Report on need-based survey and findings

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e-Desk background and introduction

The Project 'Digital and Entrepreneurial Skills for European Teachers in the COVID-19 World', abbreviated e-DESK, aims at designing, testing, and disseminating an innovative hybrid teaching methodology to provide educators from European HE institutions with the necessary tools and skills to face the challenges presented by the pandemic in terms of teaching and education.

The restrictions all over Europe meant a sudden change to a much more (and in some cases even complete) digital learning environment, many times not only lacking the material resources, but the competences to do so effectively. OECD (2020) states that the shift to online teaching and learning raised important challenges for organizing examinations and ensuring the possibility for students to progress in their studies.

Even when the confinement was finished, many HE institutions turned into a mixed system where educators had to deal with half of their students at the classroom and the other half at home. Many teachers, however, lack relevant training (Unesco, 2020). This shows the great need of support of the teachers to develop digital competences and safeguard the inclusive nature of learning opportunities, as COVID19 has shown also great inequity among students. Thousands of youth learners in Europe found themselves confined during months and with their academic lives affected, not only lacking digital resources (especially those coming from less wealthy families), but also with educators overloaded and needing skills and guidance for delivering the lessons in this new context.

Some institutions were more prepared than others because they were already implementing pedagogical research in e-learning, considered to be a key part of future curricula. To identify key success factors common of hybrid educational programs that focus on covering the current gap created by COVID-19, research on best practices was needed for finding and assessing the current methodologies being applied in the most relevant educational institutions.

e-DESK identification of best practices and methodology'

The e-DESK team will identify best practices regarding multi-stakeholder and multi-disciplinary entrepreneurial education and hybrid teaching approaches with the best characteristics of online education and the interactivity from face-to-face classrooms. In addition, it will elaborate the conception and development of the best methodology for hybrid teaching methods gained by previous experience and evidence-based research.

LUT University leads this analysis due to its expertise in conducting international research on educational entrepreneurship education, its research on methodologies and practices, also including expertise in designing teaching methods in innovative teaching methodologies learning environments and in a real-world context. All project

partners gave their own expertise in the elaboration of the survey as well as provided LUT with valuable input.

First, a need-based analysis survey was conducted among teachers, educators, professors among the university network involved, to determine gaps in hybrid teaching models as well as entrepreneurship education (EE) methods and practices within.

The survey examined the existing blended-learning models, instructional methods, key success factors as well as entrepreneurship education programs focused on skills, university-business cooperation, multi-stakeholder involvement, evaluation system, innovative (business) recognition and certification in use before and during the pandemic through a multitude of questions (questionnaire annexed in this report). The findings will provide valuable data for elaborating a best practice guide and the conception of an innovative hybrid teaching and learning methodology.

The theoretical background of the survey & methodology design

European Entrepreneurship Competence Framework (EntreComp, 2021) and European Digital Competence Framework (DigiComp, 2021) developed by the European Commission and later based on EntreComp developed EntreCompEdu Teachers Framework (EntreCompEdu, 2021), form the backbone of e-DESK methodology design, which through the findings of the good practices, challenges, and successes of the respondents, revealed by the need-based survey analysis, can be used to build up concrete tools and guidelines that will assist teachers in their demanding work of planning and implementation of entrepreneurial methods and practices in an online environment.

DigiComp offers the key building blocks to a shared vision on what digital skills are and how to develop them across Europe. EntreComp is bringing greater understanding and meaning to entrepreneurial competence and highlights the value, opportunity and innovation that flows from entrepreneurial competence. EntreCompEdu teachers' framework gives teachers even more detailed information and function models related to entrepreneurial Teaching.

The theoretical background together with evidence-based research will also assist in transferring the findings in the rich data collected by the survey from teachers, professors and other education staff into a methodology and learning outcomes for higher education institutions in Europe.

Best practices

There are several European projects and best practices that can be utilized in e-DESK planning and implementation. Projects and practises are from different fields so they will offer a broad insight. First, the best practices within the partner universities will be used for designing the methodology for e-DESK. Discussions of digital teaching methods, tools and materials with project partners have provided valuable input to the project: for instance, the BDP (2021) Course Planning Tool developed by University of Zagreb will offer a design platform for defining the learning outcomes and course module planning of the e-DESK MOOC. Also partner universities' information packages

and practices of digital teaching support can be utilized. In the Annex 3. picture of LUT's digital teaching support centre's website.

Some of the partners have been already within BLUES project which is also combining entrepreneurial teaching in digital environment. BLUES MOOC was aimed to students but it will give valuable information in designing e-DESK methodology and MOOC. BLUES is to thank for the previous results gained first by evidence and second by the comparative knowledge compiled to BLUES Methodology. Blues produced guide documents by Rocha and Ceballos (2019) and Sarmiento et al. (2019). There is also available material from partner universities' digital teaching projects like Shnai's (2018) publication of digital learning design. Shnai's team has been within many digital teaching projects.

There are several projects related to entrepreneurship education which can be also utilized. Most of their material is implemented to digital environment. EntreCompEdu MOOC (2021) for teachers has ended recently and gives fresh insights. UNIPS (2019) project of enhancing university teachers' pedagogical expertise (including entrepreneurial teaching skills) is still running and giving aid to teachers in their course design. ENTREASSESS (2021) is also a project assisting teachers in entrepreneurial teaching. HEInnovation (2021) project and it's continuing project THEI2.0 (2021) are providing higher education institutions decision-makers and teachers support for the th development by giving wide range of information (including digitalization and entrepreneurship education).

Projects like the above mentioned can deepen our understanding of the educators' challenges and opportunities available in the pursuing their own teaching and learning practices both in digital environment and needs to include entrepreneurial teaching to be part of it.

Survey construction in teamwork

The starting point for the compilation of the questionnaire was the existing digital teaching and learning strategy of LUT University, as it was natural to tap into the most familiar environment and expertise of the project members. After internal discussions inside the LUT e-DESK team and including the knowledge and interest of LUT digital teaching and learning team, the first drafts of questions were compiled, followed by an e-DESK partner meeting to discuss, and complement to the questionnaire draft. After several rounds of discussions, the final version to be published was completed with all the partners' contribution. The development process was fruitful with cumulating knowledge and understanding of the versatile field of entrepreneurial and digital teaching and learning, as well as polishing and sharpening the questionnaire iteratively and in open and cooperative way.

The at first rather quantitative set of questions was amended with qualitative questions, many of which were in an open text form, thus giving an opportunity for the respondents to highlight and stress issues important to them in their (often changing) teaching practices.

The questionnaire was created using the Google Forms questionnaire tool which enabled online access from any device and easy feeding of data. From Google Forms the responses were gathered in an Excel file. The data was modified to a suitable format. For instance, Likert question responses were coded as numbers ('Strongly disagree = 1, Disagree = 2, Not agree or disagree = 3, Agree = 4 and Strongly agree = 5'). This handling enables counting mean and median values with statistics software SPSS. The coded Excel data was handled with SPSS and the findings (frequencies, percentages, mean values, etc.) were saved for further analysis. The open text answers were handled separately, and same kind of replies were categorized under certain themes (for instance, challenges in assessment / challenges in interaction). LUT University along with the rest of the team used the findings in the Methodology design. The findings were also edited to a graphical format (pies, histograms etc.) and introduced to the whole project team to be analysed together and to be used as a base to find ideas to e-DESK MOOC course planning.

The e-DESK application stated the questionnaire to be translated in all the partner languages (i.e., Spanish, Portuguese, Croatian and Finnish), but in the end, a unison decision was made to have the translated versions in Spanish only, as in many universities, the students represent several nationalities and therefore, teaching is conducted in English. The questionnaire link was distributed to all partner universities, and the survey was open at the same time on Google Forms, from late August to 21st, September 2021.

Survey results handling process and aim

This report comprises e-DESK need-based preliminary questionnaire data which is analysed and will be combined to the methodology. The questionnaire itself can be found annexed at the end of this document. The most relevant questions related to e-DESK methodology design have been gathered and analysed below. The data is presented here both in visual form (charts & pies, etc.), as well as with more detailed clarifications when relevant.

In this analysis we focus on identifying common challenges in hybrid teaching and online learning environment, as well as finding best practices that deserve to be distributed to a wide public. The emphasis is not so much on the differences in how teaching practices have changed during the pandemic per country, in the four e-DESK partner organisations. Neither do we address structural issues that have an impact on how well teaching and learning can take place in lockdown circumstances from the point of view of well-being at work, teachers and students feeling isolated and lacking social networks, etc.

However, the use of entrepreneurship education methods as well as improved entrepreneurial skills, enable the teachers engage the learners in meaningful creation of value to others, and thus indirectly affect the well-being of learners in a long run. Gaining better skills in digital teaching and learning may also empower the teachers in their everyday pedagogical practice.

Questionnaire period:

September 2021 (before methodology design)

Target group:

Higher education teachers and other teaching related staff at participant organizations/affiliates in Spain, Portugal, Finland, and Croatia.

Aim of the questionnaire:

To identify the strengths, weaknesses, and gaps of HEI in digital and hybrid teaching models, as well as entrepreneurship education methods and practices to be assessed and developed in the e-DESK methodology and course design. In other words: to understand the pains and needs of teachers; what is working and what is not working.

Questionnaire delivery:

The questionnaire platform was created by CISE using the Google Forms questionnaire tool which enables online access from any device and easy feeding of data. The link to the questionnaire was circulated among the staff members in the project partners' organizations and gained a total of 167 responses. On the next page there is the distribution of respondents per country and other respondent's background information data.

Analysis of the survey data (themes 1-11)

1. Background questions

Country

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Croatia	31	18,6	18,6	18,6
	Finland	27	16,2	16,2	34,7
	Portugal	73	43,7	43,7	78,4
	Spain	36	21,6	21,6	100,0
	Total	167	100,0	100,0	

Questionnaire had 167 respondents in total. Portugal scored the biggest number of respondents (43,7 %), while other countries Croatia / Finland / Spain had 16-22 % of the respondents.

Gender

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Female	85	50,9	50,9	50,9
	Male	79	47,3	47,3	98,2
	Other	1	,6	,6	98,8
	Prefer not to say	2	1,2	1,2	100,0
	Total	167	100,0	100,0	

Respondents' gender male / female percentage was divided quite evenly.

Age

Respondents' age ranged from 25 to 69 years old. Average age was around 48 years.

Teaching years

Respondents teaching years range was from 1 year to 45 years. Average amount was around 17 years. This question was seen relevant as the number of teaching years

may have an impact both on the familiarity and experience to digital teaching as well as to entrepreneurship education.

Permanent position / work contract type / university type

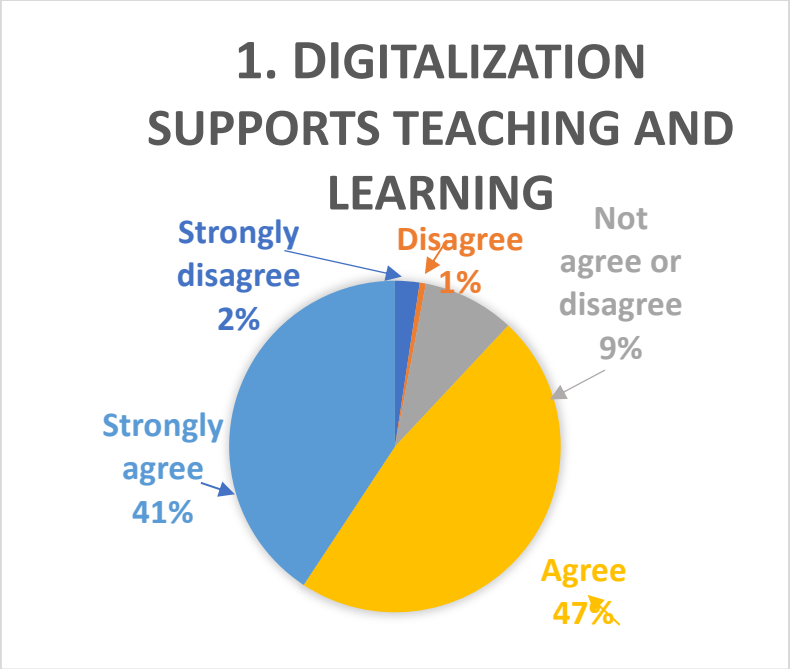
75 % of the respondents had a permanent job position in their institution or organization. Over 93 % of the respondents were working with full time work contract. 99 % of the respondents were working in public university.

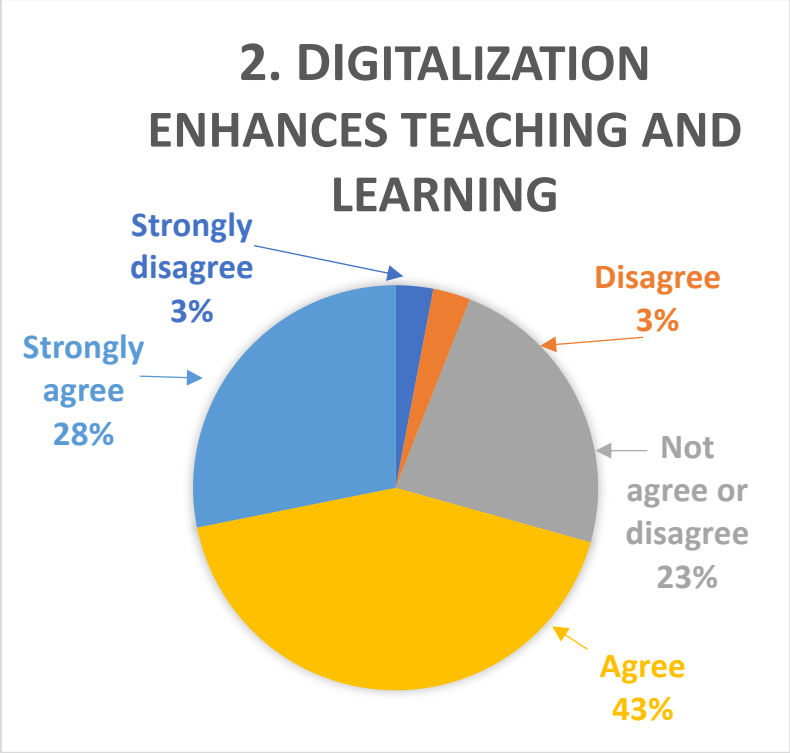
Teaching field

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Arts and Humanities	22	13,2	13,2	13,2
	Business	3	1,8	1,8	15,0
	Communication Sciences	1	,6	,6	15,6
	Engineering and Architecture	39	23,4	23,4	38,9
	General subjects	1	,6	,6	39,5
	Geography and Spatial Planning	1	,6	,6	40,1
	Geography Course (Social ? Sciences?... Humanities ?...)	1	,6	,6	40,7
	Health Sciences	13	7,8	7,8	48,5
	Humanities	18	10,8	10,8	59,3
	Mathematics	1	,6	,6	59,9
	Science	18	10,8	10,8	70,7
	Science and HE technology and pedagogy	1	,6	,6	71,3
	Sciences	9	5,4	5,4	76,6
	Social and Legal Sciences	36	21,6	21,6	98,2
	Social sciences	1	,6	,6	98,8
	Technical sciences, Traffic technology and transport	1	,6	,6	99,4
	training	1	,6	,6	100,0
	Total	167	100,0	100,0	

Respondents represented several fields of teaching. In this sample of responses, given to the nature of the universities involved, ‘Engineering and architecture’ (39 %) and ‘Social & Legal sciences’ (36 %) formed the biggest groups.

2. Attitude towards digitalization in teaching and learning





Majority (88%) of respondents agree or strongly agree that digitalization supports teaching and learning. A bit less but still a good majority (71 %) agree or strongly agree that digitalization enhances teaching and learning. The findings indicate a need to develop the digital teaching skills of the professors/teaching staff to support and enhance teaching and learning even better. Also, OECD (2018, 2021) has highlighted

in its recommendations for improving teachers' teaching skills that along with IT -skills digital teaching methods and modes of practices should be strengthened.

Even though the respondents mainly had a positive attitude towards digitalization, open text question (question 70.) of the faced challenges gave a slightly more detailed picture of the sudden, forced transfer to the digital mode and its effects.

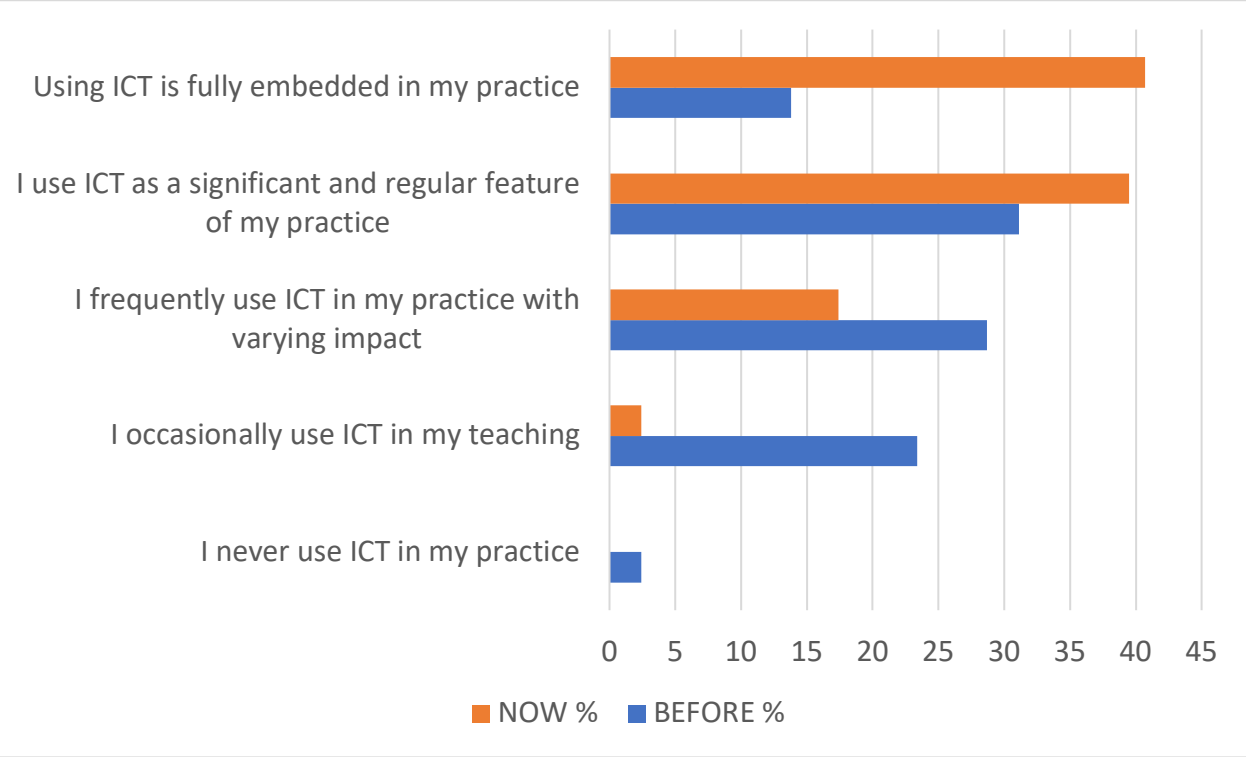
For example, the following challenges were mentioned

- Having not enough knowledge and experience of the digital teaching
- Learning new tools and techniques so that you were able to use them in digital teaching required a lot of time
- Having technical problems in digital teaching

3. Level of ICT usage in teaching

Question 3. To what extent do you use digital technology for your lessons before the pandemic?

Question 4. To what extent do you use digital technology for your lessons before the pandemic now?



Respondents' use of digital technology has increased remarkably during the pandemic. It is possible to witness an increase especially in the number of respondents using ICT fully embedded in their practice (increase from 18 % to 41 %). However, there were country-specific differences in the responses. In some countries the extent of us was still quite low even with the increase after the pandemic start, so there is a need to promote the use of digital technology.

In open text question reply comments there were quite many remarks that respondents some how see that on-line teaching is something less or quality is poorer than in face-to-face teaching. Hodges et al. (2020) are pointing out that research shows also opposite results and if teachers were able to plan their on-line courses better the courses will be much more meaningful learning experiences than on-line courses arranged in crisis situations. So, in e-Desk there is a good reason to develop teachers' abilities and guide them towards more ICT usage in teaching and better on-line course planning.

4. Used delivery modes and digital teaching modes

8-11 (Used delivery modes before pandemic):

	8. What delivery modes have you used in your teaching practices **[In person instruction]** (1=never, 2=rarely, 3= Occasionally, 4=frequently, 5=always)	9. What delivery modes have you used in your teaching practices before the pandemic? **[Fully online instruction]** 1=never, 2=rarely, 3= Occasionally, 4=frequently, 5=always)	10. What delivery modes have you used in your teaching practices before **[Blended learning]** 1=never, 2=rarely, 3= Occasionally, 4=frequently, 5=always)	11. What delivery modes have you used in your teaching practices before the pandemic? **[Hybrid learning]** 1=never, 2=rarely, 3= Occasionally, 4=frequently, 5=always)
Mean	**4,42**	**1,90**	**2,42**	**1,94**

12-15 (Used digital teaching modes now):

	12. Which digital teaching modes do you use now? **[In-person instruction]** (1=never, 2=rarely, 3= Occasionally, 4=frequently, 5=always)	13. Which digital teaching modes do you use now? **[Fully online instruction]** 1=never, 2=rarely, 3= Occasionally, 4=frequently, 5=always)	14. Which digital teaching modes do you use now? **[Blended learning]** 1=never, 2=rarely, 3= Occasionally, 4=frequently, 5=always)	15. Which digital teaching modes do you use now? **[Hybrid learning]** 1=never, 2=rarely, 3= Occasionally, 4=frequently, 5=always)
Mean	**3,41**	**3,32**	**3,20**	**3,02**

The responses to the questions comparing the delivery modes in use before and after the pandemic show that there is a vast increase in the use of digital teaching modes. However, digital teaching is still at quite a low level as is seen in the mean values, which are not rising much above 3,00. This seems to indicate that the respondents still have things to learn to make the use of digital teaching modes regular and fluent.

e-DESK will especially concentrate to hybrid learning. Selection of this teaching mode is supported by the responses to the open text question 70 addressing “Faced challenges”. The respondents described that hybrid teaching had been the most challenging format of teaching and support there is needed.

5. Used teaching methods in digital teaching

Questions 16-24

	16. What teaching methods have you used in digital teaching? **[Problem based learning (PBL)]** 1=never, 2=rarely, 3=occas. 4=freque., 5=always)	17. What teaching methods have you used in digital teaching? **[Work based learning (WBL)]** 1=never, 2=rarely, 3=occas. 4=freque. 5=always)	18. What teaching methods have you used in digital teaching? **[Flipped classroom]** 1=never, 2=rarely, 3=occas. 4=freque., 5=always)	19. What teaching methods have you used in digital teaching? **[Project-based learning]** 1=never, 2=rarely, 3=occas. 4=freque., 5=always)	20. What teaching methods have you used in digital teaching? **[Collaborative and peer learning]** 1=never, 2=rarely, 3=occas. 4=freque., 5=always)	21. What teaching methods have you used in digital teaching? [**Learning based on cooperative models** *(such a social economy or cooperative values)*] 1=never, 2=rarely, 3=occas. 4=freque., 5=always)	22. What teaching methods have you used in digital teaching? **[Questions and answers]** 1=never, 2=rarely, 3=occas. 4=freque., 5=always)	23. What teaching methods have you used in digital teaching? **[Inquiry based learning]** 1=never, 2=rarely, 3=occas. 4=freque., 5=always)	24. What teaching methods have you used in digital teaching? **[Other]** 1=never, 2=rarely, 3=occas. 4=freque., 5=always)
Mean	**3,14**	**3,05**	**2,74**	**3,02**	**3,10**	**1,88**	**3,57**	**2,87**	**1,94**

occas. = occasionally, freque. = frequently

The responses show that at least the above-mentioned digital teaching methods have not yet been in a very active use in the teachers' everyday toolkit. Mean values stay below or near 3,00 in most of the methods. That indicates that there remains much to do when training and familiarizing teachers to use different digital teaching methods. To improve this, for instance, collaborative and peer learning assignments for teachers will be used in e-DESK to introduce them to that kind of teaching method.

In the e-DESK MOOC example videos of course implementations could be shown for example some cases of problem-based and project-based learning. Sousa et al. (2018) see project-based learning and problem-based learning as good methods when combining entrepreneurial teaching to digital teaching.

6. Assessment in digital teaching and learning

Questions 26-37

26. I tried to replicate assessment approaches I used before (1=strongly disagree, 2=disagree, 3=not agree or disagree, 4=agree, 5=strongly agree)	27. I had to rethink the assessment program and introduced considerable changes (1=strongly disagree, 2=disagree, 3=not agree or disagree, 4=agree, 5=strongly agree)	28. I adopted the assessment approaches that I used before to online environment (1=strongly disagree, 2=disagree, 3=not agree or disagree, 4=agree, 5=strongly agree)	29. I utilized examination data bases (1=strongly disagree, 2=disagree, 3=not agree or disagree, 4=agree, 5=strongly agree)	30. I applied more problem-solving exercises (1=strongly disagree, 2=disagree, 3=not agree or disagree, 4=agree, 5=strongly agree)	31. I introduced peer assessment (1=strongly disagree, 2=disagree, 3=not agree or disagree, 4=agree, 5=strongly agree)	32. I introduced group reflection (1=strongly disagree, 2=disagree, 3=not agree or disagree, 4=agree, 5=strongly agree)	33. I adopted new assessment approaches using digital technology, [Other] (1=strongly disagree, 2=disagree, 3=not agree or disagree, 4=agree, 5=strongly agree)	35. I use continuous, formative digital methods for assessment of students in the course (1=strongly disagree, 2=disagree, 3=not agree or disagree, 4=agree, 5=strongly agree)	36. I use digital methods to evaluate the course (quality assure) (1=strongly disagree, 2=disagree, 3=not agree or disagree, 4=agree, 5=strongly agree)	37. I utilize students' self-assessment approaches in a digital learning environment (1=strongly disagree, 2=disagree, 3=not agree or disagree, 4=agree, 5=strongly agree)
Mean 3,38	3,62	3,39	2,51	3,25	2,54	2,77	1,77	3,53	3,37	3,05

Responses to assessment questions demonstrate that finding efficient and productive ways of assessment has been a bit challenging with the transfer to digital teaching. New methods in assessment have not been used very widely. Problem-solving exercises had the highest mean value as a used assessment method but still, it rises only to level 3,25. Peer assessment and group reflection seem to be seldom used. This brings up a need to widen and strengthen the teachers' ability to use new assessment methods in digital teaching.

Besides challenges in general, the open text question (question 70.) "Faced challenges" also addresses challenges in assessment. Teachers had difficulties to assess activity in digital courses. Besides that, they found it hard to find fair and equal ways to assess the learning process and outcomes of the students.

New needs and faced challenges in on-line teaching and learning assessment has been recognized also in the research world. JISC (2020) provides plans for assessment in an online environment for the future. It's essential to create authentic, accessible, automated, continuous, and secure assessment for online environment. For example, one way towards secure and fair assessment is adding writing style comparing tools to ensure that right person has written the assignment.

7. Interaction in digital teaching and learning

58-62

58. I interact with students more during the pandemic than before (1=strongly disagree, 2=disagree, 3=not agree or disagree, 4=agree, 5=strongly agree)	59. I interact more with my peers (other teachers) during the pandemic than before (1=strongly disagree, 2=disagree, 3=not agree or disagree, 4=agree, 5=strongly agree)	60. I interact internationally more during the pandemic than before (1=strongly disagree, 2=disagree, 3=not agree or disagree, 4=agree, 5=strongly agree)	61. I noticed students interact more with their peers than before (1=strongly disagree, 2=disagree, 3=not agree or disagree, 4=agree, 5=strongly agree)	62. I noticed students interact more with available digital teaching material (1=strongly disagree, 2=disagree, 3=not agree or disagree, 4=agree, 5=strongly agree)
Mean 2,63	2,34	2,62	2,53	3,23

The mean values in each question give evidence that the interaction between the respondents and their students, peers and international contacts has not increased during the pandemic. Neither does the students' interaction with digital material seem very convincing. This finding draws attention to the notion that digital teaching may also have a negative impact to interaction. To turn the experience more positive, it is essential to develop the interaction of the teachers to their students in a digital teaching environment generally, and specifically in situations / periods when teaching digitally is the main form or, indeed, only option of teaching.

Responses to the open text question (question 70) "Faced challenges" strongly support the above- mentioned decrease in interaction. Many teachers point out that interaction in digital teaching was challenging. With cameras off and sound muted, it was hard to know if the students were attending the lecture or even listening. Motivating students and getting feedback from them proved challenging.

8. Organization's support and digital resources

Question 40-53 (Organization's support):

40. My organization needs to offer more support to improve online teaching (1=strongly disagree, 2=disagree, 3=not agree or disagree, 4=agree, 5=strongly agree)	41. My organization offers effective support for digital teaching (1=strongly disagree, 2=disagree, 3=not agree or disagree, 4=agree, 5=strongly agree)	42. My organization offers effective support for digital teaching [Differentiated]	43. My organization offers effective support for digital teaching [Personal]	44. My organization offers effective support for digital teaching [Just in time]	45. My organization offers effective support for digital teaching [Multimodal]	46. My organization offers effective support for digital teaching [Tutoring])	47. My organization offers effective support for digital teaching [Training]	48. My organization offers effective support for digital teaching [Coaching]	49. My organization offers effective support for digital teaching [Manuals]	50. My organization offers effective support for digital teaching [Guiding tutorials]	51. My organization offers effective support for digital teaching [Videos]	52. My organization offers effective support for digital teaching [Webinars]	53. My organization offers effective support for digital teaching [MOOC]
Mean 3,59	3,34	% Dont know 46,1	21,6	30,5	61,1	39,5	39,5	47,9	17,4	17,4	20,4	29,3	44,9
		% No 21,6	24,6	22,8	16,8	22,2	22,2	26,3	13,2	11,4	18,0	18,6	31,7
		% Yes 32,3	53,9	46,7	22,2	38,3	38,3	25,7	69,5	71,3	61,7	52,1	23,4

Responses on organization support show that there has been support and it has been most individual support, manuals, and videos. Figures in response option: "I don't know" (if support is offered in my organization) are quite high. However, it is possible that there is support available, but the respondent has not seen it important to seek it.

Question 54. (Desired support format):

54. When you need ICT support in your teaching practices how would you like support to be provided?

Short courses	Videos	Manuals	Workshops	Tutorials	FAQ	Buddy	Chat	Other
81	102	79	76	81	50	37	57	7
1			1	1				

This question concentrates on the desired form of support. It seems that the respondents are not so keen to seek personal assistance and are in many cases quite satisfied with being able to at a convenient time check and self-study videos, tutorials, short courses, manuals, as well as attend common workshops on a specific topic as these forms of ICT support have gained higher scores than for instance peer support. This seems to confirm that when planning the e-DESK MOOC, videos are a good way to share information and should be kept in mind.

Question 56. Available digital resources in your organisation

56.

What kinds of digital resources do you have at your disposal in your own organization?

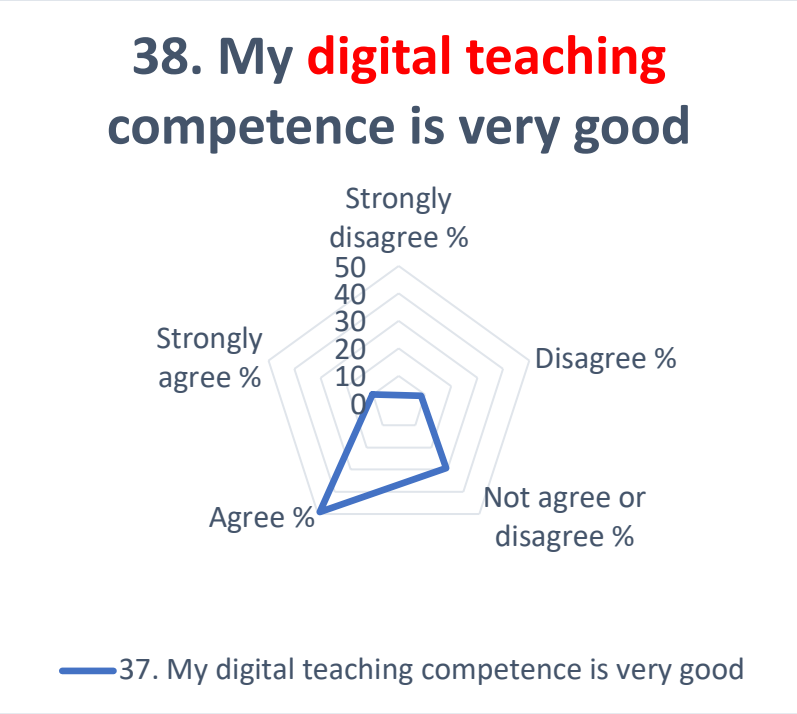
LMS (Moodle...)	Online platform (Zoom...)	Polling Tools (PollEverywhere...)	Add-on software to include questions in Moodle videos	Tools for editing (e.g. Adobe Creative Cloud...)	Game questionnaire (Kahoot...)	Brainstorming (Jamboard...)	Online platform (Perusall...)
151	162	57	49	58	49	34	31

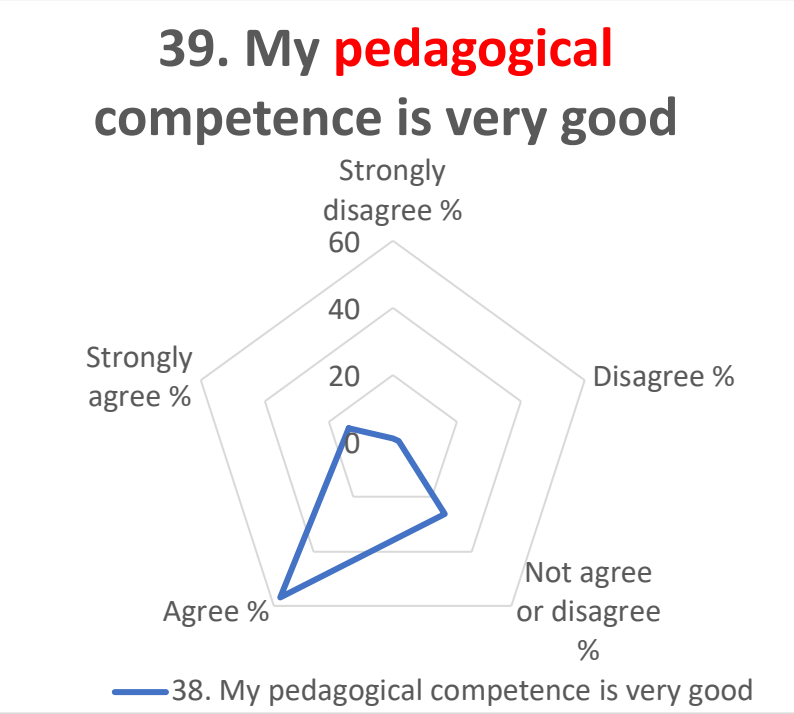
The findings indicate that respondents quite often have some Learning Management System (like Moodle) or Online platform (such as Zoom platform) in their use. Other tools and software mentioned in the question are not so commonly used. Biggs and Tang (2011) rise up the importance of ability to use different tools like videos, games and polls and variate normal lecture teaching with them.

In the design of e-DESK methodology and in the planning of the e-DESK MOOC the familiarity of the platforms will be considered. It seems to be beneficial also to introduce available open access digital resources and tools to the teachers.

One of the open access tools is Learning Design Tool. This course design tool is developed by our project partner University of Zagreb, and it helps in the course design generally and specially in designing digital teaching or parts of it. This tool will be used in e-Desk MOOC course design assignment for teachers. It is also used in planning the e-Desk MOOC.

9. Digital teaching competence and pedagogical competence



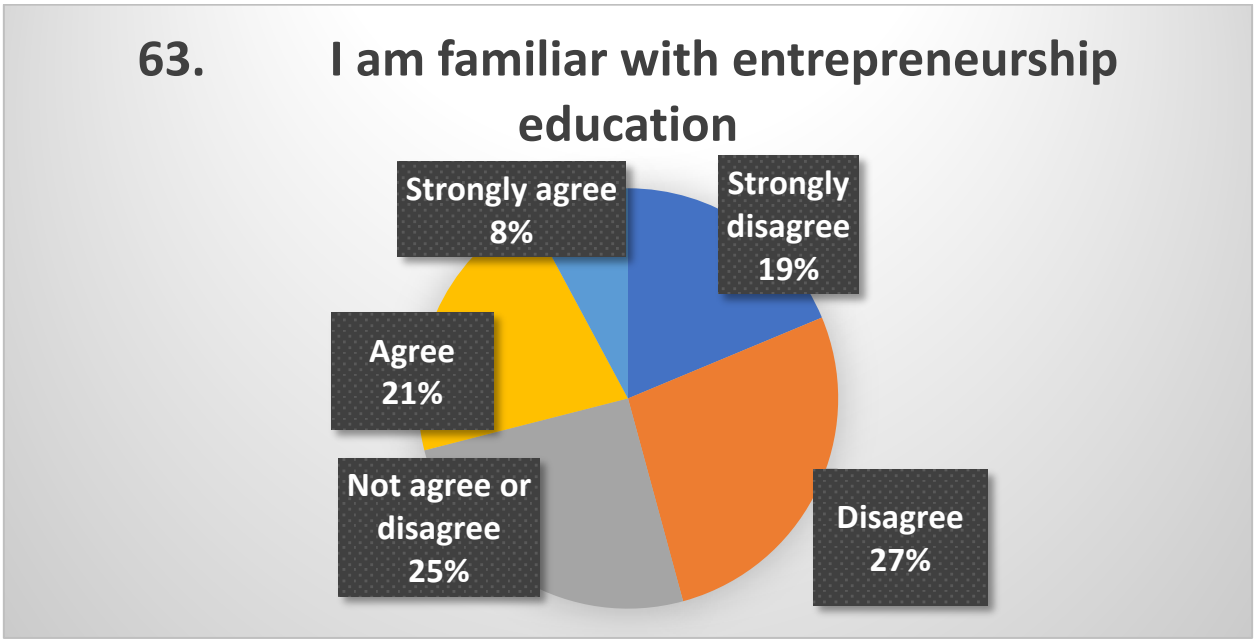


Respondents' self-assessment of their digital teaching competence level is good (50 %) or very good (10 %). This result was a bit surprising in the face of the later Questions 9–25 concerning use of digital teaching and delivery modes, that indicates quite a limited use and experience. It may be that respondents found it hard to

understand this question, so perhaps digital teaching competence could have been defined in a clearer way. Because of this uncertainty, the responses to questions 9-25 have gained more weight than Questions 38 and 39 in the planning of the e-DESK MOOC.

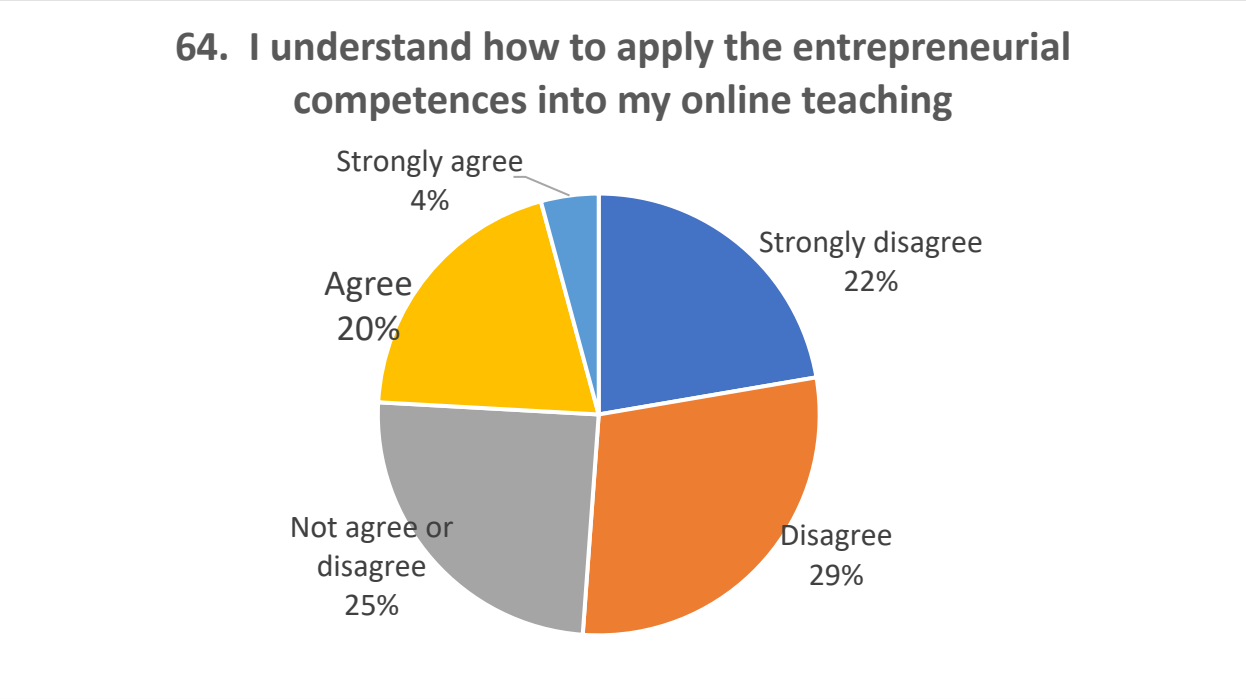
Respondents' self-assessment of their pedagogical competence is very high (almost 60 % agree and over 10 percentage strongly agree). Respondents seems to be confident of their own pedagogical skills. It is a good base for learning novel hybrid methods of teaching in a more digital teaching environment.

10. Entrepreneurial competences in digital teaching and learning



Many respondents do not seem to be very familiar with entrepreneurial education (disagree or strongly disagree 46 % and not agree or disagree 25 %). That is quite an alarming result, as entrepreneurial education has been part of national curricula for decades. Still, only below 30 % agrees or strongly agrees that entrepreneurial education is familiar to them. This shows an acute need to improve teachers' awareness of entrepreneurial education.

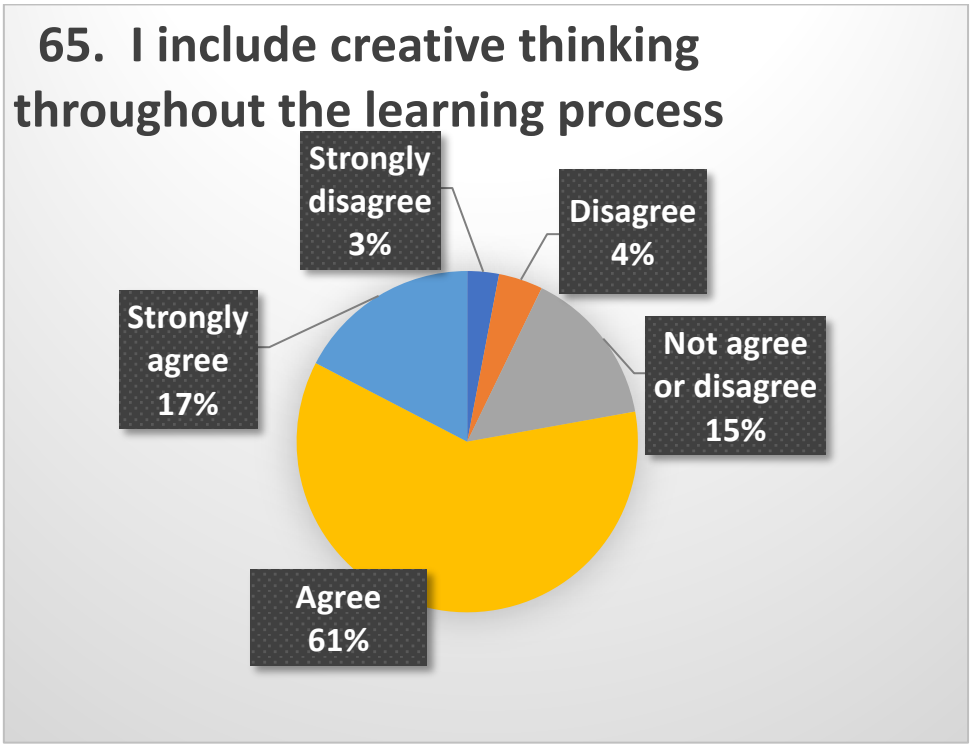
Entrepreneurial education is providing skills, methods and mindsets that are needed today and in the future. They improve students' employability and give transferable skills to meet the challenges in the world (EC, 2018). That sets a need for teachers to use entrepreneurial education (Bacigalupo et al., 2016).



Only 24 % of respondents agree or strongly agree that they understand how to apply entrepreneurial competences in their online teaching. This is a very low rate. In addition to awareness of entrepreneurial education, teachers need information and examples how to apply entrepreneurial competences into their online teaching. This is something that needs to be considered in e-DESK methodology design as well as in defining the learning outcomes for the MOOC. In e-DESK MOOC applying real-world requirements in teaching will be taken as a special field to develop in teachers entrepreneurial teaching competences.

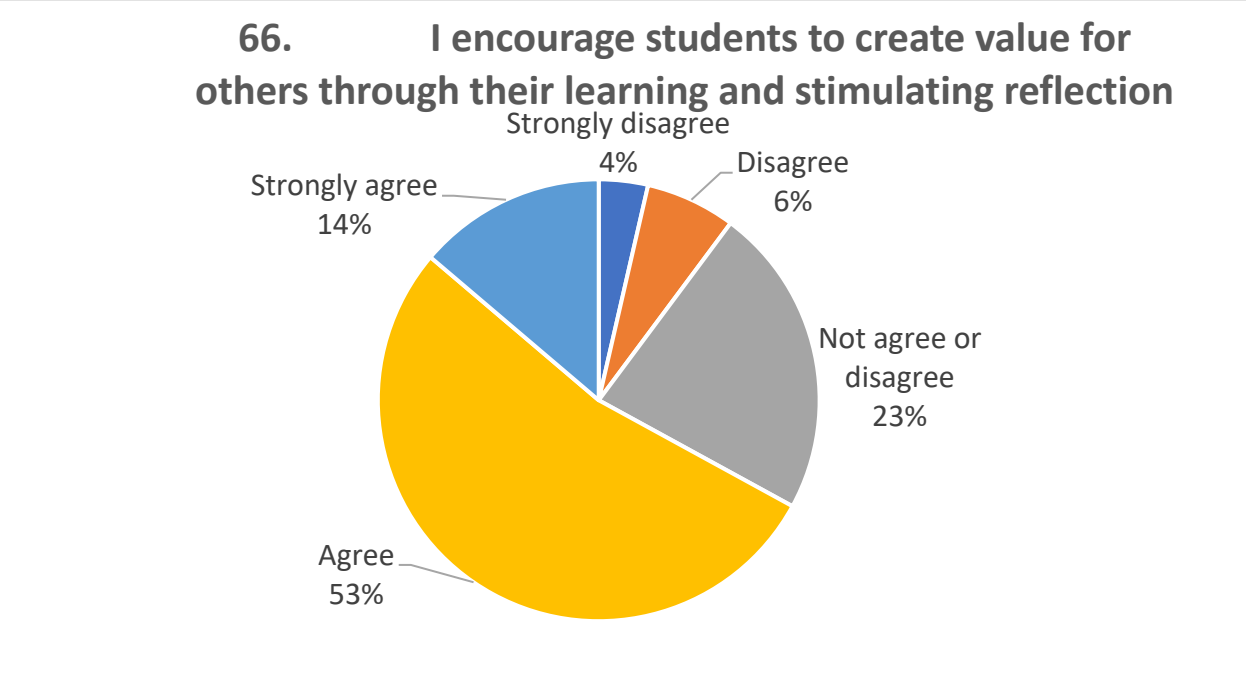
Ratten and Jones (2020) see entrepreneurial thinking very important in teaching and they consider it even more important in COVID-19 or any other crisis season because entrepreneurial thinking lies on the purpose to find solutions, tackle difficulties and challenges. So, being able to embed entrepreneurial thinking in an online teaching environment is an efficient way of providing learners tools to survive and prosper in difficult times.

Grigg (2021) describes setting real-world requirements to teaching as a great way to give learners entrepreneurial competences. When learners are given real existing problems to solve it may end up to great ideas and solutions.



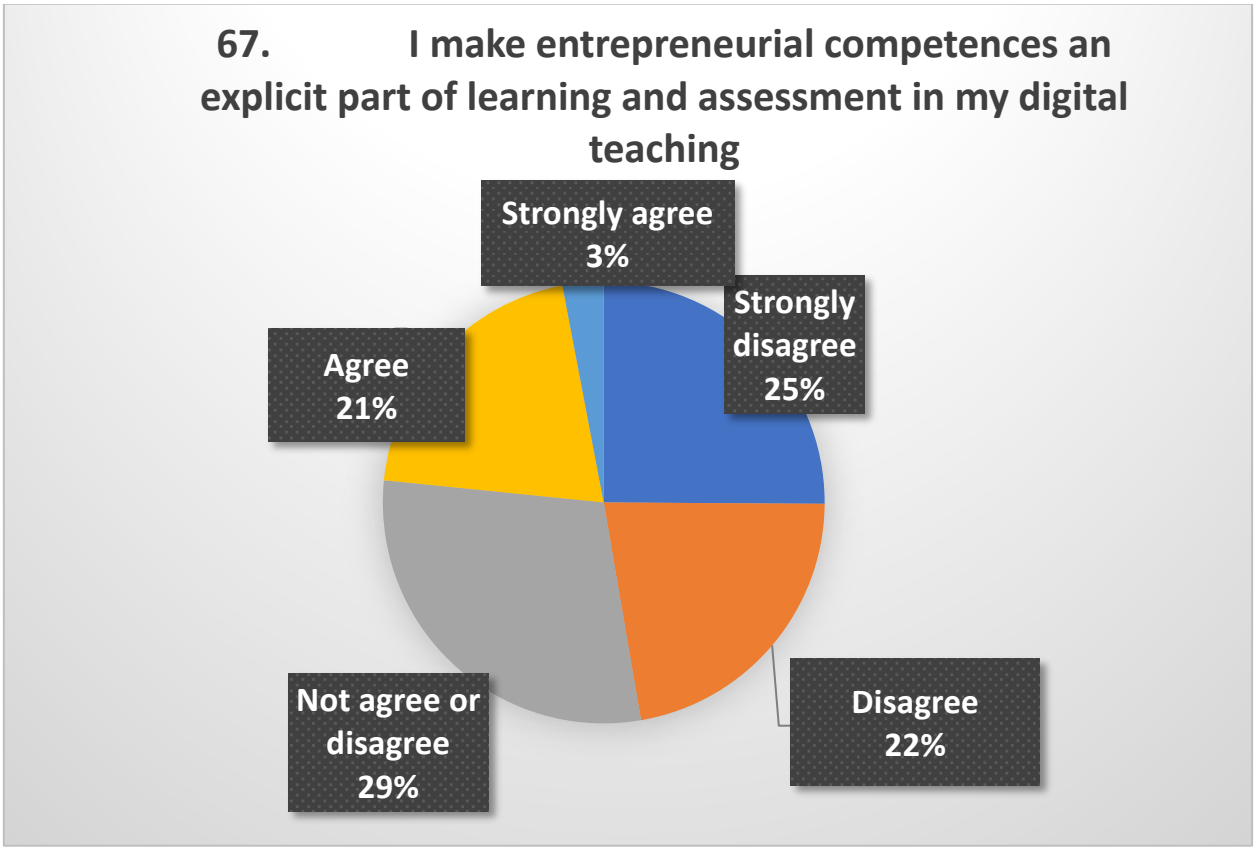
Respondents estimate that they are well or very well (in total of 78 %) able to include creative thinking throughout the learning process. In designing the e-DESK methodology as well as planning of the learning design, it is advisable via examples show how to use creative thinking in a way that promotes entrepreneurial competences.

EntreComp (2021) defines creativity followingly: “Creativity is the act of turning new and imaginative ideas into reality. Creativity is characterised by the ability to perceive the world around us in new and different ways in order to make connections among apparently unrelated phenomena and to generate innovative solutions. Creativity is the ability to produce new solutions without using a logical process but establishing distant relationships among facts. Therefore, it is not a logical process.”



Many of the respondents recognize in themselves an ability to encourage students to create value for others well or very well (67 %). However, as this is one of the key competences in EntreComp Framework and one that EU emphasises in its entrepreneurship strategies, it could be stressed in the e-DESK methodology to even more strengthen the teachers' ability to encourage students to thinking which highlights the significance of value creation and reflection.

EntreComp (2021c) explains the benefits of the value creation. Value creation is not only limited to education and courses. This way of thinking will promote your ability to create value in different environments like in work, hobbies, and organizations. Garbuio et al. (2018) see that entrepreneurial education encourages learners to see around differently and create desired futures.



The responses seem to indicate that only 24 % of the teachers agree or strongly agree of making entrepreneurial competences as an explicit part of learning and assessment in their digital teaching. This finding supports the idea that there is a demand to provide them with information how entrepreneurial competences can form a solid base also in digital teaching.

One essential issue in using entrepreneurial competences in teaching and learning is to approach the teaching subject in a way that it offers learners possibilities to acquire practical competencies by learning by doing and gain experiences in real world settings (Liguori & Winkler, 2020).

Entrepreneurial competences developing assessment is for example reflection of the course assignment. Reflection what's worked well and needs developing or improving. Creating open-minded attitude towards trial and error and learning from mistakes (Grigg, 2020).

11. Open text questions

	Question 68. Describe how digitalization changed your teaching practices?
	Workload, stress (increased)
	Digital teaching (increased)
	Finding alternative ways for teaching (increased, like online labs)
	Preparing digital learning materials (increased)
	Learning new teaching tools and methods (increased)
	Learning new assessment methods (increased)
	Feeling of control (decreased)
	Job satisfaction (decreased / in some cases increased – finding new ways)
	Interaction / communication teacher-student (decreased/increased)
	Interaction / communication student-student (decreased/increased)
	Interaction / communication teacher-teacher (decreased/increased)

	Question 69. Describe your successful experiences in digital teaching (during the pandemic)?
	Managed to complete courses enough well during the pandemic
	Managed to create even better courses than before
	Learned to use new tools
	Students' better participation, activity, and grades
	Students were more open to ask questions online
	Tools promoted project and teamwork
	Tools promoted international work
	More communication - teacher with students and students in their group
	Students liked recorded lectures (possibility to replay)
	Found new ways to teach
	Feeling that teaching is more dynamic
	Feeling that teaching is better planned and concentrating to essential issues

The many positive experiences teachers had according to the open text answers for Question 69. are described in the text box above. There were naturally also negative feelings, which will be listed in question 70. Challenges.

Respondents described the change to digital teaching contained both good and bad experiences. The restrictions brought up by the pandemic had forced many respondents to learn how to use new digital tools and methods. For some teachers this was an interesting challenge to learn something new and some found it very frustrating, while some had a neutral attitude towards the increased use of digital tools and methods. Previous experience in digital teaching had made the way easier for some respondents.

This contrast comes out in all open text questions. Some teachers have a very negative feeling of digital teaching and do not want to continue it. Others wish to continue the good, learned practices also in the future while some are already taking digital teaching widely into use even there is no forced need to do that.

Respondents' insights of the benefits, challenges and negative effects vary a lot. Some find digital teaching is challenging, less interactive, impersonal, and not controlled.

They think that it reduces students' participation and learning results. Contrarily, other teachers feel that digital teaching is dynamic, more accessible, increasing participation, communication and learning results. They had found new methods for their teaching, such as problem-solving and case studies.

	Question 70: Describe the challenges you are facing during digital teaching?
	Students' participation / activity in lectures (decreased, lost students, lower grades)
	Students' motivation (decreased, hard to keep up)
	Teacher's feeling of control and focus (decreased)
	Interaction / communication teacher-student (decreased)
	Interaction / communication student-student (decreased)
	Feedback from students (decreased)
	Hybrid teaching (parallel tools handling, attention, concentration)
	Technical problems (both teachers and students)
	Learning new teaching tools and methods (difficult, previous knowledge low)
	Workload (too much, tight timetable to adjust to pandemic)
	Lack of support from the organization
	Facing student's negative feelings in the new situation
	Assessment (adapting not easy, finding suitable methods, fairness in assessment)
	Ethical challenges (secure exams, cheating, plagiarism)

Students participation, activity, motivation and lack of interaction were listed as the most common challenges in digital teaching. Nikou and Maslov (2021) have also stated in their article of students e-learning participation during the Covid-19 that motivating and engaging learners to participate in online learning lessons is challenging.

BMC Health (2021) article of Covid-19 impacts in higher education institution staff reveals similar effects and challenges as described in questionnaire open questions 68. and 70. Decreased communication, adjustment of schedules and extra work load were reported in the study as main functional problems.

	Question 71: What actions or activities have been used/introduced during the pandemic that you would continue to apply in the post-pandemic period?
	Online lectures / courses
	Hybrid / blended teaching
	Zoom, Moodle, other Learning management systems
	Videos
	Discussion / interaction (discussion forums, chats, communication platforms etc.)
	Quizzes, polls, surveys
	Instructing / guiding / consulting / tutoring / mentoring online
	Group work / team work online
	Online visitors / seminars
	Online exams
	Online assesment

Above mentioned remarks of possible future activities were found in the comments of many respondents. It would seem that most of the respondents had found at least something good from their teaching experiences during the pandemic and wanted to continue their learned practices.

Conclusions

The data collected via the survey from European teachers was rich and manyfold, describing the transfer from mainly face-to-face teaching in classrooms to, in some cases, full digital learning environment almost overnight. The number of respondents (n=167) was not very large, but still, it gives a good insight in the current and previous state of digital teaching and learning in the four European countries, i.e., before and during the pandemic.

Previous experience of digital education and suitable methods naturally helped. Still, changing all the courses from classroom mode to online was not easy even for the most fluent of teachers. There were many challenges starting from technical issues, internet connections, helpdesk support, ranging to student interaction, exhausting workload, lacking suitable education material, uncertainty of own presentation skills, assessment difficulties in cases where cameras were off and sound muted.

What came out clearly was the need for deepening the teachers' own skills in embedding entrepreneur education in teaching and learning as well as need for improving the teachers' own digital skills, both in a hybrid education mode and blended learning mode. This is where e-DESK methodology together with MOOC course design can make a difference for the future. Improving their own entrepreneurial competencies will make it possible for the teachers to convey the importance of an entrepreneurial mindset in their students, thus giving the students significantly better competencies in their future careers, as active members of society, better qualified to create value for others. When increasing their own digital teaching skills and being able to apply the appropriate methods of delivery fluently irrespective of the learning environment, teachers can focus on the content of their teaching and give their best performance. e-DESK methodology is described in a separate report. Together with this survey analysis report and a step-to-step guide to the course methodology it forms the base for the e-DESK learning design.

Annex 1. e-DESK Questionnaire questions & question reply options

e-DESK Questionnaire

PROFILE

Gender
Age
Teaching experience (years)
Permanent (yes/no)
Full time/ Part time
Public / private university
Teaching field

Selectable teaching fields:

Arts and Humanities
Business
Communication Sciences
Engineering and Architecture
General subjects
Geography and Spatial Planning
Geography Course (Social ? Sciences?... Humanities ?...)
Health Sciences
Humanities
Mathematics
Science
Science and HE technology and pedagogy
Sciences
Social and Legal Sciences
Social sciences
Technical sciences, Traffic technology and transport
training

Section 2: Your digitalization in teaching experience

ATTITUDE TOWARDS DIGITALIZATION IN TEACHING AND LEARNING

1. ***Digitalization supports teaching and learning.***
   Please state your agreement.
   (Likert 1-5)
   strongly disagree (1)
   disagree (2)
   not agree or disagree (3)
   agree (4)
   strongly agree (5)

2. **Digitalization enhances teaching and learning.**
   Please state your agreement.

   (Likert 1-5)
   strongly disagree, disagree, not agree or disagree, agree, strongly agree

USAGE OF DIGITAL TECHNOLOGY IN TEACHING AND LEARNING

3. ***To what extent did you use digital technology for your lessons before the pandemic?***
   ***Please state your agreement*.**
   (Likert 1-5)

   I never used ICT in my practice (1)
   I occasionally used ICT in my teaching (2)
   I frequently used ICT in my practice with varying impact (3)
   I use ICT as a significant and regular feature of my practice (4)
   Using ICT is fully embedded in my practice (5)

4. ***To what extent are you using digital technology for your lessons now? Please state your agreement.***
   (Likert 1-5)

   I never used ICT in my practice (1)
   I occasionally used ICT in my teaching (2)
   I frequently used ICT in my practice with varying impact (3)
   I use ICT as a significant and regular feature of my practice (4)
   Using ICT is fully embedded in my practice (5)

AVAILABILITY AND USAGE OF DIGITAL TECHNOLOGY IN MY INSTITUTION

5. ***Digital technology was successfully integrated in my institution before the pandemic. Please state your agreement.***
   (Likert 1-5)
   strongly disagree, disagree, not agree or disagree, agree, strongly agree

6. ***Digital technology is now well integrated in my institution. Please state your agreement.***

   (Likert 1-5)
   strongly disagree, disagree, not agree or disagree, agree, strongly agree

7. ***The pandemic has had a positive effect on the use of digital technology in my institution. Please state your agreement***.

   (Likert 1-5)
   strongly disagree, disagree, not agree or disagree, agree, strongly agree

DIFFERENT TEACHING METHODS AND MODES

The descriptions:

Fully online (Full Digi) = the student completes the course entirely online. Does not require attendance on campus

Blended learning = Blended learning can include many different synchronous and asynchronous teaching methods. The learning environment consists of a mix of online environments and face to face/in person teaching.

Hybrid learning = In hybrid teaching, participants are simultaneously present in the same classroom or remotely over a network connection

Face to face/in person instruction = Traditional teaching in a classroom or other physical environment, where the student participates in lectures, practice groups, seminars, exams, discussions, for example.

What delivery modes have you used in your teaching practices before the pandemic? Please state your frequency level.
(Likert 1-5)
Never = 1, Rarely = 2, Occasionally = 3, Frequently = 4, Always = 5

	Never	Rarely	Occasionally	Frequently	Always

8. In person instruction					
9. Fully online instruct.					
10. Blended learning					
11. Hybrid learning					

Which digital teaching modes do you use now?
Please state your frequency level.
(Likert 1-5)
Never = 1, Rarely = 2, Occasionally = 3, Frequently = 4, Always = 5

	Never	Rarely	Occasionally	Frequently	Always
12. In person instruction					
13. Fully online instruct.					
14. Blended learning					
15. Hybrid learning					

What teaching methods have you used in digital teaching?
Please state your frequency level.

(Likert 1-5)
Never = 1, Rarely = 2, Occasionally = 3, Frequently = 4, Always = 5

	Never	Rarely	Occasionally	Frequently	Always
16. Problem based learning (PBL)					
17. Work based learning (WBL)					
18. Flipped classroom					
19. Project-based learning					

20. Collaborative and peer learning					
21. Learning based on cooperative models (such a social economy or cooperative values)					
22. Questions and answers					
23. Inquiry based learning					
24. Other					

25. If other or anything else, please explain what? Open answer

ASSESSMENT

Formative evaluation is used to modify or improve products, programmes, or activities, and is based on feedback obtained during students' planning and development, whereas *summative* evaluation is at the conclusion of an activity or plan, to determine its effectiveness. (Bloom et al., (1971)

Further the evaluation may be divided for the purpose of evaluation (formative or summative), type of evaluation objectives (cognitive, affective, behavioral, impact), level of evaluation (reaction, learning, behavior, organizational impact), type of instructional objectives (declarative knowledge, procedural learning, attitudes), type of instructional delivery (classroom-based, technology-based, mixed), and size and type of participant groups (individual, small group, whole group) Eseryel (2002, 96).

Students' *self-assessment* approaches may be categorized into *assessment of learning*, *assessment for learning,* and *assessment as learning* Draycott et al. (2011)

I adopted new assessment approaches using digital technology, please indicate your agreement.

(Likert 1-5)
strongly disagree (1), disagree (2), neither agree or disagree (3), agree (4), strongly agree (5)

	Strongly disagree	Disagree	Not agree or disagree	Agree	Strongly agree
26. I tried to replicate assessment approaches I used before					
27. I had to rethink the assessment program and introduced considerable changes					
28. I adopted the assessment approaches that I used before to online environmen t					
29. I utilized examination data bases					
30. I applied more problem-solving exercises					

31. I introduced peer assessment					
32. I introduced group reflection					
33. Other					

34. If other or anything else, please explain what? Open answer

	Strongly disagree	Disagree	Not agree or disagree	Agree	Strongly agree
35. I tried to replicate assessment approaches I used before					
36. I had to rethink the assessment program and introduced considera					

ble changes					

37. I had to rethink the assessment program and introduced considerable changes					

ONE'S OWN SELF-ASSESSMENT ON DIGITAL COMPETENCE

38. My digital teaching competence is very good

(Likert 1-5)
Strongly disagree, disagree, not agree or disagree, agree, strongly agree

39. My pedagogical competence is very good
(Likert 1-5)
Strongly disagree, disagree, not agree or disagree, agree, strongly agree

DIGITAL TEACHING SUPPORT

40. My organization needs to offer more support to improve online teaching
(Likert 1-5)
Strongly disagree, disagree, not agree or disagree, agree, strongly agree

41. My organization offers effective support for digital teaching
(Likert 1-5)
Strongly disagree, disagree, not agree or disagree, agree, strongly agree

My organization offers effective support for digital teaching. Select option (yes / no / I don't know) for each support form

	Yes	No	I don't know
42. Differentiated			
43. Personal			

44. Just in time			
45. Multimodal			
46. Tutoring			
47. Training			
48. Couching			
49. Manuals			
50. Guiding tutorials			
51. Videos			
52. Webinars			
53. MOOC			

54. When you need ICT support in your teaching practices how would you like support to be provided
MULTIPLE choice (you can choose more than one preference):

	Selection
Videos	
Manuals	
Chat service	
Short courses	
Workshops	
Tutorials	
FAQ	
Buddy	
Other	

55. If other or anything else, please explain what? Open answer

AVAILABLE DIGITAL RESOURCES

56. What kinds of digital resources do you have at your disposal in your own organization? *MULTIPLE choice (you can choose more than one option):*

Digital resource	***Example***	***Features/purpose***	***Selection***
Learning Management System	Moodle	*Multiple Choice Test (Quizz), Documents Submission (Online Assessment) and Discussion Forums*	
Online platforms for classes/sessions	Zoom, Teams, BigBlueButton	*Sharing video, audio, screen, chat, interactive whiteboard, built-in quizzes, group creation (breakout rooms), attendance and usage reports*	
Online platforms for classes / assignments preparation by students	Perusall	*Reading and uploading files online (text, audio and video), annotations, discussion and collaboration in chat, review of group readings*	
Online resources for group brainstorming and collaborative work	Jamboard	*Creation of multiple interactive whiteboards where several groups can work simultaneously: insertion of images, texts, post-its, symbols, and others*	
Gamification platforms for multiple choice questions in game/competition format	Kahoot!	*Quizzes, individual or group competition*	
Polling tools for varied polls / quizzes throughout the session	PollEverywhere	*Polls, quizzes, individual or group competition*	
Add-on software to include questions in Moodle videos, even if	H5P	*Inserting questions in videos and creating different forms of*	

they are uploaded on Youtube		*interactive presentation*	
Tools for editing video, audio, images, interactive documents	Adobe Creative Cloud	*Video editing/creation: Premiere, After Effects, Media Encoder* *Audio editing: Audition* *Image editing: Photoshop, Illustrator* *Documents: InDesign*	
Other			

57. If Other, please describe. *Open answer*

COMMUNICATION / INTERACTION

Communication and interaction are an important part of learning. Have you experienced differences in communication methods you use in teaching interaction situations during the pandemic? What kind of changes have you encountered, please indicate the level of your agreement?

Likert (1-5)
strongly agree, agree, neither agree or disagree, disagree, and strongly disagree

	Strongly disagree	Disagree	Not agree or disagree	Agree	Strongly agree
58. I interact with students more during the pandemic than before.					
59. I interact more with my peers (other teachers) during the pandemic than before					
60. I interact internationally more during the pandemic than before.					
61. I noticed students interact more with their peers than before					
62. I noticed students interact more with available digital					

teaching material					

ENTREPRENEURIAL TEACHING

(INSTRUCTIONAL TEXT FOR QUESTIONNAIRE REPLICANTS)

ENTREPRENEURIAL TEACHING IN DIGITAL ENVIRONMENT

Entrepreneurship education aims to develop the learner's entrepreneurial knowledge and skills and an enterprising attitude to success in life. Entrepreneurship education utilizes a variety of learning environments, tools, and cooperation outside the educational institution. Teaching emphasises social and professional life skills, entrepreneurial abilities, enterprising capacities for taking initiatives, group working skills, accountability, innovation and creativity, and self-awareness as well as self-efficacy.

	Strongly disagree	Disagree	Not agree or disagree	Agree	Strongly agree
63. I am familiar with Entrepreneurship education					
64. I understand how to apply the entrepreneurial competences into my online teaching					
65. I make entrepreneurial competences an explicit part of learning and assessment in my digital teaching					

66. **I include creative thinking throughout the learning process.**					
67. I encourage students to create value for others through their learning and stimulating reflection					

OPEN ENDED QUESTIONS

68. Describe how digitalization changed your teaching practices?

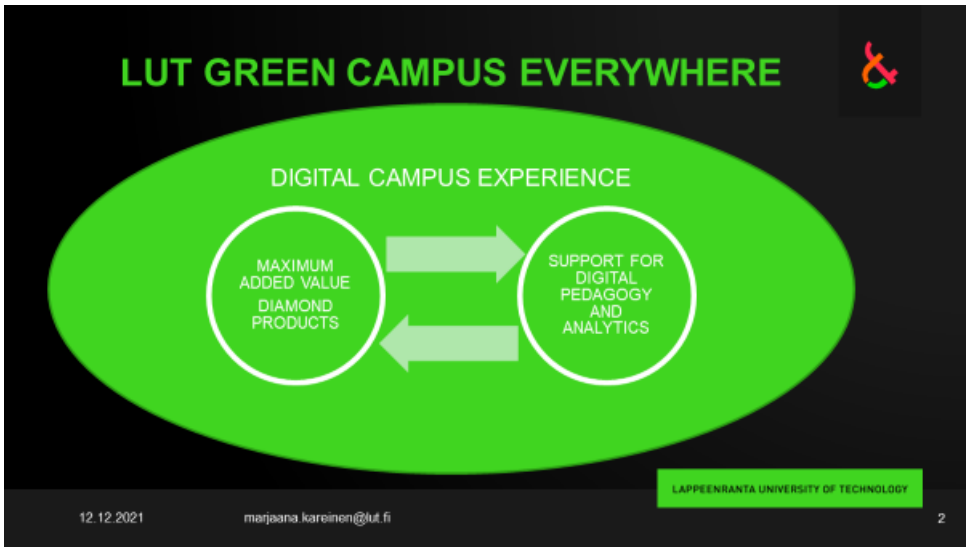
Open answer

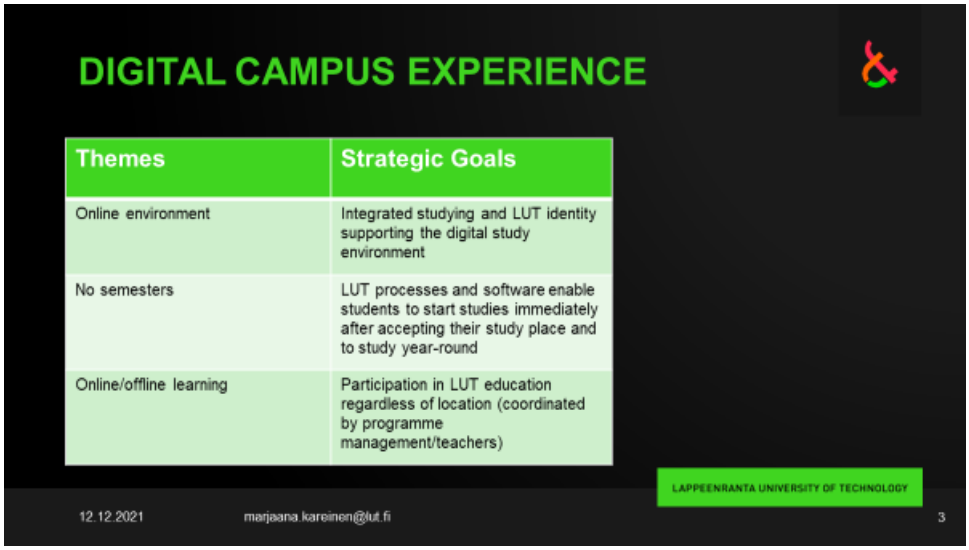
69. Describe your successful experiences in digital teaching (during the pandemic)?
Open answer

70. Describe the challenges you are facing during digital teaching?
Open answer

71. What actions or activities have been used/introduced during the pandemic that you would continue to apply in the post-pandemic period?
Open answer

Annex 2. LUT Digital Strategy of Education 2025





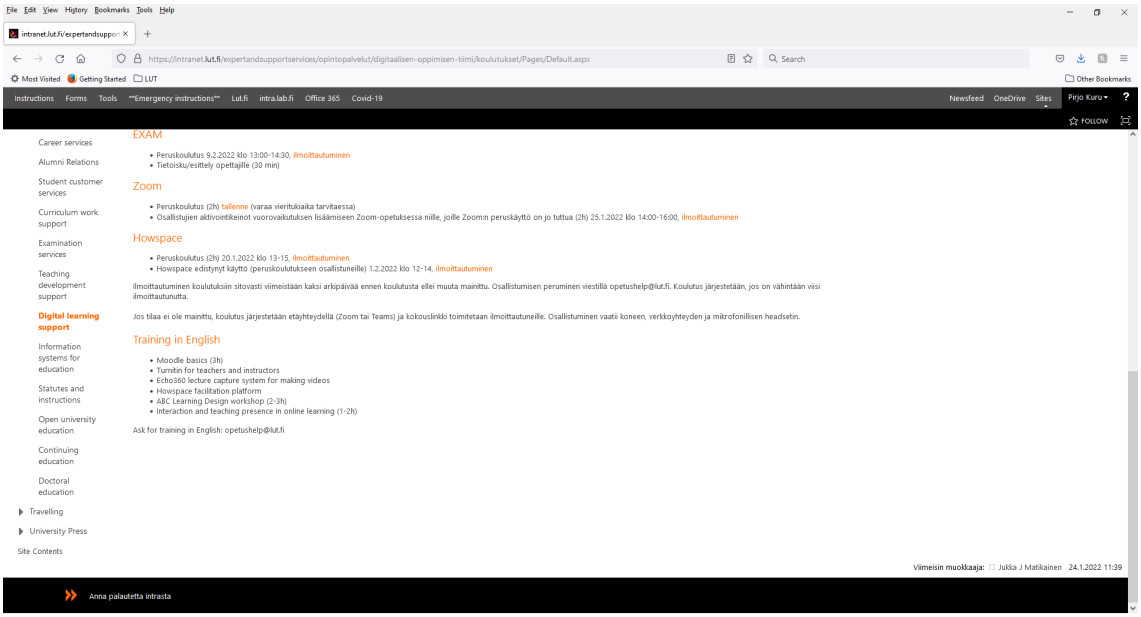
MAXIMUM ADDED VALUE WITH "DIAMOND PRODUCTS"

Theme	Strategic Goals
Online courses	Good quality digitalised "Diamond Products" to assist in scaling the education
Modules	"Diamond Products" used to the maximum in various types of study packages (degrees, add-ons)
Together	Digital realisation together with strategic partners (national and international partners, LUT Group)

DIGITAL PEDAGOGY AND ANALYTICS

Theme	Strategic Goal
Pedagogical support	Quality of "Diamond Products" assured with digital and pedagogical precision support
Analytics	LUT has a unified analytics tool to guarantee the quality and development of teaching

Annex 3. LUT / Digital Teaching help centre website



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