

Developing meaningful distance learning experiences in the era and post-era of Covid

A literature review

Samuli

Homanen

MASTER'S THESIS	
Arcada	
Degree Programme:	Media Management
Identification number:	8337
Author:	Samuli Homanen
Title:	Developing meaningful distance learning experiences in the era of Covid - A literature review
Supervisor (Arcada):	Petri Honkanen
<p>Abstract:</p> <p>This literature review - "Developing meaningful distance learning experiences in the era and post-era of Covid" - opens the challenges and opportunities that have arisen during Covid as higher education moved to distance learning. In this way, it strives to provide ideas for designing the best possible distance learning experience in the context of higher education. All the phenomena will be holistically examined from the perspectives of society, institutions, teachers, and students to get the broadest possible picture of the situation. In addition to the literature review, the usefulness of the TPACK Framework for possible further research and development of educational technologies will also be assessed. TPACK framework was chosen for study because it appeared to provide a potential starting point for the development of teaching using technologies.</p> <p>The research questions selected for the literature review were:</p> <ul style="list-style-type: none"> • What have been the main challenges when higher education switched to distance learning because of Covid? • What are the main things to consider when aiming for a successful distance learning experience in the post-era of Covid? • What should technology developers take into consideration when developing distance learning systems/Edu-tech? • Could the TPACK framework serve as a possible model or tool in Edu-tech development? <p>The findings show that while the fast transition to distance learning during Covid has posed many challenges, it has also offered many opportunities for re-evaluating and developing distance learning in the context of Covid and higher education. Because distance learning will likely continue in its various forms even after Covid, efficient, collaborative, innovative, flexible, and positive attitudes towards this kind of disruption are needed from universities, teachers, and students. In addition to the literature review, it was found that the TPACK framework was not able to meet all the expectations placed on it adequately. Instead, other alternative models as well as uses of original TPACK were found for possible future studies.</p>	
Keywords:	distance learning, online learning, e-learning, TPACK, higher education
Number of pages:	71 + 3
Language:	English
Date of acceptance:	31.5.2021

OPINNÄYTE	
Arcada	
Koulutusohjelma:	Media Management
Tunnistenumero:	8337
Tekijä:	Samuli Homanen
Työn nimi:	Developing meaningful distance learning experiences in the era of Covid - A literature review
Työn ohjaaja (Arcada):	Petri Honkanen
<p>Tiivistelmä:</p> <p>Tämä kirjallisuuskatsaus -”Developing meaningful distance learning experiences in the era and post-era of Covid” - avaa haasteita sekä mahdollisuuksia, joita on ilmaantunut, kun korkeakoulut ovat siirtyneet etäopiskeluun Covidin takia. Tehtyjen havaintojen myötä se pyrkii tarjoamaan näkökulmia parhaan mahdollisen etäopiskelukokemuksen suunnitteluun sekä toteuttamiseen korkeakoulujen kontekstissa. Kirjallisuuskatsauksen ilmiöitä tullaan arvioimaan kokonaisvaltaisesti niin yhteiskunnan, koulutusinstituutioiden, opettajien sekä opiskelijoiden näkökulmista, jotta tilanteesta saadaan mahdollisimman laaja kuva. Kirjallisuuskatsauksen rinnalla tullaan arvioimaan myös TPACK Frameworkin käyttökelpoisuutta sekä hyödyllisyyttä mahdollisia jatkotutkimuksia sekä koulutusteknologioiden kehittämishankkeita ajatellen. TPACK framework valittiin evaluoitavaksi, koska sen on väitetty tarjoavan potentiaalisen lähtökohdan tekniikan avulla tapahtuvan opetuksen kehittämiseksi.</p> <p>Kirjallisuuskatsaukseen valitut tutkimuskysymykset olivat:</p> <ul style="list-style-type: none"> • Mitkä ovat olleet suurimmat haasteet, kun korkeakouluopetus siirtyi etäopiskeluun Covidin takia? • Mitkä ovat tärkeimmät huomioitavat tavoitteet onnistuneelle etäopetuskokemukselle Covidin jälkeisellä aikakaudella? • Mitä teknologiakehittäjien tulisi ottaa huomioon kehittäessään etäopetusjärjestelmiä / Edutech-tekniikkaa? • Voisiko TPACK-kehys toimia mahdollisena mallina tai työkaluna Edutechin-kehityksessä? <p>Tulokset osoittavat, että vaikka nopea siirtyminen etäopiskeluun Covidin aikana on aiheuttanut monia haasteita, se on toisaalta tarjonnut myös monia mahdollisuuksia etäopetuksen uudelleenarviointiin sekä kehittämiseen Covidin ja korkeakoulutuksen konteksteissa. Koska etäopiskelu todennäköisesti jatkuu uusissa muodoissaan myös Covidin jälkeen, tilanne tulee vaatimaan tehokasta, yhteistyöhön perustuvaa, innovatiivista, joustavaa ja positiivista asennetta niin kouluilta, opettajilta kuin myös opiskelijoilta myös jatkossa. TPACK frameworkia ei näyttäytynyt riittävän kokonaisvaltaisena mallina etäopetuksen haasteiden ratkaisemiseksi Covidin kaltaisissa tilanteissa. Sen sijaan mahdollisia jatkotutkimuksia varten löydettiin muita vaihtoehtoisia malleja sekä TPACK:n sovellusmahdollisuuksia.</p>	
Avainsanat:	distance learning, online learning, e-learning, TPACK, higher education
Sivumäärä:	71 + 3
Kieli:	Englanti
Hyväksymispäivämäärä:	31.5.2021

CONTENTS

Figures	6
1 Introduction	7
1.1 Aim and rationale.....	8
1.2 Structure of thesis.....	10
2 Research setting and methods	11
2.1 Research method – a literature review.....	11
2.2 Research questions.....	11
2.3 Hypotheses.....	11
2.4 Data selection.....	12
2.5 Limitations of the study.....	13
3 Framework to be tested and concept definition of distance learning	14
3.1 TPACK – Introduction to the framework to be evaluated.....	14
3.1.1 <i>Introduction</i>	14
3.1.2 <i>Structure of the TPACK Framework</i>	15
3.1.3 <i>How the TPACK Framework was evaluated in this study</i>	19
3.2 Distance learning – concept definition.....	19
4 Literature review	22
4.1 Intro.....	22
4.1.1 <i>Context – Arrival of Covid</i>	22
4.1.2 <i>The importance of distance learning for universities</i>	23
4.2 Main challenges with Covid.....	24
4.2.1 <i>Financial challenges of higher education institutions and society</i>	24
4.2.2 <i>Teaching in disruption</i>	25
4.2.3 <i>Teacher vs. student-centeredness</i>	26
4.2.4 <i>Resistance</i>	27
4.2.5 <i>Distance learning is not face-to-face learning</i>	28
4.2.6 <i>Completing courses, gaining qualifications, and graduating</i>	29
4.2.7 <i>Quality assurance and feedback</i>	29
4.2.8 <i>Challenges faced by students</i>	30
4.2.9 <i>Mental, physical, and social problems</i>	33
4.2.10 <i>Inequality</i>	34
4.2.11 <i>Challenges with technologies</i>	35
5 Towards meaningful distance learning	38

5.1	Hybrid model of distance learning	38
5.2	Breaking the hierarchies of education	38
5.3	Pivotal role of the teachers in distance learning during Covid	39
5.4	No specific time or space – The world is getting smaller and more accessible	40
5.5	Distance learning is here to stay – but not as the only option	41
5.6	Virtual communities, the possible fusion of universities and shared teaching content	43
5.7	Towards more sustainable and pleasant distance learning environments	44
5.8	Student attitudes	45
5.9	The increased importance of feedback and warning signs	46
5.10	Clear guidelines	47
5.11	Co-developing quality technologies and content	48
5.12	Other technological opportunities	50
6	Evaluating the future applicability of the TPACK model	54
6.1	First impressions	54
6.2	Further findings on TPACK	55
6.3	ICT-TPCK and Activity Theory – possible combination?	58
6.4	Future of TPACK Framework?	58
7	Conclusion, discussion, and suggestions	60
7.1	Towards new normal	60
7.2	Disruption and resistance as a germ cell of development	61
7.3	New kind of learning for new kind of learners	63
7.4	Possible directions for technological development	64
7.5	Final remarks on the TPACK Framework	66
7.6	More research is needed	66
	References	68
	Appendix 1. List and description of the literature review material	72

FIGURES

Figure 1. Updated Venn diagram of Technological Pedagogical Content Knowledge (TPACK) – model.....	15
Figure 2. Relationships between terms used in teaching and learning with various technologies according to Anohina (2005, p. 100).....	20
Figure 3. ICT-TPCK by Angeli & Valanides (2009, p.159).....	56
Figure 4. TPACK XL - Theoretical framework model, in which the interconnectedness of all different Knowledge Constructs is present. (Saad et al., 2012, p.48 & 50).	57

Tables

Table 1. Criteria for inclusion and exclusion of articles.....	12
--	----

Appendices

Appendix 1. List and description of the literature review material.	69
--	----

1 INTRODUCTION

The global Covid pandemic that emerged in 2020 forced universities and their teachers to adapt to a new kind of reality and rethink their operating models and ways of working. Due to the restrictions brought by social distancing, learning was transferred almost entirely into the form of distance learning. During this process, previously well-established teaching methods have faced a partial or even complete makeover challenging institution, teachers, students, and supporting staff to expand their knowledge and skills (Barton, 2020, p. 12499; Brammer & Clark, 2020, p. 454). According to several scholars (e.g., Brammer & Clark, 2020, p. 453; Cheema, 2020, p. 2; Elfirdoussi et al., 2020, p. 1; Mladenova et al., 2020, p. 1169; Torda, 2020, p. 1151), we have faced a new normal of education, in which the future of education will inevitably be different, and distance learning will prevail even after Covid.

During this disruption, it has been shown that more research is needed in the future of distance education and e-learning. As a response to this challenge, this study seeks to examine the challenges and opportunities that Covid has highlighted when universities have moved to distance learning. This way, the aim is to present ideas for designing the best possible distance learning experience in the context of higher education. Because distance learning has become more prevalent during Covid, this was an excellent opportunity for this kind of evaluation.

The literature review also aims to provide ideas and perspectives for Edu-Tech developers, especially in the context of distance learning. Therefore, one theoretical model, the TPACK framework, will also be evaluated alongside the literature review. The purpose of this is to determine whether this model could be used as a possible tool in the development of Edu-Tech in the future. The TPACK model was chosen because it is claimed to include the essential aspects required of teachers when they implement technologies for teaching. Initially, the TPACK model was intended to be used to structure the literature review, but eventually, this idea was abandoned. The reasons for this will be addressed later in the text.

1.1 Aim and rationale

This study aims to present challenges and opportunities that Covid brought as higher education moved to distance learning. These phenomena will be examined from the perspectives of society, higher education institutions, teachers, and students. Fast transition to distance learning caused by Covid will be used as an example case of this study. This is especially because Covid's situation was seen offering many opportunities to assess the challenges and opportunities related to distance learning and thus develop better content, pedagogy, and technological opportunities. Therefore, a literature review was conducted of peer-reviewed articles published between 2020 and 2021, which discusses these topics. It must be borne in mind that Covid serves mainly as an opportunity to study the essential information about what kind of challenges or opportunities this kind of a sudden transition from formal face-to-face study to its remote forms have to offer in general. A conclusion on the findings will also be presented in the form of a synthesis that goes through the most significant challenges and strives to provide possible solutions to overcome them. Thus, in addition to the discovering phenomena brought by Covid, the aim is also to outline possible guidelines for implementing better, more efficient, and planned distance learning experiences at a larger scale and in a wide variety of other situations. This allows for the best possible ways to implement various technologies into distance learning and find possible approaches to build learning environments that promote distance learning.

The time of Covid has also spawned many innovations into the field of online education. Still, even though there is a lot of knowledge of using technologies in distance learning scenarios, research on digital competence and developing proper distance learning tools has been limited. There is not enough knowledge on how they should be implemented into distance learning to support learning in the best possible ways. (Tomte et al., 2015, p. 27.) Therefore, this study also seeks to provide insights and visions to designers and developers of educational technologies and software (Edu-tech) and contribute to establishing better distance learning tools and methods. It will also consider both international and national views of the pedagogical and digital competencies that educational institutions and teachers should possess in the contemporary world of distance learning.

In addition to the literature review, this study also seeks to evaluate whether the TPACK framework developed by Mishra & Koehler (2006) could serve as a tool for designing educational technologies that support distance learning. This framework was chosen for evaluation because it is said to provide a potential model for exploring teaching using technologies. According to the framework, the best possible learning through technologies is realized through proper knowledge of the pedagogical, content, technological and prevailing context. When these areas of knowledge support each other in the best possible way, an area of Technological Pedagogical Content Knowledge is created in which learning with technologies is as successful as possible.

Therefore, this literature review will also aim at going through an extensive range of technological, pedagogical, content, and contextual challenges that Covid has brought to the field of higher education since it emerged. Of particular interest to the model is that the TPACK framework was recently updated by Mishra (2019) to take better account of the importance of contextual knowledge of the teacher. At the end of the literature review, it is assessed whether the TPACK model is sufficient to meet and study covid-like phenomena, i.e., how it is suitable for researching and analyzing distance learning in specific situations. However, the main purpose of evaluating the model is to assess whether the TPACK model could be used either in future studies or as a tool in the development of Edu-tech.

1.2 Structure of thesis

The research is structured as follows:

1. **Introduction:** This section describes the aim and rationale of the study.
2. **Research methods:** In this section, research questions and hypotheses are presented. The research method of the study – a literature review – and the criteria of used literature are presented. Limitations of the study are also discussed.
3. **Definitions:** This section introduces the TPACK (Technological Pedagogical and Content Knowledge) - framework to be evaluated. The concept of ‘distance learning’ is also introduced.
4. **Literature review - Intro, Main challenges & Towards more meaningful distance learning:** In this section, the results of the literature review are presented. It is divided into chapters: *Intro*, *Main challenges*, and *Towards more meaningful distance learning*, in which both main challenges and opportunities will be discussed from pedagogical, substantive, technological, and contextual perspectives of distance learning.
5. **Estimating the future applicability of the TPACK model:** This section discusses the suitability of the TPACK Framework for structuring this literature review, as well as the future applicability of the Framework.
6. **Conclusions:** This chapter summarizes the findings and presents possible suggestions and directions for the future of distance learning enhanced with technologies during and after Covid.

2 RESEARCH SETTING AND METHODS

2.1 Research method – a literature review

The topics presented in Section 1 were approached using the literature review method. Articles were selected for the literature review according to the data selection presented in this section. Four research questions and five hypotheses were also generated to support the literature review process. Two of the research questions focus on the challenges and opportunities brought by Covid, one on aspects related to the development of teaching technologies and one on evaluating the usability of the TPACK Framework. Two main hypotheses arose from the observations related to the transition to distance learning due to the Covid situation. One of the hypotheses, in turn, was developed for the evaluation of the TPACK-Framework. The final research questions, hypotheses, and the observed limitations associated with the study are presented in the following sections.

2.2 Research questions

- What have been the main challenges when higher education switched to distance learning because of Covid?
- What are the main things to consider when aiming for a successful distance learning experience in the post-era of Covid?
- What should technology developers take into consideration when developing distance learning systems/Edu-tech?
- Could the TPACK framework serve as a possible model or tool in Edu-tech development?

2.3 Hypotheses

- The transition from traditional classroom learning to distance learning because of Covid has brought challenges but also many possibilities into the field of education.

- Although teachers have had technological skills and knowledge before the outbreak of Covid, there has been deficiency, especially in their technological skills and contextual knowledge.
- Contextual Knowledge recently added to the TPACK model is an integral but often ignored part of this framework.

2.4 Data selection

Sources for the literature review were found from the article search engine Helka by using keywords: "distance learning" OR "online learning" AND "higher education." Keywords such as "best practices," "competencies," "challenges," OR "possibilities" were also used to limit the search result further. A more precise delineation was also made using the keyword "Covid" AND "Covid-19" to get the most up-to-date information about the phenomenon brought by this pandemic. Only peer-reviewed journals were chosen. To get the most up-to-date information of the subject, a limitation was also made to articles published between 2015 and 2021. This interval was chosen even though Covid arrived between 2019 and 2020 to get information from pre-Covid times for comparison purposes. A total of 20 articles ended up in the final review through inclusion and exclusion criteria presented in table 1. A description of the contents of all selected papers is provided in Appendix 1. If third-party studies were used, they also came to be peer-reviewed.

Database: Helka (University of Helsinki) Main keywords: “distance learning”, “online learning”, “higher education”, “covid”, “covid-19” Keywords used to refine the search: “best practices”, “competencies”, “challenges”, “possibilities”	
Inclusion: Peer reviewed articles between the years 2015 and 2021. Articles focus on higher education.	Exclusion: Articles were out of the context of higher education. Article was a literature review. Article was an editorial.

Table 1. Criteria for inclusion and exclusion of articles.

2.5 Limitations of the study

One weakness of this study is its loose delineation of the field as it does not focus on any particular branch of science in higher education. It must therefore be borne in mind that different disciplines have different ways of implementing distance learning. Consequently, it should be noted that the results of the literature review are not directly applicable to any particular discipline but mainly provide indicative guidelines for the implementation of distance learning. It should also be noted that many disciplines have struggled with very similar challenges during Covid. Therefore, many of the solutions can be very consistent also.

Some uncertainties may be caused by the fact that articles' selection did not focus solely on higher education in specific geographic areas or cultures. Now the papers have been selected extensively from around the world from very diverse environments. However, because we are dealing with higher education, education can be seen to be pursuing the same goals at least at some level. In addition to this covid phenomenon have touched just about every corner of the world equally. Still, regardless of where the studies were conducted, their results were very comparable. As the future is also increasingly multidisciplinary as it is seen how various disciplines reinforce each other.

3 FRAMEWORK TO BE TESTED AND CONCEPT DEFINITION OF DISTANCE LEARNING

3.1 TPACK – Introduction to the framework to be evaluated

3.1.1 Introduction

The TPACK framework was chosen for evaluation because it has been developed to describe how meaningful and skilled teaching could be constructed by using technologies. Even though this framework is widely used to study the implementation of technologies into classrooms, it has also been used to examine distance learning (Koh et al., 2015, p. 460). This framework developed by Punya Mishra and Matthew Koehler (2006) presents the essential aspects required from teachers when implementing technologies into educational settings. As a return, it also provides information on what things a teacher should consider when implementing technologies into learning environments. It does this by “offering new ways of looking at and perceiving phenomena and by offering information on which to base sound, pragmatic decision making” (Koh et al., 2015, p. 459; Mishra & Koehler, 2006, p. 1019). The TPACK was developed primarily to answer the lack of theoretical grounding of technologies in educational settings. It is said to be a powerful tool for research on the use of technologies in teaching (Chai et al., 2013, p. 32). These are the main TPACK Framework features that led to the decision to evaluate the future usefulness of this model based and reflecting on the literature review. At this point, this will be done on a very basic level in qualitative manners.

As an addition, the TPACK framework is often used to provide information and understanding about how technology could enrich teaching and how teachers could develop and enhance their teaching when using technology (Mishra & Koehler, 2006, pp. 1017-1018). TPACK can also be used as an analytic tool to evaluate teacher’s development in distance learning scenarios (Koh et al., 2015, p. 460). This makes it possible for teachers to design technology-assisted interventions to develop their teaching (Chai et al., 2013, p. 31).

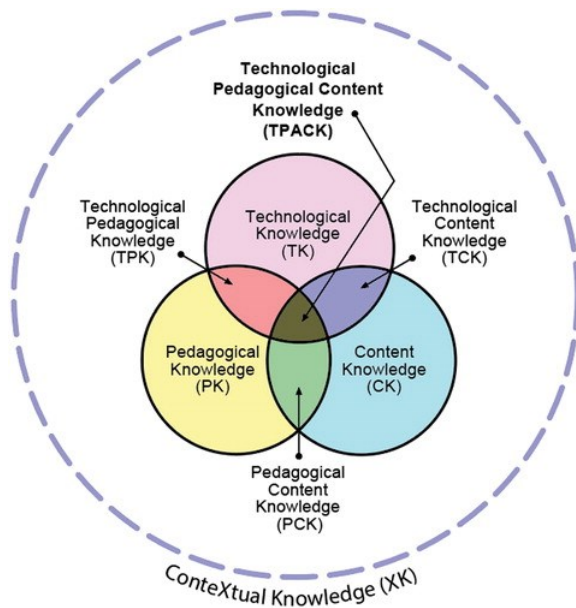


Figure 1. Updated Venn diagram of Technological Pedagogical Content Knowledge (TPACK) framework.

3.1.2 Structure of the TPACK Framework

TPACK framework is often presented as a Venn diagram (Figure 1) which consists of three main components which work as building blocks of a technologically enhanced learning environment: Content Knowledge (CK), Pedagogical Knowledge (PK), and Technological Knowledge (TK). The TPACK model's focus is on how these parts should be integrated, so they would reinforce each other and lead to the best possible learning outcome (Brouwer et al., 2013, p. 107; Mishra & Koehler, 2006, p. 1017).

When these three knowledge levels (CK, PK, and TK) intersect, they form four variable combinations:

1. *Pedagogical Content Knowledge (PCK)*
 2. *Technological Content Knowledge (TCK)*
 3. *Technological Pedagogical Knowledge (TPK)*
- and
4. *Technological Pedagogical Content Knowledge (TPCK)* that is situated in the cross-section of all three levels of knowledge mentioned above.

Digi-pedagogical competence and knowledge consist of mastering and skillfully combining all these aspects. In an ideal situation, a teacher should be able to respond to technological, substantive (content), and pedagogical challenges and the challenges that arise in the relationships between them (Glowatz & O'Brien, 2017, p. 137). As a recent update, a Contextual Knowledge Area has also been added to the model, covering all the above areas of knowledge (Mishra, 2019).

Pedagogical Knowledge (P)

Pedagogical Knowledge deals with pedagogical decisions, methods, practices, and didactics that affect teaching and learning. This includes Knowledge of the diverse factors behind the teaching processes such as teaching methods, goals for teaching, or information on how teaching should be organized to achieve students' best possible learning outcome. It also deals with how students are assessed and how to ensure that students get enough support and supervision. In Pedagogical Knowledge, the cognitive, social, and developmental theories of learning are used to assess how teaching should be brought into classes to construct students' knowledge and support their education best possible way. (Brouwer et al., 2013, p.110; Glowatz & O'Brien, 2017, p. 137.)

Content Knowledge (C)

Content Knowledge describes what teachers need to know and understand to organize proper teaching, i.e., teachers' knowledge of the field and subject they are teaching. This includes, for example, information on the central concepts, practices, theories, and content of the topic being taught (Glowatz & O'Brien, 2017, p. 137; Mishra & Koehler, 2006, p. 1026).

Pedagogical Content Knowledge (PCK)

Pedagogical Knowledge and content Knowledge together form the area of Pedagogical Content Knowledge (PCK). This area reflects how pedagogical and didactic decisions, methods, and practices should be considered when teaching specific subjects. And how they would support learning and understanding of the subject being taught. In this process,

situational awareness is needed to assess students' prior knowledge and needs. It also explores what students could offer to build up a better distance learning experience. (Mishra & Koehler, 2006, p. 1026.) In simple terms, PCK questions what kind of a teaching approach should be chosen to support the content and how it should be presented to make teaching as effective as possible.

Technological Knowledge (T)

Technological Knowledge is understanding the learning environments and tools used in them, i.e., knowledge and skills to use new and old technologies in pedagogical settings. This area covers both basic and advanced software and hardware skills and the ability to deal with and adapt to technological challenges. Technological Knowledge is the most dynamic of all the three areas of Knowledge as legacy tools are constantly updating and changing while new ones are also emerging and taken into action faster. This also poses a big part of the teacher's ongoing challenges using technologies. (Brouwer et al., 2013, p.110.)

Technological Pedagogical Knowledge (TPK)

Technological Pedagogical Knowledge involves knowledge about how chosen technologies support desired pedagogical objectives, strategies, and teaching methods. For example, what kind of programs and tools there are generally available for teaching the subject. It is also the ability to choose technologies that best suit the pedagogical goals. For example, what software should be used to encourage student participation. From the pedagogical perspective, TPK is also knowledge about how or into what direction teaching changes if a particular technology is introduced into teaching, i.e., capabilities of various technologies to affect learning.

Technological Content Knowledge (TCK)

Area of Technological Content Knowledge deals with the relationship between technology and content, i.e., the relevance of technologies with the subject being taught. For example, which tools or formats (animation, images, sound) would best suit to present

the content of the subject being taught, or what kind of effect they have on the content being taught. It also considers how "changes in technologies can fundamentally change the understanding of the subject" (Glowatz & O'Brien, 2017, p. 137).

Technological Pedagogical Content Knowledge (TCK)

As all the areas mentioned earlier overlap, a dynamic area of Technological Pedagogical Content Knowledge is generated. The combination of proper Knowledge of ideal technologies, pedagogical decisions, and content works as a basis for good distance learning enhanced with technology (Glowatz & O'Brien, 2017, p. 137). According to Mishra and Koehler (2006, p 1029), knowledge in this area differs from the Knowledge of pedagogically qualified persons and technologically alert experts.

ConteXtual knowledge (CX):

The area of Contextual Knowledge surrounding the TPACK framework is the latest addition to the TPACK model. This addition, or rather a change from *Context* to *Contextual Knowledge*, was made by the developer of the TPACK Framework, Punya Mishra (2019, p. 79), to respond to many views on how the TPACK model did not adequately address the importance of context and how the context (e.g., Chai et al., 2013, p. 46; Koh et al., 2015, p. 459; Rosenberg & Koehler, 2015, pp. 15-16). Mishra (2019) states in the update:

“Context Knowledge highlights the organizational and situational constraints that teachers work within. The success of their efforts depends not as much on their knowledge of T, P, C, and its overlaps, but rather on their knowledge of the context. This allows us to go beyond seeing teachers as designers of curriculum within their classrooms but rather as intrapreneurs — knowing how their organization functions, and how levers of power and influence can effect sustainable change.” (Punya Mishra, 2019, p. 77.)

With the update, Mishra presents the Contextual Knowledge Area as containing all the contextual information surrounding situations in which teaching is done using technologies. This newly updated part of the TPACK will be taken into more detail, especially when evaluating the model, as the importance of context can be very significant, especially during Covid.

3.1.3 How the TPACK Framework was evaluated in this study

Parts of the TPACK Framework were initially intended to be used to structure the literature review. However, this did not materialize due to various reasons and challenges that emerged during the review process. The most significant reasons were the apparent absence of the subject of the activity, i.e., the students, from the framework and the vagueness of the concept of contextual knowledge. The chosen format - a literature review - also contributed to this decision not to use the framework as initially intended. These and other reasons are discussed in more detail in Section 6, which focuses on the future applicability of the TPACK framework. Although such a solution was reached, the main parts of the model - Technological Knowledge, Pedagogical Knowledge, Content Knowledge, and Contextual Knowledge - and their contents served as essential tools for heuristic thinking throughout the literature review process.

3.2 Distance learning – concept definition

The concept of distance learning was chosen for this study as it best reflects the way of learning during Covid. Focusing on one concept also helps with the delineation of this research.

Anohina (2005, p. 96) describes the features of distance learning as follows:

- A teacher and a learner are separated one from another by time, place or both factors at most part of the learning process.
- A learner works with learning materials at time, place and pace convenient for him/ her.
- A teacher provides help, tutorials and evaluates learner progress.
- Information and communication technologies are used to link a learner and a teacher and to provide their interaction.
- Some occasional on-campus contacts or learning events between a learner and a teacher could exist.

Although these definitions describe well the distance learning that takes place during Covid, there are specific weaknesses associated with the concept of distance learning. For example, there is criticism of how the concepts of distance learning and distance

education should not be confused with each other. It could be possible to assume that the term distance learning refers to the learner's activities, distance teaching refers to the teacher's activities, and how the idea of distance education more generally reflects both. However, distance learning is one of the most consistent, widely used, and topical concepts among researchers for learning that takes place physically, temporally, or geographically apart and uses various teaching materials. For example, in the study conducted by Ahmed et al. (2020, p. 3) about the Covid situation, the concept of distance learning was chosen by most teachers and other participants because it equated learning through technologies and fit the situation brought by Covid. (Anohina, 2005, pp. 95 & 99-100; Moore et al., 2010, pp. 129 & 134.)

In addition to these weaknesses, many new terms have also emerged and created confusion in the field of distance learning. For example, there are terms like computer-supported collaborative learning, distributed learning, and networked learning (Anohina, 2005, p. 101). Still, even these concepts are seen falling under the concept of distance learning and function as the teacher's pedagogical methods when organizing distance learning. According to Traxler (2017, p. 2), the choice from these is mainly about the delivery mechanism of teaching. Still in the end, according to several researchers (e.g., Anohina, 2005, p. 100; Traxler, 2017, p. 2), the concept of distance learning works as an umbrella term that covers the concepts such as e-learning, online learning, Internet-based learning, and computer-based learning (Figure 2). This confirmed the choice of the distance learning concept for this literature review.

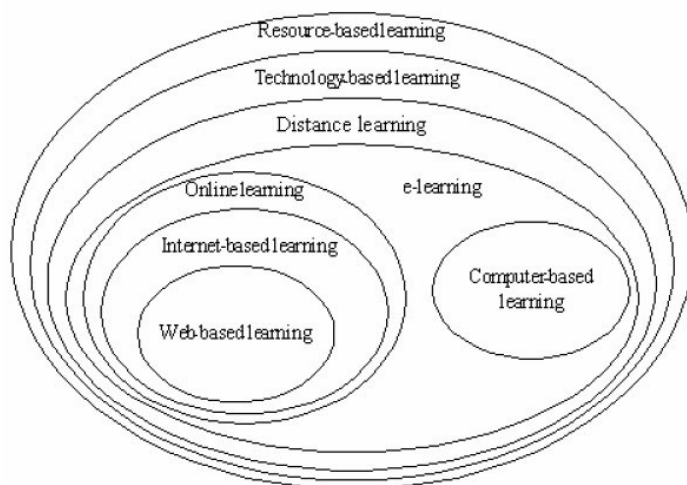


Figure 2. Relationships between terms used in teaching and learning with various technologies according to Anohina (2005, p. 100).

Teachers are always somehow present in distance learning, at the very least, providing support and tutorials to students. Distance learning also involves students' independent learning through material usually provided online (Thomson, 2018, p. 77). Still, distance learning can be understood more broadly than online learning or e-learning, which are always carried out using technologies or the Internet. In other words, it is not limited to digital technologies, real-time communication, or teaching via the Internet but may also include other communication forms (Al-Hosan et al., 2020, p. 3; Moore et al., 2020, p. 129). Al-Hosan et al. (2020, p. 3) give an example of how it can be handled with the help of study materials delivered to students' homes. This is an example of how distance learning can use more analogous forms of teaching that take place at a distance: non-electronic ways to deliver learning. A historical example of this is correspondence courses which were established by snail-mail. A more contemporary example could be a pedagogically innovative approach that uses course materials shipped to students, and in a way, offers an opportunity to imitate campus-based learning (Tomte et al., 2015, p. 27).

4 LITERATURE REVIEW

4.1 Intro

4.1.1 Context – Arrival of Covid

At the beginning of 2020, a global Covid started to threaten human lives globally. Because the disease was unknown even to health organizations, big decisions had to be made quickly, and as a result, people were, for example, forced to stay at their homes. States and governments had to make very far-reaching decisions on higher education also. During all this, teachers, students, and other staff of higher education institutions were one of the groups most affected by the resulting social constraints (Al-Hosan et al., 2020, p. 2; Al-Taweel et al., 2020, p. 1296). In this context, the future of teaching is undergoing a very dynamic change as things that have been discussed and planned for years have started to happen on accelerated schedules. As Covid, in many cases, emerged in the middle of the academic year, the completion of ongoing courses was often jeopardized. In many higher education institutions, this led to an inevitable transition to distance learning, making it possible to continue teaching. As this had to be done in weeks or even in days, the situation led to the fastest and most extensive changes in education history. During this process, everyone had to move from their comfort zone towards a new kind of norm where teaching took place remotely or, in some form, a hybrid model. Even the universities accustomed to very stable teaching methods and environments faced a crisis when teaching began to be transferred to less familiar online environments. At this point, especially universities that were previously ill-prepared for distance learning were forced to extensively test their digital and pedagogical skills and abilities and often paid the most demanding price. Therefore, higher education institutions are said to be in the middle of disruption in which their habits and operating models have been challenged. (Al-Hosan et al., 2020, p. 11; Al-Taweel et al., 2020, pp. 1295-1298; Blankenberger & Williams, 2020, pp. 404 & 410; Brammer & Clark, 2020, pp. 453-454; Dennis, 2020, pp. 3 & 5; Driessen et al., 2020, p. 12431; Mladenova et al., 2020, p. 1169; Raaper & Brown, 2020, p. 345; Torda, 2020, pp. 1150-1151.)

Simultaneously, services such as student health care or a study psychiatrist were closed in a panic-like manner, even though they could have been essential in resolving many issues faced in this protracted situation. Previous logistic, technological, academic, and social support provided to students were also challenged (Barton, 2020, p. 12505; Brammer & Clark, 2020, p. 453; Driessen et al., 2020, p. 12435). After the initial shock of Covid other waves also followed and brought new challenges. While many of them were easy to address, the problems and consequences caused and left by them were, on the contrary, very challenging, including, for example, concern about the well-being of teachers and students and difficulties in terms of educational content (Driessen et al., 2020, p. 12432; Torda, 2020, p. 1151).

As the estimates of the situation's persistence range from months to years, uncertainties of the future make it difficult to anticipate problems and plan studies. Still, there are examples of efficient and exemplary transitions to distance learning during Covid, especially given the scale and seriousness of the situation. For example, several universities already had an existing infrastructure or platform on which it was possible to transfer studies quickly and relatively painlessly. In many cases, this was related to the fact that universities are located either in current or former crisis areas or in areas where annual natural disasters occur. (Al-Hosan et al., 2020, p. 4; Al-taweel et al., 2020, p. 1297; Barros Silva et al., 2020, p. 5; Brammer & Clark, 2020, p. 455; Dennis, 2020, p. 3.)

4.1.2 The importance of distance learning for universities

The use of distance learning (including online learning) has been expanding worldwide for decades (Tomte et al., 2015, p. 27). Higher education, in particular, has used distance learning long before Covid, and its popularity has increased significantly in recent years, especially to narrow the gap between supply and demand of education. For some universities, its use has been a necessary part of teaching offerings or even their main selling point. Examples of successful learning environments that have used distance learning extensively are open universities. (Mladenova et al., 2020, p. 1169; Okanda & Sheeny, 2020, p. 1; Thomson, 2018, p. 74.) In this context, higher education institutions have been said to be among the best prepared for Covid and distance learning following it, mainly

because their materials have mainly been in digital form and therefore ready for distance learning (Brammer & Clark, 2020, p. 455).

Still, students in distance learning have always been in the minority compared to face-to-face teaching. In many cases, face-to-face teaching has been seen even as a matter of course. This view is often connected to the academic year students are currently attending or their backgrounds (Driessen et al., 2020, p. 12432, Torda, 2020, p. 1152). During Covid, however, this situation has changed, and the importance of distance learning has increased. Therefore, its skillful management has become an integral part of the competitiveness of almost every higher education institution. (Blankenberger & Williams, 2020, p. 410; Thomson, 2018, p. 74.)

4.2 Main challenges with Covid

4.2.1 Financial challenges of higher education institutions and society

Even though higher education institutions are claimed to be best prepared for the Covid situation among other academic levels, the transition to and organization of distance learning has increased financial pressure on their budgets. In many cases, financial hardships had emerged because universities have in practice been able to enjoy their well-stagnant and unchallenged role for a long time before Covid struck them. (Al-Taweel et al., 2020, p. 1296.) The Covid situation has been difficult, especially because the results obtained through universities' success and their teaching quality are often essential issues for higher education institutions, especially in terms of funding. Their financial stability may, therefore, even depend on how well they can respond to this kind of situation. (Cheema, 2010, p. 1.) Thus, their financing has become increasingly precarious during Covid as they are involved in constant balancing with state budgets, social isolation, and public health authorities. Uncertain consequences of the situation are very likely to make them even more accurate with their financial affairs in the future. (Blankenberger & Williams, 2020, p. 409.)

The budget deficits caused by Covid have led, for example, to cuts in the organization of higher education, a decrease in the number of students enrolled in studies, and increased

tuition fees. Funding for certain studies has also been at stake due to the tight financial situation of the universities. In particular, many site-specific studies and study trips have been suspended. For some teachers who have previously been actively involved in research assignments, the work has shifted more towards teaching planning, which has easily led to a reduction in the amount of research and a deterioration in its quality. Thus, many of the universities' financial challenges will certainly also affect how teaching will be implemented in the future. (Al-Taweel et al., 2020, p. 1296; Barton, 2020, p. 12503; Blankenberger & Williams, 2020, pp. 408-409 & 417; Brammer & Clark, 2020, pp. 453, 455 & 456; Darling-Hammond et al., 2020, p. 458; Mladenova et al., 2020, p. 1163.)

In addition to higher education, the effects of Covid are also visible elsewhere in society. Especially the economic and social consequences have been quite extensive, both globally and in terms of communities, states, national governments, and institutions. (Al-taweel et al., 2020, pp. 1299-1300; Blankenberger & Williams, 2020, p. 404; Elfirdoussi et al., 2020, p. 1; Okanda & Sheeny, 2020, p. 1.) Therefore, the adequate provision of distance learning has been seen as an essential part of maintaining national competitiveness and coping with many economic challenges provided by Covid. For example, students' enjoyment of distance learning has played an essential role in maintaining the national economy. (Mladenova et al., 2020, p. 1169; Okanda & Sheeny, 2020, p. 15.) Because distance learning has been found to help many disadvantaged groups participate in education and thus act, for example, to increase states' competitiveness and enable equality in society, politicians, organizations, and communities have actively promoted its use. Even new laws and rules calling for its use have been set by the states and institutions (Al-taweel et al., 2020, p. 1298).

4.2.2 Teaching in disruption

Blankenberger & Williams (2020, p. 415) mentions how pedagogical adaptation was one of the main challenges for faculties when distance learning was introduced to teaching. This was apparent especially when Covid started closing universities at an accelerating pace and forced teachers to make very rapid and low-anticipatory decisions and movements. Lack of time associated with the transition to distance learning challenged even those teachers who had the technological skills required by the situation and were already

familiar with distance learning possibilities. In particular, the transfer of all teaching materials into digital and online forms challenged most of the teachers skillfully, content-wise, and mentally especially in the early days of Covid. The situation was even more complicated when the teacher lacked the required digital skills. The number and versatility of different software from multiple providers brought even more confusion to the case. Oversupply of various discussion forums, co-development platforms, and writing platforms is mainly seen as a resource problem because teachers must go through several program opportunities. (Ahmed et al., 2020, p. 2; Al-Taweel et al., 2020, p. 1295; Cheema, 2010, p. 2; Darling-Hammond et al., 2020, p. 457; Driessen et al., 2020, p. 12432.)

As some universities were physically closed overnight, the situation often led to overtime being done online among teachers and their peers mainly because they needed to study new technological, pedagogical, and practical skills to support their teaching. Finding applicable digital content for the subject being taught was often one of the most burdensome tasks at this stage. Thus, distance learning has also taken a wide variety of forms depending on the universities, situations, and teachers during Covid. (Ahmed et al., 2020, p. 2; Darling-Hammond, 2020, p. 462; Torda, 2020, p. 1153.)

4.2.3 Teacher vs. student-centeredness

Before Covid, education has been increasingly moving toward student-centricity. Therefore, during the early days of Covid, this has easily led to a view among teachers that students would take more responsibility for their studies, even though their need for teacher support was most often enormous for them. (Ahmed et al., 2020, p. 2; Torda, 2020, p. 1150.) As this situation began to be noticed after the transition to distance learning, the focus was shifted again and forced teachers to take greater responsibility for their students. This rapid change, in turn, led to a situation in which teaching became very teacher centered. (Elfirdoussi et al., 2020, p. 12.) The trend towards teacher-centeredness is a common but also problematic aspect of distance learning, especially because it has been seen to degrade the quality of learning (Barton, 2020, p. 12503).

After getting used to the Covid situation, distance learning began to shift back towards student-centeredness. This is probably related to how more time had been spent resolving the Covid situation, and all participants were able to orient themselves with the new semester with time. This transition was important as better results have been achieved through distance learning methods that place students in collaborative and experimental fields in which they work as the main actors. (Barton, 2020, p. 12503.)

4.2.4 Resistance

Ahmed et al. (2020, p. 4) have found how teachers feel they create a more professional impression and meaningfully inspire students with their expertise in a face-to-face teaching situation. The problem with distance learning, in turn, has proven to be that it is not as easy to establish meaningful relationships with students. Therefore, some teachers consider distance learning as an inferior teaching method, and a large proportion of them have experienced the transition from contact teaching to distance learning negatively affecting their teaching (Barton, 2020, p. 12503). Switching to distance learning for an indefinite period has therefore provoked opposition and hesitation among teachers and students. This kind of resistance is often caused by prejudices about how distance learning is more challenging than traditional face-to-face learning. In a situation like this, the teacher's example has a significant impact on the general acceptance of distance learning, technologies, systems, and software. This has also been one reason why the fast transition to distance learning by Covid has caused a lot of resistance and a low acceptance rate among students. The problems and consequences of resistance are not only caused by teachers but also by educational institutions. For example, the inflexible rules of educational institutions and their general attitudes have been found to act as an obstacle to the development of better educational content. (Traxler, 2017, p. 9.)

Even though there has been much prejudice against distance learning among teachers, more than half of them have been positive about its use even before the outbreak of Covid. The situation with the pandemic has also inevitably forced teachers to be more efficient, collaborative, innovative, and flexible. However, it remains to be seen whether this is a good thing or a bad thing, for example, in terms of coping. (Darling-Hammond et al., 2020, p. 459; Torda, 2020, p. 1153.)

4.2.5 Distance learning is not face-to-face learning

There have been assumptions among teachers of how distance learning can be arranged with similar pedagogical beliefs and mentality to conventional face-to-face learning events regardless of the subject. Familiar practices and methods from traditional contact teaching are preferred, even if they are more cumbersome, more laborious, and less effective than alternative distance learning methods (Blankenberger & Williams, 2020, p. 415). This is problematic as designing distance learning in the same way as conventional teaching often leads to non-innovative teaching content and solutions and a decline in students' interest in studies, especially in situations where classes have been uninteresting before moving on to distance learning (Thomson, 2018, p. 75). The difference between traditional campus teaching and distance learning should therefore be noticed and understood. It should be considered how face-to-face teaching differs from distance learning and whether it is in any way more valuable than distance learning. Moreover, if so, why is this the case. (Dennis, 2020, p. 5; Mladenova et al., 2020, p. 1169; Thomson, 2018, p. 76; Traxler, 2017, p. 2.)

Still, it should also be noted that not all teaching is possible through distance learning. For example, some subjects, studies, and topics demand attendance as their teaching content cannot be transferred online, or ways to implement teaching remotely might not exist in the first place. There might also be too much practical information to be transferred to students through computer screens. (Blankenberger & Williams, 2020, pp. 411 & 415.) Studies usually held in the field have in particular suffered due to Covid. For example, in medical studies, the implementation of clinical teaching has been seen as challenging in distance learning, which does not offer good enough opportunities to practice social skills and cognitive communication (Ahmed et al., 2020, p. 5; Torda, 2020, p. 1151).

Torda (2020, p. 1151) highlights perhaps one of the most important challenges related to the decline of contact teaching: How to consider and increase the first-year students' study skills. Starting studies in higher education can involve many practical things and skills that may be impossible to teach remotely. Even though some technologies are available online for teaching basic skills, they are not always sufficient when the subject being

taught includes practical tasks. Sometimes things must be experienced live as well. (Barton, 2020, p. 12504.)

4.2.6 Completing courses, gaining qualifications, and graduating

Distance learning has raised concerns and pressure among teachers and students regarding completing courses, gaining adequate qualifications, and graduating. It has also highlighted difficulties in organizing internships and exchanges. (Brammer & Clark, 2020, pp. 453-454.) For example, internship positions have been canceled because the work providers cannot guarantee adequate protection for students or arrange mentors who could remotely take care of their well-being (Torda, 2020, p. 1152). Therefore, one concern is how students will acquire all the skills they need in working life through distance learning and how the skills learned online can be transferred to real-world situations (Al-Hosan et al., 2020, p. 2). This is paradoxical in the sense that a great deal of the working life is increasingly shifting to teleworking, especially due to Covid. Alternative paths to arrange internships and practical training have therefore been considered, especially as workplaces and other partners associated with higher education have equally moved to unusual ways of working (Blankenberger & Williams, 2020, p. 411). Efforts to solve this challenge have been made, for example, by trying to get later-year students to work under the guidance of working life mentors. Alternatively, recent year students may have been introduced to lower year students as their mentors more frequently. (Torda, 2020, p. 1151.) On the other hand, the situation has also been very favorable for some research fields; for example, a pandemic has naturally provided many job opportunities, especially for medical students and graduates (Torda, 2020, p. 1152).

4.2.7 Quality assurance and feedback

Even though distance learning from an economic viewpoint is seen as an opportunity to reduce costs without compromising the teaching quality, there are more critical perspectives on the matter. Transition to distance learning has, for example, challenged various learning outcomes and a guarantee of adequate teaching quality. It has also jeopardized the quality of assessments, final projects, taught content and led to a slight deterioration in the general quality of courses. (Brammer & Clark, 2020, p. 454; Cheema, 2010, p. 2;

Elfirdoussi et al., 2020, p. 12; Rizun & Strzelecki, 2020, pp. 15-16.) Therefore, adequate quality control has been proposed to address these issues, even though it takes much time and more financial investment (Ahmed et al., 2020, p. 9).

Quality issues are faced, especially with the online implementation of exams and standardized tests. This is quite often because good alternatives for organizing them are often unavailable. In remote assessments and exams, cheating is also more accessible than in a conventional classroom experimental situation. As a functional but time-consuming solution to solve this problem, Mladenova et al. (2020, p. 1169) have found test questions individually customized for all participants, making cheating between participants more difficult. Other possibilities are tests and exams which are time-limited or use continuous video connections. This, on the other hand, raises completely new types of security and privacy issues when, for example, it is possible to record teaching or exam situations without being noticed. Due to the challenges of organizing and supervising the exams, their importance has diminished during distance learning related to Covid (Torda, 2020, p. 1151).

4.2.8 Challenges faced by students

Students have embraced distance learning in many ways during Covid. In a study by Rizun and Strzelecki (2020, p. 15), students' perceptions of how distance learning affect their study effectiveness, course performance, and productivity ranged from low to average. More generally, students have been increasingly confused with their learning during Covid as it poses a whole new set of challenges they cannot meet without the right kind of guidance. For example, even though students mainly get along well with the various tools and software used for distance learning, new challenges often arise with their increased use, especially among students with cognitive difficulties. (Rizun & Strzelecki, 2020, p. 15.) Therefore, it is vital to notice how every student has unique and personal styles to implement learning and various other individual needs that should be considered when planning distance learning.

However, providing personalized teaching through distance learning is challenging, especially as it is more difficult to identify students' problems through the internet and the

technologies used. When students participate in distance learning for the first time, observing these things is even more challenging. (Brammer & Clark, 2020, p. 455; Driessen et al., 2020, p. 12434.) Therefore, key areas of concern during Covid include how students can be supported enough with their distance learning so that they would not drop their studies and how the lessons to be learned could be delivered to students most efficiently. Moreover, it should be considered how each student's strengths could be considered in distance learning (Ahmed et al., 2020, p. 2).

Distance learning has been very natural for some students, while some have experienced how it does not suit them. In general, those who do well in traditional learning situations are more likely to do well in distance learning. In contrast, for those with learning difficulties already in typical educational settings, the situation is increasingly challenging. For example, students with a diagnosed ADHD have felt how the home environment interferes with their studies and homework. Especially the freedom offered by distance learning does not suit these personalities. In turn, those who have also been socially active outside their studies are more likely to face a decline in their quality of life in a situation like this. (Blankenberger & Williams, 2020, pp. 410-411; Sutton, 2020, p. 9.) Driessen et al. (2020, p. 12432) investigated how students' study patterns changed in the early days and months of Covid. A week after the transition to distance learning, the students' attitudes reflected that the emergence of covid put pressure on their learning. After a month, attitudes had changed slightly against distance learning. The increased responsibility for their study, self-discipline to complete assignments, and the fact that all materials had to be studied online were primary concerns among students. The importance of issues related to distance learning environments, e.g., distractions at home or changes in daily routines, was also raised at this stage. (Driessen et al., 2020, p. 12434.)

The structure related to studying and one's own daily life is connected to students' study motivation. When students feel that either one of these familiar structures is missing or otherwise broken, their motivation decreases, affecting learning outcomes. The disappearance of regular routines and being excluded from social interactions has thus quickly led to increased confusion, anxiety, boredom, and frustration, especially among those who have had previous symptoms of depression or anxiety. In addition to this, a study path that has been too loose, full of options, and required much self-directed learning has

easily lowered study motivation, created confusion, and increased frustration among students. (Ahmed et al., 2020, p. 7; Barros Silva et al., 2020, p. 5; Driessen et al., 2020, p. 12435; Mladenova et al., 2020, p. 1164.)

Technologies have much impact on these issues. For example, it has been observed how a conversation between screens increases more anxiety than ordinary face-to-face teaching. (Ahmed et al., 2020, p. 5; Rizun & Strzelecki, 2020, p. 15.) Thus, even though these new generations of students are proficient in multitasking, especially with technologies, this often leads to them being less focused on the issues at hand, which can also lead to increased anxiety. (Mladenova et al., 2020, p. 1163.) Uncertainties and other concerns related to studies have also created nervousness among people close to students. The consequences of this have included increased conflicts and the avoidance of social situations with family members or acquaintances. (Brammer & Clark, 2020, p. 453; Driessen et al., 2020, p. 12435.) Although concerns about covid have, in some cases, even outweighed study-related concerns, this has been only a temporary phenomenon (Barros Silva et al., 2020, p. 5; Brammer & Clark, 2020, p. 454; Driessen et al., 2020, p. 12434).

Over time students have increasingly shown a willingness to get back to traditional teaching, especially because distance learning environments do not offer many face-to-face teaching features. They appreciate the freedom and diversity provided by contact teaching and prefer the opportunity to discuss with both their teachers and peers face-to-face instead of via computer screens. This is often because distance learning is seen as a less engaging and motivating way to study than face-to-face learning. For example, learning practical skills through technologies may seem artificial or social aspects of the used systems are often very restrictive. The reasons behind these problems are often the modalities of the distance learning systems in particular and the fact that tools available in contact teaching make it easier to organize interesting, engaging, and inspiring teaching than the tools available in distance learning. In addition to this, contact teaching creates a more professional atmosphere than distance learning as teachers are more easily seen as professionals of their field in these situations. (Barton, 2020, p. 12506; Torda, 2020, p. 1153.) It is no wonder that Ahmed et al. (2020, p. 1) have found how face-to-face teaching is better than distance learning to inspire students and enable meaningful encounters.

4.2.9 Mental, physical, and social problems

The prolonged social isolation caused by the pandemic is linked to many mental and physical health problems, which also have a detrimental effect on distance learning success (Driessen et al., 2020, p. 12435). There are adverse psychological effects, especially among young people participating in distance learning. Many of the symptoms have appeared shortly after the onset of Covid and quickly began to have a detrimental effect on students' quality of life. (Barros Silva et al., 2020, p. 5; Mladenova et al., 2020, p. 1164.) A big cause of increased stress, nervousness, and other mental problems is the blurring of the line between studying and personal life. This phenomenon has brought a sense of timelessness and ambiguity in studying and created situations where it is difficult to say when work or studying will end and personal time will begin (or vice versa). This applies to both teachers' and students' lives as many teachers implement teaching from their homes (Brammer & Clark, 2020, p. 454; Torda, 2020, p. 1150). In this context, the students with disabilities have been at greater risk of developing depression-related symptoms than students who are not disabled. Besides, the pandemic has further reinforced the challenges that students with disabilities face in their learning situations. (Sutton, 2020, p. 9.)

In many cases, the emotional scale of both students and teachers has been vast quite often because decision-makers such as universities have not paid enough attention to their needs. Universities should therefore focus closely on monitoring the mental and physical well-being of teachers and students in particular. Respectively, teachers and university staff play an essential role in ensuring and monitoring students' well-being (Al-Hosan et al., 2020, p. 2; Al-Taweel et al., 2020, p. 1296; Barros Silva et al., 2020, p. 1; Darling-Hammond et al., 2020, p. 458). Many mental and physical problems are also related to maintaining social distances and restrictions on gatherings and hobbies. These have often led to deterioration or even disappearance of students' social relationships and otherwise important connections. Some students have therefore felt completely isolated from the rest of the world. (Brammer & Clark, 2020, p. 453; Driessen et al., 2020, p. 12432; Barros Silva et al., 2020, p. 5.) In other words, maintaining social relationships remotely is not always a matter of course. Instead, students from diverse backgrounds have very different

ways of dealing with social connections with people who are not physically present in action (Haaper and Brown, 2020, p. 349).

Sitting too much in front of computers also threatens both physical and mental health over the long run. This view is supported by Ahmed et al.'s (2020, p. 5) observation of how students with special needs do not feel good about distance learning, especially physically. Therefore, the length of lessons and breaks should be proactively considered in more detail when distance learning is practiced (Mladenova et al., 2020, p. 1169).

4.2.10 Inequality

The view on how prolonged distance education caused by Covid can create inequality among students has been a concern shared by teachers in general. This is an important thing to acknowledge because distance learning perpetuates, contains, or produces some form of inequality, the consequences of which often include serious problems such as alienation or a deterioration in the socio-economic status of students. Thus, not all students have not been on an equal footing when Covid forced them to move on to distance learning. (Ahmed et al., 2020, p. 5; Barton, 2020, pp. 12503-12504.) It should be noted that many of the problems that emerged in distance learning are still related to indirect phenomena brought by Covid. In other words, contextual phenomena such as keeping social distances can indirectly affect students' success in their distance learning. (Blankenberger & Williams, 2020, p. 409; Driessen et al., 2020, p. 12436.)

It has been observed that many students have dropped out of their studies during Covid. There are many factors behind this, the most well-known of which are related to students' study skills, personal income, weaker socio-economic status, or underrepresented backgrounds. Students' weaker socio-economic background, in particular, has made students, for example, wonder whether they can afford to study at all during Covid. Due to this kind of inconvenience, many students have ended up taking an intermediate year, which has further increased the risk of dropping out. (Al-Hosan et al., 2020, p. 2; Blankenberger & Williams, 2020, pp. 410, 412 & 414.)

The very mundane problems such as increased debt, food insecurity, and access to health care have been exacerbated by Covid and indirectly started to affect education (Elfirdoussi et al., 2020, p. 1). In some cases, worries about these problems have driven students to work to support themselves or their families through the prolonged situation. Some students have also moved back to their families, in which case everyday household tasks might have become either an obstacle or an added challenge to their studies. As a result, universities are also prepared for declining numbers of enrollments due to Covid. (Blankenberger & Williams, 2020, pp. 409 & 411; Dennis, 2020, p. 3; Driessen et al., 2020, p. 12436.)

According to Sutton (2020, p. 9), many of these concerns have affected students with disabilities more than others. Therefore, they are more often in greater need of help in a situation like this. For example, they do not feel they receive enough support during a pandemic. In addition to distance learning, their problems were mainly related to financial situations, housing, sense of belonging, learning commitment, and prospects. One of the most significant issues among students with disabilities was food insecurity.

4.2.11 Challenges with technologies

Before Covid, digital solutions and technologies for teaching have been seen most often as a good addition, but rarely as a necessary part of education (Brouwer et al., 2013, p. 6). Teachers have used technologies mainly for very traditional tasks such as sending emails or files, while very few innovative and experimental technologies have been introduced. Before Covid, the biggest technological problems have thus often arisen with the numerous changes and updates associated with technologies. (Tomte et al., 2015, p. 27.)

However, the pandemic and the transition to distance learning have brought technological challenges to the fore more quickly and more prominently. Technological challenges have often emerged because there is still a great deal of inexperience among teachers and students in teaching technologies and software. In addition to this, many characteristics of the technologies used in distance learning have created a lot of confusion among students with cognitive difficulties. The situation has not been alleviated by the fact that covid has,

in many cases, reduced the amount of technical support or even made it absent. (Cheema, 2010, p. 2; Rizun & Strzelecki, 2020, p. 15.) Problems related to technologies and software errors are essential to consider, as they can even act as a barrier to learning. (Agarwal, 2020, p. 554; Torda, 2020, p. 1150.) However, with this in mind, it has often misunderstood how good technological skills lead directly to good teaching, and therefore teachers should develop these qualities. Instead, even though teachers would have the proper technological knowledge, it is not always certain that they can use their skills in pedagogically effective, innovative, or intelligent ways (Mishra & Koehler, 2006, pp. 1031-1032).

Increased use of digital technologies has also added inequality and division among students. Many of these problems are due to limited access to learning environments, technologies, and software required for the studies. (Zuo et al., 2020, p. 664; Haaper & Brown, 2020, p. 349; Rizun & Strzelecki, 2020, p. 15; Traxler, 2017, p. 2.) This has been seen to create inequality, especially when the subject being taught requires expensive paid software or powerful enough computers. For example, the lack of necessary software and licenses makes it difficult to learn them remotely. Although free alternatives are often available, in many cases, their use is not justified either. For example, specific software may be mandatory for future employment, or there are no good enough free alternatives. (Agarwal, 2020, p. 554; Barton, 2020, p. 12506; Rizun & Strzelecki, 2020, p. 15.) Technological inequalities often arise also from things that are self-evident to many. For example, some students' neighborhoods lack internet access altogether, or alternatively, poor internet connection can affect the accessibility or functionality of teaching materials and content. This has been a problem not only for students but also for teachers, even though efforts have often been made on behalf of universities to provide them with the appropriate technologies and connections required by the situation (Al-Hosan et al., 2020, p. 3; Driessen et al., 2020, pp. 12431 & 12436).

Teachers share views on how students' backgrounds can prevent them from gaining access to adequate technology, software, or connections needed for their studies. This view is quite accurate as the students with financial challenges or physical disadvantages are at greater risk of being left without the necessary technologies (Ahmed et al., 2020, p. 1). This can drive students back to Campus facilities where they can access proper

technologies and software. On the other hand, due to phenomena like Covid, such activity is often excluded or at least strictly regulated. Students' opportunities for equal education could therefore be increased, for example, by providing them with the necessary tools and software on behalf of the university or at least by offering them safe access to the required type of equipment (Barton, 2020, p. 12506; Haaper & Brown, 2020, p. 349).

5 TOWARDS MEANINGFUL DISTANCE LEARNING

5.1 Hybrid model of distance learning

Many studies (e.g., Ahmed et al., 2020, p. 2; Mladenova et al., 2020, p. 1163; Torda, 2020, p. 1151) distinguish distance learning into three various forms: synchronous, asynchronous, and hybrid. Synchronous is done live by using, for example, videotelephony software, while asynchronous is established via other online platforms in similar ways to email exchange or social media communication. The hybrid model combines these two ways with other forms of learning, like face-to-face learning. Still, several studies (e.g., Ahmed et al., 2020, p. 7; Mladenova et al., 2020, p. 1163) have shown that using only synchronous or asynchronous forms of distance learning does not lead to the best possible efficient outcomes. Instead, different hybrid models which combine distance learning with other learning types should be preferred, as they often lead to better student engagement and study outcomes. As the use of distance learning will increase in the future, universities and teachers should be prepared to consider what kind of combination of these various forms can offer equal and integrated teaching to students (Thomson, 2018, p. 77).

5.2 Breaking the hierarchies of education

Covid is challenging the past hierarchies of higher education in many ways. Even before Covid, it has been observed and acknowledged that teachers need to have at least some knowledge and skills to deal with how students' social and emotional aspects affect distance learning situations. After the advent of Covid, the consideration of these issues has become increasingly important, and teachers have a much more significant part in dealing with students' well-being and how they are coping with the transition to distance learning. This has happened in stages as distance learning has increased, and challenges related to emotions have been identified in communication between students and teachers. In other words, there has been a redefinition of the previously very well-defined relationships between teachers and students and their personal lives. (Al-Taweel et al., 2020, p. 1296; Darling-Hammond et al., 2020, p. 457; Dennis, 2020, p. 4.)

As an example, in the pre-covid context of higher education, teachers are often used to thinking about how students in many study activities do very well on their own, but over time, while with the pandemic, the situation has changed, and teachers have even had to start taking more responsibility for their students. This is visible in how teachers have clearly shown more human traits about themselves through distance learning. Some students have even felt how their teachers are concerned for them for the first time, which may have had a significant impact on students' well-being. This is important because students experience learning more positively when they feel the teacher cares about them and their well-being by offering even small gestures of concern (Ahmed et al., 2020, p. 2.; Driessen et al., 2020, p. 12435). These findings also support the earlier idea of how teaching has been very teacher-centered in the time of Covid.

5.3 Pivotal role of the teachers in distance learning during Covid

Universities are often placed where many different social segments and environments intersect. In some cases, the economy of some communities or cities even revolves around universities. Therefore, the example of universities and their teachers often acts as a driving force for more widely seen phenomena in societies and communities. Setting an example in distance learning can significantly promote a better, healthier, and equal future, social relationships, and lifestyles. Of course, it must also be borne in mind that the phenomenon is also bidirectional. Thus, many of the societal challenges created by Covid are also seen in higher education. (Al-Hosani et al., 2020, pp. 2 & 10; Blankenberger & Williams, 2020, pp. 404 & 409.) As higher education institutions also have a responsibility to train their students to succeed in working life, their commitment is becoming even more visible in crisis times like the time of Covid. Ways to enhance social skills and cognitive communication during distance learning should therefore be explored, especially to give students an understanding of how the experts work in social situations related to working life. (Barros Silva et al., 2020, p. 1.)

Teachers are often the most visible part of the whole educational community when distance learning is used. While they are situated in such a pivotal position, they have a significant role in setting an example for students. Acting as an example can be socially meaningful, especially when students must study in other family members' presence.

Therefore, teachers are often required to have leadership and strength to tackle the situation as discreetly, effectively, and innovatively as possible. (Al-Hosan et al., 2020, p. 10; Brammer & Clark, 2020, p. 454.) Teachers also have a central role in ensuring good, equal opportunities, especially when distance learning is established with technologies. This includes establishing a functional distance learning environment and ensuring that teaching can be of the highest possible quality (Al-Hosan et al., 2020, pp. 2 & 10; Cheema, 2010, p. 2).

Within these limits and through innovative and effective use of technologies, teachers can increase students' awareness of the Covid situation. They can even contribute to preventing the spread of a pandemic by sharing important information about the Covid situation or providing students with tools and information on how to deal with the pandemic and, for example, related fake news. (Al-Hosan et al., 2020, pp. 2-3 & 10.) Simultaneously, teachers should try to extensively gain and use all the contextual knowledge to facilitate learning in the direction needed and design better lessons. Therefore, the utilization of teachers' capital, resources, and professional networks are also essential in supporting students' distance learning (Haaper & Brown, 2020, p. 349).

5.4 No specific time or space – The world is getting smaller and more accessible

Distance learning is a very flexible way of studying as it does not restrict learning to any specific time or place. Especially the time benefits offered by distance learning are significant as the extra time caused by the logistics of contact teaching and transportation between venues is often eliminated, leaving time for other tasks required by the teaching, and studying. The student can also do assignments and studies at their own pace and according to their own schedules. (Ahmed et al., 2020, pp. 2 & 12; Cheema, 2010, p. 2; Elfirdoussi et al., 2020, p. 12.) This way, its use offers global possibilities to arrange and participate in courses worldwide as students and teachers no longer need to be in the exact physical or geographical locations. Therefore, there has been an increasing effort to introduce distance learning even before Covid. (Cheema, 2010, p. 4; Traxler, 2017, p. 2.)

With the emergence of the “new normal,” universities have increasingly begun to look for opportunities to implement distance learning so that people who live geographically far away or who are otherwise unable to participate in contact teaching could be reached (Barros Silva et al., 2020, pp. 7-8; Tomte et al., 2015, p. 2). For example, as international students have had to stay in their home countries due to Covid restrictions, distance learning was used to provide them with a significant opportunity to participate in their studies (Brammer & Clark, 2020, p. 454). Simultaneously distance learning has also broken down many barriers to accessing education and, in many cases, enhanced participants’ life quality. For example, there is more time left to be with the family, or study schedules are more flexible. (Blankenberger & Williams, 2020, p. 410.)

When it comes to spaces, the learning environment in use is of great importance for studies. It has, for example, been observed how participating in distance learning from a workspace intended for learning alone helps students maintain their quality of life (Barros Silva et al., 2020, p. 8). Therefore, it might be useful to pay attention to the physical space where distance learning occurs: the stimuli it provides, its tranquility, and its practicality. It is equally important to note that many students do not have a daily opportunity to enter a separate space dedicated to studying during Covid. Further research could be done, for example, on whether participants should be provided with separate facilities in which to study or what might be the best possible spaces and environments to enable learning in the time of Covid.

5.5 Distance learning is here to stay – but not as the only option

Although distance learning deprives many of the advantages and features of face-to-face learning, it is here to stay. Even if education does not permanently move to distance learning, different hybrid models will become more common. The possibility of choosing between distance learning and face-to-face learning will, therefore likely remain in the future. Consequently, it could be suitable for higher education institutions and teachers to prepare for the proliferation of different forms of distance learning and seek the best possible ways to implement distance learning, face-to-face teaching, and the different variations between them into their teaching. (Ahmed et al., 2020, p. 12; Blankenberger & Williams, 2020, p. 411; Brammer & Clark, 2020, p. 455.)

If contact teaching has been required during Covid, students have been divided into small groups to minimize the risks. However, as even short group encounters can predispose to disease, some teachers and students are not ready to engage in such activities, especially if they belong to Corona's risk group (Barton, 2020, p. 12506; Torda, 2020, p. 1151). If and when the transition from distance learning back to extended contact teaching begins, teachers and students at risk and those otherwise concerned about the Covid situation should be considered. Some of them might not even be able to return to contact learning, in addition to which no one should not be forced to expose themselves to risks like Covid against their will. Risks and concerns are addressed in many ways depending on each individual's background, and therefore, they should be handled on a personal level. For the same reasons, flexible methods of distance learning should be developed for both students and teachers. In this task, it is essential to notice how the development of innovative and flexible distance learning is easily and too often hampered by institutions' various quality control activities. (Barton, 2020, p. 12506; Darling-Hammond et al., 2020, p. 461; Thomson, 2018, p. 76; Torda, 2020, p. 1151.)

According to Blankenberger and Williams (2020, p. 411), this time requires modifying or renewing physical and social technologies to suit the situation. Physical tools situated in campuses should support distance learning, while social tools should be designed so that students can get all the help they require, both present and remote. This should include, in particular, academic, social, and financial advice and support. New arrangements might also be possible if this would happen. For example, teachers at risk could act remotely as assistance or planners of study content for teachers working face-to-face. However, this kind of departure from traditional delivery norms of teaching and student services towards alternative hybrid delivery methods often requires a reorientation of funding and careful consideration of what might be the right direction to go with educational planning. (Blankenberger & Williams, 2020, pp. 411 & 414.)

5.6 Virtual communities, the possible fusion of universities and shared teaching content

Maintaining meaningful encounters and connections has been very challenging during Covid. Many studies call for the importance and usefulness of various remote communities and meetings to virtually maintain social distances between students, teachers, and university staff to reduce this deficit. Many functions of higher education institutions could, for example, be transferred to virtual forms. Examples of such approaches are "Virtual Recharge hours" and virtual coffee breaks which serve as a platform where participants can discuss the current situation by asking questions, highlighting their challenges, and looking for various possibilities to deal with it. This also works as a possibility to go through general informative matters. This kind of activity is important because meetings like this have been found to reduce student insecurity and anxiety. (Ahmed et al., 2020, p. 6; Dennis, 2020, p. 5.) For teachers and support staff, this kind of gathering also serves as an opportunity to identify areas that should be addressed in distance learning. In private virtual meetings, teachers can then share ideas, methods, or innovations that improve learning and student engagement. In this way, virtual meetings also act as their support network when planning distance learning. (Al-Taweel et al., 2020, p. 1297; Brammer and Clark, 2020, p. 454; Torda, 2020, p. 1151.)

Increased demand for distance learning works as an opportunity for universities in a tight situation to join forces and resources to arrange more effective distance learning experiences and, this way, to develop their competitiveness (Zuo et al., 2020, p. 664). Examples of this idea already in operation are "team-teaching" done between two or more universities, guest lectures from other universities, and multidisciplinary collaborations between various faculties within higher educational institutions. There have even been thoughts of university amalgamations to better manage and deal with teaching and the Covid-like situations in general. (Blankenberger & Williams, 2020, p. 409; Darling-Hammond, 2020, p. 461; Dennis, 2020, p. 5.)

With this in mind, it could be suitable for universities and teachers to increase efforts to create platforms where they can share their experiences of the situation so that teaching could be adjusted to the desired "new normal." To accomplish this, teachers could create

support networks to share their expertise and best practices in distance learning. This would allow them to work outside of their silos and move towards the world of co-development and cooperation to find the best possible solutions to this phenomenon of common concern. (Darling-Hammond, 2020, p. 461.) As an example of this kind of activity, Traxler (2017) presents a parable of how information is created in social media by sharing ideas and ideas.

5.7 Towards more sustainable and pleasant distance learning environments

According to Traxler (2017, p. 2), different types of distances exist alongside the physical one. These distances can, for example, be socio-economical, cultural, cognitive, and psychological, and they should be considered to achieve empowering, equal, and best possible distance learning. There are many possibilities to build more pleasant and sustainable distance learning environments that could support these aspects. Still, first universities and teachers should work especially for social justice and ensure that no student is left out. Blankenberger & Williams (2020, pp. 415-416) suggest that the solution could incorporate critical approaches offered by critical pedagogy into distance learning studies. This would make it possible to consider issues related to equality, devaluation, and study difficulties. At the same time, it could work as an opportunity to create a safe and functional space for dialogue for people from different classes, gender roles, and ethnic backgrounds. These ideas are in line with the thoughts of Darling-Hammond et al. (2020, p. 458). They also emphasize knowledge about students' social, emotional, cultural, and cognitive aspects as matters for consideration and call out for "equity-based educator preparation" in which similar topics would be discussed. This activity would especially include culturally responsible actions that also take family relationships into account, for example, by discussing how students could keep in contact with their relatives and other important people during Covid (Darling-Hammond et al., 2020, p. 459).

However, incorporating these methods into distance learning once again requires more effort from universities and teachers. This may also include financial support to enable every student to participate in distance learning and a great deal of knowledge from teachers about the context of students' daily lives. As higher education institutions often receive

public funding, the integrity and importance of their account should be emphasized in situations like this. They need to act responsibly, credibly, and transparently and communicate clearly how they serve these common goals. (Blankenberger & Williams, 2020, pp. 410, 414 & 417; Okanda & Sheeny, 2020, p. 16.)

5.8 Student attitudes

Covid has been taken seriously among students. Thus, students' study morale, confidence in self-efficacy, and satisfaction have been in line with pre-Covid times, even when studies are done remotely (Agarwal, 2020, p. 554; Rizun and Strzeleck, 2020, p. 15). Students have mainly found various distance learning opportunities to be positive, important, useful, and interesting. They are even demanding services like distance learning as it, for example breaks the monotonous formula of traditional classroom learning (Ahmed et al., 2020, p. 5; Agarwal, 2020, p. 554; Thomson, 2018, p. 74). Still, it should be kept in mind that reasons for favoring distance learning may often relate to the student's geographical location, mobility difficulties, or belonging to a risk group (Okanda & Sheeny, 2020, p. 2).

In their mixed-method study, Okanda and Sheeny (2020, p. 1) have explored distance learning characteristics that keep students better motivated and lead to the most effective and committed learning possible. According to their research, many students appreciate the positive social, cognitive, and emotional aspects of distance learning through friendly and fun learning activities. Happiness is also an essential part of distance learning. Hence, distance learning can be made more pleasant and modified into a direction that enhances social interaction, for example, through fun games and role-playing. Still, it is also important to consider how a small proportion of students feel this has adverse effects on their learning. Therefore, it is better to create a friendly atmosphere by using fun presentations rather than driving students into fun activities themselves. In other words, whatever the means of enhancing distance learning are, students should be allowed to implement their personal, specific learning styles in the process. (Okanda & Sheeny, 2020, p. 15.)

Students' commitment and flexibility towards distance and online learning can be improved by exploring the structure of their support networks and the formal (provided by the university) and informal (e.g., family, friends, and social media) support they provide. This can be done, for example, by finding out what kind of networks students are substituting for everything the campus normally has to offer. It would also be good if teachers understood how they could use their professional network to best support their students. According to this observation, opportunities should be actively sought from students' social networks. It is an excellent practice to get to know the student support network, for example, by making a map of them together with them. On the other hand, whatever the technique is, what is most important is that each student should find a unique way to identify their most important support providers, both within their studies and other social circles. (Brammer & Clark, 2020, p. 455; Haaper & Brown, 2020, p. 349.)

5.9 The increased importance of feedback and warning signs

When learning is carried out as contact teaching, a considerable amount of implicit information is transferred. This can be conveyed, for example, in the form of gestures, gazes, sound pressure, and small talk. Instead, in distance learning, this kind of feedback is tough to get or interpret. The reason for this is mainly interaction through technology. For example, while technologies already allow visual feedback, it is still often insufficient to convey this kind of implicit information. Feedback should therefore be collected in other ways. By actively gathering current information from students, it is possible to modify and adjust teaching so that it supports their studies, for example, by responding to the challenges they face with their remote studies. Especially students' faith and satisfaction towards distance learning should be actively monitored in Covid-like situations because they are an important part of the success of distance learning. (Driessen et al., 2020, p. 12435; Okanda & Sheeny, 2020, p. 15; Torda, 2020, p. 1152.) Collecting feedback only after courses makes collected information worthless to students who have just finished the course. Feedback on teaching should therefore be collected regularly, and results should be used for the continuous development of teaching in a timely manner. Because giving feedback is not natural for students in distance learning, it is also worth actively asking for it. Besides other feedback, students should also be offered an opportunity to

receive feedback to monitor their personal course performance and their study progress as actively as possible. (Al-Hosan et al., 2020, pp. 3-4.)

Besides taking feedback into account, teachers should learn to identify various indicators and warning signs that occur when organizing or assessing distance learning, especially in situations where students do not stay involved in teaching. These warning signs include deadline overruns, decreased participation in synchronous instruction, complaints about used technologies, increased dissatisfaction with university staff, and declining grades. Other noteworthy indicators to evaluate distance learning are data about student completion, drop-outs, and decline in learning outcomes (Ahmed et al., 2020, pp. 5, 11 & 12; Okanda & Sheeny, 2020, p. 15). Especially students at risk of dropping out should be considered more closely when planning distance learning. These groups consist especially of students who are disadvantaged, disabled, or struggling with mental health problems. Surprisingly, risk groups also include first-year students and socially active students whose lives have been greatly affected by maintaining social distances. One possibility could be learning management systems which would help to take care of these groups more systematically. Suggestions for this kind of system are “trauma-informed approaches” and carefully planned, explicit “policies to support students.” (Barros Silva et al., 2020, p. 7; Sutton, 2020, p. 9.)

5.10 Clear guidelines

Because vague guidelines and study paths often increase confusion among students, a very simple, straightforward, and concretely packaged curriculum should usually be considered. Clear instructions and directions can help students to engage in distance learning more effectively, develop their distance learning skills, and increase their study motivation in general. (Ahmed et al., 2020, p. 7; Thomson, 2018, p. 76.) Therefore, the courses' content and objectives, including the criteria, should be opened as clearly as possible. Continuous review of distance learning curricula should also be a norm, as it allows for identifying and implementing best practices. It is, for example, possible to use concrete guidelines based on research information introduced as "action steps for distance learning." However, in that case, it should be noted that the curriculum must also adapt to diverse and complex situations. Thus, more flexibility is needed from teachers, students,

and universities alike. (Ahmed et al., 2020, pp. 11-12.) This requires resources, especially from teachers and institutions, so that the situation does not put, for example, the students with a lower income in an even more unequal position. Instead, by establishing more flexible practices, even the curricula of full-time students could become more open and more accessible so that studies could be more easily divided and adapted to meet personal challenges at home and work life (Dennis, 2020, p.4).

5.11 Co-developing quality technologies and content

The growing use and importance of various technologies play a constantly more prominent role in future education. Therefore, numerous technologies that enable distance learning have even been used for a long time before the advent of covid (Cheema, 2020, p. 4). Yet, Covid forced universities to make massive steps towards fast-paced digital transformation, and this way has made the "use of technologies an imperative in the field of education" (Al-Taweel et al., 2020, p. 1296; Mladenova et al., 2020, p. 1169). The popularity of technologies has increased, especially because they have enabled teachers to meet more students' learning needs. Many technological advances and developments have also improved access to distance learning. Examples of these are faster internet connections, more efficient computers, and improved distance learning infrastructures. Consequently, the possibilities for organizing distance learning also increase as technologies continue to become better, cheaper, and easier to transport. (Cheema, 2010, p. 4; Thomson, 2018, pp. 75-76.)

The widespread use of distance learning has increased the need and demand for the best possible designed and high-quality digital teaching content that a teacher can quickly deploy. The use of digitized teaching materials can, for example, reduce inequalities in situations where access to materials has previously been a privilege for campus students. Content-wise, innovative, and inspirational teaching approaches and materials can, in turn, strengthen students' interest in distance learning. Therefore, providing authentic and relevant educational content online is crucial because it can prepare students for modern working life. (Darling-Hammond et al., 2019; Elfirdoussi et al., 2020, p. 12; Traxler, 2017, p. 9.) As various digitized teaching materials are seen as an essential part of future learning, digital literacy is becoming an increasingly important part of distance learning.

However, this skill is not a matter of course among students or teachers. This may be due, for example, to the fact that people have very diverse cognitive skills. Because of this, the level of the content offered to students should not be reduced. Instead, content should be thought of from as many perspectives as possible.

It should be noted that even if teachers are skilled users of digital tools, digitizing almost all material and teaching activities requires time and precision when done carefully. Therefore, if distance learning occurs on a tight schedule and using utterly new distance learning systems, teachers should be given enough time to transfer their teaching materials into the required formats. This is necessary because each new learning environment often requires completely new types of materials. (Blankenberger & Williams, 2020, p. 411; Mladenova et al., 2020, p. 1169.) Time and preparation are needed, especially because new tools, techniques, and rules related to distance learning need to be designed carefully and brought into action step by step. This work involves finding out about technological problems, practicing new skills, and getting to know distance learning environments in more detail, even if teachers are familiar with the systems used. (Al-taweel et al., 2020, p. 1298; Rizun and Strzelecki, 2020, p. 16.)

As teachers increasingly adopt different software and technologies into their teaching, curriculum development gradually becomes an open field in which even private software and content developers can participate. Since the materials must be pedagogical, content-wise, and technologically supportive of teaching aims, experts of several fields must be involved in their design. (e.g., Torda, 2020, p. 1153.) Therefore, involving universities, teachers, and students in software and technology development would be a good opportunity for Edu-tech developers. The real-life situations can provide the best possible feedback to develop more interesting, engaging, and practical tools and distance learning systems. Time of Covid could also serve as an opportunity to create new social platforms designed for scholarly communication. Even the very elementary Covid-related questions can bring very significant and valuable application possibilities (Driessen et al., 2020, p. 12435; Torda, 2020, p. 1152).

5.12 Other technological opportunities

Although many educational technologies and software might already be very functional, they might still be useless or impractical unless they do not support distance learning's pedagogical or substantive aspects. In this context, Covid has accelerated the development of various pedagogical systems and created situations where poorly functioning technological solutions have had to give way to better ones (Brammer & Clark, 2020, p. 456). This has also forced many software developers and service providers to expand their knowledge and tailor their technologies to meet the demands of the educational field when Covid broke out. While this has been challenging for them, it has created many technological opportunities in the teaching field. (Blankenberger & Williams, 2020, p. 410; Traxler, 2017, p. 6.)

Thus, technologies related to online learning can be of great importance for distance learning success and may significantly depend on technological developments in the right direction. Well-designed and carefully chosen teaching technologies offer many benefits. For example, technologies that support study content and pedagogical goals significantly enrich learning (Barros Silva et al., 2020, p. 7). In addition to this, well-designed technologies that provide a pleasant and engaging learning environment can even empower students and affect their well-being (Okanda & Sheeny, 2020, p. 16). Using the latest technology improves the learning process and ensures that the link between teachers, students, and technical support works. This has a significant impact on how teachers and students receive distance learning. For the same reasons, teachers involved in teaching need good internet connections. (Al-Taweel et al., 2020, p. 1296; Elfirdoussi et al., 2020, p. 12.)

The most featured distance learning programs and platforms in the studies were Blackboard, Zoom, Youtube, and Moodle (e.g., Al-taweel et al., 2020, p. 1298; Barros Silva et al., 2020, p. 4; Torda, 2020, p. 1151). Many programs and social platforms support distance learning, and many of them are even free of charge. The system to be implemented must still allow either direct or indirect interaction between the student and the teacher with ease. Besides, they must not contain features that may cause interference to the learning situation. As an inoperative example, a completely free and well-known Moodle

system requires much practice, especially when no previous experience with the system can be found. (Al-Hosan et al., 2020, p. 5; Barros Silva et al., 2020, p. 8.)

The most common ways to convey teaching in distance learning are video materials, reading assignments, and teachers' online examples. Although video tutorials can be seen as very passive and one-way teacher-centered methods, they have been nevertheless seen as effective teaching aids. This may be related to ways how current digital generations are accustomed to learning new things and phenomena. (Barton, 2020, pp. 12503-12504.) Using social media in innovative, creative, and engaging ways is one way to get students involved in distance learning. As an example, Al-Taweel et al. (2020, p. 1298) present an inclusive project in which people's sensations evoked by the covid situation were gathered under common hashtags. Therefore, it is sometimes good to allow students to participate in studies through a discussion board or chat functions instead of a speech connection. Yet, at the same time, it should be noted how using the best-known social media platforms is not always desirable, as students may not want their teachers in the same environment or vice versa (Ahmed et al., 2020, p. 6).

During Covid, teachers have also found interest in bringing completely new platforms and technologies to support their teaching. A good example is the increased interest in the use of virtual reality. It may be possible to increasingly organize distance learning in the near future by using various possibilities provided by virtual reality, augmented reality, or mixed reality systems that provide three-dimensionality and gamification. Some learning environments have even introduced systems related to artificial intelligence learning, facilitating students' decision-making related to their studies. In other cases, artificial intelligence has provided teachers with more time when performing simple tasks such as automatic reviews of simple tests. (Brammer & Clark, 2020, p. 455; Torda, 2020, pp. 1151-1152.) This kind of increased distance learning adoption and technological development may lead to more technology savvy and multidisciplinary pre-requirements and job descriptions in the teacher labor market and an increase in lifelong learning among teachers (Brouwer et al., 2013, p.6; Cheema, 2010, p. 4). Support should therefore be provided, in particular, for updating teachers' pedagogical and technological knowledge. Possibilities for this could be to create curricula that focus on training teachers to find tools best suited to their subject's distance learning or to provide teachers with

continuous technological and pedagogical training alongside work (Darling-Hammond et al., 2020, p. 461). The future of teacher training could be re-evaluated on this basis.

Getting familiar with distance learning systems, developing them, and finding the best possible ways to use them requires increased financial investments. In this context, it is still good to note that well-designed educational software can enable cost-effective, more interactive, and flexible learning, which can even affect universities' economics positively (Traxler, 2017, p. 8). This can be a good opportunity for the future, even though the situation has challenged universities financially. Even the states and their governments should notice how this time could serve as a significant opportunity for competitiveness in the field of Edu-tech, not only economically but also in terms of quality of teaching and its content (Blankenberger & Williams, 2020, pp. 404 & 414).

Students use both computers and mobile devices to participate in distance learning sessions (Barros Silva et al., 2020, p. 4). Still, mobile technologies provide more accessible and flexible ways to participate in distance learning in terms of location and situations, among other things (Al-Taweel et al., 2020, p. 1296; Elfirdoussi et al., 2020, p. 12). They offer many possibilities to increase students' well-being by enabling mobility simultaneously alongside studying. Both mental and physical fitness could be taken care of, for example, by remote lectures established via mobile devices during walks. Learning like this could also provide opportunities to implement innovative teaching methods, such as remotely held field studies and activities, into teaching (Barton, 2020, p. 12499).

Alongside the increased use of mobile devices, the Internet, streaming media, and television have gained popularity among students during Covid. However, many devices and services are not necessarily used for study or recovery purposes but to reduce overall boredom. Therefore, it is essential to notice that over-consumption of technologies and increased screen time can negatively affect student well-being. (Barros Silva et al., 2020, pp. 4 & 7.) Yet when these issues are considered with the seriousness they require, this also serves as an opportunity to develop innovative distance learning methods. The starting point could, for example, be how some private TV companies have been participating in arranging distance learning studies by broadcasting teaching/content-related programs at a time specific to the current studies (Al-Hosan et al., 2020, p. 3). This could work as

an opportunity, for example, for universities which curricula include studies in television and broadcasting. Another potential option that has received little attention is related to the hybrid teaching model, in which the tools and equipment needed for distance learning are delivered to students' homes while teaching itself takes place remotely (Blankenberger & Williams, 2020, p. 411). The question, then, is how to make the most effective use of both existing and future technologies and actors of the surrounding environments in a mutually supportive way.

6 EVALUATING THE FUTURE APPLICABILITY OF THE TPACK MODEL

6.1 First impressions

The Technological Pedagogical Content Knowledge (TPACK) framework was initially intended to be used as a heuristic model to structure this literature review and help to answer the selected research questions. However, this was not fully materialized for various reasons. One reason was that it was not easy to separate different Covid-related phenomena between various components of TPACK due to the ambiguity of the framework. For example, deciding in which area of TPACK did the observations concerning students should have belonged ended up being quite challenging or nearly impossible. Numerous overlaps in parts of the framework made this increasingly difficult. Another significant shortcoming was the absence of the subject, i.e., the student, in the TPACK framework. This was problematic because students should not be kept separate from designing the best possible teaching with or without technologies. Because of this, the model could be described as a little deterministic regarding the development of teaching, i.e., the model can be seen as very teacher-centered, which has in many cases been found to be a weaker way of learning compared to student-centered learning. Perhaps the model reflects times when teaching was most often based on traditional transaction logic. In what part of the model could students be placed, the question remains, especially as education has been gradually moving towards a broader use and understanding of student-centered teaching.

As a result, the use of the TPACK framework was restricted because it effectively forced to delineate matters relevant to the study for the reasons outlined above. With the decision, the focus moved back towards the main issues of the literature review, i.e., to explore the opportunities that the Covid situation could offer to developers of educational technologies. What was left of the TPACK framework to this literature review most prominently was how the text still opens technological, pedagogical, substantive, and contextual challenges and opportunities. The findings are just not presented according to the TPACK Framework due to its weaknesses presented in this chapter.

Because using the framework to structure the text seemed increasingly challenging, its backgrounds and history were further studied by exploring more information about its usability and previous use cases. As a result, it was found that many studies had reached very similar conclusions regarding the usefulness of the framework.

6.2 Further findings on TPACK

As the literature review progressed, it became increasingly clear how vital contextual knowledge is when the aim is to establish the best possible distance learning experience during covid-like situations. This claim is supported, for example, by Rosenberg and Koehler (2015, p. 15), who describes the importance of context in the studies of technology-supported teaching as follows:

”Attending to context can place researchers into contact with diverse teachers and learners in diverse settings, strengthening our understanding of teaching with technology across contexts, as well as contributing support and guidance in settings that we know little about, such as educational technology use in high-poverty urban settings.”

Still, even though the TPACK framework has been recently updated to consider the importance of the context, it did not seem to take sufficient account of certain elements that were proved to be important in this literature review. Since the framework very likely suffers precisely from the vagueness of the concept of Contextual Knowledge, an adequate theorization of it could have helped a great deal in structuring this literature review also. Further support for this view is again given by Rosenberg and Koehler (2015, pp. 15–16), who present how the concept of context has not been sufficiently theorized to be more easily used in studies using the TPACK framework. At the same time, they open up the lack and importance of context in the TPACK framework as follows:

“Context is an important aspect of educational research and the Technological Pedagogical Content Knowledge (TPACK) framework, but is often missing from TPACK research, or its specific meaning is not clear” (Rosenberg & Koehler, 2015, p. 1).

Similar conclusions were also reached by Angeli and Valanides (2009, p. 157), presenting epistemological problems related to the TPACK Framework. As a result, they put the framework under scrutiny, mainly because they see it needing theoretical clarity. Interestingly, they also conclude that learners are missing from the model and how the relationships between the different parts of the TPACK model are sometimes very vague. The following statement from Angel and Valanides (2009, p. 157) nicely illustrates the very

similar observation made in this literature review, i.e., how even the updated version of the framework is still not sufficient to deal with complex situations such as distance learning in the time of Covid holistically enough:

“... the framework (TPACK) in its present form does not take into consideration other factors beyond content, pedagogy, and technology, such as, for example, teachers’ epistemic beliefs and values about teaching and learning that may be also important to take into account. This simplified or general view, one might argue, may lead to possible erroneous, simplistic, and naïve perceptions about the nature of integrating technology in teaching and learning.” (Angeli & Valanides, 2009, p. 157.)

Based on their observations, Angeli and Valanides (2009, p. 159) present an alternative ICT-TPCK model that seeks to address the problem areas of the TPACK Framework. What is interesting about this model is how it takes into account things that even this literature review expected from the TPACK framework: learners and context. Their importance can even be seen in the fact that they have become part of the ICT-TPCK model, as shown in Figure 3. Of particular interest to this model was the idea of a "conceptual ecology of a student" that considers students' cognitive and holistic development. This holistic development, in return, considers the factors surrounding students and affects their development (Angeli & Valanides, 2009, p. 159).

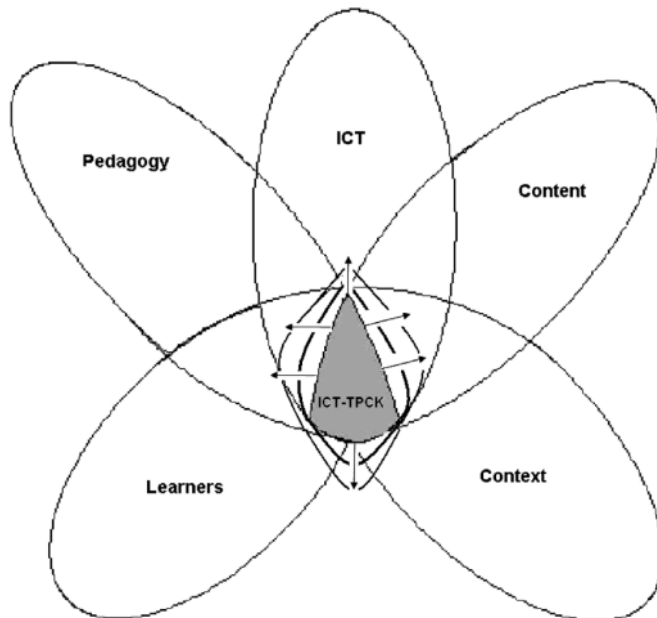


Fig. 3. ICT-TPCK.

Figure 3. ICT-TPCK by Angeli & Valanides (2009, p.159).

Therefore, the ICT-TPCK framework appears to be a more potential alternative to the original TPACK model and may require revision in future studies. On the other hand, with the help of further research, other alternatives were also found. One of these was the TPACK-XL framework, which in turn was developed by Saad et al. (2012, pp. 48 & 50) based on the ICT-TPCK model. While the TPACK-XL model offers by far the most versatile framework by modernly aiming at a more multidisciplinary field of learning, its vastness still raises the question of whether it may eventually suffer from its versatility. This question arises primarily from the observation that the model contains 31 different fields of knowledge, as shown in Figure 5. Nevertheless, just like the ICT-TPCK framework, this model also opens up the world of contemporary technology-driven teaching much more multidimensionally and considerably than the original TPACK framework. Perhaps at least the main areas of knowledge in the TPACK-XL framework could be evaluated in future studies as well.

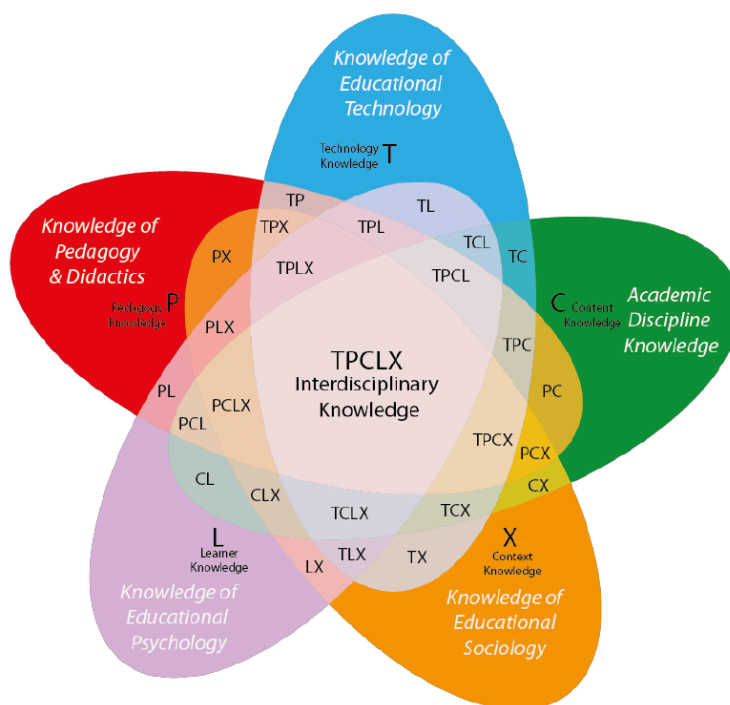


Figure 4. TPACK XL - Theoretical framework model, in which the interconnectedness of all different Knowledge Constructs is present (Saad et al., 2012, pp.48 & 50).

6.3 ICT-TPCK and Activity Theory – possible combination?

After several options of the TPACK framework, the ICT-TPCK model seemed to be perhaps the best option to be used in future studies and technological development processes. However, like Chai et al. (Chai et al., 2013, p. 46) mention, the TPACK model should also be introduced with other research tools or frameworks. In connection with this comment, the ICT-TPCK model, in particular, raised one intriguing idea that could be examined and tested in possible further research: Could the ICT-TPCK framework and Activity Theory either complement each other, or could Activity Theory even as such, completely replace the ICT-TPCK model? Still, as this is a purely hypothetical idea, its evaluation requires further reflection and research. In addition to this, the model of Expansive Learning and the concept of Change Laboratory, which are often linked to Activity Theory, could also be a potential tool for studying the Covid situation. In particular, they could be used to analyze and deal with disruptive classroom scenarios where old practices are no longer seen as sufficient to address the situation. (Engeström & Sannino, 2010, p. 7.)

6.4 Future of TPACK Framework?

Even though the recently updated TPACK Framework is a valuable frame of reference in some instances, it was not found to be a sensible enough framework to structure or address all the challenges that arise in this literature review. It especially seemed that the role of contextual knowledge might have been underestimated in many of the earlier studies that have used TPACK. In this light, even though Mishra's (2019) recent addition of contextual knowledge is vital to the TPACK model's future, the question remains: is it still enough? And if so, in what kind of scenarios can it work best and offer the most?

If and when research is conducted using tools like TPACK, they may influence the direction of future research as well. Therefore, the tools used should be able to adapt to reflect their era. That being said, there is a constantly greater need to consider the complex nature of the world. It is no longer necessarily enough to think about how simplifications such as the TPACK model could tell enough, for example, about how learning could be achieved most successfully. Instead, there should be more discussion about how an interdisciplinary approach is gradually taking over education among other disciplines.

Therefore, even the challenges posed by Covid need to be considered and addressed in a genuinely holistic way. In other words, the time of Covid has shown how all phenomena are at least immediately connected. For example, how phenomena wholly detached from the academic world can still affect it in the most trivial ways. Related to this idea, especially the latest update to TPACK - the Contextual Knowledge - looks loose. This update also reflects how minor the role of contextual knowledge has been in many earlier studies that have used TPACK.

It is very likely that, even after moving into the 21st century, we have not fully understood well enough how tools and frameworks could and should be updated to meet the needs of future students instead of them maintaining their existing norms. It should be remembered how the world of Edutech is changing exponentially faster alongside new technological achievements. Updating this kind of framework can therefore be critical, especially in situations where digital leap is being implemented at a record pace, as in the Covid era. The idea is supported by Koh et al. (2015, p. 459) who mention, that “further theorizing of the epistemic nature and processes involved in creating TPACK is needed.” Thus, there might be a need for an updated version of TPACK, which could also serve as a tool for teachers to study and think about their decisions regarding planning studies and taking education with technologies towards 21-century competencies (Koh et al., 2015, p.459).

With these many views alone, the TPACK model can still be seen looking its final shape. Perhaps the developers of the original TPACK framework are already aware of many of the limitations related to their framework when they mention:

“We are sensitive to the fact that in a complex, multifaceted, and ill-structured domain such as integration of technology in education, no single framework tells the “complete story”; no single framework can provide all the answers. The TPCK framework is no exception. However, we do believe that any framework, however impoverished, is better than no framework at all.” (Mishra et al., 2006, p. 1047.)

Thus, in defense of the TPACK framework, it should be mentioned that it was initially developed to address the lack of reference frameworks around educational technologies. The framework itself is not, therefore, too limited, or too simple. Instead, the model is likely to be better suited to studying learning processes in more limited learning environments. In doing so, however, the study must most likely be very strictly limited, for example, to scenarios in which an exact distinction between technological, pedagogical, and content knowledge is possible.

7 CONCLUSION, DISCUSSION, AND SUGGESTIONS

7.1 Towards new normal

Distance learning, while done online, offers opportunities for many teaching methods that are impossible in traditional face-to-face teaching. It also provides possibilities to use various technologies creatively and build up rich content that inspires and engages students. For example, Torda (2020, p. 1151) describes how distance learning enables more efficient "Flipped Classroom" teaching in medical studies and allows more advanced and effective teaching tools. In many other cases, distance learning has taken advantage of many proven pedagogical approaches such as blended learning, self-paced learning, simultaneous learning, social/peer-based approaches, and Massive Open Online Courses (MOOCs) or different combinations of them (Darling-Hammond & Hylar, 2020, p. 457; Tomte et al., 2015, p. 27). In 2018, it was even argued that distance learning would lead to a paradigm shift in education. Back then, Massive Open Online Courses (MOOCs) were seen as an opportunity to equalize education, but in the end, their use was not seen to engage students well enough until the courses were completed. Consequently, they were not seen to be productive, especially when used by small universities. (Thomson, 2018, pp. 75-76.) However, Covid's time has clearly shown how distance learning can really break old ways of studying and finally even lead to such a paradigm shift.

Before Covid, there have been arguments of how the amount of distance learning use would stabilize over time. However, the pandemic has created a new kind of situation in which the growth of distance learning usage no longer seems to be stabilizing but instead growing significantly. Now, distance learning is even as important as face-to-face learning (Ahmed et al., 2020, p. 2). Amid these considerations, the pandemic has provided a lot of time and opportunities to weigh whether teaching should be transferred to distance learning or in some alternative direction. If so, to what extent should it be used and in what context.

7.2 Disruption and resistance as a germ cell of development

Change can always be complex, labor-intensive, and disruptive. Often it also causes a lot of resistance. However, this is often inevitable in Covid-like situations in which operating models are no longer able to serve the future demands. (Blankenberger & Williams, 2020, p. 404.) As the time of Covid has clearly led to numerous innovations and opportunities to rethink the technological, content, and pedagogical aspects of distance learning, the situation should therefore not be frightened. Instead, it should be used more effectively to explore the challenges and opportunities of the pandemic. (Brammer & Clark, 2020, p. 455; Darling-Hammond, 2020, p. 463; Torda, 2020, p. 1150.) The preparedness, flexibility, and adaptability of higher education can therefore determine whether Covid will become a problem for their teachers and students in the future. Therefore, both the current situation and the uncertain future will require an efficient, collaborative, innovative, flexible, and positive attitude towards big and challenging changes from universities, teachers, and students. Especially pedagogical challenges should be actively mapped and discussed. Possible solutions for these challenges should then even be sought beyond the boundaries of universities (Blankenberger & Williams, 2020, p. 416).

Recently, there has been talking about returning to "old normal" with the increased availability of vaccines. The question, however, is whether it makes sense to go back to the old normal when we can move towards a more sustainable and better "new normal," which could be more rational and productive for all those involved in higher education. Instead, returning to pre-Covid teaching methods and styles would be like denying the situation we are in and denying the numerous opportunities offered by the situation (Dennis, 2020, p.4). Therefore, one big question is whether teachers and educational institutions are ready for a situation where studies move towards the "new normal."

According to several scholars (e.g., Ahmed et al., 2020, p. 12; Dennis, 2020, pp. 3-4), the future of education will not be the same, which is why we must strive to find the best possible directions and ways of working to ensure the best possible teaching. Therefore, it is reasonable to think positively about how the situation is sure to create long-term benefits for institutions and teachers (Torda, 2020, p. 1153). That is why universities, teachers, and students should review the situation through the goggles of the future

researcher and look towards alternative futures as they live in a period of transition during which it is good to consider what studying and education after Covid might look like. The new normal of studying, and distance learning, in particular, can look just as good and exciting as what we imagine and create from it. Of course, amid all this, one must also consider how many of the benefits that Covid brings are temporary (Ahmed et al., 2020, p. 5).

For example, Dennis (2020, pp. 4-5) outlines how universities and their teachers should strive to open visions for their future; to create a vision plan. However, this does not mean the same as an action plan or a strategic plan. In the vision plan, it is possible to go through how distance learning could look at its best once Covid is over. Insightfully, Dennis describes the vision plan as "thinking with no box." Perhaps various modern methods such as design fiction or future research could contribute to this kind of development work. In this way, for example, teachers could critically evaluate their teaching and think about what the most positive and attractive curriculum would be like.

In this light and terms of sustainability, it was strange to notice how only a very few articles thought of distance learning as an opportunity to strengthen the ecological mindset of universities, teachers, and students. Still, delivering education as widely as possible through distance learning could work as an opportunity to educate people to deal with important contemporary topics such as circular economy, rapid population growth, climate change, or phenomena such as Covid (Okanda & Sheeny, 2020, p. 1).

Covid is not the first pandemic in history, and it is unlikely to be the last either. In addition to this, phenomena such as climate change can cause something similar. Perhaps universities should therefore plan their policies and strategies for possible future phenomena as well. One possibility could also be an emergency remote learning procedure system that includes guidelines to be introduced in these kinds of exceptional situations. Universities that are already familiar with this, for example, because of the annual natural phenomena they are facing, could serve as preliminary examples for designing such systems. On the other hand, during the time of Covid, many universities have inevitably developed such systems without further thought. (Al-Taweel et al., 2020, pp. 1295 & 1298.)

7.3 New kind of learning for new kind of learners

Students often have very different perceptions from their teachers of how they learn best. These differences become even more apparent with the increasing use of distance learning. This is highly important to acknowledge because both teachers' and student's conceptions of learning are key to a successful distance learning experience (Chai et al., 2013, p. 46). Feedback from new net generation students has shown that even though they value distance learning through technologies, their attitudes towards the advantages and disadvantages of distance learning resemble earlier generations' attitudes. Still, the knowledge, interests, learning styles, and other characteristics of these generations are one thing to consider when planning distance learning in the future. For example, there is a lot of technical knowledge and skills in particular among these generations. Therefore, the potential use of future technologies such as Virtual Reality, Augmented Reality, Mixed Reality, or Artificial Intelligence in distance learning should not be overlooked.

New generation students are also constantly more attached to socialization, both physically and remotely, with and without technologies. Therefore, collaborative, interactive, and global learning solutions are often powerful ways to learn for these digital native learners. In this context, students have begun to be attracted to study in new and more effective ways. The situation has already changed how students accumulate the credits they need to graduate (Blankenberger & Williams, 2020, p. 408; Cheema, 2010, p. 4). On closer inspection, one may question how aware teachers and universities are about how students would like to continue their studies once Covid is over?

As teaching shifted to distance learning, new norms began to emerge into the field of education at a faster pace, or at least they have been under discussion. As an example, Dennis (2020, p. 4) presents how traditional semester-bound studies might be changing in a direction where lessons are conducted throughout the year regardless of the season. The idea is based on how new generations of learners like to be online all the time irrespective of the time or seasons. Traditional semester-based teaching might therefore be facing a disruption somewhere in the future. The ways how students enter and graduate from their universities may also have to experience change if this happens. This would allow students to be admitted to education throughout the year while graduations occur

more and more through distance learning. (Blankenberger & Williams, 2020, p. 410; Dennis, 2020, p. 5.) Therefore, the future seems to demand new, innovative approaches with curriculums, teaching methods, and developing alternative learning paths. One thing to consider could be the debate on whether it would be possible to provide teaching faster so that studies could be completed even more flexibly and quickly.

The big question also in this process is whether teachers and educational institutions are even ready for the "new normal" or have the skills and knowledge required. What happens, for example, if students indicate that they want to stick with distance learning permanently. Moreover, in what ways might teachers' work change in the future as students learn things faster through technology, even without the existence of teachers. For example, could the roles of teachers change even more towards working as sparrer, peer, facilitator, and enabler rather than authority? (Blankenberger & Williams, 2020, p. 411.) It should be questioned from time to time who universities and teachers are and what they do. That is why higher education institutions and teachers must strive to find ways of working that can flexibly adapt to the new norms that emerge over time (Ahmed et al., 2020, p. 6; Brammer & Clark, 2020, p. 456).

Another disruptive question could be whether there really a need for as many semesters in the future is as there have been in the past. One might think, for example, that semesters still follow the features of an agrarian society where students return to their homes for agricultural work during their summer holidays. However, the situation is no longer the same for today's younger generations who have lived all their lives in modern environments equipped with technologies. Thus, it could be questioned how much teachers with their old formulas know about the usual learning styles for these age groups, or in general, how valuable, and productive their use of technologies that seem like vanities can ultimately be.

7.4 Possible directions for technological development

The unexpectedly fast leap that has now taken place has updated the technological skills of many to match even the decades to come. This would not necessarily have been possible without Covid. There is, therefore, much potential to be seen in technologies for

distance learning. The role and proliferation of mobile devices in teaching and learning are especially topics that should be considered in future studies and education. Choosing mobile devices instead of computers as a platform for distance learning could work even as a matter of equality. In addition to this, technologies such as artificial intelligence and cloud services could be harnessed to achieve more equal distance learning opportunities. Otherwise, they could be used to create educational systems which could support distance learning situations.

Elfirdoussi et al. (2020, p. 1), who examined the challenges of distance learning posed by Corona from the perspective of both teachers and students, identified four major dimensions which can be used to assess the technological issues Covid has brought to the field of distance education: economic, psychological, social, and environmental. The Economic dimension deals with tools and infrastructures in general. The psychological level is used to reflect the transition from traditional teaching towards distance learning. The social dimension considers various issues related to security and trust, both at the individual and institutional level, and deals with how technology is operated and managed at a general level. The environmental dimension considers the role of context and locations when dealing with technology. Mishra and Koehler (2006, pp.1032-1033), on the other hand, have presented a list of things that makes the learning of new technologies challenging but also problematic for teachers: The rapid rate of technology change, inappropriate design of software, contextual nature of education, and an emphasis on what, not how. These complementary lists by Elfirdoussi et al. (2020) and Mishra & Koehler (2006) are fascinating and important because the numerous findings made in this literature review also fall within these dimensions almost without exception while reaffirming their importance. These technological issues might therefore serve as a starting point for possible future research for developers of Edu-tech. As all these challenges were quite visible in chosen studies, these dimensions should be carefully considered in developing new teaching technologies.

However, while alternative teaching technologies, methods, and skills for distances are being sought more actively, it is good to choose the projects to be funded carefully. The introduction of technology into educational settings should not, therefore, be taken for granted. Instead, it is mainly a question of what teachers should know when adopting or

introducing technologies to teaching to achieve the best possible learning outcome and how the used systems support their pedagogical decisions and the subject being taught. (Al-Hosan et al., 2020, p. 5; Mishra & Koehler, 2006, p. 1018.) In this context, information gathered from universities, teachers, and students' experiences during Covid is like data collected from a large-scale experiment. In other words, this period can work as an opportunity for technology developers and various service providers involved to join forces with universities and teachers, to develop distance learning tools and content based on the best possible knowledge from the educational field. By observing the historical development of the most successful software before and during covid, we can learn something new and vital from technological development.

7.5 Final remarks on the TPACK Framework

TPACK Framework was not seen as sufficient for holistically dealing with distance learning in Covid-like situations. Instead, the ICT-TPCK and TPACK-XL models developed based on the TPACK Framework aroused interest in testing and evaluating them in further studies. On the other hand, the study also raised the question of whether any of these models could be combined with other theoretical models to fulfill their function better. One potential option could be to combine either the ICT-TPCK Framework and Activity Theory or even evaluate whether Activity Theory could be used as a separate alternative alone. This idea arose primarily from the observation that Activity Theory can seem to include all the features of ICT-TPCK, and maybe even more.

7.6 More research is needed

There is not enough research done on distance learning during Covid-like situations yet. One possible reason for this is that international pandemics of this magnitude have not occurred during the twentieth century since the Spanish flu. The changes and challenges caused by Covid will ultimately spare no one. Since the situation with Covid is quite similar everywhere, it should be put to good use. With good foresight, research, and planning, distance learning will offer many possibilities beyond social, economic, and demographic boundaries. However, the situation needs to be addressed now and not later in the future. Therefore, it is necessary to make rigorous decisions based on the data collected,

primarily since contradictions often serve as the starting point for development. (Cheema, 2010, p. 2; Dennis, 2020, p. 5.)

In other words, the time of Covid is and has been favorable for research as it has brought many possibilities into the field of science in the form of opportunities for research that have been impossible without the presence of Covid (Driessen et al., 2020, p. 12431). Therefore, studies performed on Covid should be closely explored and used, especially if we end up heading towards the "old normal." Many universities presumably have many things to learn from these results (Driessen et al., 2020, p. 12435).

All the data gathered from the time of Covid can serve as a good starting point to implement a change of direction, realignment of priorities, and plan well in advance how to move into the post-Covid era. The consequences of Covid in distance learning should be studied in more detail, focusing on, for example, the most prominent challenges and phenomena present. Examples of possible research topics can be phenomena that have emerged through this literature review, such as how teachers can transfer teaching to distance learning as effectively as possible (Barton, 2020, p. 12500). Or how we should consider students and the context around them better when planning distance learning. Addressing the challenges of inequality and exclusion, in particular, would be an important place to start in situations where social interaction is limited to computer screens.

REFERENCES

- Agarwal, S. & Kaushik, J. (2020) Student's Perception of Online Learning during COVID Pandemic. *The Indian Journal of Pediatric*, 87, 7, 554.
- Ahmed, S., Hegazy, N., Malak, H., Kayser III, W., Elfarie, N., Hassanien, M., Al-Hayani, A., Saadany, S., Al-Youbi, A. & Shehata, M. (2020) Model for utilizing distance learning post COVID-19 using (PACT)TMa cross sectional qualitative study. *BMC Medical Education*, 20, 400.
- Al-Hosan, A., AlRajeh, N. & Arnout, B. (2020) The Role of University Teaching Staff Members in Cognitive Awareness and Raising the Level of Health Protection, Value and Moral of Students through the COVID-19 Pandemic. *Journal of Public Affairs*, 20 (4).
- Al-Taweel, D., Al-Haqan, A., Bacis, D., Al-Bader, J., Al-Taweel, A., Al-Awadhi, A. & Al-Awadhi, F. (2020) Multidisciplinary academic perspectives during the COVID-19 pandemic. *Int J Health Plann Mgmt*, 35, 1295–1301.
- Angeli, C. & Valanides, N. (2009) Epistemological and methodological issues for the conceptualization, development, and assessment of ICT–TPCK: Advances in technological pedagogical content knowledge (TPCK). *Computers & Education*, 52, 154–168.
- Anohina, A. (2005) Analysis of the terminology used in the field of virtual learning. *Educational Technology & Society*, 8, 3, 91–102.
- Barros Silva, P., Oliveira, C., Borges, M., Moreira, D., Alencar, P., Avelar, R., Sousa, R. & Sousa, F. (2020) Distance learning during social seclusion by COVID-19: Improving the quality of life of undergraduate dentistry students. *Eur J Dent Educ.*, 00, 1–11.
- Barton, D. (2020) Impacts of the COVID-19 pandemic on field instruction and remote teaching alternatives: Results from a survey of instructors. *Ecology and Evolution*, 10, 12499–12507.
- Blankenberger, B. & Williams, A. (2020) COVID and the impact on higher education: The essential role of integrity and accountability. *Administrative Theory & Praxis*, 42, 1, 1–20.

- Brammer, S. & Clark, T. (2020) COVID-19 and Management Education: Reflections on Challenges, Opportunities, and Potential Futures. *British Journal of Management*, 31, 453–456
- Brouwer, N., Dekker, P. & Van der Pol, J. (2013) e-Learning Cookbook - TPACK in Professional Development in Higher Education.
- Chai, C., Koh, J. & Tsai, C-C. (2013) A Review of Technological Pedagogical Content Knowledge. *Educational Technology & Society*, 16, 2, 31–51.
- Cheema, M. (2020) COVID-19 revolutionising higher education: An educator's viewpoint of the challenges, benefits, and the way forward. *Biome Journals*, 4, 9, 61.
- Darling-Hammond, L. & Hyler, M. (2020) Preparing educators for the time of COVID... and beyond, *European Journal of Teacher Education*, 43, 4, 457–465.
- Dennis, M. (2020) Consider higher education opportunities after COVID-19. *The successful registrar*, 20, 7, 1–7.
- Driessen, E., Beatty, A., Stokes, A., Wood, S. & Ballen, C. (2020) Learning principles of evolution during a crisis: An exploratory analysis of student barriers one week and one month into the COVID-19 pandemic. *Ecology and Evolution*, 10, 12431–12436.
- Elfirdoussi, S., Lachgar, M., Kabaili, H., Rochdi, A., Goujdami, D. & Firdoussi L. (2020) Assessing Distance Learning in Higher Education during the COVID-19 Pandemic, 2020.
- Engeström, Y., & Sannino, A. (2010) Studies of expansive learning: Foundations, findings and future challenges. *Educational Research Review*, 65.
- Glowatz, O. (2017) Academic Engagement and Technology: Revisiting the Technological, Pedagogical and Content Knowledge Framework (TPACK) in Higher Education (HE): The Academics' Perspectives. *IAFOR journal of education*. [Online] 5 (SI).
- Koh, J., Chai, C. & Lee, M-H. (2015) Technological Pedagogical Content Knowledge (TPACK) for Pedagogical Improvement: Editorial for Special Issue on TPACK. *Asia-Pacific Edu Res*, 24(3), 459–462.

- Mishra, P. & Koehler, M. (2006) Technological Pedagogical Content Knowledge: A Framework for Teacher Knowledge. *Teachers College Record*, 108/6, 1017-1054.
- Mishra, P. (2019) Considering Contextual Knowledge: The TPACK Diagram Gets an Upgrade. *Journal of Digital Learning in Teacher Education*, 35, 2, 76–78,
- Mladenova, T. et al. (2020) Covid 19 – A Major Cause of Digital Transformation in Education or Just an Evaluation Test. *TEM Journal*. [Online] 9, 3, 1163–1170.
- Moore, L., Dickson-Deane, C. & Galyen, K. (2010) e-Learning, online learning, and distance learning environments: Are they the same? *Internet and Higher Education*, 14, 129–135.
- Okanda, A. & Sheeny, K. (2020) Factors and Recommendations to Support Students' Enjoyment of Online Learning with Fun: A Mixed Method Study During COVID-19. *Frontiers in Education*, 5, 584351.
- Raaper, R. and Brown, C. (2020) The Covid-19 pandemic and the dissolution of the university campus: implications for student support practice. *Journal of professional capital and community*, 5, 3/4, 343-349.
- Rizun, R. and Strzelecki, A. (2020) Students' Acceptance of the COVID-19 Impact on Shifting Higher Education to Distance Learning in Poland. *International Journal of Environmental Research and Public Health*, 17, 6468.
- Rosenberg, M. & Koehler, J. (2015) Context and Technological Pedagogical Content Knowledge (TPACK): A Systematic Review. *Journal of Research on Technology in Education*, 47, 3, 186–210.
- Saad, M., Barbar, A. & Abourjeili, S. (2012) Introduction of TPACK-XL, A Transformative View of ICT-TPCK for Building Pre-Service Teacher Knowledge Base. *Turkish Journal of Teacher Education*, 1, 2, 41–60.
- Sutton, H. (2020) COVID-19 disproportionately impacts students with disabilities across all sectors. *Disability Compliance for Higher Education*, 26, 6.
- Thomson, A. (2018) Technology Review: Three Interconnected Distance Learning Education Challenges. *Community College Enterprise*, 24, 2, 74–77.

Tomte, C., Enochsson, A-B., Buskqvist, U. & Kårstein, A. (2015) Educating online student teachers to master professional digital competence: The TPACK-framework goes online. *Computers & Education*, 84, 26–35.

Torda, A. (2020) How COVID-19 has pushed us into a medical education revolution. *Internal Medicine Journal*, 50, 1150–1153.

Traxler, J. (2017) Distance Learning - Predictions and Possibilities. *Education Sciences*, 8, 35.

Zuo, L., Dillman, D. & Juvé, A. (2020) Learning at home during COVID-19: A multi-institutional virtual learning collaboration. *Medical education*. [Online] 54, 7, 664–665

APPENDIX 1. LIST AND DESCRIPTION OF THE LITERATURE REVIEW MATERIAL.

Article:	Context/Description:
<p>Agarwal, S. & Kaushik, J. (2020) Student's Perception of Online Learning during COVID Pandemic. <i>The Indian Journal of Pediatric</i>, 87 (7):554.</p>	<p>Based on online teaching and a student survey, this study describes students' perceptions of online distance learning during Covid. The study was conducted for 12 days in the form of Zoom sessions.</p>
<p>Ahmed, S., Hegazy, N., Malak, H., Kayser III, W., Elfariq, N., Hassanien, M., Al-Hayani, A., Saadany, S., Al-Youbi, A. & Shehata, M. (2020) Model for utilizing distance learning post COVID-19 using (PACT)TM a cross sectional qualitative study. <i>BMC Medical Education</i>, 20, 400.</p>	<p>The research seeks to find important things when looking for a balance between distance learning and contact teaching in the post-Covid period. The text considers, e.g., how it would be possible to deliver teaching content to students in a way that would be adequate. This has been implemented using the Polarity Approach for Continuity and Transformation model (PACT), of which polarity map is used to deal with opposites, namely face-to-face learning, and distance learning. The study included 79 educational institutions from 19 different countries.</p>
<p>Al-Hosan, A., AlRajeh, N. & Arnout, B. (2020) The Role of University Teaching Staff Members in Cognitive Awareness and Raising the Level of Health Protection, Value and Moral of Students through the COVID-19 Pandemic. <i>Journal of Public Affairs</i>, 20 (4).</p>	<p>The study addresses the role of teachers in addressing student needs during the Covid era in situations where distance learning is used. The topic is approached qualitatively, reflecting teachers' views on how they can respond to the challenges posed by Covid in distance learning scenarios. More precisely, their cognitive, skill, health, and ethical roles have been addressed.</p>
<p>Al-Taweel, D., Al-Haqan, A., Bacis, D., Al-Bader, J., Al-Taweel, A., Al-Awadhi, A. & Al-Awadhi, F. (2020) Multidisciplinary academic perspectives during the COVID-19 pandemic. <i>Int J Health Plann Mgmt</i>, 35, 1295–1301.</p>	<p>The article presents how academic institutions and their researchers have adapted to the new reality brought by Covid. Thus, it describes the adaptation of different disciplines and their struggle with the professional and social challenges that Covid has brought. Phenomena that directly or indirectly affect the higher education institutions are also discussed.</p>
<p>Barros Silva, P., Oliveira, C., Borges, M., Moreira, D., Alencar, P., Avelar, R., Sousa, R. & Sousa, F. (2020) Distance learning during social seclusion by COVID-19: Improving the quality of life of undergraduate dentistry students. <i>Eur J Dent Educ.</i>, 00, 1–11.</p>	<p>This study explores how increased social isolation through distance learning during Covid has affected students' quality of life. This has been accomplished by conducting an observational cross-Sectional study that elucidates the psycho-emotional phenomena that have emerged with Covid among students.</p>

<p>Barton, D. (2020) Impacts of the COVID-19 pandemic on field instruction and remote teaching alternatives: Results from a survey of instructors. <i>Ecology and Evolution</i>, 10, 12499–12507.</p>	<p>Barton studied how teachers acted and managed to transfer teaching to distance learning after the emergence of Covid. The survey generally revealed negative instructor views on many remote teaching substitutions, yet also showed several approaches that instructors regarded as more effective, despite potential challenges equitably teaching them. The article also suggests several models of remote substitutions for traditional field teaching.</p>
<p>Blankenberger, B. & Williams, A. (2020) COVID and the impact on higher education: The essential role of integrity and accountability. <i>Administrative Theory & Praxis</i>, 42 (1), 1-20.</p>	<p>The article opens the role of higher education in dealing with the Covid situation. The issue is approached using the so-called Gaus's ecological approach, which offers a beneficial lens to view the impact of COVID-19 on higher education. The Integrity of Universities and the importance of their accountability are also emphasized in the article.</p>
<p>Brammer, S. & Clark, T. (2020) COVID-19 and Management Education: Reflections on Challenges, Opportunities, and Potential Futures. <i>British Journal of Management</i>, 31, 453–456</p>	<p>The article presents how Covid-19 has impacted higher education in the business sector in Asia, Australia, and the United Kingdom. The text deals with related challenges, opportunities, and possible future directions. The text also deals on, e.g., how colleges have been able to respond to the challenges posed by Covid.</p>
<p>Cheema, M. (2020) COVID-19 revolutionizing higher education: An educator's viewpoint of the challenges, benefits, and the way forward. <i>Biome Journals</i>, 4,9,61.</p>	<p>This article explores online teaching and learning from the teachers' point of view. The text also highlights the challenges and benefits brought by Covid to the context of higher education. It also offers possible ways to overcome these challenges and general guidelines on how teachers can implement better distance learning during and after Covid.</p>
<p>Darling-Hammond, L. & Hyler, M. (2020) Preparing educators for the time of COVID... and beyond, <i>European Journal of Teacher Education</i>, 43, 4, 457–465.</p>	<p>The article discusses what decision-makers could best support teachers to help their students during and after the Covid pandemic. The text addresses the issue from social, emotional, and pedagogical viewpoints.</p>
<p>Dennis, M. (2020) Consider higher education opportunities after COVID-19. <i>The successful registrar</i>, 20, 7, pp. 1-7.</p>	<p>In her study, Dennis presents the opportunities that opened and appeared up for higher education institutions during Covid. Although she goes through the topic more at the institutional level, many of the ideas are also related to the evaluation and planning of distance learning.</p>
<p>Driessen, E., Beatty, A., Stokes, A., Wood, S. & Ballen, C. (2020) Learning principles of evolution during a crisis: An exploratory analysis of student barriers one week and one month into the COVID-19 pandemic. <i>Ecology and Evolution</i>, 10, 12431–12436.</p>	<p>This study focuses on how the outbreak of Covid impacted students studying habits. It goes through especially the emotional and cognitive impacts awoken by the situation among students. With this, it presents a summary of the various barriers as well as recommendations for addressing them.</p>
<p>Elfirdoussi, S., Lachgar, M., Kabaili, H., Rochdi, A., Goujdami, D. & Firdoussi L. (2020) Assessing Distance Learning in Higher Education during the COVID-19 Pandemic, 2020.</p>	<p>This qualitative study examines distance learning during Covid in the context of higher education. It aims to assess the</p>

	limitations of distance learning platforms and how distance learning otherwise takes place during the Coronavirus.
Mladenova, T. et al. (2020) Covid 19 – A Major Cause of Digital Transformation in Education or Just an Evaluation Test. TEM Journal. [Online] 9 (3), 1163–1170.	The article analyzes three different ways of distance learning: Synchronous, Asynchronous, and hybrid. In addition to this, it compares these to traditional contact teaching. The study was conducted as a survey on two occasions, just after Covid's outbreak and the end of the semester. Both student attitudes and real-life experiences are addressed. The findings indicate how the new generation of students have experienced a wide variety of distance learning opportunities and styles.
Okanda, A. & Sheeny, K. (2020) Factors and Recommendations to Support Students' Enjoyment of Online Learning with Fun: A Mixed Method Study During COVID-19. Frontiers in Education, 5:584351.	The study addresses the importance of having fun for student enjoyment and engagement in the context of Covid and distance learning. It does this by examining students' beliefs as well as attitudes, both quantitatively and qualitatively. The fun was seen to be linked with student well-being, motivation, and performance.
Raaper, R. and Brown, C. (2020) The Covid-19 pandemic and the dissolution of the university campus: implications for student support practice. Journal of professional capital and community, 5 (3/4). pp.343-349.	The paper discusses and problematizes the support students have received during Covid. It also seeks to provide ways to develop more effective ways to support students regardless of their socioeconomic backgrounds.
Rizun, R. and Strzelecki, A. (2020) Students' Acceptance of the COVID-19 Impact on Shifting Higher Education to Distance Learning in Poland. International Journal of Environmental Research and Public Health, 17, 6468.	The study addresses students' Experience, Enjoyment, Computer Anxiety, and Self-efficacy when they switched to distance learning because of Covid. This has been done using the GET-AMEL model in the context of the Coronavirus in Poland. The research provides important information, e.g., matters relating to the acceptance of distance learning.
Sutton, H. (2020) COVID-19 disproportionately impacts students with disabilities across all sectors. Disability Compliance for Higher Education, 26, 6.	The article opens up how students with disabilities are among those most affected by Covid. The text also reveals how the challenges with distance learning already present before Covid have become even more apparent during the pandemic.
Torda, A. (2020) How COVID-19 has pushed us into a medical education revolution. Internal Medicine Journal, 50, 1150–1153.	The article discusses how Covid has led to many innovations and how inevitable challenges like Covid sometimes act as a trigger for action and drivers of development. Although the text describes innovations in medical education, the text serves as a good example of how the situation has forced institutions, teachers, and students alike to find new innovative ways to replace old, dysfunctional ones.
Zuo, L., Dillman, D. & Juvé, A. (2020) Learning at home during COVID-19: A multi-institutional virtual learning collaboration. Medical Education, 664–665.	The article offers alternative ways to implement teaching when contact teaching is limited due to Covid. This has been implemented using Kotter's Change Management model. For example, the text presents how the situation could be responded to quickly and effectively by reorganizing the resources of several institutions.