if applicable)	IO1: Building a strategic partnership for digital education responding to the needs of universities during the Corona crisis and beyond
Document version	Final
Lead author	Francis Brouns, Open Universiteit
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Dissemination level	
Confidentiality Status	*Public*
Date	16 May 2022
CC License	CC-BY-SA 4.0

Versioning and Contribution History

Revision	Date	Author	Organisation	Description
V1	22 February 2022	Francis Brouns	Open Universiteit	Initial version
V2	22 April 2022	Francis Brouns, Iwan Wopereis, Roland Klemke	Open Universiteit	Version for review
V3	16 May 2022	Francis Brouns,Iwan Wopereis	Open Universiteit	Revision following review

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Executive Summary

This deliverable reports on challenges encountered by higher education as reported in literature on early phases of the Covid-19 pandemic. Our focus lies with teachers' needs, but includes perspective and experiences of students, academic and support staff. We provide some suggestions and directions for the coming phase that would allow higher education to provide more digital education.

The Covid-19 pandemic caused major upheaval of education across all levels. Schools, colleges, higher education institutions closed and had to move to online delivery of content and teaching almost overnight. Of course, this imposed some challenges and problems. Immediate response was to make learning material available online and look for solutions to provide online lectures. This was dubbed as 'remote emergency teaching' as an indication that the quality of this education is not as it should be. Moving to online education entails more than quickly providing content online and making use of commercial conferencing software. Although students appreciated the effort in the attempt to continue education, after time some objections arose both by teaching staff and by students as quality was not always as used to be. Even higher education institutions that already have some forms of online delivery encountered challenges.

Many teachers felt overpowered by the abrupt change and experienced an increase in workload and change in their role as teacher having to provide mental and psychological support to students due to the crisis situation. Teachers did not have the proper technical resources, tools and internet access. More importantly, teachers reported not being equipped for online teaching and felt that they lack the skills and competences to develop new learning material suitable for online delivery. While there was not sufficient time to adjust instructional design and pedagogy, teachers tried to find alternatives for the interaction with students. Similarly, students wellbeing was affected. Students also report lack of facilities at home, such as a proper place to study, access to a computer for schoolwork and sufficient internet access. While solutions were found for online delivery of learning material and lectures, several other processes were discontinued. Many institutions had difficulty in taking exams and providing assessment; some institutions even completely stopped the exams, other institutions resorted to some form of online assessment. The Covid-19 pandemic also highlighted the existing digital divide and showed increased negative impacts for disadvantaged groups.

Not all was perceived as negative though, because the pandemic illustrated the need and provided opportunities to move forward. We already know a lot about various forms of online delivery of education, be that in hybrid, blended or fully online and distance education. The various EU and national policies on digital society and digital education support the further need of digitalisation of higher education. Most pregnant issues reported seems to be with social aspects, with the home situation and with didactical perspectives. Some of the directions needed are continued teacher professionalization for digital education, educational models for online education, and more support for diversity, inclusion and accessibility. We provide some suggestions what these directions entail.

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1. Introduction

The Covid-19 pandemic caused a major disruption to the educational system. Many schools, vocational and higher education institutions were forced to close their buildings – temporarily – and had to switch immediately to online provision of education. For most educational institutions this caused a major disruption of all educational processes.

In this deliverable, we present findings from the literature on the early phases of the Covid-19 pandemic to discover what teachers in higher education would need when moving to forms of digital education with a substantial online component. Because students' needs and the institutional context influence teachers' needs, we also present findings on these stakeholders. However, the focus is on the needs of teachers in providing online education.

During the lockdowns periods, educational institutions had no choice other than to go fully online. However, it is not likely that campus-based higher education institutions will convert and transform their education to be fully online. It is much more likely that they will continue face-to-face education and combine that with various forms of online delivery of course components and synchronous and asynchronous online teaching and tutoring processes. Even those changes will require that teaching and support staff as well as students need to prepared for online, blended, and hybrid education. The Covid-19 pandemic demonstrated that digital approaches to teaching and learing need more attention in higher education. The lock-down period emphasized the importance of online education, and in periods of restrictions on attending educational activities onsite, it became clear that the proper use of blended and hybrid approaches to education needed exploration before implementation. In short, the pandemic clearly illustrated that teachers and learningers in higher education are not yet fully prepared for digital education.

1.1. Digital education

The term digital education is generic and is typically used as an umbrella term to indicate education where contemporary computer technology is used (e.g., Quality Assurance Agency for Higher Education, 2020; Siemens et al., 2015). Digital education has a less negative connotation than online education with which it is often associated. In this literature review, we focus on digital education where online is a necessary component. We look at approaches such as hybrid and blended, but emphasize the online variant because this form of digital education was central to the first phase of the Covid-19 pandemic. The transition from onsite to (almost entirely) online and the implications for future education that will exceed online has been the most widely published in the past two years.

The terms digital education and online education might be confusing as everybody gives another meaning to it. Digital usually refers to the use of computer technology. And in that sense digital learning material and digital tools of course are inherent even in classroom teaching. Who is not using Powerpoint presentations, or various online tools like polling or communication tools? In the context of this deliverable, this is not the digital aspect of online education we refer to.

Online education also is not new and various forms of online education have been used for some time now even by campus-based universities. To name a few examples of common approaches: flipping the classroom, blended learning, hybrid learning. The pandemic pointed out that not everybody agrees on what online education means and therefore have different opions and approaches on what online education entails. The British Quality Assurance Agency for Higher Education (2020) suggest the use of a more neutral term *digital* to prevent the varies connotations that are attached to the terms online and virtual. Common digital approaches include:

- synchronous hybrid learning: based on settings that have in common that both on-site or 'here' students and remote or 'there' students are simultaneously included;
- blended learning: based on a course design with a deliberate combination of online and offline learning activities;
- online and distance learning: based on a course design with a continuous physical separation between teacher and learner, synchronously and asynchronously.

All these digital approaches have in common that at least part of the education and learning takes place online, meaning through the use of the Internet. Singh and Thurman (2019) define online education as

> education being delivered in an online environment through the use of the Internet for teaching and learning. This includes online learning on the part of the students that is not dependent on their physical or virtual co-location. The teaching content is delivered online and the instructors develop teaching modules that enhance learning and interactivity in the synchronous or asynchronous environment. (p. 302)

Central to this definition is the delivery of education through the Internet, which enables teaching and learning at various *sites* (e.g., homes, libraries, public transportation, and parks), *settings* (e.g., individual, small group, large group) and *moments in time (e.g., asynchronous, synchronous, and bichronous)*. The expression 'anyplace, anytime, anywhere' thus fits contemporary online education. However, online delivery alone is not sufficient. As the second part of the definition points as the courses needs to be designed accordingly and make use of learning designs and pedagogical models that promote and enhance learning in an online setting. Such education may offer new windows for innovative teaching and learning. However, the degree of innovation is strongly related to resources and expertise available at institutions.

Definitions like this tend to focus on the teaching and learning processes. However, we would like to point out that education includes many more digital processes, such as administration, enrolment, accreditation and many other staff roles. In this deliverable, we will use the term online education instead of digital education, because most of the publications presented in this deliverable use the term online education when refering to various digital approaches to education that include at least some form of online delivery of content or teaching and learning. Moreover, our focus will be on teaching staff and students and not that much on other staff.

2. Methodology

We undertook a literature review that included several waves of data collection and analysis in a relatively short period, mainly based on literature collected during the early phases of the pandemic. As such, the review can be characterized as rapid. Rapid reviews can take different forms, which is evident when we for instance look at the existing collection of this type of reviews on emergency remote teaching and learning at the time of the corona pandemic (e.g., Cowden et al., 2020; Ellis-Thompson et al., 2020; Khan, 2021). Our approach differs from these instances; it can be metaphorically viewed as a concertina (i.e., ongoing narrowing and enlarging the search like a concertina windbag; (Levy & Ellis, 2006) that included two main stages. In the first stage (September 2021), we constructed a preliminary list of publications consisting of articles, papers, and reports. This body of literature was built on an initial list of publications collected for the DigiTeL Pro project proposal. It further included literature found by (a) keyword searches in Google Scholar and renowned databases like EBSCO's ERIC and PsycINFO and Clarivate's Emerging Sources Citation Index and Social Science Citation Index using terms 'covid*' OR 'pandemic' AND 'higher education',

(b) backward and forward searches in/via databases and sources (i.e., 'snowballing'), and (c) targeted notifications of journal updates. We included the following types of sources in the publication list: (a) national surveys, reports, and guides, (b) institutional reports and guides (e.g., from partner universities and associates), (c) reports from associations like Unesco, OECD, and the open university networks, (d) papers and articles, and (e) the May 2020 surveys. A source should (a) report about the Covid-19 situation in higher education; (b) relate to educational or learning processes; (c) indicate what happened and how institutions, teachers and students dealt with the situation; (d) be peer-reviewed (with exception of national and international reports); and (e) preferably report on European countries.

During the second stage, October and November 2021, we invited all project partners to contribute to the publication list by adding titles of publications they deemed interesting, valuable, or relevant from point of view. This resulted in a list of 193 publications (Annex A). Next, from October 2021 until March 2022, partners selected several publications from this list and provided a summary of lessons learned. For each of the selected publications, we gathered information about type of publication, peer review, methodology, participants, discipline and country (see Annex B).

A comprehensive review was written based on the selected publications from the list provided in Annex A. While writing this deliverable the main authors looked for and included new Covid-19 related publications for those aspects such as assessment that had not been covered in the previously selected literature. Moreover, we looked for publications reporting for findings on later phases of the Covid-19 pandemic. Furthermore, we reference publications about existing knowledge, theories and frameworks on aspects such as digital education, teacher professionalization established and published before the Covid-19 pandemic.

Initially 31 articles have been summarised. While writing the report, this number was expanded to 60 (plus an additional 17 relevant publications that were not directly related to Covid-19) to cover additional areas and later phases of the Covid-19 pandemic. Even though many publications reported about early to mid-pandemic phases (2020), half of the publications were published in 2021. We read many of the publication while being published as early online version. However, while writing this deliverable we checked all those early online versions for updated metadata. Consequently, the reference list will show publication dates as 2022, while most publications still report on early to mid-phases of the Covid-19 pandemic.

The selection consisted of 30 journal articles and 19 reports. It was not always possible to determine if publications had been peer-reviewed, 36 publications were peer-reviewed. About half of the publications reported on results obtained through surveys; others employed reviews, mixed-methods or empirical studies. Participants were students (11), teachers (10), students and staff (7), staff (varying from academics, teachers to supporting staff and management) (11).

The bibliography in Annex C lists all publications we gathered during the process of writing this deliverable, including those that are not discussed in the deliverable.

3. Results

The overall picture seems to be one of major disruption, negative impact and experiences. Many schools, vocational and higher education institutions had to close buildings and had to switch immediately to online provision of education. For most educational institutions, this was a major challenge even for those higher education institutions that already make use of an online learning environment to distribute logistic and procedural information and provide access to learning material. This switch to online education caused a major challenge to teachers, students, pupils, and

parents alike. Several authors have dubbed this switch to online education 'remote emergency teaching' as an indication that the quality of this education is not as it should be. Teachers reported not be equipped for online teaching, lacking pedagogical skills and digital competences to teach online or to develop new learning material suitable for online delivery, not having the proper technical resources and internet access. Similarly, many pupils and students lack facilities at home, such as a proper place to study, access to a computer for schoolwork and none or insufficient internet access. It proved difficult to provide examination and assessment. In several countries, institutions decided not to take assessments such as the end of year examination or the leaving school exams, while others relied on the regular class work assessment instead. Impact was not restricted to teaching staff and students. The support staff of educational institutions also faced major challenges in having to reschedule and organise online teaching or to design alternatives for assessment. This created not only a lot of challenges but also imposed a huge workload. Some of these negative feelings and perceptions might be due to staff and students having insufficient experience with online education, pedagogies and didactics and lack of suitable learning environments and supporting technology and infrastructure. While many of the publications report on the major disruption of the Covid-19 pandemic, some indicate that this provided opportunities to move forward.

In the following paragraphs we will present some of the perspectives and experiences in more detail without being exhaustive.

3.1. Challenges at multiple levels

Surveys conducted around the start of the pandemic (March-May 2020) indicate that 90% or more of higher education institutions had to shift to some form of online delivery of their education (e.g., EADTU, 2020; European University Association, 2020; International Association of Universities, 2020; Marinoni et al., 2020). In most instances, this was limited to providing information and content online, such as online live lectures and pre-recorded lectures. Although this allowed classes to continue more or less, it was not always considered proper education (Farnell et al., 2021). Some dubbed this *emergency remote teaching*: rapidly providing content online, but lacking in teaching presence and accommodating students' needs that transgressed those of immediate learning processes (Bozkurt & Sharma, 2020; Hodges et al., 2020). The open public consultations on the impact of the Covid-19 pandemic that the European Commission conducted from February to September 2020 showed that stakeholders agreed on the need for effective and inclusive distance, online and blended learning. Stakeholders mentioned that digital competences are important, including digital literacy and information skills to deal with information overload and fake information. Many publications raised concerns about continuity of education, access, equity and inclusion, and the increase in digital divides (European Commission, 2020a, 2020b). One of the first to be impacted were internationalisation, mobility and research due to the limitations of travel and physical mobility, although some of the mobility students could continue virtually (European Commission, 2020c; International Association of Universities, 2020).

Moreover, the shift included not merely migrating the teaching and learning process online; it entailed digitalisation of all educational processes, including administrative, logistics, support, finance, IT, infrastructures. Impact transgressed educational processes: it affected personal life and home settings and was influenced by socio-economic settings. There are financial and economic consequences as well as changes and consequences for student recruitment, sustainability, HRM, job security, etc. (e.g., Di Gesú & González, 2020; Watermeyer et al., 2021).

3.2. Teachers' perspectives

Many publications reported that teachers did not feel confident or competent enough for online education (e.g., Cutri et al., 2020; Johnson, 2020; Johnson, 2021; Marinoni et al., 2020; Scherer et al., 2021). This might also be due because many teachers are educated for classroom teaching and have insufficient experience and competences for online teaching and threfore do not make this shift as easily without receiving additional support and investing in professionalization activities. The pandemic showed that this should go beyond regular continuing professional education programmes, given all the additional issues that became apparent. Although the professionalization programme should focus on online and blended learning, it should take into account the context of the current educational system in which teachers operate. Of course, existing knowledge should be taken into account, but it should not be limited to content only. Skills and competences like reflection, and active methodologies and didactical approaches such as experiential learning are more effective. Furthermore, institutions should invest in engaging and motivating teachers by pointing out relevance, determine strategies, and involve staff, students and parents (Abaci et al., 2021; Di Gesú & González, 2020; Ferri et al., 2020; International Association of Universities, 2020; Khan, 2021; Manca & Delfino, 2021; OECD, 2020; Schildkamp et al., 2021; Schildkamp et al., 2020; Schleicher, 2021; Uerz et al., 2021; van der Spoel et al., 2020; Vincent-Lancrin, 2022).

Teachers provided an enormous effort in looking for solutions to continue with their courses and find alternative approaches to what usually would take place in a classroom setting. In general, teachers managed to find ways to provide learning material online and substitute classroom teaching with online lectures or recorded lectures. They struggled more with suitable pedagogical scenarios and the interaction with students . It is not suprising that this resulted in an increase in workload (e.g., Aristeidou & Cross, 2021; Cirlan & Loukkola, 2021; Khan, 2021). Teachers reported several reasons for the increased workload. One of the reasons is due to the change in teaching mode, having to switch to online delivery, having to learn new online tools, to look for alternative approaches for activities that usually would take place in a classroom setting, to find ways and tools to interact with students. Other reasons are related to perceptions and wellbeing of staff and students. The pandemic caused a lot of stress and anxiety and teachers had to act as mentor and deal with emotional and psychological problems of students they did not feel empowered for.

Although there are some reports indicating that teachers' digital skills improved because of the move to online education (e.g., Johnson, 2021), this was not the general tendency. While most teachers wanted to accommodate students needs, not all teachers felt confident or even willing to try new things. Many publications report that teachers who had use new tools experienced feelings of insecurity and felt not competent enough, did not want to use new tools at all, or felt they did not get sufficient training and support in using new tools (Cutri et al., 2020; Johnson, 2020; Johnson, 2021; Marinoni et al., 2020). Nevertheless, some of the teachers who were less inclined to using digital tools, actually used the tools to interact with students (Rutherford et al., 2021). Teachers did not feel to have the necessary digital competences that are required for online tools and pedagogical approaches for online education. The institutional strategy on digitalization of education seems to have an even more important role than the provision of infrastructure, technology and tools (Hofer et al., 2021). Therefore institutions need to provide not only technical but also pedagogical support and invest in competence development (European Commission et al., 2020; Vincent-Lancrin, 2022). However, even teachers who perceive to get sufficient technical and pedagogical support from their institution can still feel less inclined and less able to engage in online teaching. Scherer et al. (2021) found three teacher profiles: a) teachers who are reluctant in using technology in their classes and who don't perceive sufficient technology and educational support

from their institution in this respect; b) teachers who are reluctant in using technology in their classes and education although they receive sufficient technology and educational support; and c) those fore-front teachers enthusiastic about using technology. Other situational factors, such as prior experience with technology as well as the context of the change, or the teachers' achievement goals influenced both teachers' expectations and actions. Teachers wanting to achieve learning tended to be more positive regarding the move to online education during the pandemic, while teachers with performance avoidance goals saw this move as a threat (Daumiller et al., 2021; Lust et al., 2013; Swift et al., 2010). Teachers who already familiar with a learning management system were more positive about the move to online education than those without experience with a learning management system. Inexperienced teachers indicated that they needed more support and they expected that online education would require more effort from their side (Dindar et al., 2021; Johnson, 2020). González Bravo et al. (2022) indicates that the inclination to use new tools might be influenced by position, role and frequency of use of educational management information systems and perceived acceptance of these systems.

3.3. Learners' perspective

Although students did acknowledge the effort in bringing education online, in general students were less positive about the quality of the education (e.g., Brink et al., 2021; Hofer et al., 2021; Oliveira et al., 2021; Phillips, 2021). Students indicated to experience problems with motivation, engagement, concentration; they missed the physical interactions and felt lonely (Aristeidou & Cross, 2021). Students experienced these issues more when they also encountered financial problems. A study conducted in the Netherlands in December 2020 (Brink et al., 2021) indicates that higher education students suffered most from socio-economic and emotional problems and that most would not like to continue online education, even though they could see some advantages of some features, such as pre-recorded lectures. This could be due to the quality of the education in the early phases of Covid-19 pandemic not yet being optimal, or could indicate students' preferences. Other studies reported more positive experiences. However, this seem to be influenced by the context and implementation (e.g., Beardsley et al., 2021; Dascalu et al., 2021; Jamalpur et al., 2021; Oliveira et al., 2021). For example, a small inventory conducted by a students from a specific master 'Education and innovation' in March 2021 suggests that students would like to keep pre-recorded lectures, video clips, more variety and interaction during online lectures including break-out rooms, online Q&A facilities, individual online tutoring, online collaboration, more formative assessment, hybrid synchronous classrooms, and importantly: engagement and interaction with students (Meijer, 2021). Although findings vary, some publications report that students experienced the blended forms of online education as positive and able to increase student engagement. Students preferred empathic teachers who also act as mentor, replacing a major part of the high stakes summative assessments by formative assessment, reducing duration of online classes and screen time to not more than half an hour, and adaptation of the curriculum (Jamalpur et al., 2021). These findings illustrates that online education includes both high quality content and relies on effective learning designs, learning scenarios and pedagogies that are aligned with the learning objectives.

3.4. Learning space and pedagogy

For the digitalisation of education to become effective, efficient and enjoyable, a purely technical digitalisation is insufficient. Instead, a digital learning space should evolve, making use of digital objects and services that provide a personalised learning environment (Goodyear, 2021). Practices, pedagogies and technology should be aligned with subject, disciplines and content. Like Bygstad et al. (2022) summarises, this requires that the learner and the learning process is put central, and that both staff and students have to change roles and adapt to a new form of teaching and learning.

Teachers have to get used to new pedagogical and didactical approaches and use digital resources to the best possible outcomes. Students having to develop skills and competences to study in online, blended or hybrid settings (OECD, 2020; Vincent-Lancrin, 2022).

Online education includes both high quality content and relies on effective learning designs, learning scenarios and pedagogies that are aligned with the learning objectives. Technology itself can play only a minor role and should provide meaningful affordances to stimulate learning activities. The choice of technology should be aligned with the objectives and embedded in pedagogies and didactics. Several of the studies and meta-analyses indicate the use of innovative pedagogies such as inquiry-based learning and collaborative learning (Zhang et al., 2022) that rely on innovative technologies. When applied properly these pedagogies and technologies can have beneficial effects on student engagement, promoting feeling of presence and inclusion (Logemann et al., 2022).

3.5. Wellbeing and inclusion

The pandemic had a major impact on wellbeing of staff and students. This resulted in psychological and emotional issues and an increase of the number of students at risk. The digital divide and socio-economic gaps became more prominent. In general, the pandemic highlighted existing disadvantages. Students who have low competence or self-concept, are anxious or non-native were more prone to experience stress, fear, anxiety due to the crisis-situation (e.g., Arsandaux et al., 2020; Baumann et al., 2020; Béduchaud et al., 2020; Ferry & Patros, 2020; Ministère de l'Education Nationale de la Jeunesse et des Sports, 2021; Roux et al., 2021).

Staff experienced a higher workload, but also feared for continuity of their jobs, as they expected consequences for student recruitment and therefore continuity of higher education institutions (Watermeyer et al., 2021).

The pandemic also invaded the privacy of the home situation. Families now life and work together 24/7, having to share spaces and roles, conducting activities at home they usually do elsewhere (e.g., job, hobby, or sport). Often, parents and children have to juggle for space, sharing space and devices, commonly not even having a suitable device like laptops for every individual and having to resort to the use of smartphones (Di Gesú & González, 2020; Ferri et al., 2020). Parents had to take on the role of teachers while still needing to work from home.

Often it is taken for granted that everybody has access to internet and suitable devices, while the pandemic made clear that this is not the case (e.g. Di Gesú & González, 2020; Ferri et al., 2020; Hofer et al., 2021; Watermeyer et al., 2021). Not all staff and students have access suitable devices, such as personal laptops. Many had to share a device at home or resorted to using a smartphone. Although a smartphone can be used to access internet and websites, a smartphone is not always suitable for something more advanced than reading simple texts.

While inclusive education is paramount regardless delivery mode, in online education, accessibility and inclusion becomes even more important. When platforms and tools are not accessible many students and staff are being disadvantaged (e.g., Ismaili, 2021). Without accessible platforms and tools, content cannot be accessible at all, nor can interaction, communication, and exchange between students and teachers take place. When course designers, teachers and tutors do not create accessible and inclusive content and learning design and apply accessible and inclusive didactical scenarios, even more students are being disadvantages.

Inclusive education is not limited to accessibility but has to consider many aspects, such as content diversity. That will require additional competences and skills for course designers, developers and teachers (Cabero-Almenara et al., 2022). Moreover, a lot of the content and many websites still do

not adhere to accessibility guidelines making access via mobile devices such as tablets and smartphones difficult. Certainly, in the early phases of the pandemic, there was insufficient attention to accessibility due to the need to move learning material online as soon as possible. Nevertheless, accessibility is an important factor (W3C Web Accessibility Initiative, 2022) and already since 2016, public institutions are obliged by law to make their websites accessible in order not to exclude certain target groups (European Parliament & Council of the European Union, 2016a, 2016b) and often many institutions offer support for accessibility in education (ECIO, 2022; Logius, 2022).

3.6. Provisions, infrastructure, technology

The EU Digital Education Action Plan 2021-2027 (European Commission, 2020a, 2020b) introduces EU political guidelines and emphasise the importance and need for digital technologies in support of the rapid digitalisation of society. The Covid-19 pandemic accelerated the need for this change, at the same time highlighting some obvious challenges and obstacles. Even though the apparent need for digitalisation, statistical data obtained in 2018 by OECD Pisa and Teaching and Learning International Survey and by Eurostat indicate the lack of access to computers, broadband internet, and that teachers do not feel well prepared for digital education and using digital technologies. Covid-19 experiences confirmed the lack of digital readiness and highlighted the lack of accessibility of tools, platforms and content, disadvantaging many learners and staff.

The reports seem to focus on availability of tools and skills on how to use the tools. It is clear that that merely providing online tools will not guarantee that these tools are used at all. However, course design requires more than knowing how to use a tool. Tools need to have a function in learning and activities to be performed (Dascalu et al., 2021; Hofer et al., 2021; Scheibenzuber et al., 2021) and students, teachers and staff need to receive support and training in making efficient use of these tools (European Commission et al., 2020; Johnson, 2020; Rutherford et al., 2021).

Moreover, even if students have been using social media tools and WhatsApp during the Covid-19 situation, this seems to be out of necessity and both students and teachers indicate this to be an invasion of privacy. These kind of social media are intended for personal use and should not be mixed with professional life or educational situations (Di Gesú & González, 2020; Ferri et al., 2020).

The rapid change to online provision of education meant that choices for tools and platforms were not always appropriate. However, institutions that already were using online tools and platforms encountered less problems. Clear vision and guidelines by leadership turned out to be beneficial (e.g., Delcker & Ifenthaler, 2021). Of course, moving to more online education requires that institutions invest in IT infrastructure, learning management systems, assessment systems and accompanying systems needed for provision of online education (e.g., Johnson, 2020; Mathias et al., 2020). In addition, institutions need to develop a vison and strategies regarding digital education (Farnell et al., 2021). Institutions need to provide training and support both for teachers (e.g., Cirlan & Loukkola, 2021; Delcker & Ifenthaler, 2021; European Commission et al., 2020; Farnell et al., 2021) and ensure that less privileged students are not disadvantaged students (e.g. Di Gesú & González, 2020; Farnell et al., 2021; Ferri et al., 2020; Garcia-Morales et al., 2021; Hofer et al., 2021; Johnson, 2020; Watermeyer et al., 2021).

With the use of online technologies, it also becomes easier to gather more (digital) data and it is tempting to simply obtain access to digital data and personal data and make use of these data. There are many risks involved in this as well as ethical aspects that need to be considered (e.g. Garcia-Morales et al., 2021; Johnson, 2020). Institutions need to consider and invest in online security, ethical aspects, data privacy, self sovereignty, and develop codes of conducts regarding these

aspects that are inline with scientific integrity and regulations regarding the use of personal data such as the General Data Protection Regulation (GDPR).

3.7. Assessment

The publications contributed by the partners focused on the teaching and learning process. Therefore, we searched for publications that reported about assessment. Although assessment and exams are crucial to education, exams became one of the first to be postponed or cancelled, at least in the early stages of the Covid-19 pandemic (Aristeidou & Cross, 2021). One of the reasons has to do with the requirements that are needed to ensure exams are valid and reliable and settings to prevent fraud and cheating. Therefore most exams are taken on paper in a physical location, supervised by supervisors to authenticate students and prevent fraud and cheating. When moving assessment online, this becomes more difficult to monitor. Moreover, using computers for assessment can enable academic dishonesty, fraud and plagiarism when students can access other tools or the Internet. During the pandemic, we saw a rapid increase in the use of online proctoring for exams. Online proctoring is used to determine the identity of the student taking the exam and supervises the surroundings during the exam to ensure the student is not cheating. This online proctoring caused anxiety and concerns by students about the use of their personal data and concerns for privacy. There are also many technical and ethical issues to resolve (Langenfeld, 2020; St-Onge et al., 2022). Some institutions have taken some security and privacy issues of online proctoring for granted because it was their only option to take exams during the Covid-19 pandemic. Other institutions refrained from using online proctoring even during Covid-19 because of the privacy issues or objections by students (Cirlan & Loukkola, 2021). However, we now see that institutions are becoming more reluctant in the use of online proctoring.

With the move to online education, institutions should consider new forms of assessment (OECD, 2020), because technology offers many possibilities for assessment. Many learning platforms and online tools are available that can be used to assess the student. These tools and platforms offer advantages in particular for assessment for learning (AfL), also known as formative assessment and assessment as learning. AfL forms part of the learning process and aims at supporting the process and progress. Assessment can also be used as a form of learning, e.g. in the form of self and peer assessment. Technology also can improve summative assessment (Brady et al., 2019; Farrell & Rushby, 2016). Whatever the purpose of assessment, assessment should always be constructively aligned with the learning goals and objectives and use of tools and technology should be embedded in the learning design and pedagogical approach.

3.8. Opportunities

Even when many publications present a rather negative picture of the impact of the Covid-19 pandemic, there were also positive findings. Many organisations, educational institutions and researchers started providing support and shared knowledge and experiences to support schools and higher education to make the move to online education. These support actions were received well and resulted in community formation and exchange of knowledge. This together with shared vision and culture benefited the transition (Manca & Delfino, 2021). the pandemic also indicated the need and opportunity for change, accelerating a move to digital education that has started years ago, but did not take off as well as it should (Blanford et al., 2021; Diercks et al., 2021). The pandemic also indicated the need and opportunity for change, accelerating a move to digital education that has started years ago, but did not take off as well as it should (Blanford et al., 2021; Diercks et al., 2021; O'Dea & Stern, 2022; Oliveira et al., 2021; Whitelock et al., 2021). A small study by Guppy et al. (2022) suggests that university staff foresee more blended or hybrid education to become the norm with a smaller increase in online education, while students remain more sceptical.

This strengthens the call for digital competences. In our digital society, digital education, acquiring digital skills, competences and digital literacy are paramount (e.g., European Commission, 2020a, 2020b; European Commission et al., 2017; Khan, 2021; Redecker, 2017) and several studies confirmed the importance of digital competences for both students and teachers (e.g., Manca & Delfino, 2021; Uerz et al., 2021). And already there were reports that students and teachers reported in increase in digital skills due to having to use online tools during the pandemic.

3.9. Making use of what we know already

During this Covid-19 pandemic, many publications report mainly on the effects the pandemic on the sudden and unexpected need to provide education in an online manner. Often the level of research was not of sufficient quantity and depth and further research is needed in particular on enablers of digital education in times of crisis to really work out what went well and what didn't. Nevertheless, there already is extensive research on online education and learning and use of technology in education and we should resort to this literature.

As an example we mention the AECT special issue 'Shifting to digital: informing the rapid development, deployment, and future of teaching and learning' from February 2021. The editors invited comments on 17 key publications that could be of value in the pandemic situation. For each of these key publications the essays address impact and value, application for the shift to digital, limitations and constraints and provide suggestions for future work. These papers not only address different forms of online teaching and learning, needs and skills of students and teachers, but also aspects that might not be so obvious, such as ethical aspects and privacy of data (e.g., Abaci et al., 2021; Gogus, 2021; Lin & Johnson, 2021).

Several of the studies and review articles indicate that innovative pedagogical approaches, such as inquiry-based learning and collaborative learning have been applied. Several studies on various forms of online and blended learning indicate that students' perceptions and emotions should be catered for even more when moving education online. Students and teachers sentiment can reflect on their attitudes on online and blended learning (Acosta-Gonzaga & Ramirez-Arellano, 2021; Butz et al., 2016; Huang et al., 2021; Ramirez-Arellano et al., 2019).

Many frameworks, models instruments and tools have been developed too either evaluate online education, or describe required knowledge, skills and attitudes. These frameworks and models try to explain the conditions for digital and online teaching and learning. This includes familiar frameworks like TPACK (Technological Pedagogical Content Knowledge). TPACK states that teachers need to combine knowledge and skills on all these four areas to design and provide courses effectively. Most frameworks include teachers' attitudes, skills and infrastructure, and sometimes include learning outcome. While many of these frameworks do not explain how technology might benefit or support learning outcomes, some frameworks, like the Cflat model (Sailer et al., 2021), put the learner and learning outcomes central and emphases the affordances offered by technology. Of course teachers need to have sufficient skills and positive attitudes to use technology effectively and in such manner that this supports students' learning. To promote learning, the learning activities, learning opportunities and digital technology should support the relevant cognitive processes, activate and stimulate self-regulation skills and digital skills. The ICAP framework links specific activity types (passive, active, constructive, and interactive) to cognitive processes that lead to storing, activating, linking and inferring, and thus from remember to knowledge construction to co-construction. This illustrates again the importance of suitable learning design and pedagogical approaches. Technology itself can play only a minor role and should provide meaningful affordances to stimulate learning activities. Only then, research indicates some effect on learning outcomes.

Other frameworks to take into account are the digital competence frameworks aimed at developing digital competences of citizens in the context of 21st century skills (Joint Research Centre et al., 2013; Joint Research Centre et al., 2022) and the digital competence framework for educators, aimed at teaching professionals (European Commission et al., 2017; Redecker, 2017). The latter not only describe the digital competences to be attained, but also indicates the necessary pedagogical competences involved. However, the framework is generic and has to be adapted to the various educational levels.

4. First conclusions and recommendations

Online education is not new. We already know a lot about online education. However, higher education seemed to be reluctant in taking this up, as shown by many EU initiatives, such as the Digital Education Action Plan. Despite all we know about online education, the sudden switch to online education during the Covid-19 pandemic left teachers, learners, and universities puzzled. While universities managed to switch to online delivery of education quite fast, many aspects fell short. The sudden move to online education did not leave sufficient time to redesign courses and apply instructional design and pedagogies suitable for online education. The reviewed publications made clear that students and teachers struggled to maintain social aspects, interaction and communication. The pandemic highlighted the digital divide, further disadvantages certain groups, and indicated several aspects that are usually taken for granted such as access to devices and infrastructure and a place to work and study.

Didactical perspective: While technology for online education was generally available at universities, many organisations did not adapt their instructional and pedagogical models accordingly to overcome shortcomings of technology while benefitting from its advantages. Given time constraints many universities simply tried to transfer their existing lectures into online lectures.

Social aspects: Consequently, students felt isolated and left alone. Social aspects of teacher-student interaction and student-student interaction fell short, leading to decreased motivation and increased risks of dropout and failure.

Learning situation at home: The home situation for students and staff differed significantly; some did not have separate rooms to have proper learning or teaching conditions. In addition, the technological equipment available to students and staff varied significantly, leading to disadvantages for students with lesser quality devices or poor internet connections.

To better prepare universities for similar situations in the future, we see the following main directions as important steps towards resilient higher education.

4.1. Adaptation of educational models towards more online education

Even when various forms of online education are not new to higher education, the Covid-19 pandemic brought to light several issues connected with the digitalisation of education. Several publication seem to focus on availability of tools and skills on how to use the tools. It is clear that that merely providing online tools will not guarantee that these tools are used at all. However, course design requires more than knowing how to use a tool. Tools need to have a function in learning and activities to be performed (Dascalu et al., 2021; Hofer et al., 2021; Scheibenzuber et al., 2021) and students, teachers and staff need to receive support and training in making efficient use of these tools (European Commission et al., 2020; Johnson, 2020; Rutherford et al., 2021).

Too often, it is assumed that learners already possess the self-regulated learning skills that are even more essential in online education while that often is not the case. Moreover, motivational and emotional factors and other learner characteristics play a larger role in online education than traditional education (e.g., Acosta-Gonzaga & Ramirez-Arellano, 2021; Butz et al., 2016; Huang et al., 2021; Ramirez-Arellano et al., 2019). Like teachers, learners need to have the necessary digital skills to benefit from online education. Therefore, the education and pedagogies need to accommodate the needs for self-regulation, learning strategies and digital skills.

Online education exists in many forms, and the institution should make choices that suit and are applicable to their vision and strategy. Involve not only academic and teaching staff, but also researchers, and support staff and allow sufficient time to develop and implement vision and strategy. Give students an active role in the change towards online education. Students can provide input on what they want from education or a specific course. Consider a more flexible approach, with educational models better attuned to students' needs. It is not always necessary to complete overhaul the educational model: starting with small changes might suffice to kick-start the process. Institutions should ensure that conditions stimulate a change in culture, perspective and attitudes. Rogers' (2003) model of diffusion of innovation could be helpful in determining the various phases and processes teachers pass through when having to integrate technology into their teaching.

There are areas that need additional attention when moving to online education, such as assessment and those disciplines, domain, professions that rely on acquiring complex competences that need to be trained or require lab or fieldwork. It pays off to consider a move towards assessment for learning and assessment as learning, peer feedback and self-assessment, in addition to the more conventional assessment of learning or summative assessment. Nowadays, a plethora of tools, technology and learning environments can support and optimise assessment. Innovations in pedagogies and didacties that make use of advanced technologies, like game-based learning, virtual and augmented reality offer many opportunities to support acquisition of practical skills and competences, and to practices field and lab work that in the past would require students to attend specific locations and labs.

4.2. Teacher professionalization towards online education

Digitalisation of education transgresses the need for teacher professionalization, notwithstanding the importance of teacher expertise and digital competence. There is sufficient existing knowledge and theories about designing and delivering education in online modes. Teachers will need to realise that online delivery of education the social aspect changes drastically (Vincent-Lancrin, 2022). Teachers and students accustomed to campus education will have to find new ways, methods and mechanisms to deal with social interaction. Even when theories on computer supported collaborative learning (Dillenbourg, 1999; Dillenbourg & Bétrancourt, 2006; Dillenbourg & Schneider, 1995), community of inquiry, Laurillard's conversational framework (Laurillard, 1999; Laurillard, 2002; Laurillard, 2009) give insight how to deal with online interaction, it requires expertise to put this into practice.

It seems obvious to state that teachers are in need of professional development. Of course, digitalisation of education calls for the required digital competences. Teacher professionalization should also cater for the various roles being assigned to teachers. In higher education, teachers often have to take on the role of course designer, developing course materials and designing courses. Therefore, one of the needs is to ensure that not only teachers but also students have the required digital competences and are able to select suitable teaching methods and tools (OECD, 2020). Competence frameworks such as DigComp, DigComp2.2 and DigCompEdu (Anusca, 2013;

Joint Research Centre et al., 2022; Redecker, 2017), or models such as TPACK (Dobi Barišić et al., 2019; Graham, 2011; Mishra & Koehler, 2006) could form the basis of professionalization programmes and include instruments and self-assessments tools (i.e. SELFIE (European Commission, n.d.)) to assess current competence levels. Digital competence models like TPACK and DigCompEdu indicate that digital competences also include knowledge and pedagogical content and competences. Training should include use of relevant pedagogies didactical models depending on context and learning objectives, forms of active online learning, virtual or online class, tools and apps, to name a few aspects.

However, professionalization should not be limited to a single off training. Teachers, tutors, course developers but also support staff need training and continuous support in various forms of online teaching. Institutions need to provide not a single training, but invest in solid teacher professional development programmes. Even if these already exist, more focus should be on pedagogies, didactics and methodology for online teaching and assessment, while not forgetting the teachers' characteristics and the institutional context.

Important for a teacher professional development programme to become and remain effective is not to focus on content only. Professionalization should address the teachers' needs, cater for their process of change and motivation, provide sufficient support from policy and management (e.g. considering workload), facilitate learning strategies and disseminate not only knowledge, but also skills and attitudes for various forms of online teaching and learning (e.g., Gogus, 2021; Philipsen et al., 2019; Schildkamp et al., 2021). This includes creating a culture of presence, interaction and community, supporting each other, building a learning community and paying catering for teachers' perspectives and perceptions.

4.3. Inclusion and support for disadvantaged learners

The pandemic highlighted a variety of factors that are relevant, even when not immediately apparent as part of online education. Conditions and factors like student readiness, home and family life, access not only to tools, platforms, devices, but also to safe and secure places to study and work. More than in classroom situations, staff need to pay attention to student wellbeing and need to learn how to notice signals.

Education always should be diverse and inclusive. When education contains digital or online content and tools, institutions and staff need to invest in accessibility of tools, platforms and content, as well. This is not restricted to infrastructure and tooling, but includes accessible and inclusive content, educational processes and support such as additional Q&A sessions, quiet learning spaces, library access, etc.

While online education potentially offer benefits for disadvantaged learners (and staff), because the have more flexibility in when, where and at what pace they learn, the Covid-19 pandemic clearly highlighted the digital divide and showed the negative impacts e.g. for socially disadvantaged learners. Institutions should cater for these needs and consider financial support or make use of already existing plans and programmes. Already local initiatives provide additional learning support, such as devices, financial reimbursements, etc. Institutions need to ensure that these facilities exist and that staff and students know about these facilities and resources.

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Annex A List of publications to append and to choose from for analysis

Initial list composed by OUNL, listed in black.

- References in blue have been added by OUNL
- References in green have been added by TU Delft
- References in red have been added by KUL
- References in purple have been added by DCU
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Annex B DigiTeL Pro template to report on teachers and student needs

To distill the needs and expectations of teaching staff and leadership, we suggest that you report for each of the publications which problems, needs and expectations arose during the pandemic situation, how these problems have been tackled, needs and expectations have been addressed, what the value (benefits, disadvantages) of these (ad hoc) solution is, what we can learn from this. Also consider students' needs as they will impact on teachers' needs.

Furthermore, please summarise the top 10 most commons problems, needs and expectations, and list any saillant problem/need/expectation that is excluded from the top-10.

Suggested criteria to report for each publication

Metadata about publication
- Citation details; i.e. author, title, journal, etc. Please report exact date if known so that we can determine the stage of the Covid pandemic.
- Is publication peer-reviewed
- Article type
- Methodology/type of study conducted
- Participant type (academic/teacher/leadership/student/community
- Discipline
- Country
- Covid-related: is it reporting explicitly about the Covid situation? If so, which period, start, mid, end, post-pandemic (rough estimates: start: the immediate start of the pandemic, in Western Europe March-April; post: approx start of the new academic year (September?).

Thematic
- Brief description of problems, needs, expectations mentioned in the publication
- For each problem, need, expectation, how has this been addressed/tackled? What solution has been used?
- What were the benefits of this solution? (if applicable)
- What were the disadvantages of this solution? (if applicable)
- What can we learn from this according to your opinion.

Possible aspects

- digital learning: benefits and/or disadvantages for staff, students, institutions,course, curriculum, infrastructure, etc
- challenges of digital learning, e-learning (not only limited to staff or students, also including technical, infrastructure, etc)
- transition to digital assessment (not always possible in all disciplines, e.g. those with professional and statutory regulatory bodies, like medicin, law, engineering, accountancy, etc)
- psychological impact
- creating collaborative cultures
- role of leadership
- student voice

Top-10
- Are there recurring problems, needs or expectations? If so, list the top-10.

High impact problems, needs, expectations

- List those problems, needs, expectations that will occur only occasionally or in a certain context, but have a large impact or are of great or far-reaching importance or consequence.

Annex C Bibliography of publications related to online education and Covid-19

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