Pandemic-Induced Constraints on Rapid Transformation to Digital Education

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Abstract. Once the World Health Organization declared the COVID-19 outbreak a pandemic, many countries abruptly established a lock down requiring their populations to stay home to avoid any contact with others to stop the spread of the disease. Consequently, most schools and higher education institutions closed access to campuses and face-to-face class meetings were suspended. Students were sent home and temporarily left without access to traditional educational resources. The migratory solution for this situation is moving toward extensive use of distance learning tools and techniques. However, many teachers were not prepared for this transition. There remains a gap in knowledge about how to quickly transform educational content and manage e-teaching. In this paper, we describe the process of transforming a face-to-face course in Augmented Reality to the online format in a rapid way. We wish to establish case evidence for educators regarding how to convert traditional course content to online content, in the face of incidents, such as the COVID-19 pandemic. In this paper, we present an approach including examples and highlighting opportunities for educators in higher education to support the transformation of courses for distance learning.

Keywords: Distance Learning, Disruptive Education, COVID-19 Pandemic.

1 Motivation

Between the first reports of a pneumonia of unknown cause detected in Wuhan, China (31 December 2019) and declaring an outbreak a Public Health Emergency of International Concern (30 January 2020) there was just a month. On 11 February 2020, the World Health Organization (WHO) announced a name for the new coronavirus disease: COVID-19. Six weeks later the WHO characterized it as a pandemic. WHO has called countries to take urgent and aggressive action. WHO appealed for countries to detect, test, treat, isolate, trace, and mobilize people in the response. Governments had to take actions to stop or slow down the spread of this virus. Many countries rapidly introduced national response plans with efficient multi-sectoral measures to contain the spread of the virus and this way safeguard the health of their citizens. Mitigation measures to

slow transmission through infection prevention and physical distancing have been introduced at different points in time and at varying intensities across the globe.

As a consequence, many educational institutions were suspending all in-person classes and transitioning to online classes. Universities were adjusting to the new environment to put arrangements in place that will enable students to continue and complete their studies. However, many educational institutions were not prepared for such a step. Teachers and educators need support and guidance to develop skills in using the technology and tools for teaching at a distance. The technical infrastructure needs to have the capabilities to support access to educational materials and to organize activities online. The infrastructure needs to be flexible enough to quickly deal with the increased demand (see a discussion of readiness, enablers, barriers, and bottlenecks in [1]). While digital education is rapidly growing in popularity, the teaching competence and exchange of good practices in this field are still very fragmented.

This paper addresses the gap in knowledge about how to quickly transform a course from a face-to-face (f2f) to an online format and how to manage e-teaching in the midst of pandemic, during the recovery, and for the second waves or similar events in the future. We do not aim to describe how to create the best possible online learning experience, but how to rapidly transfer a course to online with limited resources and in a short time. We outline the pandemic-induced constraints on such a transformation, suggest technological alternatives, and requirements for digital platforms. Our overarching goal is to provide students with the opportunities to successfully complete their studies even under the lockdown. At the same time, the paper is most useful for educators who aim to transfer their teaching online to create these opportunities. The alternative arrangements must be appropriate and deliver all necessary learning outcomes without compromising standards or devaluing degrees. The COVID-19 pandemic is forcing students and academics to separate physically, but this is certainly a time to learn to adapt and to use what we have available. We wish to set an example on how to face the challenge and develop sustainable solutions for similar incidents that can happen in the future.

We use an example of an Advanced Augmented Reality (AR) course. It is a pilot course prepared by an international consortium of five universities in a scope of the AR-FOR-EU project. The course was designed to be delivered in a week of intensive f2f classes. The consortium decided to completely move the course to the online format. The reader will find a description of this process in the paper.

The paper is structured as follows. We present the current state of the art with emphasis on constraints induced by COVID-19 pandemic in section 2. We describe the new pandemic-induced constraints, comparing to the conditions before the pandemic in section 3. We describe the process of transforming the course from f2f to distance learning using as an example the Advanced AR course, including the alternatives we identified and technology requirements in section 4. We discuss our design decisions and present recommendations for practitioners in section 5. We present conclusions and outline future work in section 6.

2 State of the Art in Practice

There is ample literature comparing f2f and online learning, and the findings are mixed. Some studies report that online academic courses have higher satisfaction rates and higher performance rates, for example, in [2]. Other studies report better academic performance in online format compared to the f2f mode with the same level of satisfaction [3]. However, there are also multiple studies reporting no difference [4-7]. Some studies even report the opposite results, namely that f2f students have better performance than the online students [8, 9].

As research presents such contradictory data, we draw a conclusion that the mode of the delivery is not the only factor determining learning. In our view, the quality of the course is crucial. Creating activities and assignments that are interesting for students and motivating them to put in more effort, 'investing' in the topic can make the learning more effective [10]. We assume that our online teaching can have similar results as the f2f, and its effectiveness depends more on how the course is designed and taught. We agree with Miller that "*good teaching is good teaching, regardless of technology*" [11]. Moreover, from the students' perspective employing the technology to learn does not mean that they automatically develop their problem-solving abilities, information-reasoning skills, communication skills, creativity, and other higher order thinking skills [12]. The key for us is to create conditions under which students can strive.

In order to transform our course from f2f to the online format, in a short span of time, we have drawn from the literature on online course quality [13-16]. Alqurashi associated factors that allow predicting student satisfaction and perceived learning within online learning environments [17]. She concludes that student satisfaction rates are higher when students find that online course materials helped them to understand the class content, stimulated their interest for the course, helped relate their personal experience to new knowledge, and were easy to find and access. Furthermore, student satisfaction and perceived learning rates were higher if students have high quality and quantity interactions with their instructor. To be successful, an online course must be (1) well-organized and (2) presented with well-specified learning objectives and assessment. In addition, (3) the importance of interpersonal communication and collaboration seems to be pivotal. When it comes to technology (4), it needs to be chosen thoughtfully to underpin content, meet the needs of learners and support student learning.

Classroom and online environments are both equally hard to define, so transforming from the f2f mode to online may be very challenging [18]. Often teachers simply transfer the teaching material and connected pedagogy directly to the online platform without providing opportunities for interpersonal interaction [19]. Such an approach may result in failure, disappointment and lower student and faculty satisfaction. Borrego notes that it is a common mistake to assume that it is sufficient to just select the virtual learning environment, and then to port the classroom-based material to it [20]. Nevertheless, to transfer a course to an online environment successfully, it is necessary to select the technique and tools carefully, to be able to convert the f2f classroom-based activities to the activities appropriate online. When the course is transferred to the online environment, the design must compensate for the lack of interaction between students and teacher. Vaughan et al. discuss the associated organizational challenges,

such as common institutional understanding of online learning and allocation of time and resources [21].

As the above literature conveys, it is possible to successfully convert courses to an online environment. Even at the midst of pandemic educators can provide students with a chance to benefit from the advantages of technology. However, it is not online teaching with 'business as usual'. We can say it is 'emergency remote teaching' [22]. Working during a pandemic is different on many levels. In the next section, we present an overview of teaching constraints and learning challenges induced by the COVID-19 pandemic.

3 New Pandemic-Induced Constraints

As the COVID-19 pandemic has prompted universities across the world to suspend all f2f classes, a common move was the transition to online teaching. It was a sudden transition, an unprecedented shift. In the rapidly changing situation, universities, teachers, and students had to adjust to the new environment and to the new ways of working.

However reconfiguring lives around the new constraints of quarantine lockdown requires facing many challenges and rearranging priorities. We gathered them all in Table 1. We realize it is not a complete neither absolute list. We rather wish to commence a discussion in the community to prepare educators for any such disruptive incidents. Of course, several of the issues identified cannot be resolved by a teacher, as they are not necessarily under their control, nor are there necessarily accepted solutions around already. There are issues, nonetheless.

Table 1. Comparison between challenges in teaching before and during pandemic.

	Before pandemic	**During pandemic**
Access to space and equipment	Full access to equipment and campus: book slot, go to lab, gather the equipment; Simple cleaning: Wipe visor of smart glasses, maybe use disinfectant wipes	• Reduced access to equipment and campus: use emulators, buy online spare equipment, post expensive equipment • It is not clear what is the best way of disinfecting, contradictory advice • Limited access to resources, for example, libraries
Infrastructure	One PC per group	• Sometimes too few PCs per family household (five people sharing three computers) • Fallback to mobile devices (tablets, phones); juggling devices requires more asynchronous working mode • Lacking internet access or connectivity (not enough for simultaneous video streaming / conferencing)

		• New Learning Management System installation may be needed (the Bavarian State's school Moodle, for example, could not take the load), bandwidth, and CPU power [1].
Work-Life balance	Personal and professional can be clearly separated: Lecture halls/lab/local companies are physically in different location than private home	• Retreat into the private: props needed, lack/less dress code, kids around and interrupting • Disruptions resulting in longer hours of work • No need to commute, no travel gives more time
Social Distancing	Small groups, bonding experience over social programme	• Lack of interaction • Meeting virtually via chat applications • Can be an improvement for people with difficulties in social interaction
Evaluation	Evaluation: Study participants from target group; Assemble in lab or reserved room	• Evaluation: by experts (switching from quantitative to qualitative); using remote access or sideloaded apps; alternatively, based on demo film recordings if special equipment is needed but not accessible to evaluators • Pre-tests or verification are equally affected • Assessment: no face to face exams
Circadian Rhythms	Managed by institute/school, paced daily schedule	• Disruption of daily life, missing time 'anchors', missing daylight markers due to indoor environment, disrupted schedule: "Days become fluent" and the passing of the week is marked only by the arrival of the bin men, lack of social events organising day and week. • Family life may require not to be available at core working hours (e.g., looking after kids)
Mental Health	Background levels of mental health challenges	• Coping with anxiety and worry • Living through a crisis, uncertainty, distressing, can be traumatic • Greater family and work stress • Coping with isolation, social shift • Work-from-home environment needs practice • Coping with grief
Physical Health	Possible to take care of health (e.g., being active, healthy eating, sport)	• Limited access to health care • No sport facilities available • Limited nourishment • Additional stress • Excess screen time, fatigue, limited outside time

Social Awareness	Motivation through audience feedback, reactive Q&A	• Lacking awareness
Attrition	Background levels of attrition.	• Some dropouts due to illness • Lowered expectations as e.g. childcare duties prevent full working and learning time ("we are just asking you to work as much as you can")
Openness	Limited: restricted to number of places available in the lecture hall / seminar room	• Unlimited, if online hosting allows • Commitment of learners can vary tremendously. They are no longer forced by being there to participate. • Anonymous online environment potentially limits willingness to engage. • Can be beneficial for people with disabilities
Student Support	Drop-in hours, private 1:1 sessions, easily available resources, and services at the university	• Only online sessions and limited resources

As the reader can see from the table above, the state of quarantine induced by COVID-19 creates many challenges that both teachers and students need to cope with while transferring teaching to online space. We agree with Hodges [22] that what we can observe in the face of pandemic is emergency remote instruction which is not standard online teaching, and therefore it requires different measures.

In the next section of the paper, we describe how we managed the rapid transformation from f2f to online with our course.

4 Transformation Decisions and Process

Before we describe in detail how we rapidly transformed the course from f2f to online mode, we explain the decision-making process.

4.1 Original course design planned prior to the COVID-19 pandemic

The Advanced AR Course was designed as an intensive f2f training event taking place on 19–24 April 2020 and hosted by one of the AR-FOR-EU partner universities. The training modules were designed and were going to be delivered by trainers from all five partner universities. The course consisted of 10 lectures (15 hours) and nine tutorials (13.5 hours). The lectures were designed to give the theoretical knowledge, while the tutorials were intended to give students practical hands-on experience with AR hardware and software tools and a chance to apply the new knowledge, developing their practical skills. In addition, a hackathon was scheduled for Saturday and Sunday 25–26 April 2020. We intended to assign all participants to small teams of four or five

students for a small group project. We would provide tutor support during the practical tutorials and at the hackathon, where the bulk of the small group project would be developed. The project work was designed to be the basis for the credit-bearing assessment, marking design, development, and evaluation of the resulting AR applications.

The decision to transform the f2f AR course to the online version was made because of the COVID-19 pandemic and associated travel restrictions. Moving instruction online allowed continuing to teach and learn while keeping students and teachers safe.

The decision was made by the consortium on 12 March 2020, right after WHO characterized COVID-19 as a pandemic, and only five weeks before the planned date of the course. That left us with little time to manage this change.

The consortium had experience in designing and running both f2f and online courses. We also had experience of adapting teaching materials and activities from a f2f format to online, although without string time limitations. In 2019, the consortium designed and delivered a f2f course 'Foundations of Augmented Reality'. In early 2020, we adapted this course to an online mode, using video recordings of the f2f lectures and workshops. However, we were still in the process of running this course when we were making the decision that the 'Advanced AR course' will be transformed to a fully online course. Below we describe the process in detail.

4.2 Design decisions

First and foremost, we decided that the new form of the course would be a MOOC (Massive Open Online Course). This way we were able to reach out to a wider audience and accommodate more students. We realize that it is not the most common case. As the pandemic started in the middle of the semester, many universities had to find a solution to provide students with an opportunity to finish their courses. Our course is not a part of formal education, so we could afford to make the decision to transform it into a MOOC. When the lockdown regulations were not yet clear, we also considered a blended format with some local f2f participants going through the course together with online participants who would not be able to attend in person.

The second decision we made was to change the timeline of the course. The f2f course was planned as an intensive one-week event. As we moved it online, we decided to spread the teaching over eight weeks. As neither instructors nor the students need to travel to join the course, there is no need to compress teaching. It also gave us more time to prepare a good quality teaching material. The approach we have taken was similar to a 'Conventional MOOC' and 'Lecture MOOC', as described in [23]. We could say our course was an 'Emergency MOOC' – an educational scenario created as an answer to pandemic-induced constraints, such as access to infrastructure, mental and physical health, or social awareness (see Table 1).

In order to ensure the quality of the course, we decided to design and deliver completely new material created specifically for the online course. The aim was to create conditions for students to succeed in their learning despite the constraints induced by pandemic. We followed the recommendations stated earlier in Section 2. The course was (1) well-organized with a weekly schedule and each session mapped explicitly against intended learning outcomes from our skills framework [24]. It is presented with

(2) well-specified learning objectives and assessment. When it comes to (3) interpersonal communication between students and teachers, we decided to introduce a few synchronous sessions. The selection of (4) technology is described in detail below (Tables 2 and 3).

4.3 Platform alternatives and requirements

We identified three main alternatives for the deployment of a digital platform, each with advantages and limitations, summarized below (Table 2).

Table 2. Digital platform alternatives.

	Own Server	**Hosted Commercial**	**Institutional**
Pros	Retain intellectual property, branding, fully configurable, open to externals, export possible (to other institutions)	Wide outreach	Configurable, institutional infrastructure support
Cons	Bandwidth could be problematic (but videos can be hosted separately)	Lacking flexibility, cannot configure with emerging requirements, no export	Enrolments limited to home students, add on costs

The choices of the platform and its components were made by the consortium based on several requirements, such as adaptability, scalability, interoperability, availability, and affordability. Table 3 summarizes the requirements and decisions taken when choosing the online environment.

Table 3. Requirements for the digital platform.

Requirement	**Description**	**Design Decision**
Adaptability	Look & feel, corporate branding, bespoke configuration possible	Open Source system with plugin architecture and rich ecosystem of themes and tools
Scalability	Bandwidth and computational power of own hosted server is scarce and could pose a problem when too many students live interactive stream video material simultaneously	Separate video streaming from learning platform, so as to use own hosted server without massive bandwidth requirements (public YouTube videos + own Moodle instance)
Interoperability	The course material will be provided as open access, so export of the whole course should be as easy as possible	Moodle export

Affordability	Platform skinning with themes should be off the shelf, bespoke development should be light touch	Professionally designed Moodle theme
Availability	As small delays as possible to the solution going live. Short installation and deployment process. For pay procurement processes cost time, especially at big organisations.	Open Source on LAMP system
Flexibility	Possibility to continue to configure and extend the system as we go along, and as requirements emerge.	Rich plugin universe (survey plugin, social comments plugin, H5P plugin for content production)
Security	A secure server run by a trustworthy company	Moodle installation at a partner university
Reliability	System running the whole duration of the course without downtime	Moodle has a release schedule, providing patches and updates at convenient times
Maintainability	Offer possibilities to author and update as much as possible. Separate learner data from course resources (so it can quickly be removed when the course is repeated).	Moodle rollover features allows to re-run the course easily; export with defined format allows import at other sites. GitHub is used for the Open textbook.
Sustainability	Minor updates required when repeating, but over time bigger stock of resources	Lectures chopped into small 5-20min units allows replacing and adding parts more conveniently
Interactivity	Active Learning is the underlying methodology we deploy in project seminars. All learning materials should be as interactive as possible, requiring learners to get active.	H5P content production plugin offers many enhancements in widget form (such as interactive videos).
No Freemium	No hidden costs	
Retain intellectual property	Do not sign away the intellectual property rights in exchange for free software	Running own platform, but using YouTube for streaming at scale was the compromise chosen
Trackability	Competency register and possibility to track user behaviour and engagement	Moodle has competency register and does support xAPI (through plugin)

We decided to use the 'Own server' alternative (see Table 2) and installed a Moodle at a partner university and openly available via the project website. The course was divided in weeks, and the teaching material is being uploaded on a weekly basis.

Activities in online courses may be offered in either synchronous or asynchronous mode. We use a combination of both. We offer most of the classes in our Advanced AR course in the asynchronous mode. This design decision was motivated by our objective to make the activities we design as reusable as possible. Two sessions are designed to be delivered in a synchronous mode and open for participants from outside of the course. The intention is to create an opportunity for interaction between instructors and students as well as to promote the course.

In the Advanced AR course, we use different formats for the teaching material and activities. Each lecture is pre-recorded as multiple short videos (3–6 videos, 3–30 min each) with slides, video demonstrations, and the video of the narrating instructor as a picture-in-picture. All the lectures follow the same template to provide a visual coherence, but with a personal touch by each instructor. Such a form allows students to easily navigate the course.

Tutorials delivered by an instructor in a classroom could not be easily converted for consumption online. For example, we know from some of the classroom recordings from our foundation course that the bits with the instructor walking from desk to desk to help tackle the same problem over and over, simply does not work on video. In addition, the GDPR rules prevent (or make it difficult) recording and sharing of videos that could identify students.

The classroom-based activities were substituted by appropriate activities online. The practical exercises of the course are mostly presented as systematic, step-by-step tutorials in different media formats. Some of them are video tutorials, created using screen capture, where the instructor is demonstrating something on the screen. Other exercises are presented in a text format available as web pages with embedded screenshots, videos, and links. For some of the tutorials, we provide downloadable examples of AR apps or content. Similarly, for lectures – simply recording a lecture and posting it in a learning platform can be less useful in distance education. For the online course, we created dedicated content with shorter, easy to navigate videos.

The formative assessment is designed in the form of embedded quizzes and summary dialogues in some of the videos. For the summative assessment, students are requested tasked to design, develop, and evaluate their own AR application.

As teaching how to create AR apps is an emerging topic in Higher Education there are little textbooks to support teaching and learning. For this course, we write our own textbook on the topic in the GitHub-based open source format. Some of the lectures and practical exercises are adapted for the book format (such as video lectures) and some are published in the book directly (such as the text-based practical exercises). Some of the tutorials are opened by a short, five-minute video, but they are essentially step-by-step guides with screenshots and code snippets included, using markdown for typesetting, and git actions for integration.

Every book about high tech risks being outdated already when going into print. Our book is continuously developed and updated, by an open community of contributors, Open Source style.

5 Discussion and take-away message

We introduced the new constraints the pandemic imposed on us in Table 1, which we took into account, when making our design decisions for transferring teaching online as summarised in Tables 2 and 3. We made these decisions based on the state of the art in the field of how to convert a course to online. It is important, however, to connect explicitly the design implications to the pandemic constraints outlined initially, as only then it becomes evident how the given situation influenced these decisions. It would also to allow sharing recommendations for future similar situations.

The decision to change from intensive one-week f2f course to MOOC format was dictated by the travel ban and the lockdown restrictions preventing gatherings of even small groups of people. An alternative would have been to create a SPOC (Small Private Online Course) just for the registered students. But with the pandemic conditions and closed education institutions we realised there are many students who could benefit from the course and we decided to make the material accessible, so as to help remediate this educational state of emergency in general. We opened the course to the wider public allowing students from outside our universities and even outside the university context as such. Changing the target audience brings several challenges. In cases when the access to the course is limited to the students who are enrolled in a formal education program, often know each other and (not necessarily, but often) with mandatory attendance, synchronous activities may play an important role in the course. They may allow for better communication and help students to cope with isolation and reduce drop-out levels. However, opening the course and allowing anyone to join greatly reduces the attendance and effectiveness of synchronous activities under normal circumstances already, not to speak of the pandemic.

The closure of universities has meant that students are learning from home. Many had to leave their university accommodation and move to their family home. In consequence, the conditions students are now working in are likely to differ considerably, as we summarized in Table 1. Lacking internet access or connectivity can be an issue during pandemic [25]. This is also a problem on the other side, with server capacity potentially hampering the ability to stream to larger numbers of people. In both cases, the broadband as well as the server computational capacity can be insufficient for video streaming to larger numbers. We suggest using a broadcasting network (YouTube) in combination with Moodle to balance the load.

Beside that students may not have sufficient access to computers or devices required for learning and assessment. Asynchronous delivery enables shuffle devices.

Another problem in pandemic is the distorted balance between work and private life. Some students have responsibilities to care for children or vulnerable family members. Reports show that they also may not have a suitable space to carry out their university work [25]. Our recommendation is to produce the learning material in smaller blocks, so students can make best use of their time and have natural pausing points.

Social distancing rules enforced during pandemic means that people may feel isolated and miss the social interaction. Interpersonal communication and collaboration are crucial for the online course to be successful. For the pandemic 'emergency MOOC', we decided to give students an opportunity to connect with teachers and each

other in live events. It is difficult, however, to organise for an audience to meet all at the same time, due to individualisation of schedules (some people take care of children during day and work at night, some rise earlier due to missing commute). We suggest organising only a very limited number of live meetings, focusing these on a 'happening' character, where the live experience matters (e.g., in our course, this was a research directions panel organised with several well-known speakers). This can be organised with video conferencing solutions such as Zoom, WebEx, or Microsoft Teams (to mention a few popular solutions). The feeling of isolation can be mitigated by having synchronous sessions, and they may also reduce drop-out levels. When it becomes possible to gather for such synchronous activities in a f2f format, it is possible that restrictions on the number of people per room are introduced. Such restrictions might require blended solutions to allow everyone to attend, partly in person and partly via video conferencing. New issues arise though, such as acquiring microphones that work properly even when the speaker wears a facemask.

Generally, asynchronous activities might be more reasonable than synchronous ones. If all the activities are synchronous, there is a risk of excluding people with access difficulties (childcare, lack of devices, etc.). At the same time, with only asynchronous activities, the risk of social isolation is higher, and the mental health of students may deteriorate. It is a thin line, to find the right trade-off between the two modes of delivery, and we can only recommend sparse use of live events that are also open to the public to provide the necessary level of flexibility. Opening to an external audience may additionally help to ensure that there is audience and impact. Synchronous activities can often be recorded to share with those who could not attend or to produce a short, high quality video summary of the live event at a later stage.

Similarly, flexibility with deadlines for assignments within course is needed to allow students to successfully follow the course despite distorted work-private life balance by pandemic.

Making videos public – to help remediate the general state of educational emergency – poses several new challenges. Copyright is affected, as the course is no longer in a university context, where 'academic review' applies. The learning material can be taken out of context, for example, a critique and analysis exercise of existing systems and their design flaws can suddenly be misunderstood as criticism of others. A solution may be found in using examples but leaving the students to do the criticism work inside the course, using overlays like offered by H5P. In this way, students might also learn more.

Workshops that cannot be done f2f require using innovative online tools to engage students in interaction and provide them benefits of the workshop despite the mode of the delivery (e.g., shared files, online forms, and online whiteboards).

Hardware availability is limited in pandemic. Some of the workshops we planned required specific hardware that cannot be made available in an online course easily. A solution can be using emulators instead of the real hardware. In addition, specialist equipment can be bought online, but may require restructuring plans to keep them affordable. In our course, for example, this included the recommendation of low-cost Arduino and sensors and pointers where to order them off-the-shelf with still-functioning delivery services (in our case, Amazon), with other sites not operating with their staff furloughed.

6 Conclusion

This paper intends to fill in the gap in knowledge about how to quickly transform course content from the traditional f2f format into digital education in the event of incidents such as the COVID-19 pandemic. We used an example of a course on AR to establish case evidence for educators regarding how to manage such change. We conclude that such a transformation can be done successfully. We described and discussed technological alternatives and requirements for such a transformation. Future work may include a similar analysis of the pedagogical aspects.

The COVID-19 situation is changing while we are writing this paper. Many issues stay open and require further attention. We wish to start the discussion in the Technology-Enhanced Learning community to be able not only to provide emergency remote instruction but quality education despite any disruptive event in future. Moreover, we intend to gather feedback on success and student satisfaction with the course. At the time of writing this paper, the course is still ongoing.

When normality returns, policies will likely be created putting recovery plans in place for future eventualities. Decisions will have to be made about responsibilities for rapid conversion such as the one presented here. We hope our analysis of the pandemic-induced constraints and design decisions can contribute to framing this discussion.

Acknowledgments. The work presented in this paper is supported by the AR-FOR-EU project funded by the European Commission, grant 2017-1-NO01-KA203-034192.

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