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Professor's and student's perspectives on digital education during the COVID-19 pandemic in Germany: Online teaching, adaptation of courses and OER

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Open educational resources (OER) and digital education (DE) have shown the ability to improve teaching and learning possibilities, particularly in light of unpredictably occurring events. Especially the COVID-19 pandemic revealed that universities were experiencing technological, socio-psychological, and didactic issues. In order to promote, enrich, and improve DE and OER for crises and beyond, this research article addresses specifically the target audiences of students and teachers in Library and Information Science (LIS) programs in Germany. A qualitative approach with interviews and focus groups was applied to identify, analyze and compare students' and professors' attitudes, experiences and problems in remote teaching and learning during a crisis.

The results showed that LIS professors from our sample are experienced and innovative regarding the use of DE during a period of crisis. However, diverse obstacles for the use and production of OER for online education become visible. Students' first difficulties with online learning could be resolved and show how quickly they were able to adjust to the new teaching environment. Both LIS professors and students recognize the advantages of employing DE and OER in higher education. They emphasize positive learning experiences based on flexibility when integrating DE and OER in LIS programs.

Keywords: Open educational resources, digital education, COVID-19, library and information science

1. Introduction

The COVID-19 pandemic forced educational institutions to focus their teaching more strongly on digital tools and content. The shift to digital education (DE) occurred under time pressure and was partially improvised (Altwaijry et al., 2021). Nonetheless, stronger digitization of higher education teaching has not only been expressed as a

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political demand, but learning which is facilitated by technology is also a trend in society. There is the hope of providing socially inclusive, individualized, adaptable, and more specialized digital learning experiences in LIS education (Krtalić & Mandl, 2019).

The purpose of this study is to gain an understanding of how students' and teachers' attitudes towards digital education (DE), specifically towards open educational resources (OER) have evolved over time. In particular, the process during the COVID-19 pandemic and in comparison to pre-pandemic experiences is analyzed. Within the current discourse regarding the digitalization of education, the concept of OER has been very influential. OER are delivering digital teaching and learning materials that are freely available to all users (Otto et al., 2021). In July 2002, the United Nations Educational, Scientific, and Cultural Organization (UNESCO) symposium on *the impact of open courseware for higher education in developing countries* introduced the idea of OER for the first time (Nwankwo, 2017). The UNESCO Commission provided the most popular definition of OER, defining it as materials "of any sort and in any medium that are available under an open license (Butcher et al., 2015). In the context of OER, *open* refers to the resources' open license. If we define *educational* narrowly, OER refers to all resources that can be utilized for teaching and learning in the broadest extent permitted by the present UNSECO definition (Fahrer & Heck, 2023). Publication under an open license is essential for OER. The *Creative Commons* license is one of the well-known open licenses, with which creators control how and in what circumstances their work may be used. OER can be utilized, processed, combined, and distributed in accordance with the 5R freedoms, depending on the license (reuse, retain, revise, remix, redistribute) (Wiley, 2014).

We were particularly interested in professors' and students' responses to the challenge of the new crisis situation for LIS faculties in Germany which had no prior experience using and customizing OERs to their needs and capacities. The COVID-19 pandemic's global outbreak at the beginning of 2020 and its impacts continue to pose substantial difficulties for the education sector, in addition to challenging society and the health system. German universities needed to quickly restructure their study and teaching approaches during this crisis. The pandemic made it clearer than ever before that digitization measures need to be implemented in the German higher education system.

Regarding students, it is likely that they are often unaware of what an OER is, but their interactions with materials during remote teaching, including exercises, games, and quizzes, can serve to determine how OER or other educational resources were adapted. Even though the majority of the students are digital natives and though they are familiar with online environments, they were exposed to DE much more than they were in the past. This unique circumstance enables us to carry out a highly specific analysis, which can provide hints for the use of OER in (LIS) teaching in the future. This can contribute to the development of better digital teaching systems which can be beneficial in crisis situations.

In view of the progressing digitization, the creation and use of OER could contribute to didactic innovation for German Library and Information Science (LIS) institutes. It is necessary to explore to what extent OER are already established in university teaching and in which context lecturers use them. Furthermore, it is necessary to determine, whether the digital semesters contributed to stimulating interest for the use of OER. As a result, this research examines how LIS teachers have used DE and OER in the face of the COVID-19 pandemic in Germany. This research is part of the *DECriS* project: *Digital Education for Crisis Situations: Times when there is no alternative*. The project's target groups are students and teachers from programs in LIS. Institutions were approached in regard to their use of OER and ways for promoting, enriching and improving, DE for crisis situations, and beyond (Mičunović et al., 2021; Bosančić & Aparac-Jelušić, 2023).

The methodology used to address the research objectives consists of a literature review focusing on students' and teachers' experiences with DE and OER during COVID-19 presented in the following section and the used methodology of an interview guideline with professors and focus groups with students described in Section 3. The results, based on content analysis and sub-categories which emerged will be presented in Section 4. The implications and conclusion of DE and OER in LIS education during COVID-19 will be discussed in Sections 5 and 6.

2. Related work

As the purpose of the study is to gain an understanding of teachers' and students' perceptions of DE, specifically of OER, primarily during the COVID-19 crisis and in comparison to their pre-pandemic experiences, we present studies that report on experiences with digital education and OER during COVID-19. Studies on the shift from face-to-face to online learning analyze the level of motivation and satisfaction in higher education (Almendingen et al., 2021; Budur, 2020). With this study, we want to close the gap and compare the perspectives of professors and students in the field of LIS during COVID-19, as most studies put a greater emphasis on students and their perception than on professors (Aguilera-Hermida, 2020; Händel et al., 2020; Arcebuche, 2022). These studies concentrated on attitudes about COVID-19 at a specific time, as the majority of these studies were carried out at the initial phase of the lockdowns. Therefore, it is important to mention that not all countries experienced a lockdown, nor did they all begin it at the same time (Cranfield et al., 2021).

Factors on how to support student engagement in online teaching have been studied for various domains already (Boca, 2021; Hollister et al., 2022). Examining students' attitudes, it becomes apparent that the usage of technology increased following the shift to online education, whereas motivation, self-efficacy, and cognitive engagement dropped (Aguilera-Hermida, 2020; Sales et al., 2020). The latter effect may stem from problems with time management, as distance learning is time-consuming and includes many tasks to be completed (Altwaijry et al., 2021). Methodological discussions

suggest that it might be necessary to measure engagement over longer periods of time (Muir et al., 2019).

Therefore, the identification of best practices of OER in digital teaching has the potential to provide appropriate learning experiences for a variety of audiences and purposes (Bell, 2021; Doi et al., 2022). Students obtain and standardize their technology and digital competencies through OER.

The availability of OER may reduce also the existing digital divide along a variety of variables, such as age, gender, socioeconomic class, and location (Anderson & Rivera-Vargas, 2020).

In order to identify potential obstacles to the use of OER and the best ways to promote OER in teaching, it is essential to understand how academics perceive and use OER in higher education (Belikov & Bodily, 2016). An interesting aspect is the involvement of students as authors of OER. This shift of perspective has the potential to increase motivation and develop skills as information producer (Trust et al., 2022).

Regarding teachers' motivation to create OERs, attitudes are a key concept that helps to explain OER engagement. So far, OER initiatives are driven by highly motivated individuals who act as early adopters (Krtalić & Mandl, 2019; Otto, 2021). Teachers are mostly not involved in the creation and production of OER, but use and apply them in digital teaching in higher education (Hylén, 2021). In order to motivate researchers to publish their existing materials as OER, challenges such as the time required to create, find or revise OER and potential uncertainty about licenses must be considered. A recent study of over 100 copyright ownership policies at institutions in the US showed that they contain a certain amount of vagueness regarding copyright ownership (Gumb & Cross, 2021) which might lead to doubts. As a result, legal guidance connected to the usage and development of OER should be given a high priority and is being implemented in the form of individuals in charge of OER-related matters (Otto, 2022). Other problems include the lack of expertise in using OER. Teachers might also lack the expertise required to include open learning materials in their courses. Another barrier that has been documented by research results is lack of trialability (Menzli et al., 2022).

Since students are more accustomed to traditional learning methods, they may find it challenging to self-regulate and adjust to a course with an OER structure (Wester et al., 2021). Therefore, OER fundamentally calls on practitioners, both as learners and teachers, to be more open, engaged, and innovative (Huang et al., 2020). To establish OER in higher education as an enriching concept for both teachers and students, educators should expand student access to educational resources. The revision or adaption of the materials and considering students' needs throughout a global crisis are necessary to optimize learning opportunities (Wiley et al., 2017). The essential infrastructure for making OER accessible to users and enabling them to upload or download learning materials is OER repositories (Leng et al., 2016). The usability or user-friendliness of OER repositories is another significant new research issue that has not yet been extensively studied (Heck et al., 2020; Otto et al., 2021).

The introduction of OER to educators is necessary to promote their use instead of commercially produced materials. Providing freely available learning materials such as OER with an open license in a repository supports the potential to increase equity in learning in higher education (Van Allen & Katz, 2020).

The literature on LIS student and professor perspectives and experiences with digital education and OER during COVID-19 is still in its early stages. The state of research shows that the perspective of LIS education has not yet been sufficiently researched. A focus on different perspectives of teachers and students seem desirable in order to identify strategic and systematic barriers towards a broad use of OER. The next section presents the methodology in more detail and elaborates on the focus group topics and the interview guideline.

3. Methodology

3.1. Qualitative approach

In order to explore the topics, we employ qualitative techniques, such as focus groups with students and semi-structured interviews with teachers. An interview guideline for semi-structured interviews with professors was designed to explore individual opinions and experiences, as well as a moderator guide for focus groups were used (Boté-Vericad et al., 2022). We used a question set with five thematic blocks regarding digital education and OER: Attitudes and expectations, problems, adaptability, advantages and disadvantages, and improvements (Boté-Vericad et al., 2022). The interview guideline can be found in the appendix.

This method offers more flexibility and openness to address new issues and add or modify research questions. The interviewer uses the questions as a tool to guide the subject into a natural discussion and elicit responses that would not be provided in a closed questionnaire when developing this form of an interview (Luo & Wildemuth, 2017).

With respect to a number of crucial concerns regarding the adoption of DE and OER, focus groups provided the chance to compare what the professors had to say in the interviews with the viewpoints of the students. As Wildemuth and Jordan (2017) point out, focus groups offer the advantage that participants can assess their opinions with those of other group members rather than just reporting their opinions to an interviewer. Participants express their agreement or disagreement with one another's opinions during this process. The objective is to ask questions on each of the theme complexes in both focus groups. Based on this approach, we ensure comparability between the findings of focus groups.

3.2. Sampling

Our study applied two qualitative methods that only involved just a small percentage of the total teacher and student populations. Consequently, it was necessary to establish

clear criteria and a sampling system to choose who would be interviewed and who would participate in the focus group. The following criteria and sample systems were used to apply the purposive sampling methodology (also known as non-probabilistic sampling) (Etikan et al., 2016):

1. It is necessary to have representation from German LIS professors at both the undergraduate and graduate levels of education. In relation to the research topic, professors from different LIS locations in Germany should be recruited in order to compare different perspectives and experiences.
2. Our second target group included LIS students from one German LIS Institute (University of Hildesheim) who were enrolled during the pandemic and who experienced teaching during lockdowns (2020–2021). Students both at the bachelor and master level should be represented.

Before beginning an interview or focus group, participants must sign an informed consent form. Only sound was recorded for each technique. According to the website of the German university association for information science (*Hochschulverband Informationswissenschaft*, n.d.), there are 12 universities and universities of applied sciences in Germany. Eight interviews with professors from five German universities in the field of LIS were conducted between January and February 2022 using an interview guide. Two focus groups with five students in one and four participants in the second focus group (out of 181 LIS students in total) took place in May 2022 (in the second group, two students cancelled at short notice). A pilot study was carried out in each case.

3.3. Research's objectives and purpose

The goal of this research is to learn more about how students and teachers feel about DE, specifically about OER or educational resources in general, particularly during the COVID-19 crisis and in comparison to their experiences prior to the pandemic.

We explore what expectations professors and students had when using digital resources and teaching tools during COVID-19 as they moved to an online or blended mode of learning, as well as what issues they came across. Our objectives were divided into five blocks. Table 1 shows the research topics and description (Boté-Vericad et al., 2022).

4. Research results

A technique for assessing qualitative data is qualitative content analysis. Usually, it refers to a collection of texts, such an interview or a transcript. The researcher carefully studies the data to find recurring themes, or subjects, concepts, and meanings. For data analysis, we used inductive content analysis (Mayring, 2014). This approach allows us to explore the material step by step, as emerging topics were added as sub-categories that were thoroughly created and revised during the analysis process. Two project members performed the analysis at a time, as the procedure has the claim to be intersubjective comprehensible (Mayring, 2000).

Table 1
Research topics and theme description

Theme	Description
Attitudes & Expectations	The attitudes and expectations of professionals and students toward distant and online teaching and learning were identified, analyzed, and categorized.
Problems	Examine and classify the problems that educators and students have encountered, especially with regard to OER.
Adaptability	It is crucial to identify and evaluate the kinds of adjustments and levels of adaptability that teachers and students have made in response to unexpected circumstances, particularly for those teachers who were unfamiliar with the pedagogical requirements of DE.
Advantages & Disadvantages	Examine and categorize the justifications given by professors and students in the event that they anticipate ongoing use (or none) of DE tools that were tested during remote teaching.
Improvements	Categorize teacher and student suggestions for improvement of online teaching and learning, the use of OERs in the future, in the event of new crisis situations, or in standard teaching.

Table 2
Categories with sub-categories from interviews with professors

Attitudes and expectations	Adaptability	Problems	Advantages of online teaching	Improvements
Experience with blended learning	Use of various tools	Legal regulations for the use of OER	Teach independently of time and location	Digital teaching being improved
	Video production	Finding, adopting and curating OER	Convenience for individuals in balancing work and private life	Future of teaching being digital
	Quality assurance of online teaching	Establishing interactivity in online teaching		

Interviews with professors

Table 2 shows the identified sub-categories from the interviews with professors. The data analysis revealed that professors especially discuss issues on the adaptability, problems as well as advantages of digital teaching during COVID-19.

Attitudes and expectations

Experience with blended learning

Some of the professors indicated that they have degree programs at their universities that are partially or fully online. This applied specifically to continuing education courses as well as master's degree programs. Therefore, the majority of the teachers had experience in the didactic aspects of online teaching. At the beginning of the pandemic in early 2020, they were therefore well equipped to master the transition to online teaching and to offer appropriate courses for students in a short time:

Yes, we have been doing this at the institute for quite a long time and started very,

> *very early to record our lectures and make them available digitally, because we wanted to allow greater flexibility and we also have a distance learning program here at the institute. In other words, we were not completely without experience* (Professor 3).

Adaptability

Use of various tools

LIS teachers have tried out a variety of different tools for online teaching, especially in the beginning when the use of a particular technology was not specified from the institute (*Skype, Zoom, Moodle* etc.). Thus, a variety of screencasts are being used or are newly produced to teach in asynchronous mode. They were aware that these should be as interactive as possible in order to provide students with an appropriate learning experience in remote mode (quizzes, interactive questions or other gamification elements):

> *So what I thought was great was that I took screencasts and then built in queries at individual points, you could add H5P in the screen. You could learn independently at individual points in the screencast. So, learning goals control is possible. I think that helps a lot to internalize the contents once again. I thought that was great* (Professor 8).

Video production

LIS teachers focused on producing screencasts to deliver online teaching, despite the time required to create and ensure quality. Advantages were seen in the possibility of offering these as additional teaching materials in subsequent semesters, even if there is a return to face-to-face teaching, thus enabling flexible and time-independent learning for students. Many professors took care to ensure good sound quality of the recordings at an early stage:

> *So, I have also used that before. I have also done online teaching before to the extent that was possible for me. It was usually in addition to in-person teaching. And I also liked to use screencasts, because I think it's a good opportunity, especially for people who perhaps couldn't be present, but also for those who are otherwise regularly present in a course. You simply have the opportunity to look at it again* (Professor 8).

Quality assurance of online teaching

Ensuring the quality of online teaching was a very important concern for professors and is discussed in detail in the interviews. On the one hand, the exchange with colleagues is actively represented, for example, to exchange of information and best practices for online tools, as well as the exchange with students during synchronous teaching units. Teachers discussed the impact of pandemic online teaching on future teaching requirements, as well as possible demands from students. For example, there was an understanding that many students want to retain the benefits of online formats:

I think quality is certainly an issue. So I don't think that students are still willing to move to in-person teaching, if they don't get any added value compared to the digital offerings, which are much easier for them to take at home and independent of time and place. So I think there is certainly a new demand for quality, and I think this will probably manifest itself over the next few years. And then the teachers will certainly have to react, won't they? They certainly have (Professor 2).

Problems

Understanding legal regulations for the use of OER

Teachers used OER in teaching to some extent, but this was limited to producing their own teaching videos for introductory lectures. The results indicate that the integration of other OER did not take place for the most part. Reasons were mainly identified in the difficulty to understand rights and permissions around licenses. The individual time required to deal intensively with the topic was considered too high. Teachers often fear violating possible licenses and rights:

I quote the source accordingly and that way I'm on the safe side. But the licenses, that's actually another one of those killer arguments that I can understand. What is allowed when you make it available as OER and what are you not allowed to do? And I haven't really clarified this question for myself yet either. Licensing is a complex issue (Professor 2).

Finding, adopting and curating OER

Searching and finding OER was also recognized as a major problem by LIS professors. OER were therefore not meaningfully provided with metadata or existing repositories had too few potential materials for the LIS area that can be used or adapted:

Because the OERs that have been created so far are actually not so well indexed with metadata. And because the offer for my topics is simply not yet that extensive [. . .]

I actually use OERs for science communication. There's a good MOOC [. . .] *for Knowledge Management with film content that I can actually also integrate into teaching, but without now revising or remixing* (Professor 2).

In addition, some participants noted that there are technical problems with the reuse and adaptation of existing OER for their own purposes. This applies above all to the format of the resource, e.g., it offers only a limited possibility of revision:

I have no reservations about reusing materials. But what I notice again and again is that the materials are actually presented too statically. Now, for example, if you have slides like that for a lecture, and then they're stored as a PDF or something in some OER repository. I would actually need them more editable, in PowerPoint format or similar (Professor 5).

Establishing interactivity in online teaching

Professors taught in different teaching formats such as lectures, seminars and practical exercises. The number of students per course, therefore, varied greatly. Teachers stated that the creation of interactivity such as discussions in seminars in an online setting was a major challenge. Thus, no basis of trust between students and teachers could be established, as is the case in a face-to-face event, students, for example, never switched on their cameras and the participation was also very low:

> *But everything where more interactivity is needed. So, as I said, it's a seminar where there's passionate discussion about something. That doesn't work online via cameras, where everyone suddenly says the camera doesn't work, it's broken for everyone. So wherever interactivity is really needed, I would rely more on in-person teaching again, but still not exclusively classroom teaching, but definitely with digital tools for support* (Professor 6).

Advantages of online teaching

Teach independently on time and location

The advantages of remote teaching were also mentioned by teachers. The time required to create screencasts was estimated to be very high. However, the reuse of digital teaching materials created more flexibility compared to classroom teaching. The reuse provided professors with the opportunity to invest more time and effort in digital teaching skills. This shows that teachers were generally interested in digital and location-independent teaching:

> *And because there was so much digital now, I have at least more time simply invested in it, because the time for other things has also fallen away, time that I would otherwise have had to spend on other things. I didn't have to commute to university and then that's the time I can use for course preparation or to make screencasts differently or also to think about how I can integrate it in a different way* (Professor 8).

Convenience for individuals balancing work and private life

The comparison to the time before the pandemic is discussed in the context of work-life balance. Especially people with children emphasized that they had more time for the family through online teaching in their private lives. For example, long commutes to work were eliminated. On the individual level, this is perceived as a great advantage:

> *I mean, I'm in a home office myself and I really appreciate that. I have three children. It's quite practical to be at home from time to time. The commute is shorter* (Professor 6).

Improvements

Digital teaching being improved

Teachers reflected on their experiences over several online semesters. As already

mentioned, screencasts were reused, but the need to respond to students' needs and to keep the quality of teaching materials up to date is recognized as a major improvement of online teaching. Teachers stated that they were able to improve and further develop their teaching as a result of the experience gained:

> *I think for the third time I have now completely recycled a lecture. With the videos I think, now actually the time is reached and I must revise them, as the content evolves. For that, one does not redo the video and that would be something that I would have done at the beginning, for example. I would do something different in the meantime. It is better to divide the video into smaller bites. Always 10–15 minutes or so* (Professor 6).

Future of teaching being digital

Professors stressed that, especially at the beginning of the pandemic, they experienced more freedom regarding their teaching mode and the use of online tools for their courses. Asynchronous teaching formats were implemented and the continuation of teaching in crisis times was ensured. Teachers want to maintain asynchronous teaching options for the future. However, they see higher education policy as responsible for making decisions. Some professors noted that universities need to open up further to new possibilities, including the use and creation of freely accessible learning materials:

> *Yes, that is difficult. Politics also decides what is implemented. At the university, there are often old, traditional values that will probably no longer play a huge role at some point. I think we have to open up and develop concepts of how to respond to all these challenges in teaching* (Professor 1).

Focus groups with students

Since only students from one university were interviewed, they might have unique characteristics that need to be taken into account for the analysis and the following discussion. For example, LIS students at the University of Hildesheim take a minor subject. The experience with digital teaching within their degree program may have an influence on the results. Furthermore, it is common for students to commute to the university by train or car. During lockdowns in Germany, the university as well as the university library were closed. Teaching in the German LIS department is done in both synchronous and asynchronous forms. Seminars were taught in synchronized sessions. Exams were also administered online.

Students explain that different subjects (e.g., minors) followed their own asynchronous instruction mode. The typical method of delivery for this instruction was to create podcasts or videos, after which the learner might get in touch with the lecturers via phone or e-mail. Additionally, they discovered that the university's infrastructure and professors' teaching techniques had improved during the second semester of the lockdown. Table 3 shows the emerging sub-categories based on the qualitative content analysis.

Table 3
Sub-categories extracted from the focus groups with students

Attitudes and expectations	Adaptability	Problems	Advantages of online teaching	Improvements
Doubts about technical solutions for the implementation of online lectures and online exams	Emergency remote teaching strategies	Issues maintaining students' concentration, engagement, and attention	Studying independently on time and location	Students' shift to digital skills
Quick return to classroom teaching	Video production	Lack of self-control and discipline in students' behavior	Convenience for individuals balancing work and studying	Hybrid teaching formats
Semester abroad and internships	Communication between students and professors	Difficulties with connectivity		
	Usage scenario for OER	Lack of adequate home space for learning		

Attitudes and expectations

At the beginning of the COVID-19 pandemic, students raised concerns about the accessibility of digital learning and the quality of online education because of higher education's abrupt shift from face-to-face to online teaching in March 2020. The category *Attitudes and Expectations* includes three sub-categories describing their hopes and fears for online classes. With the sub-category *Doubts about technical solutions for the implementation of online teaching* students expressed concerns regarding the technical implementation of large synchronous courses. This included issues with internet access as well as the question of suitable software systems to be used for large lectures with more than 300 participants. In the first online semester, they used various systems such as *Zoom* and *BigBlueButton*. Here, the choice depends on the faculty as well as the size of the event:

> *I was worried about a live lecture. There are 300 students and how is the university going to run that without crashing the system? We then switched to Zoom, then it worked better. We also use BigBlueButton in some classes. But I haven't thought about doing online exams yet because they were so far away back then* (Student 1 focus group 1).

Their expectations were that online teaching will only be done temporarily and that a return to face-to-face teaching will occur in a timely manner. Therefore, no thoughts about possible forms of implementation for exams were addressed. The sub-category *Quick return to classroom teaching* emphasized the view of students who assumed that online teaching will not last long. This point of view was changing when the number of COVID-19 cases in Germany increased:

I don't know, I just thought it would be one semester with online university and then we would go back to university. Yes, that's where I was when it started (Student 2 focus group 1).
We got to see the first cases and I didn't take it too seriously and when the university said we were going to do everything online, I was like okay, um, it's a bit more serious (Student 1 focus group 1).

In the case of some LIS students, a semester abroad or the completion of an internship abroad is mandatory. Students, therefore, shared their experiences around the time they just spent abroad (in Spring 2020) or internships abroad that were cancelled due to the pandemic. The sub-category *Semester abroad and internships* at the beginning of COVID-19 reveals that students cancelled accepted internships on their own at partner universities in Europe while still hoping that they may attend these at some later point in time. In some cases, internships abroad were also cancelled. Also student jobs were terminated or short-time work was introduced because of the pandemic. Alternatively, students attended online courses at their home university or found other job opportunities:

So I got an acceptance in Croatia and then I said independently that I don't want to do that for now because it was just the beginning of the pandemic and I had more worries than now. Um and then I canceled it and then I applied for the next semester in Turkey and I also got the acceptance, but then they did not want me to enter. So I just did my semester abroad online from Germany, so not really a semester abroad (Student 4 focus group 1).
Yes, I would have actually gone abroad for an internship, but they had to lay off so many people due to the pandemic that they didn't want to hire any interns. But then I found an internship here at the startup in Hanover and took care of the English-speaking customers there. And then also, fortunately, at the university (Student 5 focus group 1).

Adaptability

The category *adaptability* revealed interesting insights into how students had to deal with the problem of uncertainty, with lecturers having to cope with short-term changes when organizing teaching activities. A return to classroom teaching was identified as a feasible option. As a result, no further emphasis on a more evolved remote digital approach was made, but then new waves of COVID-19 by the end of the year 2020 complicated university teaching once more. The sub-category *Emergency remote teaching strategies* highlights students' uncertainty about the mode of teaching, as concerns about online classes were also described in the category attitudes and expectations. However, teachers and students found ways to deal with online teaching and uncertainty. Especially teachers provided extended deadlines for term papers or new ways of examination solutions:

But I don't think we should completely blame the university; I think we should

> *completely blame politics. I'll be honest: we never knew, so the rule changed every day. [. . .] Back then, we didn't know what kind of government regulation would come tomorrow, or the day after tomorrow, so I don't want to blame the university entirely, because whatever they had planned could have been rejected by the government [. . .]* (Student 2 focus group 2).
> *Then we got all the extensions for the term papers, which reduced a lot of stress from the scenario. So, we agree that the beginning was great. However, it would have been cool if, [. . .], a half-semester could have been completed online and the remaining part completed in person* (Student 1 focus group 1).

Video production

Teachers used video or sound recordings as material for asynchronous teaching, as most students noted that a large number of face-to-face lessons were transformed directly into recordings. Rather than live streaming, an asynchronous teaching and learning method is typically adopted. Therefore, not only negative attitudes towards online teaching were discussed, as students emphasize the advantage of being able to work through lectures independently of time by learning with videos:

> *I don't really have much experience with online teaching yet, but overall, it was better than I expected. Now, over the course of time, I find it quite okay. So especially for lectures, I actually find it okay when you do that with asynchronous recordings and when there is a question, then you can ask the question directly* (Student 4 focus group 2).

Communication between students and professors

The participants discussed ways to maintain contact with each other during contact restrictions and online teaching for group work but also for social interaction. According to participants, the latter is difficult to replace in online mode. The social exchange between lecturers and students as well as interaction during their commute to the university was an important possibility for information exchange. Interestingly, no channels of the university platforms such as *Moodle* or forums were used, but large *WhatsApp* groups were formed and utilized to exchange information:

> *We had this first-year WhatsApp group in the first semester, where there were about 100 people. And later I think other people also came in there, who were new freshmen. I have no idea who organized it. Anyways, it was still possible to ask questions. At least you have the opportunity to ask a large number of people. But of course, it's different from a social exchange or something like that. It was really more like, yes, when is this seminar going to take place or do you know what the exam performance was* (Student 3 focus group 2).

Due to issues with online classes at the beginning of the COVID-19 Pandemic, students exchanged alternative learning materials for classes. The sub-category *Use and usage scenarios of OER* shows reasons for them to adopt free material and online courses. Interactive elements with gamification or various task types enhanced their learning experience:

It was quite a good support because there were also weekly quizzes that you could do. It is a bit more playful because sometimes there are videos and sometimes you can read a text. But I don't think that it now somehow replaces the whole course or something. I think it can only support the teaching but not replace it (Student 2 focus group 2).

However, the findings revealed concrete usage scenarios for OER. Students used OER as additional learning material for private use, without utilizing OER shared by their professors. Incorporating OER as a whole or partial course into teaching and thereby generating added value for the learning experience was not perceived as a sustainable scenario.

So like [Speaker 1] *I would rather do it privately and not in a university context because [. . .] you have more freedom: At what pace you want to learn, when exactly you want to do it when you want to finish it. But in the context of the university, I don't want to do it again somehow* (Student 2 focus group 1).

From the category *Problems*, three major topics arise. Students not only discussed benefits of online teaching. They were also in agreement regarding their experiences with health issues during the lockdowns. Participants shared intensively about their experiences with mental health, stress and emotions, especially at the beginning of the pandemic and the rapid transition to online teaching in the summer semester of 2020. The sub-category *Issues maintaining students' concentration, engagement, and attention* revealed that students had an optimistic attitude toward an online semester in the beginning, but this had changed over time due to the lack of face-to-face communication with lecturers and peers:

I always thought home office was cool. I always thought to myself, hey how cool would that be, [. . .] Yes, how cool would it be if we had some things online, especially the courses at eight o'clock. Because who wants to get up at six or seven o'clock and then drive to the university? I've often thought about it and now that I've seen that we only have online courses. My attitude has completely changed. But in the university, you have to learn things first, and so on, and I have the feeling that something like that is much easier in a face-to-face setting (Student 1 focus group 1).

While the online courses and use of screencasts were seen as beneficial for individual learning, students also noted that they miss interactive parts from face-to-face teaching or that these are not extensively replaced in online teaching:

And at the beginning, one was happy, but afterward, one noticed that it's difficult, because one has a screencast [. . .] and tries to work through everything and takes notes for the exams. But one has already noticed that one is still missing the lecturer. The lecturer who is standing in front of one and speaking to one, because maybe there is a question at that moment and one wants to ask questions, but one can't do that through this online teaching, one can't do that at all and in-person teaching it, was completely different (Student 1 focus group 1).

In some cases, not only the communication with the professor was lacking, but also the perceived loneliness and isolation of students led to a decrease in motivation to participate in events. This might also lead to concentration problems. The sub-category *Lack of self-control and discipline in students' behavior* indicates that students knew the importance of participation and discussion in conducting a successful seminar. However, their participation in online seminars was declining because their willingness to perform decreased:

> *I found in the seminars it also depends on the lecturers, so with some, it was then really so that you have said nothing. It depends on whether students are motivated. I think with the online seminars discussing is important also for example in the chat what is commented. That can be meaningful or somehow interesting. But in most seminars, it was not the case with me, but rather that the people were then simply silent* (Student 3 focus group 1).

The reasons for decreasing commitment can also be found in the long period of time students spent on their computers, smartphones, or laptops in order to participate in synchronous lectures:

> *Otherwise I believe that, it's just exhausting to sit in front of the PC for so many hours a day* (Student 3 focus group 2).

Difficulties with connectivity for online education

Especially at the beginning of the pandemic, students described that the university's server services were not equipped for online teaching and that there were frequent problems with *BBB* or *Zoom*. However, this included connectivity issues as well as the technical equipment needed to participate in synchronous online teaching:

> *I see quite some improvements, also with me. We had bought even better Internet. And I think the university also improved, because in the beginning I think there were also frequent problems with the university server that collapsed. I think they have bought something extra and in this respect it has also become better. And of course, one has more experience with the technology so as a result one has become more familiar with the use of new tools* (Student 4 focus group 1).

The sub-category *Lack of adequate home space for learning* must be considered in the context of the previous sub-category. Students' circumstances vary. Young people who still live with their parents or had to move back into their parents' homes due to the global pandemic felt more limited. They refrained from active participation in online teaching because of lack of space, as living space had to be shared with other people. In many cases, this led to a poorer learning experience:

> *I don't know if it's just me, but there is one more disadvantage I would like to mention, and that is when you have lessons with a big family at home, it's very, very difficult to listen when everyone is incredibly loud. And now imagine, you have to talk and turn on the microphone and then someone yells from the other side [. . .]* (Student 1 focus group 1).

The category *Advantages of online teaching* consists of two sub-categories describing the perceived benefits of the asynchronous teaching mode. As students adapted to the new mode of teaching and technical conditions with video conferences improved, the learning behavior of the target group also changed. Instead of studying in the library or at home, students valued learning independent of time and place. The following quote describes the sub-category *Study independently of time and location*:

> *I also found it really good that you can do it from literally anywhere. So in between, when it was going quite well, I was sometimes not at home, but with relatives or friends. And then I just went to university from there, which would not have been possible in the past* (Student 2 focus group 2).

The sub-category *Convenience for individuals balancing work and studying* shows in this context that students experienced more freedom and time with online classes to combine their studies with other work opportunities like internships:

> *Yes, I just found it easier somehow to combine that with work. So it was much easier to combine with each other. I have now done an internship and then I could just really somehow say so okay, I'll watch the lecture then somehow after work. Otherwise it would not have been possible. Then I probably wouldn't have been able to do the internship at all. So I did not have to drive two hours there [to University] and two hours back and still have two hours. I think that is something that you can also do in the future when the whole thing is over* (Student 3 focus group 1).

The category *Improvements* includes two sub-categories with regard to best practices which evolved from more than two years of online teaching. Students consider having acquired greater digital habits with new tools. The following quote describes *Students' shift to digital skills*:

> *I got to know a few tools, something like Trello or Asana, which I hadn't used before and which I find really practical for structuring myself in group work or myself in some way. That is especially useful when you have to manage something together online, then you can somehow do that best with such tools in my opinion. I will definitely continue using the tools* (Student 2 focus group 2).

For certain activities, some students thought that the hybrid synchronous method (with face-to-face teaching and online broadcasting or recording) was a good practice in higher education teaching. Furthermore, it appeared that completing internships was highly important to them. Therefore, combining asynchronous university activities with internships was appealing to students. As a result, *Hybrid teaching formats* are useful practices for students as it provided flexible scheduling activities:

> *Somehow be able to do polls like this online. Who wants to go back to college? And depending on how that would have turned out, they could have said okay, so if only 30 or 40 people want to go and the event is being held live anyway, then it can also take place at the university and the few people who want to go will go and for the rest, it will be broadcast online* (Student 1 focus group 1).

5. Discussion

The main objective of this study was to find out how familiar German LIS educators are with digital education and the use of OER. The results offer a starting point for investigation and discussion of LIS professors' and students' knowledge and interest in OER. During the immediate crisis situation, both students and faculty had to quickly adapt to distance and online teaching (Almusharraf & Khahro, 2020). In addition to the challenges, the pandemic also created opportunities for higher education institutions to incorporate and make more intensive use of DE and OER in general (Dsouza, 2021). The main topics addressed by professors include quality criteria for online teaching and the creation, use, and revision of OER over several online semesters, although these were not made publicly available. Students focus on the improvement of online teaching over several semesters, their usage patterns with OER, and the benefits as well as disadvantages of online teaching with regard to digital divide. These different aspects are presented in more detail below.

The interview results suggest that teachers gain experience with online teaching and are more familiar with using different online tools to provide good learning experiences. Professors from our sample view quality assurance of online teaching as a major concern. Thus, not only evaluations are carried out to take into account the students' feedback for adapting the teaching, but they also reflect on their own teaching experience in the pandemic to derive best practices.

The findings show that teachers are highly motivated and competent in incorporating digital learning materials into their teaching. However, the results cannot be generalized, as further German-speaking LIS institutes and their experience with DE during COVID-19 have to be surveyed. As the student's perspective showed, this means a positive learning experience and better knowledge acquisition for them, which is one of the most prominent benefits perceived by teachers (Aguilera-Hermida, 2020). As Krtalić and Mandl (2019) conclude, both teachers and students perceive motivation as a major asset and a major challenge for digital education and innovation.

When good experiences and best practices are identified for digital (LIS) teaching, teachers are more motivated and inspired to invest more work and time (Wang & Towey, 2017), as results showed that LIS professors reused their teaching materials. Interesting evidence for the creation and distribution by teachers of educational resources was found, even though it did not follow a fully standardized definition of what is meant by OER, such as its inclusion in an OER repository or directory. While many LIS instructors use OER, very few of them contribute to their publishing. The uneven balance of use versus creation of OER among LIS professors has also been confirmed in other studies (Katz, 2020). Teachers from our study generally support the OER principle, but they do not design their works with this label and these features in mind (Otto, 2021). They adapted existing materials and create some new ones for distance learning during an emergency situation, but they did so without keeping OER criteria and best practices in mind. Not only institutional support for the reuse of OER for lecturers is needed to promote OER in higher education, but also quality criteria for

the evaluation of OER (Camilleri et al., 2014). Attempting to define the dimensions of quality is challenged by the subjective and context-specific character of OER, which makes the process of evaluating OER difficult (Connell & Connell, 2020). Additional strategies to inspire professors to generate and publish OER, such as a commitment or career-enhancing promotions, need to be considered. To resolve these problems, collaboration among coworkers and the creation of a repository to offer free teaching and learning material in the field of LIS can both be helpful (Kullmann et al., 2021). Additionally, to integrate multiple best practices, a comparison to other LIS colleges and their experiences and best practices are beneficial (Todorova et al., 2022). However, there is a need for further assistance with information on copyright and open licenses, because teachers are not fully aware of copyright issues for educational materials. Therefore, as Otto (2022) also points out, legal advice for teachers to promote the creation and use of OER with different stakeholders is needed. For university libraries, OER offer a field of action in which they can contribute their skills in indexing and use, findability, quality assurance and training (Stummeyer, 2018). Opportunities and challenges for libraries should be identified. In order to establish the use of OER more firmly, various authors emphasize that an exchange between lecturers at universities and experts from libraries, university didactics and information technology, for example, is necessary (Hoover et al., 2020; Voss et al., 2020).

To lower potential barriers to developing digital educational materials, other authors also emphasize the need to educate and train librarians in universities to promote awareness of and give training for staff and students on the use of OER (Katz, 2020; Santos-Hermosa & Atenas, 2022). In addition to necessary investments in the area of ICT infrastructure, it is underlined that the training and further education of librarians to advise and support teaching staff and students is relevant in order to master the technological and innovative challenges (Tsekea & Chigwada, 2020; Anderson et al., 2021).

Remarkably, students did not report that they had used OER created by instructors. When learners did discuss it, there was a distinction between open access academic publications and books and OER. Interestingly, the analysis of usage scenarios for open learning materials reveals that students search and use open and easily accessible learning materials for a class to improve the quality of their learning. However, it remains unclear if students are sufficiently informed about open licenses or OER repositories. Other study findings summarize that such lack of knowledge hinder students to maximize the learning experience and use of OER (Arcebuche, 2022).

Although students expected a quick return to face-to-face teaching, they adapted well to the new situation. Participants highlighted the improvement in online teaching over several semesters. Like professors, they value the advantages in the possibility of flexible learning independent of time and place, as other studies also concluded (Aguilera-Hermida, 2020). Screencasts, for example, will continue to be offered as an additional teaching material in the future. Student participants had more time at their

disposal, which is also invested in internships and other job opportunities, as Jakopec and Aparac-Jelušić (2021) also point out.

As Anderson and Rivera-Vargas (2020) emphasize, OER have the potential to decrease the likelihood of a digital divide across students. However, the data revealed that some LIS students face inequalities due to their socioeconomic background. To prevent professors' and students' frustration, remote teaching must be carefully prepared (Boté-Vericad, 2021). The modification of learning materials with regards to OER standards is relevant to meet the needs of students and produce meaningful learning outcomes. As Huang et al. (2020) show, not only teachers but also students need to be more innovative and open to facilitate the potential of OER in higher education. To promote OER in LIS education, best-case scenarios for integrating OER in teaching are needed.

6. Conclusion

The motivation behind the use and adoption of DE and OER in German LIS departments can be seen more clearly after this study. The collective knowledge and experience gained from teaching during a crisis highlight the enormous pedagogic benefit that the resilience and diversity of digital learning and teaching resources provided. Professors and students improved their digital skills and gained substantial expertise. Teachers feel confident to provide high-quality remote teaching. However, the use, adaption, and integration of OER in LIS teaching needs further assistance and support structures, because it takes a lot of effort for professors to research the legal regulations regarding open licenses and repositories to identify high quality resources. One limitation relates to the lack of clarity and understanding of certain concepts used in the study. Despite the explanation and definition of DE and OERs given at the interview and both focus groups, not all participants might have a clear understanding of terms, e.g., *open educational resource* or *open licensing*, which may have affected their answers and findings. Due to the small number of participants and the fact that not all German LIS institutes and students could be questioned, the results cannot be generalized. In order for both university professors and students to share a common concept of OER, university-level collective impulses and innovations are necessary. To determine the best-case scenarios for OER in higher education, additional LIS research is required.

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Appendix

Model guide for teacher's interview

Step 0. Context and profile of the participant

[We want to start the conversation by capturing information related to the context of the participant from March 2020 onwards, not related to one of the 6 specific research objectives of our study, but which can help to better understand the context of the attitudes and expectations]

1. What is your teaching area? What subjects did you teach last March 2020 when the pandemic was declared? What subjects have you taught since then?
2. Which Learning Management System (LMS) platform do you work with (virtual campus or equivalent)?
3. What remote digital synchronous teaching activities have you done in this time of pandemic? Examples: Kahoot, Mentimeter or similar, class sessions with existing applications (*BBB, Zoom, MS Teams, Jitsi* ...), etc. Did you do them before?
4. Did you stream live your lectures that to reproduce what traditionally you use to deliver face-to-faced in the classroom before the pandemic? Did you replicate the classroom model in the form of streaming)? If the classes were recorded, were these videos used (edited or not) as references for activities that were out of sync with the students?
5. What non-face-to-face remote asynchronous teaching activities have you done in this pandemic time? Questionnaires, online tasks, video viewing, digital material readings, simulators, interactive applications, etc. Did you use them before?
6. What kind of digital material did you use in this pandemic time? Examples: videos of master classes, articles, written teaching materials and documents published under a commercial license, articles, written teaching materials and published open access documents such as OER, unpublished material prepared by you, etc. Did you use it before?
7. Have you used self-created materials (educational objects) just to respond to the new situation (videos, presentations, quizzes, etc.)? Why did you do that? Were you unable to use/reuse materials from other times, or from other teachers in your school or around the world?

Information on Objective 1. Attitudes

[We want to know how they got into it, with what previous attitude they coped with the emergency remote teaching. It should be clearly distinguished from what they

think now, whether they adapt or not, forcing them to remember the first days before and during March 2020 I order they answer in a way as much honest and objective as possible]

Even if you later change your mind (or not), try to remember before the COVID crisis...

8. What did you think about online or blended learning before all the COVID crisis was triggered? Had you tried it before? In what kind of courses? If you tried it, did you find it better or worse than face-to-face teaching? Why?
9. Have you used digital teaching materials before? What kind? OER? Which share of use of digital versus analog/paper material do you think describes your profile as teacher? Why?
10. Did you do online teaching activities in face-to-face teaching? What kind? Did you like them? Why?

Information on Objective 2. Expectations

[We want to know what they expected to happen, what they thought would happen. We should distinguish it well from what actually happened, inviting them to remember what were their first thoughts, being honest and objectives]

Regardless of what happened afterwards, how actually everything went at the end...

11. What did you expect to happen when you learned that there was confinement and all teaching had to go online?
12. Would you say that you generally took it well or rather badly? How did you get started?
13. Did you think you would have problems? What kind of problems did you think there would be? With teaching materials? With online classes and activities? With assessments, exams, ...? Any other problems?
14. Try to express your expectations at the time when everything changed because of the lockdown... Did you think "this is going to be a disaster" or did you make some other kind of prediction? Which one?

Information on Objective 3. Adaptability

[We want to know how and to what extent the participants have adapted themselves to the new situation, what degree of flexibility they have had, what adaptability has been given in their context, what they have adjusted and how they did it]

Surely, by force or by choice you had to make adjustments, refocusing your mind and routines...

15. Could you identify two or three specific things that you have necessarily had to change in these different areas, or in some other?
    - Teaching or study material.
    - Applications/software to do activities and/or manage materials or information.

- Physical work space.
- Devices/hardware to work with.
- Relationship with other teachers and students.

16. Have you made other changes that may not be so essential? Which ones, in which field? Why?
17. When you made changes, how did you do it? Alone? By agreement and in collaboration with other colleagues? With the help of the teaching institution? ...
18. Did you use third-party materials (found in open internet access or shared with you)? Were these materials openly licensed for reuse?
19. Have you received extraordinary training offers from your university to adapt teaching to the new situation?
20. Has the teaching support services (library, computer, ...) offered specific services or adapted the usual ones to your new needs as a teacher?
21. If you had to highlight some few changes ..., what would they be?
    - The hardest to deal with.
    - The ones that cost you the least to face.
    - The ones that have contributed the most quality to your teaching.
    - Those who have contributed less quality to your teaching.
22. Are there any changes you would have liked to have made and you couldn't? Which? Why?
22. Are there any compulsory changes you have had to make and would you rather not have made? Which? Why?
23. [In case at none of the above questions the teacher has mentioned anything about the adaptation in the way of assessing student learning and taking the exams] How did you have to do the adaptation of the assessments and exams? Did you do it all online or did you call to some exams and assessment tests?

Information on Objective 4. Problems

[We want to know what problems teachers and students have had when working with digital learning activities and materials during the crisis, how they have experienced it and how they have solved it]

Remember the real and objective problems that have occurred, regardless of what you thought would happen ...

25. Have you had any problems arising from the situation? What kind of problems: technical with computer applications, devices or connections? Lack of knowledge or skills? Psychological, economic? ...
26. How have you tried to solve your problems? Have you asked for help from colleagues, the institution, expert professionals or have you cop with the problems by yourself ...?
27. If you have not been able to solve them satisfactorily ..., why do you think it has been? What would you have needed to solve them and you didn't get?
28. Do you think that the problems correspond to what you previously expected, or did you not imagine that you would have them?

Information on Objective 5. Advantages and disadvantages

[At this point in the conversation we want to focus on the time after the "special" period of lockdown that triggered the sudden change to the online/remote model. We want to know the reasons for using or rejecting the some tools that digital education offers, based on the reflections that the lived experience has been able to generate]

Now that you have experienced what happened, and that the perspective you have makes it easier for you to reflect . . .

29. Could you mention some advantages that you already know or have discovered for the use of the applications and materials involved in digital and online teaching?
30. Could you mention some drawbacks that you already know or have discovered for the use of the applications and materials involved in digital and online teaching?
31. Highlight one strong point and one weak point of the online learning activities you have done.
32. Highlight one strong point and one weak point of open access digital material that you have used.
33. Do you think that your previous attitude towards online or blended teaching and open digital materials has changed, or is it reaffirmed with the experience you have lived through?

Information on Objective 6. Improvements, as a result of the lessons learned

[We want to invite the participant to think out loud on proposals for improvement (some may already have them in mind, or others may be generated spontaneously at this point in the conversation): we what to know what can be reused in the future, what needs to be improved and how to do it to design a better future either in the return to normal teaching/learning, or in future crisis situations that may occur]

Many voices claim that solutions experienced during the "special period" could be part of new normal of your future teaching activity in the future could be used, but sure it's not that easy and some improvements should be done . . .

34. Between the 2019–2020 academic year and the 2020–2021 academic year, what were the differences in the planning of digital alternatives due to the crisis, and what lessons have been learned from one academic year to the next?
35. What things do you think you have learned/improved in relation to teaching-learning with the experience you have lived?
36. Do you think that some changes, discoveries and learnings could be used to apply them in "normal" face-to-face teaching?
37. What things do you think should be improved with a view to the future? In what specific area (applications, connections, devices, design of learning activities, development of digital and OER material, teacher training, digital competence of students, etc.)?
38. Could you make three proposals for improvement, either for the new normal teaching activity, or for future crisis that could trigger emergency remote teaching?