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Teachers' Barriers to digital Higher Education Teaching during the COVID-19 Pandemic

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Abstract. Digital teaching has become a matter of course at higher education institutions (HEIs) due to the COVID-19 pandemic. Meanwhile, teachers have encountered barriers to digital higher education teaching. This paper identifies teachers' barriers from studies conducted around the world using a literature review. The identified barriers to digital higher education teaching during the COVID-19 pandemic are assigned to categories to get a systematic overview. We describe these categories of barriers, show current recommendations from the literature and present an action plan which helps HEIs to overcome such barriers in the future.

Keywords: Digital teaching, barriers, teachers, higher education institutions, COVID-19 pandemic

1 Introduction

The COVID-19 pandemic has posed challenges for higher education institutions (HEIs) worldwide. Within a very short time, conversion to purely digital education had to take place. As with many knowledge workers around the world, the use of technology had to be forced in order to be able to perform at all in the exceptional situation of a pandemic [1]. That addresses previous information systems (IS) research fields that now affect many other areas, such as higher education teaching. However, even before the pandemic, the digitization of higher education teaching was the subject of controversial debate. Various factors hindered teachers from implementing and offering digital formats [2]. These hindering factors "[…] decrease the desire to teach online, by discouraging, constraining, providing sources of dissatisfaction, and decreasing the rewards/effort ratio" [3] and are referred as *barriers* in the following.

General barriers related to digital higher education teaching have been explored in the past. The pandemic required a new learning environment, which forced the use of digital teaching, enabling intensive research on teachers' barriers. The term "teacher" refers to persons who are involved in teaching at HEIs. This includes professors as well as research assistants, tutors, or student assistants. However, little is known about the barriers of higher education teachers during the COVID-19 pandemic. Previous publications on digital higher education teaching during the pandemic mostly focus on the approach of individual universities or countries and outline case studies. So far,

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there is no international overview that summarizes current studies and identifies mentioned barriers systematically. However, HEIs must use the experiences of the pandemic to advance digital teaching in the future. Therefore, barriers should be made visible so that HEIs can address them specifically.

This paper aims to address the following research questions (RQs):

RQ 1: What barriers did teachers face regarding the adaption of digital higher education teaching during the COVID-19 pandemic and which recommendations are mentioned in the literature to overcome the barriers?

RQ 2: What action plan can be derived for HEIs based on the identified barriers and recommendations?

The structure of this paper is oriented on the five phases of a literature review according to Schryen [4]. After the methodological procedure of the *search and assessment* phase is described in chapter 2, the next section addresses the two phases *synthesis* and *interpretation* of the findings. For this purpose, a concept matrix is created according to Webster and Watson [5], which is presented in section 3. In addition, section 3 outlines recommendations according to literature research (**RQ 1**). Section 4 contains the phase *guidance*, where an action plan for HEIs is presented (**RQ 2**). The paper closes with the *conclusion* in section 5, in which the results are summarized, limitations are pointed out and an outlook for future research is given.

2 Method

To answer the RQs of this paper, a comprehensive systematic literature review [4, 5] was conducted. The search process is illustrated in Figure 1 and explained below.

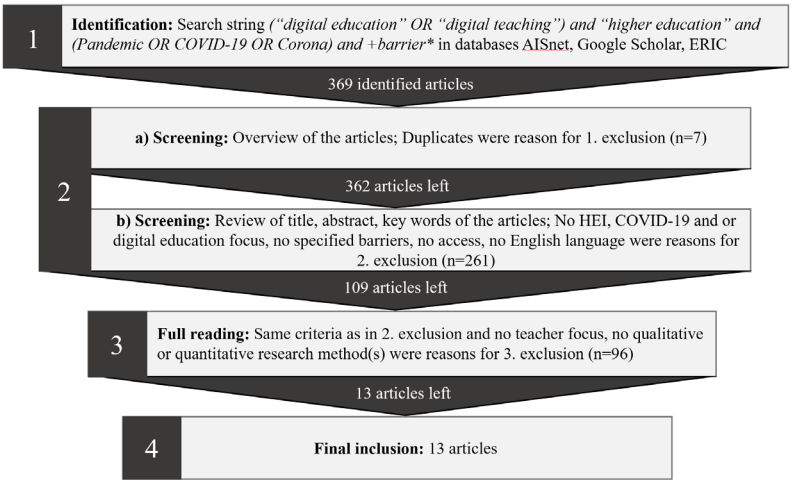

Figure 1. Search Process

Search and selection of sources were primarily implemented following Schryen [4] and divided into four steps: identification (1), screening (2a, 2b), full reading (3), and

inclusion (4) of the relevant literature concerning the research topic. Following this procedure, the researchers of this paper started with step 1 by defining a search string shown in Figure 1, which was used in several databases from the field of IS [4], to record the scope of existing contributions in the respective databases. Due to the reference to the COVID-19 pandemic, the search was limited to publications beginning in 2020 and was conducted in March 2021. Most of the articles were found in the database Google Scholar (n=266), followed by AISnet (n=16). As interdisciplinary research topics should not only use databases from the field of IS [5], we also considered the educational database ERIC (Education Resources Information Center) as an important source, which revealed some more articles (n=87). The subsequent search and documentation of the articles were carried out by two research assistants. In total, 369 articles were identified in the three databases.

In the second step, an overview of the articles was performed to identify and exclude duplicates (n=7) within a database and compared to the other databases considered, resulting in 362 articles. The titles, abstracts, and keywords of the articles were then reviewed under consideration of defined screening criteria to ensure consensus in the procedure [4]. Exclusions (n=261) were made whenever articles did not deal with HEIs, were not primarily about digital education and/or did not focus on the implementation of digital higher education during the COVID-19 pandemic - for example, only briefly mentioned the pandemic in the abstract. Furthermore, articles were excluded if barriers were not clearly stated. In terms of feasibility, only those papers that were written in English and could be accessed digitally were considered. For quality assurance purposes, all papers had to have been published in a journal or at a conference. The screening was handled by two research assistants and resulted in 109 articles. Wherever there was uncertainty about whether the exclusion criterion was met, the articles were read twice by the authors of this paper and the results were discussed.

The eligibility of the articles was checked in the third step by the three researchers of this paper by reading the full texts, where articles are also screened by multiple authors. Defined selection criteria were again set in order to carry out the work in the team as consistently as possible [4]: In addition to the exclusion criteria already applied in the second step, further exclusion of articles (n=96) also took place in cases where teachers were interviewed, but the data were not analyzed independently of other survey participants such as students, thus making it impossible to clearly allocate the results. Regarding the research method, a qualitative or quantitative survey of teachers was assumed, whose research methodology and evaluation were transparently pointed out and thus comprehensible. Field reports and practice reports without scientific method as well as literature analyses were excluded. This resulted in a total of 13 contributions, which were identified as relevant contributions in step 4 as a result of the systematic literature review and thus form the basis of the following sections.

Following this, the barriers were extracted from the 13 articles after final inclusion and assigned to different categories. In the course of inductive category formation, the various results were first assigned to subcategories, which were then subdivided into eight superordinate categories [6]. Based on the recommendations for action mentioned in the literature, an action plan is then developed that can be used to overcome the

barriers. This action plan is mainly based on the recommendations already mentioned and systematically sorts them into categories.

3 Findings from Literature Review

To answer **RQ 1**, the authors of this paper examined all 13 identified sources in a structured manner and conducted a literature review as shown above. An overview of all analyzed contributions is provided in Table 1.

Table 1. Literature Review: Findings

Source	Year	Author	Country	Study Design
[7]	2020	Popova, O. et al.	Russia	Qualitative Survey
[8]	2020	Perron, N.J. et al.	Switzerland	Quantitative and Qualitative Survey
[9]	2021	Aldulaimi, S.H. et al.	Unknown	Qualitative Survey
[10]	2020	Almazova, N. et al.	Russia	Quantitative and Qualitative Survey
[11]	2020	Egan, K./Crotty, Y.	Ireland	Quantitative and Qualitative Survey
[12]	2021	Kono, K.G. et al.	USA	Qualitative Survey
[13]	2020	Gonçalves, E./ Capucha, L.	Portugal	Qualitative Survey
[14]	2020	He, W./Xiao, J.	China	Quantitative and Qualitative Survey
[15]	2021	Kummitha, H.R. et al.	India, Ethiopia	Quantitative Survey
[16]	2020	Marshalsey, L./ Sclater, M.	Australia	Quantitative and qualitative Survey
[17]	2021	Müller, A.M. et al.	Singapore	Qualitative Survey
[18]	2020	O'Brien, W. et al.	England, Finland, Greece, Ireland, Portugal	Qualitative Survey
[19]	2021	Watermeyer, R. et al.	UK	Quantitative and Qualitative Survey

Due to the emphasis on research results during the COVID-19 pandemic, all publications are from 2020 and 2021, while the majority are published in 2020. Based on the limitation on qualitative and quantitative research methods, the publications exhibit only these study designs. In the case of a mixed method in the particular study design, both research methods as quantitative and qualitative survey are mentioned in the overview. Most of the studies were conducted in one country [7, 8, 10–14, 16, 17, 19]. Only two of the studies consider multiple countries [15, 18]. Five studies each were executed in Europe and Asia, with Russia included in the Asian continent. The continents of Australia, Africa, and North America were represented with one contribution, while no publication from South America could be considered. One study

collects results from two different countries on two continents and thus represents a specificity among the sample [15]. From one publication, the exact location of the study could not be determined [9].

The barriers identified in the thirteen contributions could be assigned to the following: *Technical Resources, Interaction, Skills, Didactics, Workload, Mental Health, Personal Readiness, Framework Conditions.* Table 2 provides an overview of the analyzed publications assigned to each category. In the following, the superordinate categories of barriers and their subcategories are presented. The explanations are complemented by the identified recommendations mentioned by the authors of the identified contributions for overcoming the barriers.

Table 2. Concept Matrix: Teachers' Barriers to digital Higher Education Teaching

Source	**Technical Resources**		**Inter-action**		**Skills**		**Didactics**			**Work-load**		**Mental Health**		**Personal Readiness**			**Framework Conditions**	
	Lack of technical resources	Insufficient internet connection	Lack of interaction	Invisible activities of students	Lack of digital competencies	Lack of training offers	Limited possibilities: lecture	Lack of practical exercise	Lack of skill transfer	Higher workload	Lack of time for research	Higher stress level	Lack of physical workplace	Lack of flexibility	Lack of trust	Fear of change	Legal framework conditions	Institutional framework conditions
[7]	X		X	X	X					X								
[8]		X	X	X	X													
[9]	X				X		X	X		X							X	X
[10]			X		X	X	X			X				X				
[11]	X	X	X					X		X		X						
[12]	X	X	X	X	X										X			
[13]	X		X					X	X									
[14]		X	X	X	X												X	
[15]	X	X			X	X		X										X
[16]	X	X	X							X		X	X					
[17]	X	X	X	X			X		X	X								
[18]			X		X		X					X						
[19]			X		X	X	X			X	X		X		X	X		

Technical Resources

Technical Resources are needed for digital teaching, but teachers see them as a barrier, because of the *lack of technical resources* and *insufficient internet connection*. Under the *lack of technical resources,* missing equipment [13], limited access to required software [16], or even limited capacity for the establishment of necessary networks [9] is mentioned. Under the subcategory of an *insufficient internet connection,* general connection problems [8, 12, 14, 16], lack of internet bandwidth [12], or even the absence of internet access [12, 15] are summarized. To overcome this barrier, researchers see it as a responsibility of the institutions to upgrade the lacking technical equipment in HEIs, including both hardware and software [7]. In countries without bandwidth expansion, the government is seen as responsible for the reformation of internet governance [15].

Interaction

Due to the omission of face-to-face lectures during the COVID-19 pandemic, teachers see the *Interaction* in digital teaching severely affected. This is marked by a *lack of interaction* and the *invisible activities of students*. Studies show a *lack of interaction* in two directions: missing interaction with students while teaching [7, 8, 10, 12–14, 16–19] as well missing social contacts with colleagues in general [7, 8, 10, 11, 16]. The missing interaction makes it difficult to create a motivating and engaging learning environment [17]. In addition, there are *invisible activities of students*. Teachers have no insight into students' reactions [12]. Especially non-verbal cues from students are lost while digital teaching [8]. So, the teachers do not know how motivated the students are and how actively they follow the lecture. As a result, teachers have difficulties in tracking the learning process of students [14]. To counter this barrier, digital interaction must be created and strengthened. More face-to-face live streams [14] and more one-to-one interaction between teacher and students can help to achieve this [12].

Skills

Special *Skills* are required for digital higher education teaching [8]. This category includes the *lack of digital competencies* and a *lack of training offers* to achieve these competencies. *Lack of digital competencies* among teachers can be characterized by their absence of proficiency in technologies [12] and their inability to use the various online tools and e-learning systems needed for digital teaching [9, 14], all caused by missing experiences [7, 12] and missing technological support [18]. To develop and raise digital competencies, further training for teachers is needed and should be offered by HEIs [10]. However, a *lack of training offers* is also noted [15]. HEIs should continue to work on providing their teachers with training opportunities to increase their online teaching abilities [14]. In addition, the institutions should also give teachers sufficient time to make use of the offers [19].

Didactics

Existing *Didactics* cannot simply be transferred to digital teaching, but must be adapted to the new circumstances, which has posed a challenge for many teachers. This stands out due to *limited possibilities for lecture design*, *lack of practical exercise*, and *lack of skill transfer* while teaching online. It was observed that the methodological work of a teacher during digital teaching differs from conventional teaching [10]. Teachers see inter alia *limited possibilities for lecture design* by the inability to use active and collaborative teaching methods [10] and restrictions of creative and critical freedoms [19]. In addition, a *lack of practical exercise* could be observed during the pandemic, which could not be compensated by digital formats. This mainly concerns practical skills that only can be thought in specific laboratories or workshops [9, 11, 13, 15, 18] and soft skills [13]. Therefore, it is accompanied by a *lack of skill transfer*. It is necessary that active, collaborative, and innovative teaching methods also find their way into digital teaching at HEIs [13]. In order to enable the acquisition of practical and soft skills, hybrid approaches can be a solution that delivers the theoretical content asynchronously online and the practical content synchronously in live sessions [17]. Advanced technologies, such as virtual environments, 3D, and artificial intelligence, also offer opportunities for practical exercises [13].

Workload

The *Workload* of teachers increased during the COVID-19 pandemic [7, 9, 10]. Therefore, the barrier category is characterized by a *higher workload* and a *lack of time for research*. The *higher workload* results from the increased time in preparation for teaching online [11, 12, 14] and the support need of the students while digital teaching [11, 19]. Digital teaching is also a novelty for the students, so there are many questions to be answered. For this reason, teachers spent a lot of time communicating with students and replying to messages [11]. Furthermore, this increased workload caused a lack of time to pursue teachers' research projects [19]. In general, the workload of teachers during digital teaching needs to be reduced [11]. For this purpose, it is conceivable to provide regulatory support from the HEIs that focuses on identifying the workload of teachers [10].

Mental Health

Mental Health is understood as a *higher stress level* on the one hand and a *lack of physical workplace* on the other hand. The increased *stress level* could be a result of external pressure to teach online [16]. Similarly, a poor work life-balance was noted during the pandemic, increasing the perceived risk of suffering stress and mental health problems [11, 19]. The stress was evident for both teachers and students [18]. To reduce this stress, HEIs should ensure workload can be managed without sacrificing quality [16]. Technological and staff support could also reduce the perceived stress [18]. Moreover, the risk of mental health problems was increased by the *lack of physical workplace* due to the home office regulations during the COVID-19 pandemic [16].

Personal Readiness

Personal Readiness combines a *lack of flexibility*, a *lack of trust*, and a *fear of change*. The *lack of flexibility* indicates conservatism as well teachers being incapable of using the various online teaching methods available [10]. To develop these skills, training or studies about the learning platforms could be provided in the institution [10]. A lack of confidence in one's own ability to use online technologies or a general unwillingness to adopt them could furthermore lead to a *lack of trust* [12, 19]. In addition, if the technology is not perceived as beneficial, a *fear of change* may arise [19]. Reduced fear could be achieved through the increased social and cognitive involvement suggested by Müller et al. as well as through increased knowledge of the benefits of online teaching methods [17].

Framework Conditions

The *Framework Conditions* are composed of *legal framework conditions* and *institutional framework conditions*. Thus, a need to adapt *legal framework conditions* and general rules to the requirements of online teaching has been observed [9]. In particular, in China, government censorship of online materials severely restricts the educational design [14]. The *institutional framework conditions* also need to be adapted to the new circumstances, for instance, by creating curricula or uniform regulations for assessment and application [9, 15].

4 Action Plan for Higher Education Institutions

Various categories of teachers' barriers could be identified due to the literature review, which can apply in different ways to various HEIs. To be able to remove the barriers, they must be identified first. Therefore, an action plan was developed that can assist in reducing barriers. The action plan consists of two components: criteria and action. The criteria should be used to evaluate the current status quo at the HEI. For example, for the criterion "If the internet connection in home office is not stable", questions can be developed such as "Do technical interruptions occur more frequently?", "Can the courses be carried out without disruptions?", "What bandwidth is available?". If it becomes apparent during the evaluation that the criterion is met, i.e., the internet connection is not stable, the actions listed in Table 3 can be taken. These actions relate to the recommended actions already mentioned in the literature review analyzed. Table 3 shows the action plan that is intended to benefit HEI leadership to minimize teachers' barriers to digital higher education teaching during and after the COVID-19 pandemic. In this regard, the recommendations for the *Technical Recourses* and *Skills* categories are directed to information systems (IS), the *Didactics* and *Interaction* are addressed to education at HEI, and *Workload* and *Mental Health* refer to working conditions in HEI.

Within the *Technical Resources* category, HEIs should ensure that internet connectivity [12, 15] is provided in HEI buildings and also at teachers' homes. In the home office, the possibilities of HEIs are limited, but the offer of mobile internet solutions is an opportunity. In institutional buildings, the assurance of internet access and connection is essential as well as internet bandwidth. In the studied literature, the

respective government of a country is seen as responsible for internet supply [15], whereby it is substantial that HEIs represent their interests and necessities regarding the internet to the governments in their country. In addition, institutions should provide the technical and software solutions needed for digital teaching [7]. For this purpose, it is essential to record the requirements of the teaching staff.

Table 3. Action Plan

B	Criteria →	Actions
Technical Recourses	If the internet connection in home office is not stable	Offer mobile internet Advocate for internet governance in the respective country
	If the internet connection in HEI is not stable	Ensure internet access and internet connection in the buildings Increase internet bandwidth Advocate for internet governance in the respective country
	If requirements that teachers place on software and equipment are not covered	Create standardized technology and software solutions that meet the requirements
Interaction	If interaction in online teaching between teachers and students causes problems	Reduce the number of students allowed in the lectures Obtain feedback from students during the semester Offer consultation hours for students Testing to monitor students' learning and keep them motivated
	If there is a reduced exchange between colleagues	Create social network platforms for teachers Organize digital networking events
Skills	If there are no sufficient digital competencies available to carry out digital teaching	Offer support in setting up technical and software solutions Increase training opportunities Offer technology training Offer online tool training Offer e-learning systems training Promote the exchange of experiences
Didactics	If the didactic concepts cannot be easily transferred to online teaching	Promotion of advanced technologies for practical exercises Offer training for teaching methods online Show examples of possibilities in lecture design Encourage creativity Create opportunities for practical exercises
Workload	If contractually agreed time is not sufficient to fulfill the workload, including research	Time compensation for teachers to have more time for research Monetary compensation for an increased workload Support in creation of sustainable concepts in digital teaching Recruiting supporting employees, who take over administrative work and act as contact persons for student
Mental	If the possible workload overrun of short-term duration	Provide emotional support Prioritization of tasks Focus on improving working conditions

	If the lack of physical separation between work and home bother teachers	Provide physical workplaces
Readiness	If there is uncertainty, mistrust and or fear of digital teaching in the HEI?	Show advantages Show best practices Involve teachers in decisions
Framework	If there are no key indicators and rules available regarding budget, evaluation, software, criteria of digital teaching, legal criteria	Provide a curriculum for teachers with the following criteria: - Clear rules - Uniform for HEI - Easy to understand

B= Barrier, Readiness = Personal Readiness, Framework = Framework Conditions

Regarding *Interaction*, teachers face challenges of lack of interaction with students and colleagues [7, 8, 10, 12–14, 16–19]. In the literature, more face-to-face and one-to-one interaction with students is recommended [12, 14]. For more face-to-face live streams, smaller course groups are most suitable, so that students also feel comfortable turning on the webcam during lectures. Thus, teachers get also students' non-verbal cues. For more one-to-one interaction, an offer of consultation hours for students might help. Regular feedback can be provided to determine how motivated students are, and regular testing of gained knowledge can be conducted to track student learning. It can be assumed that such frequent tests also have a positive effect on the motivation of the students. To promote the interaction among teachers, the HEI management can organize and offer various formats, such as social network platforms or digital network events.

The category *Skills* focused on digital competencies and the acquisition of these [7–10, 12, 14, 15, 18], what training is the basis for. However, a lack of such training opportunities was noted. A lack can be caused by an insufficient or complete absence of training offers [19]. In case of insufficient training offers, they should be increased and they should be offered anew if they have been completely missing so far. The prerequisite for new training offers is that they would be used at all, this must be found out in advance. To cover the full spectrum of digital competencies, training in technology, online tools, and e-learning systems should be targeted. Accompanying this, it is also recommended to offer additional offerings, such as support or also the exchange of experiences, which can be organized by the institution. Additional offerings, such as support in setting up technical/software solutions or the exchange of experiences among teachers, which can be organized by the institution, are also useful.

Didactics addresses the difficulties teachers encounter in implementing digital teaching in HEI [9–11, 13, 15, 17–19]. Teachers find themselves particularly challenged when it comes to digital lecture design and integrating opportunities to learn practical and soft skills. To support the teachers, HEIs can use digital didactic training and show examples of possibilities in digital lecture designs. In this way, creativity is encouraged so that teachers can face the challenges of didactics online. In addition, teachers must be supported in offering practical exercises to enable students to acquire practical and social skills in digital teaching as well. The university can create a

framework for this by enabling asynchronous teaching and promoting the use of advanced technologies, like virtual environments, 3D, and artificial intelligence.

The *Workload* of teachers increased while the COVID-19 pandemic and the conversion to digital teaching [7, 9–11, 16, 17, 19]. The workload needs to return to normal by taking advantage of digital teaching and making content sustainable so that it can be used multiple times. The HEI management should draw attention to this and provide support. The extra work done by teachers should be compensated by the institutions by giving teachers more time off for research and paying monetary compensation. In addition, recruiting additional staff may be supportive, as some of the additional work resulted from increased communication with students that could be handled by these staff.

Considering the recommendations for *Mental Health* [11, 16, 18, 19], the duration of the stressful condition is of importance [20]. In most cases, an increased stress level results from the increased workload, which is why reducing workload can have a positive impact on mental health. This is where the actions mentioned above also come into play. In addition, the institution should provide emotional support through experts, prioritize specific task areas, and review working conditions. In some cases, the lack of physical separation between work and home can be challenging. Therefore, the HEI management should examine to what extent a partial use of the HEI office space is possible under the COVID-19 requirements.

The identified barriers of *Personal Readiness* are along with missing flexibility, mistrust, and fear [10, 12, 19]. Teachers don't feel flexible enough to use new online teaching methods, that is why HEIs should demonstrate the advantages of digital teaching and show best practices. In addition, newly acquired skills can increase this flexibility, so the measures from the Skills category also have a positive impact. To alleviate mistrust and fears, HEIs should be transparent about digital teaching developments and involve teachers in decision-making.

Among the *Framework Conditions*, some issues appear that have to be addressed by the government of the country, such as political censorship or the desire for unanimous laws [9, 14]. Since the university can only influence the government to a limited extent, these issues do not appear in the action plan. For the university, the wish for concrete rules emerged, which should result in a unanimous curriculum for teachers [9, 12, 14, 15]. This curriculum should correspond to the criteria [9, 12, 14] shown in Table 3.

5 Conclusion

The COVID-19 pandemic has been around since the beginning of 2020 and there is still no sign of a complete end. IS issues will not abort in the educational landscape, but will increasingly become the focus. This means the development towards digital teaching will not stop and HEIs must prepare for it. The experiences of the past months within the pandemic provide valuable insights into teachers' barriers to digital teaching and give advice on how to overcome them in the future. This paper was devoted to systemic research of this topic and is based on two RQs. To answer **RQ 1**, a systematic literature review was conducted to examine the barriers teachers faced in digital higher education

teaching during the COVID-19 pandemic. A total of eight categories of barriers could be formed from 13 sources: *Technical Resources, Interaction, Skills, Didactics, Workload, Mental Health, Personal Readiness, and Framework Conditions.* It becomes apparent that many of the barriers in different countries and conditions are similar in essence. However, the degree of barriers varies, for example, political censorship compared to a lack of legal requirements. Of particular interest are barriers that were found in the majority of the analyzed contributions. This mainly concerns the *lack of interaction*, which could not be compensated for by technologies. In addition, the frequently identified *lack of digital competencies* among teachers worldwide was also alarming and must be approached by HEIs. Recommendations for action are furthermore suggested by the authors to overcome the barriers. It is noticeable that mainly an increase in training and resources was proposed. Based on **RQ 2**, an action plan was developed to guide HEI management in addressing teachers' barriers. This action plan consists on the one hand of the evaluation of the needs at the HEI in question and on the other hand of concrete recommendations for action. Depending on the evaluation results, the HEI management can decide to what extent the recommendations for action are necessary. In addition, a unified curriculum was frequently demanded, which should fulfill certain criteria. Many of the recommendations go in the direction of further training on digital teaching, but this, in turn, costs time, which is currently rare among teachers. HEIs need to find a way to provide equivalent digital teaching for students, while at the same time enabling training offers for teachers and not straining teachers' workloads.

Even though we have conducted our research carefully, it is still not free of limitations. Thus, literature searches are always limited to their search string, and the databases used. Extending the search string could provide more comprehensive results. For example, in addition to "higher education", "university" could have been included in the search string. Particularly because the COVID-19 pandemic is still a new phenomenon, the choice of appropriate sources is limited. Furthermore, the action plan does not claim to be exhaustive. Depending on the framework, certain actions may be supplemented or carried out at a different point in time. However, the criteria in the action plan are a first approach to investigate whether there are teachers' barriers to digital teaching in the HEI. To get the full picture, the criteria need to be explored in more depth. The presented action plan provides an initial overview of actions that can help to overcome the barriers and must be concretized for each individual case.

Our research was conducted in the spring of 2021. When searching the literature, it became clear that at the current time many sources exist, but to the best of our knowledge, only a few of the sources proceed scientifically using a quantitative or/and qualitative survey. Therefore, only 13 articles were included in the findings. This may be related to the lack of research time pointed out by the teachers in the reviewed studies. Teachers were very busy with the transition to digital teaching, so it can be assumed that important findings have not even been documented and published yet. This highlights the need for further research and constant monitoring on this topic. For example, we were unable to identify a German source. Therefore, we call for further scientific studies that specifically consider the needs of teachers during the COVID-19 pandemic.

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