

## Digital University: Investigating the Impact of the Pandemic on the Acceptance of E-Learning

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*This article explores a comparative study on the Digitalization in Teaching conducted by the FHWien der WKW (FHW) at the very beginning of the pandemic, with a follow-up one year later, after the complete changeover to distance learning. The study investigated behaviour and preferences of students and teaching staff as linked to their experience with digital tools both initially and after that year. The results were compared to the results of similar studies, focusing on answering the question about the impact of digital education on the acceptance of the digital tools and processes. This paper presents the findings of the FHW study examining the acceptance or rejection of e-learning by students and teaching staff by exploring their needs, questions, and requests. The research uses acceptance theory in its theoretical underpinnings. Its methodology consists of a quantitative survey of students and teaching staff, as well as the review of studies on related topics. The outcome of this study shows that, after a year of being forced to work with digital tools, attitudes among students and teaching staff generally became more accepting and shifts in their needs and requests could be observed.*

**Keywords:** distance learning, digital tools, post-secondary education, e-learning, acceptance

### Introduction

The COVID-19 pandemic, the most profound health crisis of the past hundred years, has been with us for about two years. The effects of this crisis have changed the ways in which we live, affecting all aspects of our lives. No other phenomenon in recent years has so fundamentally shaken our societies, nor to spread across the world at such speed (Skillsoft 2020).

The specific research area of this paper is the education sector, which was particularly affected by the imposition of measures enforcing social distancing and resulting in the closure of the majority of higher education institutions (Al-Kumaim et al. 2021, Holzer et al. 2021, Taga et al. 2020, Mohamed et al. 2020). The sudden closure of many educational institutions created challenges for both students and university staff. During this time, many educational institutions surveyed their students and employees on the impact of the sudden changes (Arndt et al. 2020, Pausits et al. 2021). Generally speaking, even those educational institutes that were already familiar with digital educational tools and distance

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learning were caught off-guard by the pandemic and the measures enacted to control it (Berghoff et al. 2021, Marczuk et al. 2021). While scholars acknowledge that the concept of online learning is not new, they also recognise that the digitalization of higher education accelerated dramatically during the pandemic (Hargitai et al. 2021, Al-Kumaim et al. 2021, Kreulich et al. 2020).

Vienna's University of Applied Sciences for Management and Communication – FHWien der WKW – is a rather small Austrian university with approximately 3,000 students spread across 10 Bachelor and 8 Master programs. The implementation of pandemic mitigation measures triggered a digitalization push throughout FHW's teaching and learning activities, with the rapid deployment of digital tools and methods across a wide range of course types. Such changes have fundamentally changed the way online teaching is approached by universities, where digital skills are in greater demand than ever (Farnell et al. 2021, Berghoff et al. 2021, Kreulich et al. 2020). While the trend towards digitalization in higher education is nothing new – also at the FHW, which has long embraced digitalization in teaching – the novel conditions of 2020 and 2021 necessitated a faster and wider implementation than many had previously expected (Kreulich et al. 2020).

"Pre-pandemic" efforts towards digitalization in teaching were constantly surrounded by concerns about effects on the quality of teaching and about the acceptance of the tools (Söbke and Reichelt 2016). At the same time, the introduction of digital/virtual distance learning is recognized as bringing advantages, such as the promotion of individual learning, independent of time and space, as well as greater flexibility during studies through video conferencing, interactive exercises, streaming, and online learning platforms (Marczuk et al. 2021, Berghoff et al. 2021, Kreulich et al. 2020). Given recent upheavals and arguments on each side of the equation, this is an opportune moment to investigate how students and faculty view these developments, and how they deal with the digitalization and virtualization of teaching after more than a year of first-hand experience.

This article is based on studies conducted by a team of experts in the digitalization of communication at FHW, who have been investigating digital trends in higher education since 2019. This research project, funded by the city of Vienna, focuses on digital communication trends in higher education and developments in digital communication studies. Since the outbreak of COVID-19 in Austria during March 2020, the project has expanded its research interest to include students' and lecturers' experiences during the pandemic. Accordingly, four surveys have been conducted so far, with two targeted at each group: students and lecturers. This study includes four waves of data collection, from Spring 2020 to Spring 2021.

This longitudinal data on attitudes and experiences, collected during a period of substantial regulatory and institutional change, enables exploration of the acceptability of digital teaching in light of the changes brought about by social-distancing measures. Thus, the guiding research question addressed here is:

How did the sudden shift to online education during the COVID-19 pandemic affect students' and educators' acceptance of digitalization in Austrian post-secondary education?

The COVID-19 pandemic can be considered as an exceptional set of circumstances, which, in many cases, forced the rapid transition to e-learning, distance learning, and distance teaching. In this light, results of the aforementioned surveys into students' and lecturers' acceptance of digital teaching and learning can be understood as short-term consequences (Farnell et al. 2021). These factors notwithstanding, the longitudinal analysis of this data by the Competence Team for the Digitalisation of Communication can provide important lessons for improving the overall online learning experience for all parties involved in higher education (Marczuk et al. 2021, Walwyn 2020).

This paper is structured in the following format: After this introduction the next section presents a short literature review and the theoretical framework of the research question. Then the methodology that is followed by the results section, in which the empirical findings are explained, and the last section concludes the study.

## **Literature Review**

The changes caused by the COVID-19 pandemic made it necessary for universities to regard digitalization as a strategically relevant topic, with many forced to implement a rapid transition to virtual teaching and learning in early 2020. During this adaptation to e-learning, and despite the extra workload implied, universities also seemed to increasingly launch surveys related to the digitalization process (Arndt et al. 2020). In the final report of the research project BRIDGING, Arndt et al. (2020) question the extent to which digitalization influences traditional transfer strategies for the development and dissemination of concepts and content in higher education. Accordingly, the research team conducted a supplementary qualitative study of internal surveys of teachers and students at German universities carried out during the summer semester of 2020. Likewise, the report "Distance Learning at Austrian Universities and Colleges in the Summer Semester 2020 and Winter Semester 2020/21" (Pausits et al. 2021) attempts to bundle and systematize the research work of Austrian universities into "distance education" during 2020. The main results of these two studies have substantially informed the current research.

The research project BRIDGING (Arndt et al. 2020) investigated what influence do the procedures to implement digital educational concepts during the first months of the pandemic have on higher education. For this purpose, the researchers conducted a qualitative study on internal university surveys among teachers and students in the summer semester 2020.

This content analysis by Arndt et al. (2020) of surveys related to digitalization within universities identified 13 areas of relevance: (a) workload, (b) life situation, (c) progress through studies, (d) examinations and forms of assessment, (e) learning progress and organization, (f) communication and interaction, (g) previous

experience, (h) media-technical and didactical competences, (i) technical equipment, (j) technical infrastructure and tools, (k) virtual teaching and learning scenarios, (l) support and support needs, and, finally, (m) evaluation of the change process. The FHW surveys on which this paper is based focused particularly on areas (a), (b), (c), (h), (e), (h), (i), (j), (k), and (l). For the purposes of this paper, however, areas (a), (b), (h), (j), and (k) are of particular relevance and a short summary of Arndt et al.'s results in these areas is presented below to facilitate comprehension of the similarities and differences between the FHW study and other related studies:

Ad (a) workload: Arndt et al.'s research stated that the workload was considered by the majority of both students and instructors to be (significantly) higher compared to face-to-face semesters – as a rule, more so by teachers than students.

Ad (b) life situation: Particularly the lack of workplaces for concentrated work and learning, financial burdens, and psychological stress can make learning and teaching more difficult. These may also be reasons for the often-expressed desire for physical presence in the sense of reopening learning spaces.

Ad (h) media-technical and didactical competences: Both teachers and students reported an increase in competence and saw this as creating opportunities for virtual teaching in coming semesters. In addition to the competence from a technical perspective, also the improvement of didactical competencies comes here into focus.

Ad (j) technical infrastructure and tools: The majority of teachers use learning management systems and video conferencing systems, primarily Zoom, on account of its high performance. Differentiation between knowledge and ability proves to be critical with respect to infrastructure and tools.

Ad (k) virtual teaching and learning scenarios: As students consider exchanges with teachers as important, they desire more than just self-learning materials. Combinations of asynchronous and synchronous teaching and learning scenarios meet the different needs and desires of both instructors and students. The designing of virtual teaching and learning scenarios, and particularly maintaining communication and interaction, generated a high workload for lecturers and various support staff actors at the universities both before and during the 2020 summer semester. Meanwhile, however, they adapted their offers to meet the needs of students and teachers.

Pausits et al. (2021) came to the conclusion that successful conversion to distance learning required of lecturers the following competencies:

- (a) skilled handling of Internet-supported teaching technologies, such as the operation of video conferencing systems and learning management systems (media informatics),
- (b) knowledge of possibilities for the methodological-didactic design of courses in distance learning (media didactics),
- (c) knowledge about the design of digital learning resources, such as learning videos (media design), and

- (d) independent management of their full scope of professional activities, including exchanges with colleagues for research activities, from their homes with the help of Internet technology.

Regarding the results for universities students, Pausits et al. (2021) concluded that the initial surveys paint a positive picture of universities' rapid responses in crisis mode, but at the same time list some key challenges that have become ever more prominent as the pandemic has progressed. These are related to:

- (a) a lack of physical learning spaces,
- (b) a lack of social contact with colleagues (Gabriel and Pecher 2020, Lehner and Sohm 2021, Schwab et al. 2020, Pausits et al. 2021, Meyer and Mara 2020, Weinberger 2020),
- (c) less enjoyment of studies conducted through individual learning (Schwab et al. 2020),
- (d) limited possibilities for group work (Gabriel and Pecher 2020, Lehner and Sohm 2021, Schwab et al. 2020),
- (e) increased difficulties in communication with individual teachers (Schwab et al. 2020, Pausits et al. 2021, Ledermüller et al. 2020),
- (f) high workloads in distance learning resulting from an underestimation of the workload by instructors (Schwab et al. 2020, Weinberger 2020, Ledermüller et al. 2020).

Eventually, Heinz Faßmann (in Pausits et al. 2021) states: "It has been shown that digital forms of teaching and learning are only innovative if they are implemented in a professional and didactically meaningful way." This is the reason the Pausits et al.'s (2021) study concludes by identifying research concerns, including the impact of distance learning on skill acquisition or any consequences and disadvantages for educational biographies.

The reviews by Arndt et al. (2020) and Pausits et al. (2021) expose a raft of important considerations that helped to inform the current study, as well as revealing common experiences at other universities, against which the FHW data can be benchmarked. First, two key aspects of the research question are defined in detail in the sections below: 1) distance learning and distance teaching, which are of equal significant here, as the main survey addresses the challenges and needs of both students and teachers; and 2) the concept of acceptance, which we operationalize by drawing on the theoretical foundations of acceptance research. A further important aspect is the context of the study, which was conducted with students and lecturers of the FHW, who experienced the pandemic-related changes in a common context. An explanation of this context is integrated in the following sections to increase the validity of the comparative analysis by setting the data within a realistic framework, while demographic data on the study participants are presented in the methodology section.

*Distance Learning and Distance Teaching*

Distance Education is nothing new: already in the 19th century distance learning courses were offered to soldiers (Kentnor 2015), while institutions made course content available to students for the purpose of self-study. Some of the most defining characteristics are the physical separation of teacher and learner, learning in the context of (yet not within) an educational institution, and the use of communication media such as radio, television, mail, internet, etc. in teaching (Fidalgo et al. 2020).

Meanwhile “[o]nline education is no longer a trend, but mainstream. Of the 18.2 million students enrolled in higher education in the fall of 2007, 3.9 million (21.4%) were enrolled in at least one online course” (Kentnor 2015).

In Germany, the term “distance education” is defined in the 1977 Distance Education Protection Act as the transmission of knowledge and skills on a contractual basis, in which the teacher and the student are exclusively or predominantly physically separated, and the teacher or their representative monitors the learning success of the students (FernUSG 1976).

With the advent of the Internet as a knowledge exchange platform providing possibilities for online data transfer, a previously unimaginable variety of distance education methods and tools has emerged. “Distance education was based on the premise that education was possible without the face-to-face interaction between the student and teacher. [...] Today, with the advancements in communications technology and the connectivity of computers and the Internet, distance education is commonplace” (Kentnor 2015).

Recent developments in communications technologies have increased usage of the term “distance learning”, placing it in close relation to e-learning, virtual learning, or online learning. The FHW uses the potentials of e-learning to better address individual needs and to achieve a wider reach of teaching content. Digital infrastructures enable, among other things, asynchronous teaching, educational games, the creation of discussion forums, and synchronous virtual contact between students and teachers. Digital teaching methods thus offer extraordinary flexibility in designing learning processes and should therefore provide for improved learning motivation among students (Reiss and Steffens 2010).

Before the year 2020, the FHW was not interested in radically replacing traditional learning content with virtual content, but rather in enhancing it by blending real and virtual learning offerings. The terms “augmented learning” and “blended learning” accurately express FHW's original intention, yet this intention changed significantly when pandemic mitigation measures forced a complete change to distance learning in a very short time period. The FHW used this as an opportunity to learn more about the possibilities for digital design in teaching as well as to better understand the acceptance of distance learning by students and teachers, given the circumstances.

Despite being two sides of the same coin, this article distinguishes between distance learning and distance teaching in order to precisely address the challenges that are experienced differently by students and teachers in distance education.

*Acceptance Definitions*

In discussing the acceptance of digital teaching, we apply the term as defined by Simon (2001) with respect to the acceptance of innovations: Acceptance stands in opposition to the term rejection and denotes the positive acceptance decision of an innovation by the users. The central elements of acceptance research are (a) the acceptance concept (What does acceptance of an innovation mean?), (b) the users (who has to accept an innovation and how?) as well as (c) the innovation (what is to be accepted?) (Simon 2001).

Attitudinal acceptance (Müller/Müller 1986) comprises both affective (emotional) and cognitive (rational) components. The affective component considers motivational-emotional states associated with the innovation. The cognitive component weighs the costs and benefits of an innovation, taking into account personal context. Attitudinal acceptance by users is not directly observable. Behavioral acceptance (Müller-Böling and Müller 1986) extends the acceptance concept by an activity aspect. Behavioral acceptance is spoken of when innovations are accepted in the form of an observable behavior, such as use (Simon 2001).

Acceptance research also investigates the reasons for the acceptance of technological innovations with the aim of identifying and counteracting, undesirable developments as early as possible (Schlohmann 2012). The research interest of this article, the digitalized teaching program of the FHW, is considered as the innovative “product” and is examined according to its acceptance by students and teachers. Because the digitalized educational program relies on technological implementation and technical skills, the Technology Acceptance Model (TAM) is adopted as the reference model for our analysis.

The TAM aims to describe the motivational processes involved in using technological systems. It postulates that the characteristics of the system determine the degree of use by individuals and presents the relevant determinants of acceptance. The TAM assumes that the user’s attitude toward the system is an important determinant of the decision to actually use it (Schlohmann 2012). According to Davis et al. (1989), the developer of the model, perceived usefulness and perceived ease of use are the key determinants of attitude toward technological systems. In addition, perceived ease of use influences perceived usefulness (Schlohmann 2012).

The TAM offers tools to observe users’ satisfaction with their experience with new technologies. In a study about the contribution of technology acceptance to learner satisfaction in distance education, Ilgaz and Aşkar (2013) showed that students who perceived online learning systems as easy to use and useful for their learning were more satisfied with distance education, as were students who were able to develop a sense of community. Perceived usefulness was found to explain 45% of the variance in satisfaction and to have the highest predictive power. The researchers further determined that students in undergraduate degrees are more positive about distance education than students in higher degrees (Ilgaz and Aşkar 2013).

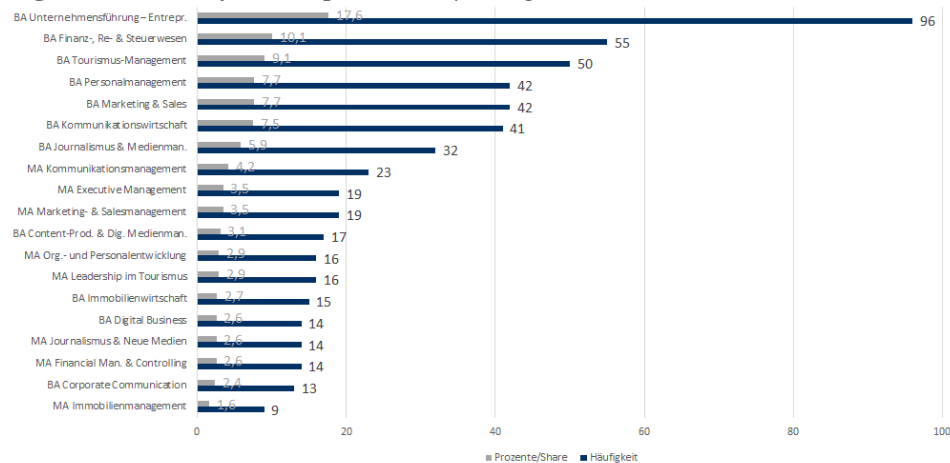
## **Methodology**

This paper examines the acceptance of e-learning by students and teaching staff at the FHW University of Applied Sciences for Management and Communication by exploring their needs, questions, and requests. The research uses acceptance theory as its theoretical underpinnings to analyze quantitative surveys of students and teaching staff in light of review studies on related topics (Arndt et al. 2020, Pausits et al. 2021).

Data collection consisted of four online surveys conducted at the FHW, two surveys which were conducted with students of the FHW and two surveys which were conducted with lecturers at the FHW. The surveys were generated via the online survey tool Unipark and distributed via email. Students were first surveyed from April 8th to April 22nd, 2020, with a follow-up survey conducted from March 2nd to March 20th, 2021. The student survey in 2020 achieved a response rate of 70%, attracting 510 participants comprising 70.7% female and 29.3% male respondents. The average age of students was 20.15 years in 2020. The latter student survey in 2021 achieved a response rate of 66.3%, attracting 561 participants comprising 69.1% female and 30.9% male respondents. The average age of students was 21 years in 2021. Similarly, the initial survey of lecturers ran from April 20th to April 22nd, 2020, and the follow-up from June 3rd to June 17th, 2021. The first survey of lecturers in 2020 achieved a response rate of 75.94% with 150 respondents comprising 49.6% female and 50.4% male respondents. The latter survey of lecturers in 2021 yielded a completion rate of 70.35%, with the 159 respondents showing a gender distribution of 56.6% male and 43.3% female. The average age of lecturers was 37.81 years in 2021.

The surveys were distributed amongst all students and lecturers of the FHW, which offers ten different Bachelor programs and eight different Master programs, which are the following (see also Figure 1): Content Production & Digital Media Management, Corporate Communication, Digital Business, Finance, Accounting & Taxation, Real Estate, Journalism & Media Management, Corporate Communication, Marketing & Sales, Human Resources Management, Tourism & Hospitality Management, Management & Entrepreneurship (Bachelor studies) and Digital Innovation Engineering, Executive Management, Financial Management & Controlling, Real Estate Management, Journalism & New Media, Communication Management, Leadership in Tourism & Hospitality, Marketing & Sales Management, Organizational & Human Resources Development and Urban Tourism & Visitor Economy Management (Master studies).



**Figure 1.** Share of Participants/Study Program in Percent (2021)

Source: Author.

Lecturers at the FHW University of Applied Sciences are qualified in different fields of Management and Communication and work either as full-time employees or as external lecturers. In 2021 the composition of lecturers at the FHW survey consisted of 1,025 lecturers in total from which 943 lecturers were external lecturers, 81.6% “external lecturers” and 18.4% “full-time employees” of the university.

In order to ensure that the participants were anonymous and that the study was confidential, no sensible data was asked throughout the study, apart from the demographic information. Anonymous participation was made possible through an online link invitation which was sent out to all participants through the university’s email database.

The following two main questions guide the elaboration of the surveys. The first one offered guidance to the survey directed to students and the second one to the survey aiming the teaching staff.

- 1) What impact does the situation around COVID-19 (“Corona Crisis”) have on the studies (perception of digital learning processes, dealing with changed learning conditions (100% Distance Learning), use, application and suitability of tools, communication and cooperation among students, compatibility of studies and job, etc.) of FHWien der WKW students from the students' perspective?
- 2) What impact does the situation around COVID-19 (“Corona crisis”) have on the teaching (use, application and suitability of tools, communication and collaboration with students) of FHWien der WKW teachers from the teachers' point of view?

Following, the content of the conducted surveys will be discussed in detail. Starting with the two surveys conducted with the students of the FHW, the main topics leading the online surveys were: (a) burden of the pandemic on students, (b) burden of Distance Learning on students, (c) preferred forms of Distance Learning (synchronous, asynchronous), (d) ideal duration of Distance Learning, (e) tools of

Distance Learning and how useful they are, (f) efficiency of tools for Distance Learning, (g) personal experience of Distance Learning and learning process, (h) Online Communication tools, (i) workload during Distance Learning, (j) Satisfaction of Distance Learning. An attempt was made to compare the results of 2020 and 2021 to see changing preferences, habits or experiences.

Regarding the two surveys conducted with lecturers at the FHW, the main topics leading the online surveys were: (a) burden of the pandemic on lecturers, (b) burden of Distance Learning on lecturers, (c) preferred forms of Distance Learning (synchronous, asynchronous), (d) ideal duration of Distance Learning, (e) tools of Distance Learning and how useful they are, (f) efficiency of tools for Distance Learning, (f) support of lecturers through the university, (g) quality of submissions, (h) collaboration of students, (i) attendance and motivation of students, (j) online exams, (k) workload of lecturers.

Along the following lines a selection of scales used in the surveys will be presented (for a detailed list of questions and their scales see Tables 1 and 2):

When students and lecturers were asked about the degree of burden caused by the pandemic or Distance Learning, the following scale was used: from 1-10, when 1 meant not a burden at all and 10 meant very much of a burden. When students and lecturers were asked about the appropriation of specific tools for Distance Learning, the following scale was used: from 1-5, when 1 meant very appropriate, 2 meant appropriate, 3 meant partially appropriate, 4 meant less appropriate, 5 meant not appropriate at all, and there was an option for not used yet. When students and lecturers were asked about their agreement, e.g., in the context of the appropriate workload estimation, the following scale was used: from 1-5, 1 meant full agreement, 2 meant rather agreement, 3 meant partially agreement, 4 meant less agreement and 5 meant no agreement at all. When students and lecturers were asked about their satisfaction, e.g., in the context of overall Distance Learning the following scale was used, from 1-5, when 1 meant very satisfied, 2 meant satisfied, 3 meant partially satisfied, partially unsatisfied, 4 meant pretty unsatisfied and 5 meant very dissatisfied.

After the collection of the data the results of the surveys were analyzed using SPSS and will be presented in the results section.

**Table 1. Students Survey 2020**

Students Survey 2020			
	Question	Representation	Labeling
1	In general, how do you feel your personal burden from the current COVID-19 crisis? Drag the slider to the desired position.	Scale (1 to 11)	1 = "Not a burden," 11 = "A great deal of a burden"
2	How do you feel about the stress in your studies due to the current COVID-19 crisis?	Scale (1 to 11)	1 = "Not a burden," 11 = "A great deal of a burden"
3	What is your preferred form of distance learning?	List	(1) synchronous teaching units (2) asynchronous teaching units

4	What do you feel is the optimal duration for synchronous (= simultaneous, with presence) teaching?	Dropdown	List: from 15 minutes until 180 minutes
5	Which of the following tools were used in a course you attended? Moodle, Microsoft Office 365 Apps, Adobe Connect, Zoom, Skype, Panopto video platform, Other communication tools, namely:	List of tools. Possible Answers: yes, no & I don't know	1 = "yes", 2 = "no", 98 = "I don't know"
6	In your experience, how appropriate are the following tools for use in distance learning teaching? Moodle, Microsoft Office 365 Apps, Adobe Connect, Zoom, Skype, Panopto video platform, Other communication tools, namely:	Matrix & Scale (1 to 5)	1 = "very suitable", 5 = "not suitable at all"
7	In general, how well do the following online activities help them capture instructional content? Synchronous online teaching with Microsoft Office 365 apps, Asynchronous online teaching with Microsoft Office 365 apps, Live online teaching with Adobe Connect, Live online teaching with Zoom, Live online teaching with Skype, Learning videos on-demand with Panopto video platform, Livestream with Panopto video platform, Online quizzes, Exchange with instructors via email, Presentations set to music and video insertion of instructors, Presentations set to music, Group work with Microsoft Teams, Group work with Zoom (break out rooms).	Matrix & Scale (1 to 5 + 98)	1 = "very good", 5 = "very poor", 98 = not yet used
8	The following is about how you experience the digital learning environment. How much do you agree with the following statements? 8.1) It is clear to me at all times what purpose the digital teaching and learning materials fulfill (exercises, pre/post-processing, further information, etc.) 8.2) Distance Learning activities are associated with clear tasks and goals. 8.3) The material provided is sufficient to complete the tasks. 8.4) For me, the course content is clear and understandable for the most part. 8.5) In my opinion, the Distance Learning offerings are, for the most part, carefully and competently created. 8.6) The tasks to be completed through Distance Learning activities are well suited for distance learning. 8.7) The learning materials are regularly maintained so that the content (information, course materials, exercises, links, etc.) is, for the most part, always up to date. 8.8) In the current phase of 100% Distance Learning, I generally feel well supported. 8.9) Most instructors correctly estimate the workload for independent assignments. 8.10) The quality of Distance Learning offerings varies greatly from course to course.	Matrix & Scale (1 to 5)	1 = "fully agree", 5 = "do not agree at all"
9	The following is about how you experience your learning through the use of 100% Distance Learning. How much do you agree with the following statements? 9.1) By using 100% Distance Learning, I engage with the content more intensively. 9.2) By using 100% Distance Learning, I learn more independently 9.3) By using 100% Distance Learning, I can better monitor my learning progress.	Matrix & Scale (1 to 5)	1 = "fully agree", 5 = "do not agree at all"
10	How much do you agree with the following statement: I would have learned more if the topics and assignments worked on in Distance Learning had been covered in face-to-face sessions.	Scale (1 to 5)	1 = "fully agree", 5 = "do not agree at all"

11	What communication tools do you use to stay in touch with your fellow students (for study purposes)? Smart Phone, Facebook, WhatsApp, Facebook Messenger, Telegram, Instagram, Email, Google Hangouts, Skype, SMS, Zoom, Slack, Jitsi, Microsoft Teams, Other communication tools, namely:	List of tools. Possible Answers: yes, no & I don't know this tool	1 = "yes", 2 = "no", 98 = "I don't know this tool"
12	Overall, the increased use of online communication tools (WhatsApp, Facebook, Zoom, Microsoft Team, etc.) has improved collaboration in student workgroups/with my fellow students.	Scale (1 to 5)	1 = "fully agree", 5 = "do not agree at all"
13	How much has your workload increased with the switch to 100% Distance Learning?	Scale (1 to 5)	1 = "very much", 5 = "not at all"
14	We would now like you to think of a specific course in the current semester that has been converted to 100% Distance Learning.  2 treatment groups randomized (random selection), i.e. half of the subjects get version A: Please name a course that you think has been particularly well converted to 100% Distance Learning:  And the other half of the test persons gets Version B: Please name one course that in your opinion has been particularly poorly converted to 100% Distance Learning:  Which of the following tools were used in this course? Moodle, Microsoft Office 365 Apps, Adobe Connect, Zoom, Skype, Panopto video platform, Other communication tools, namely:	List of tools. Possible Answers: yes, no & I don't know	1 = "yes", 2 = "no", 98 = "I don't know"
14 (1)	This question contains 12 statements. Please think about each statement in relation to the course you indicated and indicate how true it is. 14.1.1) The quality of the content and information provided in this course helped me stay attentive. [Note: (A)ttention] 14.1.2) I was able to stay motivated even when the lector wasn't online all the time. [Note: (A)ttention] 14.1.3) The online tools used helped to stay attentive. [Note: (A)ttention] 14.1.4) It will be easy for me to apply what I learned online in this course in practice. [Note: (R)elevance] 14.1.5) The way the content was delivered made me feel like the content was worth knowing. [Note: (R)elevance] 14.1.6) The content of this course will be useful to me. [Note: (R)elevance] 14.1.7) When I worked on the assignments for this course, I felt confident that I would learn the content. [Note: (C)onfidence] 14.1.8) As a result of this course, I feel well and adequately prepared for the exams. [Note: (C)onfidence] 14.1.9) The organization of this course has helped me to feel confident that I am learning the content. [Note: (C)onfidence] 14.1.10) I enjoyed the course so much that I would like to learn more about this topic. [Note: (S)atisfaction] 14.1.11) I really enjoyed the course. [Note: (S)atisfaction] 14.1.12) It was a pleasure to participate in such a well-designed course. [Note: (S)atisfaction]	Matrix & Scale (1 to 5)	1 = "does not apply", 5 = "applies"

15	How much do you agree with the following statements about distance learning? 15.1) I can complete my assignments even if there are online distractions (e.g., sending emails or websites to browse). 15.2) I can complete my tasks even when there are distractions at home (e.g., television, children, and the like). 15.3) I can manage conversations well using online tools. 15.4) Sometimes I prefer to have more time to prepare answers to a question. 15.5) Regular contact with lecturers is important to my learning success in Distance Learning. 15.6) Quick technical and administrative support is important to my learning success in Distance Learning. 15.7) I feel that previous experience with online technologies is important to my success with Distance Learning. 15.8) The ability to use course materials immediately is important to my success with Distance Learning.	Matrix & Scale (1 to 5)	1 = "fully agree", 5 = "do not agree at all"
16	Overall, how satisfied are you with the distance learning opportunities at FHWien of WKW?	List	
17	I would like to see more traditional face-to-face courses replaced by distance learning in the future. Please indicate to what extent you agree with the statement.	Scale (1 to 5)	1 = "fully agree", 5 = "do not agree at all"
18	How would you rate your ability to grasp, understand, and use digital content for the tasks at hand?	Scale (1 to 5)	1 = "fully available", 5 = "not available",
19	How much does FHWien of WKW promote the (proficient) use of digital teaching content?	Scale (1 to 5) & I don't know	1 = "very good", 5 = "very poor", 98 = "I don't know"
20	Do you have any further comments and/or requests regarding Distance Learning at FHWien of WKW?	Open question + no answer	

Source: Author.

**Table 2. Teaching Staff Survey 2020**

Teaching Staff Survey 2020			
	Question	Representation	Labeling
1	In general, how do you feel your personal burden from the current COVID-19 crisis? Drag the slider to the desired position.	Scale (1 to 11)	1 = "Not a burden," 11 = "A great deal of a burden"
2	How do you feel about the burden in your teaching activities due to the current COVID-19 crisis? Drag the slider to the desired position.	Scale (1 to 11)	1 = "Not a burden," 11 = "A great deal of a burden"
3	What is your preferred form of distance learning?	List	(1) synchronous teaching units (2) asynchronous teaching units
4	What do you feel is the optimal duration for synchronous (= simultaneous, with presence) teaching?	Dropdown	List: from 15 minutes until 180 minutes
5	Which of the following tools have you used in any of your courses? Moodle, Microsoft Office 365 Apps, Adobe Connect, Zoom, Skype, Panopto video platform, Other communication tools, namely:	List of tools. Possible Answers: yes, no & I don't know	1 = "yes", 2 = "no", 98 = "I don't know"
6	In your experience, how appropriate are the following tools for use in distance learning teaching? Moodle, Microsoft Office 365 Apps, Adobe Connect, Zoom, Skype, Panopto video platform, Other communication tools, namely:	Matrix & Scale (1 to 5)	1 = "very suitable", 5 = "not suitable at all"
7	Which of the following tools would you like to see added to one of your courses in the future? Moodle, Microsoft Office 365 Apps, Adobe Connect, Zoom, Skype, Panopto video platform, Other communication tools, namely:	List of tools. Possible Answers: yes, no & I don't know	1 = "yes", 2 = "no", 98 = "I don't know"

8	Can FHWien of WKW support you in the planned use of these tools? Provide training, Manuals on Moodle, Premium accounts/licenses, Overview of tools and their possibilities, Helpdesk, Other support possibilities, namely: [Are there any other support options you would like FHWien of WKW to provide?].	List of actions. Possible Answers: yes, no & I don't know	1 = "yes", 2 = "no", 98 = "I don't know"
9	In general, how well do the following online activities help you teach content? Synchronous online teaching with Microsoft Office 365 apps, Asynchronous online teaching with Microsoft Office 365 apps, Live online teaching with Adobe Connect, Live online teaching with Zoom, Live online teaching with Skype, Learning videos on-demand with Panopto video platform, Livestream with Panopto video platform, Online quizzes, Exchange with instructors via email, Presentations set to music and video insertion of instructors, Presentations set to music, Group work with Microsoft Teams, Group work with Zoom (break out rooms).	Matrix & Scale (1 to 5 + 98)	1 = "very good", 5 = "very poor", 98 = not yet used
10	In the process of switching to Distance Learning, I have adapted/changed X% of my course content to Distance Learning.	Scale (1 to 5 + 6)	1 = 80%, 5 = 10%, 6 = I didn't have to change anything
11	During or after Distance Learning sessions, students actively contact me with questions.	Matrix & Scale (1 to 5)	1 = "fully agree", 5 = "do not agree at all"
12	What communication tools do you use to stay in touch with your students? Smart Phone, Facebook, WhatsApp, Facebook Messenger, Telegram, Instagram, Email, Google Hangouts, Skype, SMS, Zoom, Slack, Jitsi, Microsoft Teams, Other communication tools, namely:	List of tools. Possible Answers: yes, no & I don't know this tool	1 = "yes", 2 = "no", 98 = "I don't know this tool"
13	Overall, the increased use of online communication tools (WhatsApp, Facebook, Zoom, Microsoft Teams, etc.) has improved student interaction.	Scale (1 to 5)	1 = "fully agree", 5 = "do not agree at all"
14	Please indicate to what extent you agree with the following statements: 14.1) I have had good experiences with online performance assessments. 14.2) I find online performance assessments to be an adequate form of performance assessment. 14.3) The quality of student submissions is higher in asynchronous distance learning units than in face-to-face teaching. 14.4) Student participation is more active in synchronous distance learning units than in face-to-face teaching. 14.5) It is more difficult to formulate digital teaching content clearly and comprehensibly than in face-to-face teaching. 14.6) It takes longer to convey content if the course is held exclusively digitally. 14.7) I have the impression that distance learning promotes students' independent learning.	Scale (1 to 5) & I don't know	1 = "very good", 5 = "very poor", 98 = "I don't know"
15	How much has your workload increased with the switch to 100% Distance Learning?	Scale (1 to 5)	1 = "very much", 5 = "not at all"
16	How satisfied are you overall with the distance learning opportunities at FHWien of WKW?	List	1 = "very satisfied", 5 = "not satisfied at all"
17	I would like to see more traditional face-to-face courses replaced by distance learning in the future. Please indicate to what extent you agree with the statement.	Scale (1 to 5)	1 = "fully agree", 5 = "do not agree at all"
18	How would you rate your ability to capture, understand, and use digital content for teaching?	Scale (1 to 5) & I don't know	1 = "fully available", 5 = "not available", 98 = "I don't know"
19	How much does FHWien of WKW promote the switch to digital teaching content?	Scale (1 to 5) & I don't know	1 = "very good", 5 = "very poor", 98 = "I don't know"
20	How much does FHWien of WKW support the technical introduction to individual tools? Moodle; Microsoft Office 365 Apps; Adobe Connect; Zoom; Panopto Videoplattform	Scale (1 to 5) & I don't know	1 = "very good", 5 = "very poor", 98 = "I don't know"
21	How much does FHWien of WKW support the didactic introduction to formats of Distance Learning?	Scale (1 to 5) & I don't know	1 = "very good", 5 = "very poor", 98 = "I don't know"
22	Whenever I have questions regarding Distance Learning, I get quick and competent help from FHWien of WKW.	List	1 = "fully agree", 5 = "do not agree at all"

23	Are there specific communication and support measures that you would like to see from FHWien of WKW as a teacher?	Open question + no answer	
24	Do you have any further comments and/or requests regarding Distance Learning at FHWien of WKW?	Open question + no answer	

Source: Author.

The follow up surveys (2021) contained mainly the same questions as the previous surveys except for the fact that the 2021 surveys include more questions about e-assessment. However, these questions are not relevant for the purpose of this paper and, therefore, in this paper, they will not be taken into account.

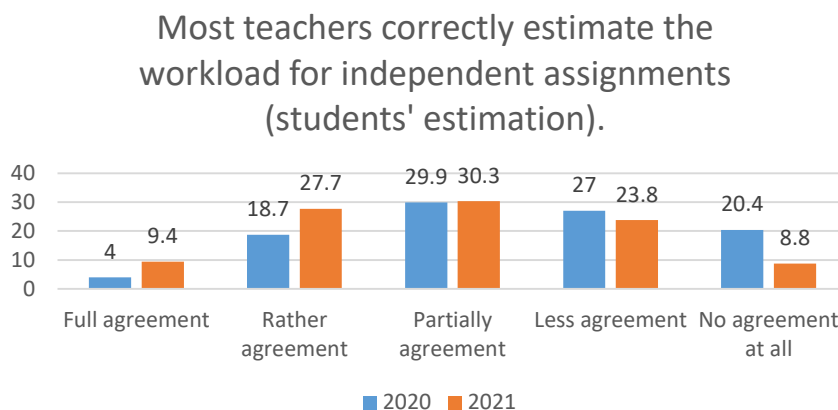
## Results

This section presents a selection of results from the FHW surveys that are pertinent to the research question. These are structured according to the selected categories from Arndt et al. (2020): (a) workload, (b) life situation, (h) media-technical and didactical competences, (j) technical infrastructure and tools, and (k) virtual teaching and learning scenarios.

### Workload

As shown in Figure 2, below, students of the FHW der WKW University of Applied Sciences for Management and Communication were asked whether they think most teachers correctly estimate the workload for independent assignments. A comparison between the years 2020 and 2021 shows that student evaluations have become more positive over time. In 2020, a lower percentage of students expressed “full agreement” or “rather agreement” that lecturers correctly estimate student workloads, with a greater percentage opining “less agreement” or “no agreement at all”. Thus, an overall improvement over time could be noted, even though almost one third of students still disagree (less agreement or no agreement at all) that lecturers estimate workloads correctly in 2021.

**Figure 2.** Student Evaluations of Teachers’ Correct Estimation of Workload/ Comparison 2020 and 2021



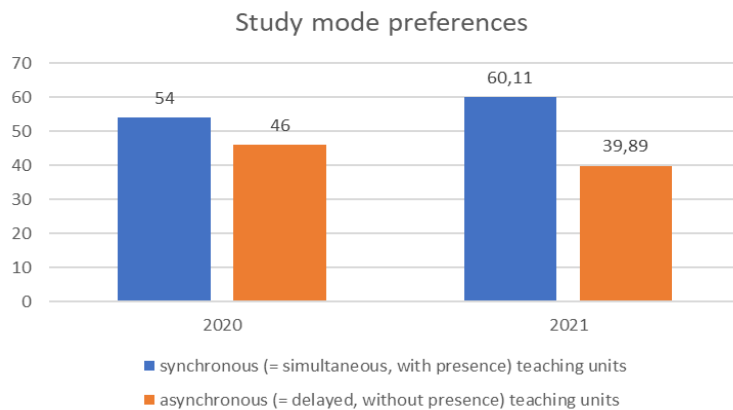
Source: Author.

*Life Situation*

Both students and lecturers were asked about their study mode preferences, where the synchronous study mode refers to simultaneous Distance Learning, while the asynchronous study mode involved delayed Distance Learning and without presence. This information seems relevant not only to how students prefer to organize their studies, but more broadly to organizing their study-work balance/study-life balance.

The data is presented in Figures 3 and 4, below, where Figure 3 shows a longitudinal comparison of study mode preferences by students between 2020 and 2021, and Figure 4 shows a cross-sectional comparison of study mode preferences between students and lecturers in the year 2021.

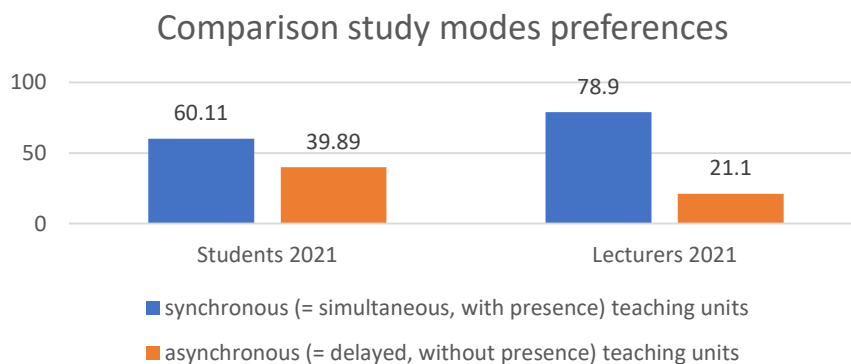
**Figure 3.** *Comparison of Students' Study Mode Preferences between 2020 and 2021*



Source: Author.

Interestingly, Figure 3 shows that students have a stronger tendency towards the synchronous study mode in 2021 compared to 2020. After one year of distance education, students increasingly prefer to be simultaneously online when engaged in Distance Learning.

**Figure 4.** *Comparison of Study Mode Preferences between Students and Lecturers*



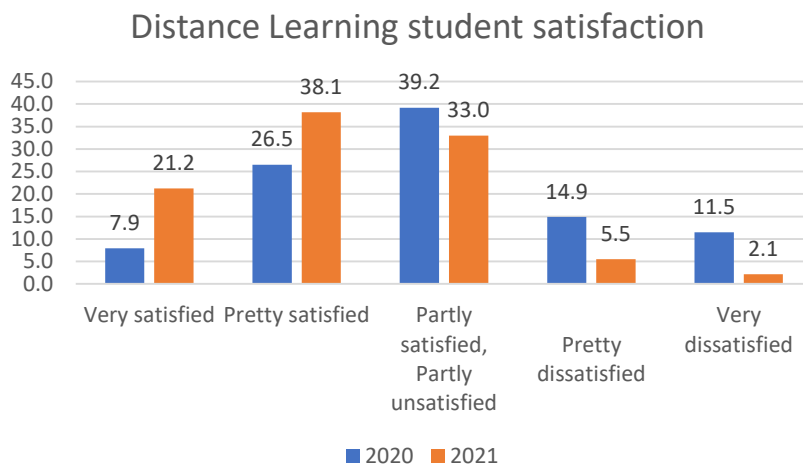
Source: Author.



The increasing preference of students for synchronous instruction is also reflected among lecturers. Figure 4 shows that approximately 80% of lecturers prefer a synchronous study mode in 2021, exceeding the approximately 60% of students who prefer the synchronous study mode. It is clear that both target groups prefer synchronous study modes to asynchronous study modes, and that this tendency has increased over the course of the study period.

The FHW surveys further asked students about their level of satisfaction with Distance Learning, both in 2020 and again in 2021. The data presented in Figure 5 show a comparison of student evaluations across these years.

**Figure 5.** Student Satisfaction with Distance Learning in 2020 and 2021



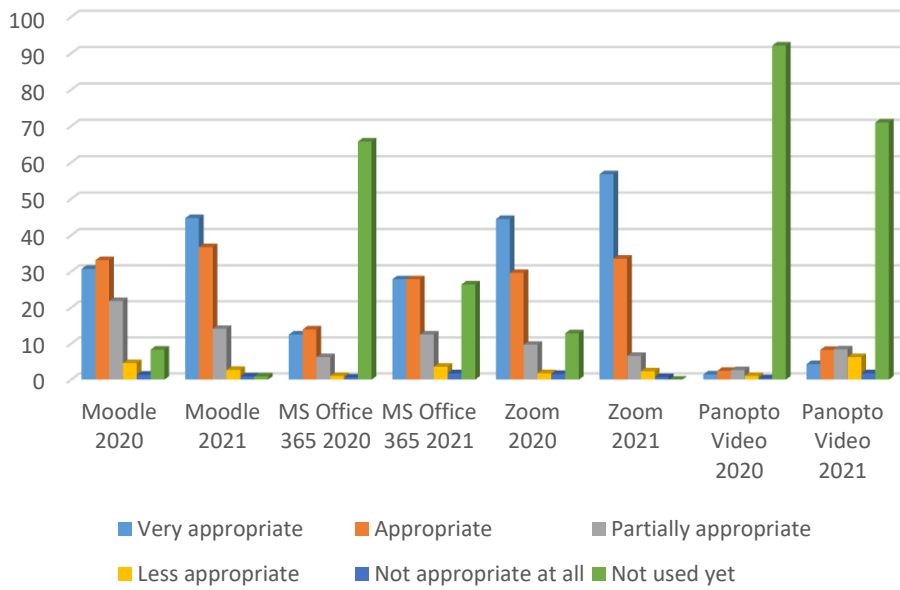
Source: Author.

Interestingly, after one year of the COVID-19 pandemic, students expressed higher levels of contentment (“very satisfied” or “pretty satisfied”) with Distance Learning, while the percentage who are “partly satisfied, partly unsatisfied”, “pretty dissatisfied”, or “very dissatisfied” decreased in comparison to 2020. This shows that students are generally more satisfied with Distance Learning now than they were when commencing this experience.

#### *Media-technical and Didactical Competences, Technical Infrastructure and Tools, and Virtual Teaching and Learning*

As shown in Figure 6, students were also asked about the appropriate deployment of technical infrastructure and tools used for Distance Teaching. For the purposes of Distance Teaching at the FHW, the four tools Moodle, Microsoft Office 365, Zoom, and Panopto were employed. In Figure 6, student evaluations are compared between 2020 and 2021.

**Figure 6.** *Tools for Distance Learning (2020 and 2021)*

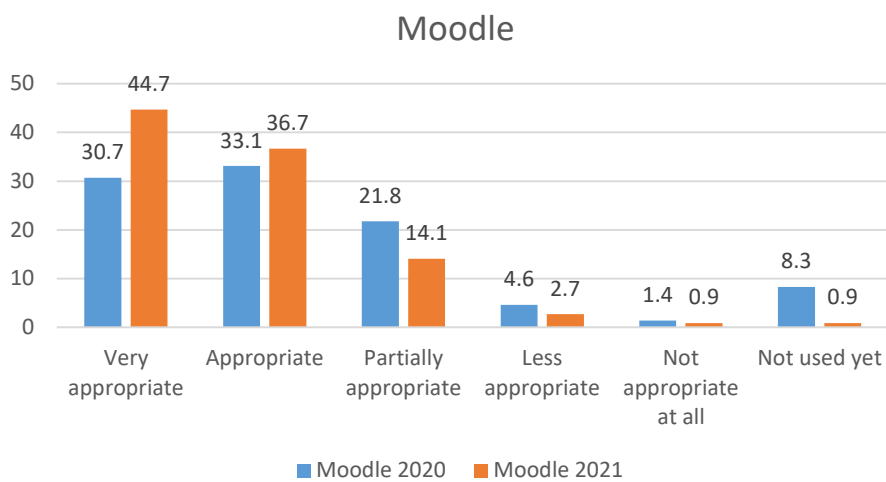


Source: Author.

As shown in Figure 7, students found Moodle to be even more appropriate for their studies in 2021 than in 2020. The graph also reveals that the proportion of students in the “not used yet” category declined over the course of the year.

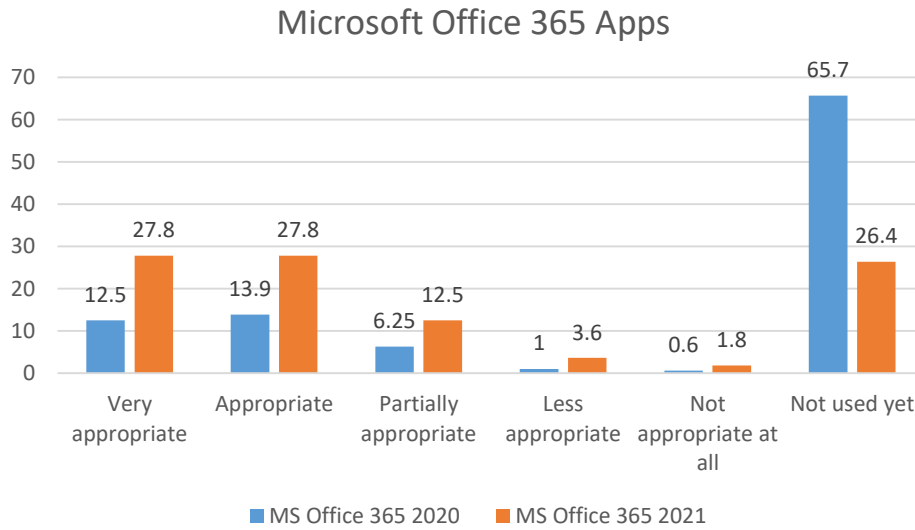
Figure 8 shows that more students consider the online tool Microsoft Office 365 as “appropriate” to “very appropriate” in 2021 than in 2020. As with Moodle, the percentage of students who claimed not to have used the tool also declined from 2020 to 2021.

**Figure 7.** *Moodle for Distance Learning (2020 and 2021)*



Source: Author.

**Figure 8.** Microsoft Office 365 Apps for Distance Learning (2020 and 2021)

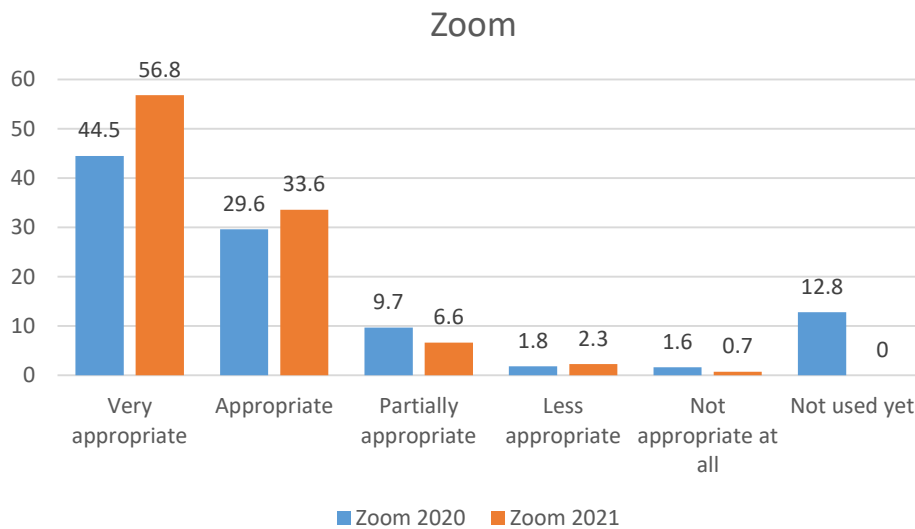


Source: Author.

Contentment with the online tool Zoom also increased between 2020 and 2021, as shown in Figure 9. In 2021, students are more likely to find Zoom “very appropriate” to “appropriate”, as the proportion of students declaring that they had “not used (Zoom) yet” dropped to near zero in 2021.

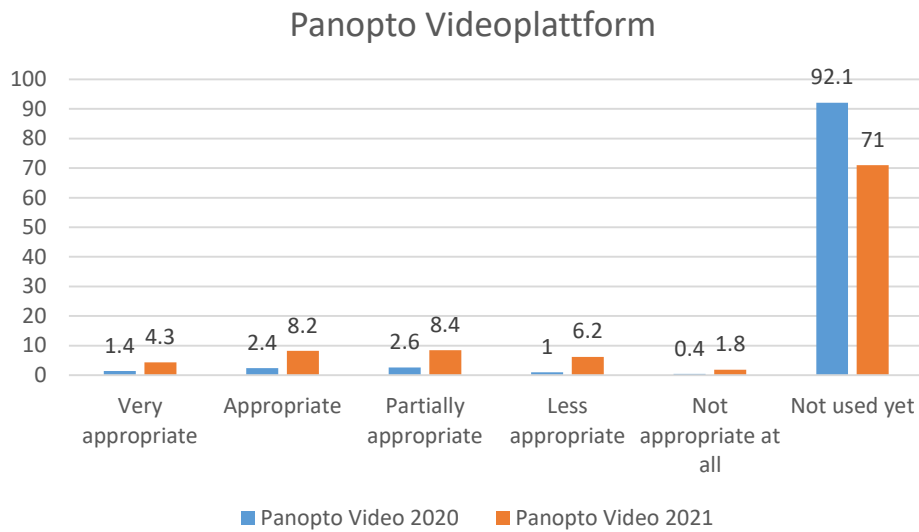
As Figure 10 demonstrates, even though students find the online video platform Panopto slightly more appropriate in 2021 than 2020, most participants had still not used the video platform.

**Figure 9.** Zoom for Distance Learning (2020 and 2021)



Source: Author

**Figure 10.** Panopto for Distance Learning (2020 and 2021)



Source: Author.

Furthermore, the outcome of this study shows that full-time and part-time students have different needs and acceptance levels regarding distance learning and digital tools. Shifts in these needs and requests are observed after one year of being forced to work with digital tools, with both students’ and teaching staff’s attitudes generally becoming more accepting.

## Discussion and Conclusions

The results of the FHW student and lecturer surveys offer valuable insights regarding questions about the acceptance of digital education by students and educators. Since the surveys were conducted at the beginning and at the end of the first year of COVID-19 restrictions in Austria, they enable identification of shifts in attitudes towards digital education.

Compared to the related studies cited in the literature review section of this paper, the FHW results correlate well with their results. Hence, while student satisfaction correlates with their perceived usefulness towards digital education in the Ilgaz and Aşkar (2013) study and therefore has the tendency to increase as more students get used to digital education, the FHW results shows that one year into the pandemic 59.3% of students are “very satisfied” or “pretty satisfied” with distance learning, compared with only 34.4% the year before. On the other side of the equation, the percentage of “pretty unsatisfied” to “very dissatisfied” students declined from 2020 (26.4%) to 2021 (7.6%), which also indicates the positive overall trend.

Related to the (a) *workload*, which according to Arndt et al.’s (2020) BRIDGING study became higher compared to face-to-face-semester, the following results were observed in the FHW surveys. Student (full or rather) agreement with the proposition that lecturers correctly estimate workloads rose

from 22.7% in 2020 to 37.1% in 2021, while disagreement (less or no agreement) with this statement fell from 47.4% in 2020 to 32.6% in 2021. Although the FHW surveys do not facilitate a direct comparison of students' workload perceptions between traditional teaching model and distance learning models, the improvement in student evaluations of the accuracy of lecturers' workload estimations from 2020 to 2021 nevertheless indicates issues of increased workloads when switching to distance learning. Although this issue seems to have somewhat mitigated over time, the approximately one third of students who continue to express issues with workloads in 2021 suggests value in further research on this point.

Another area of relevance for digitalization within universities identified by Arndt et al. (2020) was that of (b) *life situation*. Related to this element, the FHW survey results show that students and lecturers have certain preferences when it comes to study modes. Even though it could be assumed that students and lecturers actually prefer an asynchronous study mode, meaning that teaching and learning happen independently of time and place, results from one year after the outbreak of the pandemic surprise with a different outcome. While 54% of students preferred a synchronous teaching mode in 2020, a slight increase to 60.11% was noted in 2021. Interestingly, the comparison of students' and lecturers' study mode preferences in 2021 shows that lecturers prefer synchronous study modes even more strongly, with 78.9% favoring this option and only 21.1% preferring asynchronous teaching. This development shows that after one year of the pandemic, both parties prefer synchronous study modes involving more interactive and engaging teaching. This effect also supports the findings from the FHW surveys regarding lecturer's preferences for Zoom, which is a helpful tool for synchronous classes. Therefore, in contrast to the BRIDGING studies, the preference for Zoom in the category (j) *technical infrastructure and tools* can not only be attributed to its good performance, but also because this tool satisfies lecturers' and students' needs.

As for the area of relevance (h) *media-technical and didactical competences*, the surveys point to a considerable increase in students' competencies as the use of the software tools has progressed. Comparing 2020 to 2021, students increasingly perceive the digital tools as appropriate for teaching. The acceptance of Moodle as a learning platform and of MS Office365, for example, has increased by 17.6% resp. 29.2% in this period ("very appropriate" and "appropriate" were counted as positive responses). At the FHW, students and the teaching staff can also rely on the Competence Centre for E-Learning to enhance their digital competencies. Adapted to the situation, the FHW provides a COVID-19-specific Moodle Help Course, a weekly Distance Learning Q&A session, co-moderation for live online teaching, early roll-out of the Panopto video system, and guides for online teaching. Thus, the results of the FHW surveys in this area are very similar to the results of the BRIDGING study.

The BRIDGING study also pointed out the students' and lecturers' desire for synchronous lectures over abundant self-learning materials (area of relevance: (k) *virtual teaching and learning scenarios*). This preference was confirmed by the surveys at the FHW.

The insights gained from the surveys and from academic papers such as those by Pausits et al. (2021) opened up opportunities to implement measures to support digital learning and teaching at the FHW. As mentioned before, the Competence Centre for E-Learning offers courses and support for teachers and students, facilitating the deployment of digital teaching skills. Yet, these four FHW surveys focused primarily on the impact of the use of digital tools and their features related to educational purposes. Therefore, not all key challenges mentioned in the Pausits et al. (2021) study were discussed here. However, the surveys did investigate the challenge “*high workloads in distance learning*”, and the results agree with the findings of the Pausits study:

Most students (2020: 77.3 %, 2021: 62.9 %) did not or only partially agree with the statement “Most teachers correctly estimate the workload for independent assignments.” Even though there is a year-over-year improvement, teachers’ estimates of the workload still could be improved, at least in the students’ opinion. Other key challenges mentioned by Pausits et al. (2021) (e.g., less enjoyment of studies conducted through individual learning, increased difficulties in communication with individual teachers) need further follow-up studies at the FHW.

The FHW surveys provide hints that with the passage of time in which universities are forced to adapt to distance learning, their technical competence increases. Hence, “perceived ease of use” - a determinant of acceptance according to TAM - enhances as well. Overall, there is a clear positive development in levels of satisfaction with distance learning at the FHW.

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