



Emergency Remote Education in Higher Education Institutions: Estonia's Response to COVID-19

Katri Lamesoo, Eda Tagamets

Acknowledgements

This report is based on the research carried out under ERASMUS+ project *Navigating social worlds: toolbox for social inquiry* (2020-1-PL01-KA226-HE-096356); <https://social-worlds.eu>

The European Commission's support for the production of this publication does not constitute an endorsement of the contents, which reflect the views only of the authors, and the Commission cannot be held responsible for any use which may be made of the information contained therein.

With the support of the
Erasmus+ Programme
of the European Union



Table of content

Summary	2
Introduction	3
1.1 Overview of higher education sector in Estonia	3
1.2 Digital learning and teaching in higher education in Estonia before COVID-19	4
Methodology	6
2.1 Terms and concepts	6
2.2. Legal and normative acts	8
2.3 Academic and policy studies by HEIs	10
2.4 Case study	13
Analysis	13
3.1 Digital preparedness	14
3.1.1 Faculty’s digital skills	14
3.1.2 Students’ digital skills	15
3.1.3 Internet coverage and availability of devices	16
3.1.4 Existing digitalization strategies within universities	17
3.2 How Estonia managed the transition to online teaching and learning	18
3.2.1 Problems associated with online teaching and learning	18
3.2.2 Institutional response	20
3.2.3 Equity and equality in distance learning	21
3.3 Challenges and opportunities stemming from the crisis	21
Summary and implications	25
Case Study	26
Bibliography	29

Copyright info:

Everyone is permitted to copy and distribute verbatim copies of this document, but changing it is not allowed. You are free to share, copy and redistribute this document in any medium or format under the conditions of the following license.

This work is licensed under the Creative Commons Attribution-NonCommercial-NoDerivs 3.0 Unported License. To view a copy of this license, visit <http://creativecommons.org/licenses/by-nc-nd/3.0/> or send a letter to Creative Commons, PO Box 1866, Mountain View, CA 94042, USA.

1. Introduction

The global pandemic of COVID-19 has caused a major disruption in the educational systems around the world and some of the changes are likely to persist. Strielkowski (2020) refers to Schumpeter, calling it a *'creative destruction' in making that will forever change the status quo in academia and higher education*. Global research community has already started to work on the novel situation and its implications, in K-12 education as well as colleges and universities. Existing analyses of the HEIs response to COVID apparently demonstrate great diversity on global scale depending on the local policies and resources (Crawford et al, 2020; Marinoni, Land & Jensen, 2020).

Most universities had to move instruction online – partially or completely. It has been pointed out that a distinction needs to be made between regular online instruction and what should be called emergency remote teaching (Hodges et al 2020, Mohammed et al, 2020, Bozkurt & Sharma, 2020). Mohammed et al (2020) point out that due to urgency, providing a reliable, temporary access to the instruction was critical rather than constructing a sophisticated educational ecosystem. Bozkurt & Sharma (2020) warn that if these temporary crisis solutions were not properly identified as such, they might remain in people's memories, discrediting all online/distance education. (Bozkurt & Sharma, 2020).

In Estonia the term used for emergency remote education has been forced distance learning. We will subsequently give an overview of Estonian higher educational institutions' response to this and the experiences reported by university staff and students.

1.1 Overview of higher education sector in Estonia

The higher education system in Estonia has two branches: academic and professional. The general structure of academic study has three levels: bachelor's studies (nominal duration 3 years), master's studies (2 years), doctoral studies (4 years). The study load

of one academic year shall be 60 credit points, which is 1,560 hours of student's work spent on studying. Some programmes contain integrated Bachelor's and Master's study and give the qualification of the second level of academic higher education.

There are 18 higher educational institutions (HEIs) in Estonia, in 9 different locations: 6 public universities, 7 state professional higher education institutions and 5 private higher education institutions. The biggest HEIs are University of Tartu (13 449 students in 2020/2021), Tallinn Technical University (9863), Tallinn University (7122) and Estonian University of Life Sciences (2962). In the academic years of 2020/2021 there were 45 259 students: 30 980 doing bachelor's studies, 11 962 in master's studies and 2317 in doctoral studies. 37 291 conducted their study in Estonian language, the number of foreign students was 5235. 26 641 (59%) of the students were women and 18 618 (41%) men. 10% of the students were 19 or younger, 42% were in the age group 20...24, 17% aged 25...29, 13% aged 30...34 and 18% 35 years or older. The number of teaching staff in HEIs was 4218, 2163 of them with PhD. 4% of the teaching staff were younger than 30, 25% aged 30...39, 31% 40...49, 20% 50...59 and 19% 60 or older (Haridussilm, n.d)

1.2 Digital learning and teaching in higher education in Estonia before COVID-19

Tiger Leap was an initiative launched in Estonia in 1996 to prepare the education system for the Information Age: to provide the schools with computers and Internet access, to offer in-service training to teachers and create electronic learning assets (Aru-Chabilan, 2020). While the program targeted primarily the general education, higher educational institutions were actively going along with and benefitting from these developments, as a big part of the students who started to enter the universities had already some had experience with e-learning.

The universities of Estonia formed a consortium to coordinate the activities. Development of e-learning was also supported by the structural funds of the European Union. In 2002 the Government of Estonia approved a 3-year national ICT program for

higher education called The Tiger University, this was followed by Tiger University Plus in 2005-2008. In 2006, an e-learning development centre was created at the Estonian Information Technology Foundation and a Journal of E-Learning launched. However, in 2006 the researchers still had to conclude that e-learning was not a priority for the universities and its adoption relied largely on the personal preferences of the teaching staff rather than organizational pressure (Marandi et al 2006). “The best e-course” contests have been held since 2005; in 2008 the eLearning Development Centre started to award e-course quality labels (HITSA 2019). In 2012 three major national initiatives and institutions of technology in education were incorporated into HITSA (Foundation of Information Technology in Education. An instrument has been created to assess the quality of e-courses (E-course Quality Evaluation Tool (2021). The Estonian Quality Agency for Higher and Vocational Education has issued guidelines for creating a high-quality e-course (EKKA, 2021). Data protection remains an issue to be further addressed in e-learning (Andmekaitse Inspektsioon 2017).

The University of Tartu was first connected to the Internet in 1992 (EENet, n.d.). In 1997, the University started to use the web-based learning environment Web Course Tool. In 1998, 9 first web-based courses were created with support from the Open Estonia Foundation. As the used base grew quickly, in 2001 the university purchased an unlimited number of user licences for WebCT. A digital study information system started to operate in 2000. An E-learning strategy 2006-2010 was approved by the Council of the University of Tartu in December 2005, with an objective *to create at the University a modern, flexible, and internationally open educational process supportive of efficient and independent learning* (E-Learning Strategy, 2005). The central web-based learning environment Moodle has been used since 2009 by students and staff (Lasn, n.d.). In fall 2009, the university published a first issue of the online Journal of eLearning that continues to be published to this day (Tartu Ülikooli e-õppe ajakiri, 2021). Lifelong Learning Centre offers support and training for digital learning and teaching, conducts surveys and monitors outcomes.

In the Tallinn University of Technology, an e-learning environment (TalTech Moodle) is used to support the studies. The University’s Educational Technology Centre

assesses compliance of a course to the e-learning levels, helps in the creation of e-courses and learning objects, e-learning technical advice, creation of learning objects, video and audio recording and processing, video conference support and training. The basic level of e-learning needed to be ensured in all the compulsory courses by the academic year of 2020/2021, basic level meaning that a course shall include organizational side of the course (learning outcomes, course action plan, assessment criteria, feedback to the course), study materials (study outlines, links to external materials/ resources), self-reflection tools (e.g. tests, repetition questions, thinking tasks) and feedback from lecturer (announcements, mid-term evaluation), feedback and communication tools with fellow students (e.g. forum, chat, etc)(TalTech, n.d.a).

In Tallinn University, E-learning Centre provides advice and training to teaching staff on how to best use different e-learning methodologies and technical solutions in their teaching: how to use e-learning in classroom work, what e-learning environments to use and how to build an e-course, how to create learning materials and activate learners. The centre also organizes training workshops for the university employees and offers multimedia services like recording of lectures, editing recorded videos and doing live broadcasting. (TLU, n.d.a)

2. Methodology

2.1 Terms and concepts

While speaking of emergency remote education, we will mostly focus on its online learning component. Different institutions may use different terms to describe distance/remote learning and online/digital learning. Distance learning has earlier been used as a term for a type of studies where the students gather for classroom work once or twice a month, for 2 to 4 days in a row, and go most of the coursework outside the classroom. In the University of Tartu, this is now called block mode study, in Tallinn University cyclical study and in Tallinn University of Technology – session-based study.

For example, in 2020, out of the 13,641 students at the University of Tartu, 3454 studied in block mode and 10187 in regular mode. In the context of the transition to online studies during the COVID-19 pandemic it is worth mentioning that while block mode students may have been better prepared to individual coursework and less contact learning, they may also have more difficulty coordinating work, family, and study commitments.

Also, distance learning does not necessarily equal online or digital learning, as digital devices can be used in contact learning too. Estonian Quality Agency for Higher and Vocational Education is using the following terminology in its reports:

- *Face-to-face learning – teaching is provided in a classroom.*
- *Distance learning – a form of remote education, where students are physically separated; can be organized as blended or online learning.*
- *Forced distance learning – distance learning due to COVID-19 pandemic.*
- *Contact learning – teaching and learning with learners and teacher (lecturer, trainer) interacting simultaneously; contact learning can take place in a classroom, online or in the form of flexible learning with some learners in the classroom and some online.*
- *E-learning or digital learning – using digital tools for teaching and learning. E-learning or digital learning can be set up as face-to-face, classroom, blended, flexible or online learning.*
- *Flexible learning, also hybrid learning – a form of contact learning with some students present in the classroom and others joining online.*
- *Blended learning – tuition is organised as a mixture of face-to-face and online or flexible learning.*
- *Online learning – the entire process of teaching and learning takes place over the internet.*
- *Independent learning with online support – the lecturer assigns tasks that students work on independently (such as working with web-based study materials or watching pre-recorded video lectures or reading chapters from a book) at the beginning of the course and assesses their performance at the end of the course without any interaction in between. (EKKA, 2020)*

Finally, universities have offered fully or mostly online courses before the COVID-19 pandemic, too. In the University of Tartu, a master's programme of educational technology was launched in 2017, where the students only physically gather for two short sessions: one in the beginning and one in the end of the studies. In general, the number of students taking courses fully online before 2019/2020 was rather small in Estonia (below 1% of all students), compared to some other countries (OECD, 2020).

2.2. Legal and normative acts

On March 6, 2020, Estonian Ministry of Education and Research sent a call to all educational institutions to be ready to temporarily close their doors and reorganize their studies, if necessary, in order to prevent the spread of the infection. On March 13, the government decided that all Estonian educational institutions, except kindergartens, would close their doors from March 16, and switch to distance learning. Every two weeks, the situation would be assessed, and a decision made on the need to extend the distance learning period. From May 15, partial contact learning was restored. Restrictions on the activities of educational institutions were further relaxed from June: indoor activities were permitted for groups under 100 people, if the occupancy of the room did not exceed 50%.

In August 2020, the Ministry of Education and Research issued recommendations to educational institutions, calling for risk management and contact reduction but advising to start regular contact learning. On December 10, 2020, the government decided to establish additional restrictions on educational institutions: from December 14 to December 31, students would not be allowed to be on school premises. From January 25, 2021, contact studies were allowed in general, vocational and higher education but at the end of February restrictions were reinstated and continued until mid-May. From May 14, all general education schools, vocational schools, and higher education institutions were allowed to open for the students.

Thus, in Estonia, nationwide full closure of physical campuses in 2020 lasted from March 16 to May 14 and from 14 to 31 December -- a total of 78 days, which is exactly

the average across 24 jurisdictions according to an OECD report “The state of higher education one year into the COVID-19 pandemic” (OECD, 2021).

Higher educational institutions adopted their own somewhat differing policies, relying on distance learning as much as possible and allowing for exceptions only in the cases where it was absolutely necessary because of the nature of studies. At the beginning of the academic year of 2020/2021, University of Tartu announced that they had prepared for three different scenarios: A being normal learning and C being completely remote learning. Scenario B would involve hybrid learning, distancing, mask wearing and, in some cases, registration for contact tracing. Tallinn University of Technology developed three scenarios with rather similar conditions, also setting criteria for when the change from one scenario to the other would take place. Also, TalTech transferred all of its English-language curricula to remote learning until the end of the academic year and would not be admitting third-country students. Tallinn University developed a similar colour-based system with an added “blue” scenario for a national emergency situation. The University of Life Sciences did not make explicit plans, but stated that students should follow the instructions of the Health Board, regarding social distancing and mask wearing. The Estonian Academy of Arts introduced distancing rules and said that faculty would be authorized to request the students wear a mask (ERR, 2020a).

On November 24 2020, the Rectorate of the University of Tartu decided to relaunch distance learning in the university, citing increased coronavirus infections. The restrictions remained in place until the end of the spring term. Tallinn University of Technology announced on December 11, 2020, that they would start to implement the red risk scenario: distance learning and remote work with the only exceptions for exams, assessments, tests, personal consultations, and practical learning (TalTech, 2020b). Tallinn University announced on March 24, 2020, that the studies would continue to take place mainly in distance learning until the end of the second contact study period of the spring semester (May 16) and only such practical studies which require special equipment would be organised on the premises of the university (TLU, 2020) Estonian Academy of Arts said all lessons were taking place online but exams were held at the university premises. University of Life Sciences cited two spring term

scenarios, preparing to allow graduating students access to laboratories to perform the tests required for dissertations (ERR News, 2020b).

2.3 Academic and policy studies by HEIs

In October 2020, the Estonian Quality Agency for Higher and Vocational Education conducted a survey among higher education institutions on how the so-called forced distance learning was coped with under COVID-19 conditions and what help was expected from the government. The questionnaire was distributed to vice-rectors for academic affairs and heads of office of academic affairs of all universities and professional higher education institutions in Estonia. The following HEIs submitted their written answers: University of Tartu, Tallinn University of Technology, Tallinn University, the Estonian University of Life Sciences, the Estonian Academy of Music and Theatre, the Estonian Business School, TTK University of Applied Sciences, Tartu Health Care College, Tallinn Health care College, Estonian Aviation Academy, Estonian Military Academy, Pallas University of Applied Sciences, the Estonian Academy of Security Sciences, the Estonian Entrepreneurship University of Applied Sciences and the Baltic Methodist Theological Seminary. The Estonian Academy of Arts answered the questions through a focus group interview.

The questions asked were the following:

1. *Teaching staff*

a. *Did the work-load of teaching staff increase or decrease during distance learning?*

What is your answer based on and what could be the underlying reasons for such an outcome?

b. *Which forms of tuition did your lecturers use the most (hybrid learning, e-learning, blended learning, independent learning with online support)?*

c. *What kind of support did lecturers need for the move to distance learning? What kind of support did HEI provide for the teaching staff without any prior experience in e-learning?*

2. *Students*

- a. *What kind of feedback did students give to the courses conducted during distance learning?*
 - b. *In your estimation, was the workload of students increased or decreased during distance learning? Based on what can you say that?*
 - c. *What kind of support did students need for the transition to distance learning?*
 - d. *Did the dropout rate increase or decrease during distance learning? What could be the possible reasons for one or the other?*
 - e. *Did the academic progress (grades) improve or worsen? What could be the possible reasons for one or the other?*
3. *Study process and support services*
- a. *Did lecturers and students have the tools and solutions necessary for distance learning (computers, internet connection, access to e-learning platforms)? What kind of support did the university offer to teaching staff, students, support staff if any problems arose?*
 - b. *How were apprenticeship / practical work / practical courses organised?*
 - c. *How would you rate the study process delivery in general? Please indicate the key challenges and successes.*
4. *What changes have you made or plan to make to forced distance learning in the current cycle compared to the previous one?*
5. *What kind of support would you expect from the state (infrastructure, training, sharing best practices from abroad, or other)? (EKKA, 2020)*

In the University of Tartu, Centre of Applied Social Sciences conducted a survey “Lessons Learnt From Emergency Situation: Distance Learning at the University of Tartu” (Trumm, Urmann, Remmik, Mägi, Tubelt & Espenberg, 2020). Data was collected using both qualitative and quantitative methods. The study aimed to find answers to the following questions: *How did we cope with teaching and studies during the emergency situation?*

What was complicated, what was a success, what did we learn?

What must we be ready for in autumn? What do we want to change in the longer run?

Do the students’ grades, feedback and other data give evidence of how we coped with

distance learning (incl. e-learning)? Are there any differences within the university? (Trumm et al, 2020)

Researchers of Tallinn University conducted a survey of distance learning among their students and teaching staff (Poom-Valickis, Aus, Väljataga, Rumma & Tammets, 2020). A total of 153 teaching staff and 527 students participated. Specifically, the study sought to find answers to the following research questions: *How did students and lecturers evaluate the organization of studies and the support offered during emergency distance learning? How did the special situation affect the study load of students and the workload of teachers, and what factors was it primarily related to? What were the distance learning strategies and practices that most supported learning from the perspective of both students and teachers? What aspects influence the most effective coping in distance learning for both students and teachers? What is the combined effect of learners' individual characteristics and teaching strategies used in distance learning on learner involvement and meaningful learning?* (Poom-Valickis et al, 2020)

In Tallinn University of Technology, an internal assessment has been made by the Department of Academic Affairs about coping with remote learning during the spring and fall terms of 2000. Data were collected from a survey conducted among lecturers at the beginning of May 2020, with the objective to find out: *1. What kind of teaching methods they used during distance learning? 2. What kind of tools and/or learning environments they used during distance learning? 3. Based on their experience, how had distance learning affected the participation in lectures/studies and acquisition of learning outcomes (how would they predict the number of students achieving positive results in their course) 4. What were the positive/negative aspects of conducting studies during this distance-learning period?* This document (TalTech, 2020) has not been published but will be used in subsequent overview.

2.4 Case study

We will present as a case study from Estonian HEIs' response to distance learning during the pandemic: teacher students were encouraged to volunteer as assistant teachers and tutors in kindergartens and schools where the staff or students struggled because of the impact of the COVID-19 pandemic. Initially this was launched as a purely volunteer activity with the University of Tartu and University of Tallinn acting only as mediators between the students and the educational institutions. University of Tartu offered a possibility to get credit points for the work done in schools and kindergartens, in the form of an elective course. At the end of the term all the volunteers were asked to fill in a questionnaire and describe their experience. We will present the findings of this in the final section of this report.

3. Analysis

The COVID-19 crisis has affected institutions, students, and teachers in many ways. It has been a challenge to provide a high quality learning experience for students, while also offering appropriate support for university teachers and staff. This section will describe how COVID-19 pandemic was received by higher education institutions of Estonia and how it affected teaching and learning in HEIs: how the country managed the online transition, how it was facilitated by relevant authorities.

We shall also highlight some of the best practices and lessons learnt with a particular emphasis on teacher students' learning.

3.1 Digital preparedness

3.1.1 Faculty's digital skills

Surveys conducted in Estonia identified several skills necessary for remote/digital teaching:

- applying a proper methodological approach,
- systematisation of study materials and assignments,
- ensuring the availability of necessary resources for the tasks,
- creating a course in the Moodle environment,
- selection and use of teaching and assessment methods,
- hardware setup,
- conducting webinars and recording video lectures,
- applying e-assessment. (EKKA, 2020; Trumm et al, 2020).

We can see that digital competences are understood to be closely intertwined with pedagogical competencies. This is in line with European Framework for the Digital Competence of Educators (DigCompEdu), which identifies six aspects of educators' professional activities: (1) *Professional Engagement (using digital technologies for communication, collaboration and professional development)*; (2) *Digital Resources (sourcing, creating and sharing digital resources)*; (3) *Teaching and Learning (managing and orchestrating the use of digital technologies in teaching and learning)*; (4) *Assessment (using digital technologies and strategies to enhance assessment)*; (5) *Empowering Learners (using digital technologies to enhance inclusion, personalisation and learners' active engagement)*; (6) *Facilitating Learners' Digital Competence (enabling learners to creatively and responsibly use digital technologies for information, communication, content creation, wellbeing and problem-solving)* (Puniye, 2017). However, DigCompEdu as a basis for developing the faculty's digital pedagogy skills has not been mentioned in any of the surveys.

Overall, digital skills of the teaching staff has not been seen as a major problem (Trumm et al, 2020). It has been noted that older teachers rated their digital skills

somewhat lower than younger; also researchers were more satisfied with their skills than lecturers (Poom-Valickis et al, 2020). It gets noted that the faculty’s digital competences and particularly their previous experiences affected their perceived coping the most (EKKA, 2020; Poom-Valickis et al, 2020). The nature of digital skills necessary for effective remote instruction is seen as dependent on the subject taught; in teaching practical arts necessity has fostered innovation and creativity (EKKA, 2020). Surveys reveal that teaching staff gained confidence with growing experience (EKKA, 2020). While basic digital skills almost always improved, specific analysis and assessment skills improved the least (Poom-Valickis et al, 2020).

3.1.2 Students’ digital skills

As for the students’ digital skills, the teaching staff mentioned the students' insufficient technical readiness (sound and image display problems, internet connection, etc) as an obstacle, but the lack of digital skills was not explicitly mentioned. The students themselves were generally satisfied with the Internet connection as well as the hardware and software, their digital competencies and their ability to solve technical problems. Students’ higher digital competence was related to higher satisfaction with studies (Poom-Valickis et al, 2020). The survey conducted in the University of Tartu mentions that the difference between the digital skills of teaching staff and students was a concern, but it is not specified in which areas the students’ skills were lacking (Trumm et al 2020). Another survey conducted among the bachelor’s level teacher students of the Institute of Education of the University of Tartu (n=119) revealed that most of the respondents rated their digital competences highly (Local response to online teaching: Estonia, 2021).

Table 1. Students’ self-reported digital competencies, 1st level teacher students, Institute of Education, University of Tartu (n=119)

Response	Strongly agree	Agree	Neither agree nor disagree	Disagree	Strongly disagree
I know how to connect to a WIFI network	91,5%	6,8%	1,7%	0,0%	0,0%

I know how to manage online files	87,4%	11,8%	0,8%	0,0%	0,0%
I know how to open a new tab in my browser	82,2%	12,7%	1,7%	1,7%	1,7%
I know how to connect to an online platform	78,2%	19,3%	1,7%	0,8%	0,0%
I know which information I should and shouldn't share online	72,9%	22,9%	4,2%	0,0%	0,0%
I know how to complete online forms	72,0%	23,7%	4,2%	0,0%	0,0%
I am careful about my comments and behaviours while I am online	67,2%	27,7%	4,2%	0,8%	0,0%
I know when I should and shouldn't share information online	65,5%	28,6%	5,9%	0,0%	0,0%
I know how to adjust privacy settings	50,4%	34,5%	10,9%	4,2%	0,0%
I can easily find the information I need on a website	49,6%	44,5%	5,0%	0,8%	0,0%
I know how to create a video	46,2%	30,3%	14,3%	5,9%	3,4%
I know how to use shortcut keys	40,3%	31,9%	23,5%	2,5%	1,7%
I can easily navigate through the tools included in different online platforms	34,5%	43,7%	16,8%	5,0%	0,0%
I feel confident putting content I have created online	24,6%	38,1%	22,0%	9,3%	5,9%
I know how to create an infographic	17,6%	22,7%	30,3%	22,7%	6,7%
I know how to design a website	10,1%	19,3%	25,2%	26,9%	18,5%

3.1.3 Internet coverage and availability of devices

In 2020, 90% of Estonian households had Internet connection and there were no significant differences between urban and rural households, with North-Eastern Estonia being the only outlier with 77,4% of households having Internet connection (Statistical Database, n.d.).

According to the survey of all Estonian higher educational institutions, internet coverage in the context of remote teaching and learning mostly became a problem if there were multiple family members using the Internet simultaneously, for example children of school age having video lessons. This concerned both the faculty and the students. (EKKA, 2020). Here it may be again worth mentioning that 31% of Estonia's university students are over 30 years old and 18% over 35 years. This means that they have to reconcile duties at work, at home and their studies.

Lack of devices necessary for digital learning (computers, microphones, cameras, headphones) did not pose a substantial problem, according to the surveys. In some cases the universities purchased and/or lended equipment to the lecturers; in the University of Tartu the student council organized computer rental (EKKA, 2020). In Tallinn University some lecturers mentioned that they lacked a digital pen with a touchscreen to replace the capabilities of a whiteboard in the classroom. In addition to specific devices, suitable software and licences for particular purposes were also missed in some cases (Poom-Valickis et al, 2020). As mentioned above, remote learning is not limited to online learning -- in Estonian Music and Theatre Academy the students who were not allowed on the premises of the university during the lockdown, missed the possibility to practice on high quality musical instruments (EKKA, 2020).

3.1.4 Existing digitalization strategies within universities

The strategic plan of the University of Tartu 2021-2025 lays out directions for digitalization under the headline of Inspiring and Pioneering Organization: *We increase the use of digital solutions in studies, which renders it possible to develop and provide virtual mobility opportunities in cooperation with international partners. We enhance the digital competence of our members and provide them with a secure possibility to communicate through digital channels, collect and retain data and develop cooperation with partners. We contribute to information technology capabilities and make sure that the data of the university become valuable and available assets.* (UT, 2020)

In the Development Plan of Tallinn University 2020-2022, educational innovation is defined as one of the focus fields, including digital innovations: *We lead an evidence-based approach and critical monitoring of digital innovations in education, thereby contributing to the development of the digital competences of teachers and learners.* (TLU, n.d.b)

Tallinn University of Technology states in their Strategic Plan 2021-2025 that the university would continue the activities initiated in the framework of the program called TalTechDigital in four lines of action: updating the digital infrastructure, digital teaching, supporting research 'lighthouses', and convening a digital forum (TalTech, n.d.b)

Reports of the surveys and analyses made by the HEIs do not refer to their existing strategies. One reason for this could be that before the pandemic, digitalization was mostly seen as a process to provide tools for complementing in-classroom learning, not replacing it entirely. In fact, all the institutional analyses put the emphasis on *distance*, not *digital*.

3.2 How Estonia managed the transition to online teaching and learning

3.2.1 Problems associated with online teaching and learning

Oliveira et al (2021) have identified the following key topics of emergency remote learning and teaching: educational process (evaluation, teacher-student interaction, outcomes, opportunities, class content, training); ICT usage (privacy, user experience, reliability, platform features, resilience); personal adaptation (technology adoption, productivity, motivation, workload, health). Another study cites self-regulation and technology use as main student challenges, use of technology for teaching as the main teacher challenge, and provision of technology and training as the main institutional challenges (Rasheed, Kamsin & Abdullah, 2020).

In Estonia, challenges and difficulties were faced by both the faculty and the students of the HEIs. All surveys reviewed mentioned the increased workload of the faculty, as new ways of teaching had to be introduced in a short period, and the students needed additional instructions, communication and feedback. Increased workload meant higher stress levels and burnout risk. Excessive amount of screen time added to health hazards. Teachers felt isolated, missed face-to-face communication, and mentioned that giving online lectures without immediate feedback from the audience sometimes felt like talking into the void (TalTech, 2020). Teaching staff who worked in healthcare facilities were additionally affected by the pandemic (EKKA, 2020).

The students' workload also increased, particularly on the account of individual assignments. This was especially the case in the beginning of the online learning period, when the lecturers did not have enough experiences estimating the time needed by the students to complete the assignments (EKKA, 2020). However, changes in the students' workload depended on their programme and study year. Final year students were somewhat less likely to report increase (Poom-Valickis et al 2020).

Some students expressed their discontent at the multitude of the online environments where teaching and learning took place: Google Drive, Dropbox, OneDrive, MS Teams, Zoom, Google Meet, Jitsi Meet, different blogging environments, Wooclap, Viber etc (TalTech, 2020). Depending on the programme, the students may have been deprived of opportunities for practical assignments and mobility (EKKA, 2020; Trumm et al, 2020).

Uncertainty about the organisation of studies and their own ability to cope with learning in the new circumstances caused anxiety and loss of motivation in some students (Trumm et al, 2020). Older learners may have been more resilient to fatigue and burnout, also self-regulatory skills, supportive home environment, and use of in-depth learning strategies were found to be correlated with fewer burnout symptoms (Poom-Valickis et al, 2020). Students' learning and self-regulation skills were also found to be important in the survey made at the University of Tartu (Trumm et al 2020).

An important aspect that had an impact on a lot of people among both students and teaching staff was negotiation of work, study and family responsibilities. With schools and kindergartens closed, children stayed at home and needed supervision as well as help with their studies. Situation was further aggravated for students who worked as teachers and experienced a new and challenging situation at their schools (Poom-Valickis et al, 2020).

3.2.2 Institutional response

Almost all HEIs had to make adjustments in their instruction. However, there were differences across subjects and study years. Completing practical work or apprenticeships was postponed to autumn by almost all HEIs. Deadlines were extended, postponing graduation to August and in exceptional cases allowing to complete practical training after defending the final thesis (EKKA, 2020). Tallinn University of Technology postponed the end of the semester, so that the students could use its laboratories for writing their thesis to increase the possibility of graduation. Students who were in mobility programs and did not get the required credits were offered the opportunity to stay on academic leave. (TalTech, 2020). Private higher education institutions postponed the deadlines for payment of tuition fees (EKKA, 2020).

While the number of Moodle supported courses did not see an increase, a significant change was the increase in the number of video lectures and webinars. Also, there was a considerable change in the grading methods, mainly from differentiated to non-differentiated grading (Trumm et al, 2020).

Overall, the HEIs' response to the challenges arising from forced distance learning was similar:

- organizational changes (grading, academic calendar, apprenticeships, mobility, defences, graduations);
- purchase of additional equipment (webcams, headphones, monitors etc);
- publication of guidelines and instructions;

- technological and methodological support for using learning environments and/or redesigning courses;
- offering psychological support;
- monitoring of the situation, interviews and questionnaires.

It was noted that it was easier to provide training and support to regular teaching staff while supporting visiting lecturers from outside the HEIs was a bigger challenge as it would mean preparing someone for the job who might already be replaced next year (EKKA, 2020).

3.2.3 Equity and equality in distance learning

Some issues regarding equal access to distance learning were mentioned in the surveys: two HEIs noted that online classes were not inclusive enough. However they did not further specify what were the problems experienced (EKKA, 2020). In one case it was reported that the Estonian and the international students and teaching staff were not in the same information space, and that the English-speaking university community received information later (Trumm et al, 2020).

As for more general issues of equity and equality it was mentioned that additional costs were incurred by students and teaching staff, e.g upgrading internet plans, phone bills, new devices. On the other hand, both faculty and students mentioned that there was no need to commute any more (EKKA, 2020).

3.3 Challenges and opportunities stemming from the crisis

According to the surveys, the HEIs found that the overall outcome was normal and not significantly affected by the pandemic: there was no considerable effect on the academic results of students and no correlation with interruption of studies (EKKA 2020, TalTech 2020a, Trumm et al 2020). However, there were exceptions to both directions: The Estonian Academy of Arts saw more students graduating than it had had for several years and cited as the reasons that *students focused more on their*

studies, since all entertainment facilities, bars, clubs, etc. were closed. The only HEI with a slightly higher dropout rate was Estonian Music Academy, probably first and foremost because of increased responsibilities due to COVID-19. Many had to rearrange some aspects of their work, while others had to focus more on taking care of their children. On top of that, all the technical issues and requirements. (EKKA, 2020).

Respondents in the surveys mentioned new opportunities that arose during the largely online learning, like closer cooperation between teaching staff, planning the studies together, and participating in colleagues' virtual lectures. Some HEIs found that normalization of digital learning and communication made it possible to involve foreign experts in the studies – something that would otherwise have been impossible (EKKA, 2020). No positive affective outcomes were mentioned, however, while in some other contexts teachers have reported enriching experiences learning from students whose technological skills surpassed their own and gaining a sense of empathy for their students as learners through the process. (Cutri, Mena & Whiting, 2020).

Almost all HEIs in the national survey repeatedly mentioned that they would continue to use flexible learning, with some students physically in the classroom and others joining online. Today, many HEIs already offer flexible or hybrid learning (EKKA, 2020). Future solutions are seen in blended learning and the growing share of online learning in traditional learning. Thus, the HEIs aim to create a better infrastructure, with classrooms equipped for hybrid learning and more functional online environments. We agree with those who point out that educational technology industry has seen the crisis as a business opportunity and the long-term consequences of this are yet to be seen (Williamson, Eynon & Potter, 2020).

However, some significant adjustments need to be made inside the HEIs. While during the pandemic the focus was on the technical issues and methodological approach remained in the background, high-quality e-learning experience presupposes a significantly wider pedagogical repertoire of teaching staff.

Morris (2018) claims that in developing online learning the focus of the universities has often been on efficiency, content mastery and delivery of instruction rather than rich learning experiences. However, in online teaching traditional pedagogical strategies cannot be directly transferred into online environments (Montelongo & Eaton, 2019). Using a learning-centred constructivist approach in online courses is critical to student success, as per Carwile (2007). Bryson & Andres (2020) point out that teaching online means a shift from teaching-centered to learning-centered paradigm where the instructors need to take on the roles of facilitators of learning rather than conveyors of information. According to another increasingly popular metaphor, teachers in technology enhanced instruction are seen as orchestrating a number of roles in complex environments (Roschelle, Dimitriadis, & Hoppe, 2013).

Pedagogical Technological Content Knowledge framework emphasizes the connections, interactions, affordances, and constraints between and among content, pedagogy, and technology (Mishra & Koehler, 2006). Fink (2016) has identified five college level high-impact teaching practices: 1) helping students become meta-learners; 2) learning-centered course design; 3) using small groups in a powerful way; 4) service-learning/community engagement – with reflection, and 5) being a leader with students. A more methodology oriented approach has been adopted by other authors: (1) first-year seminars and experiences; 2) common intellectual experiences; 3) learning communities; 4) writing-intensive courses; 5) collaborative assignments and projects; 6) undergraduate research; 7) diversity and global learning; 8) service learning and community-based learning; 9) internships; 10) capstone courses and projects; 11) e-portfolios) with specific recommendations given for online teaching (Linder & Hayes, 2018).

A study focusing on online teacher education cites Piccianos's (2017) Blending with Pedagogical Purpose Model with seven features: 1) content (LMS, media, games); 2) reflection (blogs, journals); 3) social-emotional learning (face to face meeting, tutoring); 4) collaboration (student generated content, Wikis, mobile technology; 5) dialectic questioning (discussion board); 6) evaluation (assignments, papers, tests, student

presentations, e-portfolios, learning analytics; 7) self-paced independent study (adaptive software) (Quezada, Talbot & Quezada-Parker, 2020).

A multitude of strategies (or rather, tactical approaches) have been proposed to facilitate the adoption of learning technologies (Liu, Geertshuis & Grainger, 2020; McGee, Windes & Torres 2017). It has to be taken into account that preparing units for online delivery takes more time from faculty than on-campus delivery (Kenny & Fluck, 2017) Designing of an effective distance learning programme is resource intensive and time consuming, thus emergency remote education has called for rapid improvisation. (Bryson & Andres, 2020). But in the future, there is a need for support from study assistants and study designers with knowledge in educational technology as well as in the psychology of learning and the didactics of teaching in higher education (Poom-Valickis et al, 2020; Trumm et al, 2020).

As for the students' readiness to cope with mostly online learning, there may be a need for training courses supporting the learning and self-regulation skills of the students, particularly first year students who were most likely to experience difficulties. Also, the methods and materials used in teaching first year courses may need to be revised. (Trumm et al, 2020).

HEIs were also asked what kind of assistance and interventions they would expect from the government, and the following topics were outlined: ICT related training, support and sharing of best teaching practices; compensation for the investments into technical capabilities; organization of joint tenders for purchasing hardware and software licenses; stable and sufficient internet coverage. A common policy of data protection was also called for (EKKA, 2020).

4. Summary and implications

Before the pandemic, digitalization was mostly seen by the Estonian HEIs as tools to complement in-classroom learning, not to replace it entirely. It appears that all the institutional analyses put more emphasis on the distance aspect of learning, not its digital tools.

All HEIs had to adjust their instruction: make organizational changes, purchase additional equipment, publish guidelines and instructions, offer technological, methodological and psychological support, monitor the situation. Most HEIs found that the overall educational outcome was not significantly affected by the pandemic. Some saw new opportunities arising: more cooperation between teaching staff, planning the studies together, participating in colleagues' virtual lectures, engaging foreign experts etc.

However, distance learning and teaching also caused increased workload for the faculty, including new health hazards (excessive screen time, psycho-social problems arising from feelings of isolation). While during the crisis people may have made concessions, these issues have to be better addressed in the future.

It was found that the changes in the students' learning experience depended on their programme, study year and age. It is recommended that the students' learning and self-regulation skills be better supported, particularly in the first-year courses or as a dedicated class. It is necessary to adequately address students' anxiety and other mental health issues. (Baloran, 2020; Gillis & Krull, 2020)

Digital skills of the teaching staff and students were not seen as a major problem. Availability of devices and Internet connection may have been a problem for some, but solutions were quickly deployed by both HEIs and other organizations. We may probably conclude that the technical problems will not hinder growing online and hybrid learning which were seen as a future solution irrespective of the pandemic

situation. However, digital competences have to be understood in the wider framework of pedagogical competencies. High-quality e-learning experience presupposes a special pedagogical repertoire of teaching staff and this will need more time and dedicated effort to develop.

5. Case Study

On January 29, 2021, Estonian Minister of Education and Research had a meeting with the representatives of the HEIs where the national response to the COVID-19 pandemic was discussed. It was proposed that the University of Tartu and Tallinn University would launch a program of assistant teachers from amongst the teacher students. Professor Margus Pedaste, director of Pedagogicum, the co-ordinating body of teacher education at the University of Tartu, prepared initial forms -- one for the volunteers and another for the receiving organizations. It was agreed that people both in Tallinn and in Tartu would monitor the responses, find matches and organize the placement of the volunteers.

A total of 353 students enrolled: 203 from the University of Tartu, 150 from other HEIs, mostly from Tallinn University. During the period of February to June 2021, they worked a total of 3374 hours in 102 educational institutions. In June, a questionnaire was sent to all participating students as well as schools and kindergartens.

113 students responded: 87 from the University of Tartu and 26 from Tallinn University. 96 had volunteered as assistant teachers: 89 in schools, 7 in kindergartens and 1 in both. 55% had been teaching in a classroom, 45% from a distance. 33% had taught a whole class, others a smaller group of students.

The most help (44%) was provided in the form of consultations and tutoring for students who were falling behind during the pandemic. The next most common form was teaching classes (20%). In 13% of the cases the students needed emotional and/or

behavioral support. Other tasks mentioned were language assistance, grading of student works, preparation of lessons, and support of digital competences.

The students said that they mostly learned from the program what the teachers' daily work really was like (24%), how important were communication and presentation skills (19%) and creation of a learning environment (19%). 11% said that this opportunity confirmed for them that they had chosen the right career. When asked what they learned in the framework of their teacher studies, the responses varied: 30% mentioned collaboration, 21% preparing lessons and teaching classes, 16% teacher's personality traits, 14% differentiation of teaching according to the learners' needs.

Nearly 50% of the respondents admitted that the scholarship offered wasn't really a motivator for them when deciding whether to enrol in the program. Only about 10% said it was very important for them.

The students were also asked what were the hindrances that affected their participation in the program. 55% mentioned logistics as a major hindrance, 26% mentioned difficulty negotiating responsibilities at the university, at work and at a volunteer placement.

Nearly 90% of the respondents said that the experience was very valuable or mostly valuable. It should be borne in mind that the survey was answered by both actively cooperating educational institutions and students, and those who during this period remained only at the level of enrolment in the program. Of the students who got placed in a school or kindergarten, 59% said it was very valuable for them. 94% said that they would definitely or likely recommend this experience to other students, recognizing both the organization of the program and the relevance of the problem to be addressed. They were also given an opportunity to describe what they thought went particularly well. 32% said it was teaching classes, 25% said interaction with students, 19% said collaboration with teachers and 14% mentioned personal development.

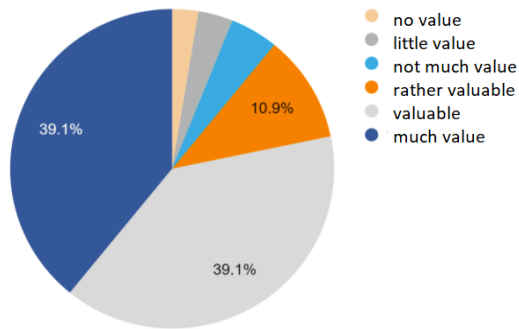


Figure 1. Value of the program

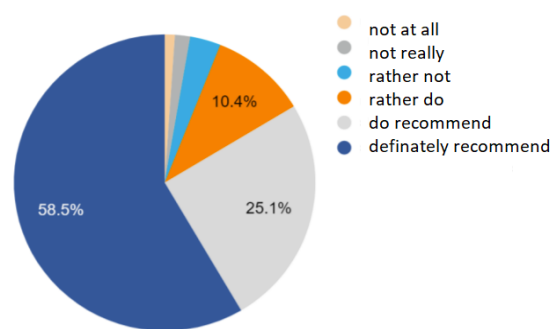


Figure 2. Would you recommend the program to other students and organizations?

Figure 1. Perceived value of the volunteer program.

60 schools and 10 kindergartens who received volunteers also gave their feedback to the program. 36% of the respondents said that collaboration went smoothly, 7% said that better and more clear communication was needed, and 7% said that good cooperation would have needed more time to grow. 40% did not mention any issues. At least one respondent mentioned that having a volunteer was a valuable learning experience for the hosting teacher too. At least one school hired the volunteer on a full-time basis. One teacher mentioned that while teacher students were taught the ideal version of school life, reality was much more diverse and complicated. Altogether, 82% of the educational institutions said that the experience was very valuable or mostly valuable for them and 75 said they would like to continue in the program after the summer holidays.

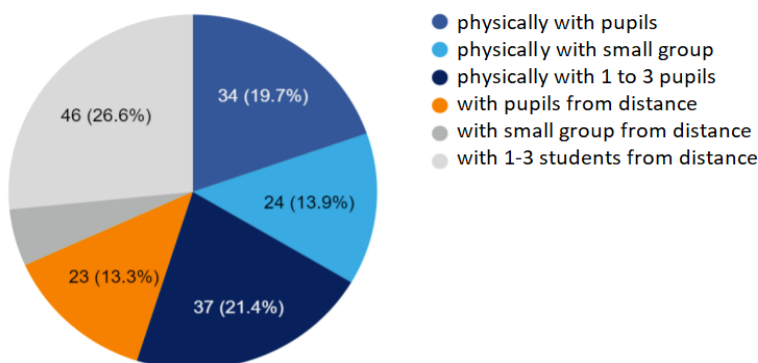


Figure 2. The form of assistance provided by the students

We can thus conclude that despite the limitations, the university, with significant institutional and financial assistance, succeed in providing the students with a rich and valuable learning experience.

6. Bibliography

- Adedoyin, O. B., & Soykan, E. (2020). Covid-19 pandemic and online learning: The challenges and opportunities. *Interactive Learning Environments*, 1–13. <https://doi.org/10.1080/10494820.2020.1813180>
- Andmekaitse Inspektsioon (2017). [The Data Protection Inspectorate] E-õppe keskkondade seire [Monitoring of e-learning environments]. Accessed at https://www.aki.ee/sites/default/files/seired/e-oppe_keskkondade_seire_kokkuvote.pdf
- Approved by the Council of the University of Tartu on 23 December 2005 (Resolution No. 85). Accessed at <https://www.ut.ee/en/studies/elearning/teaching/elearning-strategy>
- Aru-Chabilan, H. (2020) Tiger Leap for digital turn in Estonian education. *Educational Media International*, 57:1, 61-72. <https://doi.org/10.1080/09523987.2020.1744858>
- Baloran, E. T. (2020). Knowledge, Attitudes, Anxiety, and Coping Strategies of Students during COVID-19 Pandemic, *Journal of Loss and Trauma*, 25:8, 635-642. <https://doi.org/10.1080/15325024.2020.1769300>
- Bozkurt, A., & Sharma, R. C. (2020). Emergency remote teaching in a time of global crisis due to Corona Virus pandemic. *Asian Journal of Distance Education*, 15(1), i–iv. <http://dx.doi.org/10.5281/zenodo.3778083>
- Bryson, J. R., & Andres, L. (2020). Covid-19 and rapid adoption and improvisation of online teaching: Curating resources for extensive versus intensive online learning experiences. *Journal of Geography in Higher Education*, 44(4), 608–623. <https://doi.org/10.1080/03098265.2020.1807478>
- Carwile, J. (2007). A constructivist approach to online teaching and learning. *Inquiry*, 12(1), 68–73.
- Crawford, J., Butler-Henderson, K., Rudolph, J., Malkawi, B., Glowatz, M., Burton, R., Magni, P. A., Lam, S. (2020). COVID-19: 20 countries' higher education intra-period digital pedagogy responses. *Journal of Applied Learning & Teaching*. Vol.3 No.1 (2020). <https://doi.org/10.37074/jalt.2020.3.1.7>

- Cutri, R. M., Mena, J., & Whiting, E. F. (2020). Faculty readiness for online crisis teaching: Transitioning to online teaching during the COVID-19 pandemic. *European Journal of Teacher Education*, 43(4), 523–541. <https://doi.org/10.1080/02619768.2020.1815702>
- E-course Quality Evaluation Tool (2021) Accessed at <https://qualityevaluation.etu.ut.ee/>
- EENet (n.d.) Akadeemilise andmeside areng Eestis [Development of Academic Telecommunications] Accessed at https://www.eenet.ee/EENet/akadeemilise_andmeside_areng_Eestis
- EKKA (2020). How did higher education institutions cope with the forced distance learning from March to June 2020. Summary. Accessed at <https://ekka.edu.ee/wp-content/uploads/Digio%CC%83ppe-analu%CC%88u%CC%88s-Final-EN-8.1.21.pdf>
- EKKA (2021). Juhend kvaliteetse e-kursuse loomiseks. [Guidelines for Creating a High Quality E-Course] Eesti Kõrg- ja Kutsehariduse Kvaliteediagentuur, 2021. Accessed at <https://oppevara.edu.ee/ekursus/#ekursus>
- E-Learning Strategy (2005). E-learning strategy 2006-2010
- E-õppe Uudiskiri (n.d) [Newsletter of E-Learning]. Accessed at uudiskiri.e-ope.ee
- ERR News (2020a). “Universities, colleges approach to COVID-19 measures vary widely”. 10 September 2020. Accessed at <https://news.err.ee/1133100/universities-colleges-approach-to-covid-19-measures-vary-widely>
- ERR News (2020b). Universities hope to stop distance learning in spring semester. 17 December 2020. Accessed at <https://news.err.ee/1210321/universities-hope-to-stop-distance-learning-in-spring-semester>
- Fink, L. D. (2016). Five high impact teaching practices: A list of possibilities. *Collected Essays on Learning and Teaching*, 9, 3-18.
- Gillis, A., & Krull, L. M. (2020). COVID-19 remote learning transition in Spring 2020: Class structures, student perceptions, and inequality in college courses. *Teaching Sociology*, 48(4), 283–299. <https://doi.org/10.1177/0092055x20954263>
- Haridussilm (n.d.) Accessed at www.haridussilm.ee
- HITSA (2019). Estonian E-course Quality Label. Information Technology Foundation for Education, 2019. Accessed at https://ekka.edu.ee/wp-content/uploads/Process_ENG.pdf
- Hodges, C., Moore, S., Lockee, B., Trust, T., & Bond, A. (2020). The difference between emergency remote teaching and online learning. *Educause Review*, 27, 1–12. Accessed at <https://er.educause.edu/articles/2020/3/the-difference-between-emergency-remote-teaching-and-online-learning>

- Kenny, J. & Fluck, A. E. (2017). Towards a methodology to determine standard time allocations for academic work. *Journal of Higher Education Policy & Management*, 39(5), 503-523.
<https://doi.org/10.1080/1360080X.2017.1354773>
- Lasn, T. (n.d.) E-õppe esimesed 15 aastat [The first 15 years of e-learning]. Accessed at <https://kodu.ut.ee/~tlasn/E-KURSUSED/Ajalugu.html>
- Linder, K. E. & Hayes, C. M. (ed), (2018). *High-Impact Practices in Online Education*. Herndon, VA, Stylus, 2018.
- Liu, Q., Geertshuis, S., Grainger, R. (2020). Understanding academics' adoption of learning technologies: A systematic review. *Computers & Education* 151 (2020) 103857
- Marandi, T, Tiirmaa-Oras, S., Pilt, L., Reino, A., Teekivi, E. (2006). Organisatsioonikultuur ja e-õpe Eesti kõrghariduses. Projekti "Regionaalselt kättesaadav kvaliteetne kõrgharidus läbi e-õppe arenduse" lõpparuanne [Organizational culture and e-learning in Estonian higher education. Final report of the project "Regionally available high-quality higher education through the development of e-learning"]. Accessed at https://www.ut.ee/sites/default/files/ut_files/0b5ddb2e42ad950ba7e1eced5ba83227.pdf
- Marinoni, G., Land, H. V. T. & Jensen, T. (2020). The impact of COVID-19 on higher education around the world. Accessed at https://www.iau-aiu.net/IMG/pdf/iau_covid19_and_he_survey_report_final_may_2020.pdf
- McGee, P., Windes, D. & Torres, M. (2017). Experienced online instructors: beliefs and preferred supports regarding online teaching. *Journal of Computing in Higher Education*. 29, 331–352 (2017). <https://doi.org/10.1007/s12528-017-9140-6>
- Mishra, P., & Koehler, M. J. (2006). Technological pedagogical content knowledge: A framework for teacher knowledge. *Teachers College Record*, 108(6), 1017-1054. <https://doi.org/10.1111/j.1467-9620.2006.00684.x>
- Mohammed, A. O., Khidhir, B. A., Nazeer, A., & Vijayan, V. J. (2020). Emergency remote teaching during Coronavirus pandemic: The current trend and future directive at Middle East College Oman. *Innovative Infrastructure Solutions*, 5(3), 72. <https://doi.org/10.1007/s41062-020-00326-7>
- Montelongo, R. (2019). Less than/more than: Issues associated with high-impact online teaching and learning. *Administrative Issues Journal: Connecting Education, Practice, and Research*, Summer 2019. Vol. 9, No. 1: 68-79. DOI: 10.5929/9.1.5
- Montelongo, R., & Eaton, P. W. (2019). Strategies and reflections on teaching diversity in digital space(s). In L. Kyei-Blankson, J. Blankson, & E. Ntuli (Eds.),

Care and culturally responsive pedagogy in online settings (pp. 41-62).
Hershey, PA: IGI Global.

- Morris, S. M. (2018, April 4). Online learning shouldn't be "less than". Inside Higher Ed. Accessed at <https://www.insidehighered.com/digital-learning/views/2018/04/04/are-we-giving-online-students-education-all-nuance-and-complexity>
- OECD (2021), The state of higher education: One year into the COVID-19 pandemic, OECD Publishing, Paris, <https://doi.org/10.1787/83c41957-en>.
- Oliveira, G., Teixeira, J. G., Torres, A. & Morais, C. (2021). An exploratory study on the emergency remote education experience of higher education students and teachers during the COVID-19 pandemic. *British Journal of Educational Technology*, 52:1357-1376. <https://doi.org/10.1111/bjet.13112>
- Picciano, A. (2017). Theories and Frameworks for Online Education: Seeking an Integrated Model. *Online Learning*, 21(3). <http://dx.doi.org/10.24059/olj.v21i3.1225>
- Poom-Valickis, K., Aus, K., Väljataga, T., Rumma, K., Tammets, K. (2020) Tallinna Ülikooli distantõppe uuringu põhitulemused. [Main Findings of the Survey on Remote Learning by Tallinn University]. Tallinna Ülikool. Tallinn 2020
- Punie, Y., editor(s), Redecker, C. (2017). European Framework for the Digital Competence of Educators: DigCompEdu. Publications Office of the European Union, Luxembourg, 2017. <https://doi.org/10.2760/159770>
- Quezada, R. L., Talbot, C. & Quezada-Parker, K. B. (2020) From Bricks and Mortar to Remote Teaching: A Teacher Education Program's Response to COVID-19, *Journal of Education for Teaching*, 46:4, 472-483. <https://doi.org/10.1080/02607476.2020.1801330>
- Rasheed, R. A., Kamsin, A., & Abdullah, N. A. (2020). Challenges in the online component of blended learning: A systematic review. *Computers & Education*, 144, 103701. <https://doi.org/10.1016/j.compedu.2019.103701>
- Roschelle, J., Dimitriadis, Y., & Hoppe, U. (2013). Classroom orchestration: Synthesis. *Computers & Education*, 69, 523–526. <https://doi.org/10.1016/j.compedu.2013.04.010>
- Statistical Database (n.d.). Statistics Estonia. IT20: Households Having a Computer and Internet Connection at Home by Type of Household and Place of Residence. Accessed at https://andmed.stat.ee/en/stat/majandus__infotehnoloogia__infotehnoloogia-leibkonnas/IT20
- Strielkowski, W. (2020). COVID-19 pandemic and the digital revolution in academia and higher education. Preprints, 2020040290. <http://doi.org/10.20944/preprints202004.0290.v1>

- TalTech (2020a). Tallinna Tehnikaülikooli toimetulek distantsõppega 2020 aasta kevad- ja sügissemestril [How Tallinn University of Technology coped with distance learning in the spring and fall terms of 2020].
- TalTech (2020b). Organisation of Studies and Work at Taltech Starting December 14. Accessed at <https://taltech.ee/en/news/organisation-studies-and-work-taltech-starting-december-14>
- TalTech (n.d.a) Educational Technology Centre, Tallinn University of Technology. Accessed at <https://taltech.ee/en/e-learning>
- TalTech (n.d.b) TalTechDigital. Accessed at <https://taltech.ee/en/taltechdigital>
- Tartu Ülikooli e-õppe ajakiri (2021). Accessed at <https://etu.ut.ee/>
- The Tiger University Program (n.d.) Accessed at <https://www.itcollege.ee/en/it-college/foundation-management/the-tiger-university/the-tiger-university-program/>
- TLU (2020). Studies mainly continue to take place in distance. News. 24.03.2020. Accessed at <https://www.tlu.ee/en/news/studies-mainly-continue-take-place-distance-learning>
- TLU (n.d.a) Tallinn University E-learning Centre. Accessed at <https://www.tlu.ee/en/elearningcentre>
- TLU(n.d.b) the Tallinn University Development Plan 2020-2022. Accessed at <https://www.tlu.ee/en/development-plan-2020-2022>
- Trumm, E., Urmann, H., Remmik, M., Mägi, M., Tubelt, E., Espenberg, S. (2020). Lessons Learnt from Emergency Situation: Distance Learning at the University of Tartu. Tartu, CASS, 2020. Accessed at https://www.ut.ee/sites/default/files/www_ut/ut_lessons_from_2020_distance_learning.pdf
- UT (2020). University of Tartu Strategic Plan 2021-2025. Tartu, 2020. Accessed at https://www.ut.ee/sites/default/files/www_ut/ulikoolist/tu_arengukava_2025_en_web_1_0.pdf
- Williamson, B., Eynon, R., & Potter, J. (2020). Pandemic politics, pedagogies and practices: Digital technologies and distance education during the coronavirus emergency. *Learning, Media and Technology*, 45(2), 107–114. <https://doi.org/10.1080/17439884.2020.1761641>