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Review

Facilitators and Barriers to Online Teaching and Educational Technology Use by University Lecturers during COVID-19: A Systematic Review of Qualitative Evidence

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Abstract: This systematic review of qualitative evidence contributes to the understanding of individual factors that influenced Emergency Remote Teaching and the use of educational technology by lecturers during the COVID-19 pandemic. A coding scheme aimed at identifying these key factors was developed using a comprehensive theoretical framework based on the model of triadic reciprocity. A narrative synthesis of 49 studies revealed that lecturers had unique starting points for the transition, which were influenced by factors such as prior experience with educational technology and online teaching, their attitudes and beliefs towards it, and their technological knowledge. Despite varying levels of preparedness and different attitudes, lecturers were able to leverage their pedagogical knowledge, adaptability, and motivation to continue education under extraordinary circumstances. On the other hand, a lack of experience in educational technology integration, negative attitudes and beliefs towards it, and insufficient technological knowledge hindered the transition to Emergency Remote Teaching. Lecturers therefore actively sought out appropriate educational technologies that would cater to their needs and those of their students. The initial autodidactic effort required that lecturers learn new technologies, along with how to effectively use them for teaching. A significant proportion of the use of educational technology was aimed at augmenting conventional teaching practices and providing students with an interactive learning environment, in terms of social embeddedness and personalized learning pathways. However, many lecturers attempted to replicate the pre-pandemic classroom in an online setting by substituting conventional teaching practices in an online classroom. This systematic review suggests the need to implement institutional onboarding measures for lecturers to level the "unique starting points" to ensure technology-enhanced learning in emergencies. This can be achieved by equipping lecturers with digital competence and pedagogical knowledge and by fostering self-efficacy, thus preparing them for future scenarios that require rapid adaptation and for digital transformation in general.

Keywords: Emergency Remote Teaching; higher education; systematic review; narrative synthesis; qualitative research; Social Cognitive Theory; TMLT; TPACK; TAM; SAMR

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1. Introduction

The profound impact of the COVID-19 pandemic on the global education system necessitated an expeditious pivot to Emergency Remote Teaching (ERT)—a mode distinct from established online and blended learning strategies, defined by its temporary nature in response to immediate crises [1]. The pandemic-induced shift to ERT challenged higher education institutions, especially lecturers, to adapt their teaching practices swiftly and effectively.

Implementing ERT required lecturers to reevaluate and adapt their pedagogical strategies. They faced the complex task of designing comprehensive online learning processes, encompassing the creation of digital content, online classroom management, remote student engagement, and assessment. The pre-pandemic digital transformation, incorporating elements like blended learning, was essential to facilitate this transition [2].

The success of this shift, defined by the continued delivery of high-quality education during emergencies, hinged on numerous individual and institutional factors. Lecturers

with prior online and blended learning experience, robust skills, positive attitudes towards online teaching, and strong self-efficacy tended to create more effective online environments [3–8]. Simultaneously, institutions with comprehensive digital infrastructures and resources were more successful in their transition [9,10] by providing professional development on teaching and support teams to assist lecturers implement ERT and use educational technology [11–13].

This systematic review aims to build on the growing body of research on ERT in universities [14,15] by focusing on the individual factors that impacted lecturers' uptake of these technologies and on how lecturers used these educational technologies.

Considering established theories and empirical research relevant to ERT, this review introduces a theoretical framework based on Bandura's [16] model of triadic reciprocity to explore these factors. It thereby seeks to provide a holistic understanding of how individual factors among lecturers and the use of educational technology contribute to the effectiveness of ERT, thus offering insights for future emergencies necessitating similar pedagogical shifts.

2. Prior Reviews of Emergency Remote Teaching in Higher Education

In an early systematic review, conducted in 2020, Abu Talib et al. [17] analyzed 47 studies on ERT in higher education. On the negative side, they found evidence that education in an emergency mode exacerbated the digital divide, impaired the possibilities offered by practical learning settings, and stagnated communication and interaction quality. This resulted in a decline in teaching and learning quality due to the combination of technical difficulties with a lack of technological knowledge among lecturers and students. On the positive side, the review shows that learning became more flexible regarding time, space, and individual preferences in learning styles. The reviewed publications described the introduction of new technology for teaching and learning as a window of opportunity for an accelerated digital transformation. Positive experiences with new technologies were reported when they were not merely substitutions for conventional teaching, but leveraged to augment, modify, or redefine teaching [18,19].

In an integrative review using a systematic approach, Turnbull et al. [20] examined 52 studies from February to October 2020. They observed that synchronous web conferencing tools emerged as substitutes for conventional teaching. Learning Management Systems (LMSs), while prevalent pre-pandemic, became pivotal for data distribution, communication, and evaluation. Social media played a key role in ERT, extending teaching and learning environments, "perhaps because of its capability to represent classroom interactions in a familiar online form" [20]. However, the authors pointed to critical issues regarding corporate dependency and privacy concerns, as well as the lack of technological knowledge among lecturers, which often led to missed opportunities to enrich students' learning environments.

Systematic reviews of ERT in higher education, such as those by Foreman-Brown et al. [21] and Sum and Oancea [22], that focus on lecturers and investigate individual factors in conjunction with lecturer identity provide valuable insights and have paved the way for further research. However, based on the scope of previous reviews (see Table 1), there remains a gap to further explore the intricacies of individual factors and how lecturers used educational technology in their ERT efforts.

Table 1. Prior reviews on ERT in higher education (selection).

Author(s)	*n*	Date of Search	Themes
Abu Talib et al. (2021) [17]	47	October 2020	Advantages and disadvantages of technology integration in ERT
Divjak et al. (2022) [23]	18	July 2021	Flipped classroom in ERT
Foreman-Brown et al. (2022) [21]	36	November 2020	Lecturer identity and professional development
Ndibalema (2022) [9]	11	Not specified	Individual hurdles for lecturers and students, and institutional challenges in developing countries

Table 1. *Cont.*

Author(s)	*n*	Date of Search	Themes
Rodriguez and Pulido-Montes (2022) [24]	44	March 2022	Technology in ERT: support, tools, services, and media types
Stewart (2021) [25]	38	October 2020	Experiences, digital divide, technological and pedagogical competence, mental health, and didactical adaptation
Sum and Oancea (2022) [22]	32	January 2021	Integrating technology in ERT: experiences, attitudes, sociotechnological issues, institutional and individual factors, pedagogies, and peers
Torres-Caceres et al. (2022) [26]	45	July 2021	Teaching methods, technological knowledge, and technology for ERT
Turnbull et al. (2021) [20]	52	October 2020	Integrating technology into ERT: synchronous and asynchronous modes, technological issues, social media, as well as technological and pedagogical knowledge

Given this, the present systematic review seeks to take the understanding of this area one step further. It addresses this gap by providing an updated, comprehensive, and theoretically informed perspective on the individual factors that influence lecturers' ERT and their use of educational technology. The emphasis on qualitative evidence facilitates the exploration of subtleties and contexts that previous reviews may have overlooked or have not covered sufficiently, thereby providing an added layer of insight. This approach enriches the scholarly discourse on ERT by contributing a nuanced understanding of the dynamic between an individual and educational technology.

3. Theoretical Framework

This systematic review examines how university lecturers adapted to the ERT environment using a number of interconnected theories. Each theory illuminates distinct aspects of online teaching during the pandemic and educational technology use, unified in Bandura's model of triadic reciprocity, which captures the interaction between individual factors, behavior, and environment: (1) The Technology-Mediated Learning Theory (TMLT) links lecturers' attitudes and beliefs with the use of educational technology and explores the extent to which learning affordances are created. (2) The Technological Pedagogical Content Knowledge (TPACK) model further refines the knowledge dimensions that are necessary for effective technology integration. (3) The Technology Acceptance Model (TAM) establishes a connection between effort and performance experiences with technology. Lastly, (4) the Substitution, Augmentation, Modification, and Redefinition (SAMR) model enables the classification of these affordances based on their impacts on transforming teaching and learning practices (see Figure 1).

Bandura's Social Cognitive Theory [16,27] facilitates a theoretically informed understanding of lecturers' behavior in novel situations. This model contends that behavior, environment, and individual factors depend on and impact each other. For instance, institutional factors—e.g., the availability of resources, technologies, and support—can influence lecturers' teaching practices. Conversely, lecturers themselves can shape the learning environment and aspects of the institution by reflecting on their own practices, flexibly adapting, seeking support, and implementing new ideas. Active technology utilization can reshape teaching, creating effective learning environments.

(1) Bower's [3] TMLT elaborates on the model of triadic reciprocity. The TMLT captures the reciprocal relationship between the individual beliefs, knowledge, and digital competence of lecturers and students; the affordances of technology; and the teaching and learning environment. The TMLT posits that effective technology integration is not simply a matter of adding technology to existing teaching practices, but rather a process of leveraging technology to support student learning through a reciprocal relationship between the lecturer, the students, and the mediating technology itself. Lecturers can

influence the availability of technologies, for example, by making requests to the center for teaching, making personal investments, or exchanging with peers. With the essential techno-pedagogical knowledge, the integration of technology can enhance students' learning success [28].

(2) The TPACK model [29] complements the TMLT by identifying the knowledge and competence that lecturers need to integrate technology effectively, encompassing three overlapping domains: technological knowledge (TK) about how to use technology for learning; pedagogical knowledge (PK) on successful teaching strategies; and content knowledge (CK) about the subject. Effective technology integration demands a balanced interplay of these realms [30]. A qualitative study by Kushner Benson and Ward [31] examining lecturers' practices within the TPACK framework found that possessing encapsulated knowledge in these domains does not ensure enhanced student learning via technology. Instead, the "integrated knowledge supports a process of understanding technology within the context of pedagogy and content rather than an isolated set of skills or knowledge" [31].

(3) The Technology Acceptance Model (TAM) posits that perceived/experienced performance and effort shape lecturers' intentions to use technology [32]. The TAM has been extended to include self-efficacy and experience as variables [33]. The model offers insights into lecturers' acceptance and subsequent adoption, informing the development and implementation of technology solutions that are more likely to be embraced and integrated into teaching [34,35]. Notwithstanding its wide use [36], TAM has been criticized for underestimating/overlooking teaching affordances and its insufficient focus on the impact that technology has on learning. It has, however, been adapted for the ERT context [37].

(4) Lastly, the SAMR model, introduced by Puentedura [38], provides a practical framework for evaluating the role of technology in transforming teaching practices. Studies based on SAMR reveal that lecturers tend to integrate technology as a means to substitute aspects of conventional teaching practices, for instance delivering content online instead of on paper [18,19]. Yet, the effective adaptation to ERT is not merely substitutional; it also relies on individual factors, including innovation propensity, technology acceptance, and teaching perspectives [11]. In line with the model of triadic reciprocity, the research further found that course factors, among them media synchronicity, course modification, and time spent on the course, mediated the influence of individual factors on the adaptation of teaching practices.

Joo et al. [39] showed, in a quantitative study with 296 preservice teachers, that the TPACK model and teaching self-efficacy influence the intention to use educational technology, mediated by perceived usefulness and ease of use. This research provides evidence of the complex interplay of multiple individual factors for the use of educational technology, thus affirming the reliability of the proposed theoretical framework for this systematic review. In summary, these models offer a framework for understanding individual factors affecting lecturers' adaptation to ERT as well as their use of educational technology.

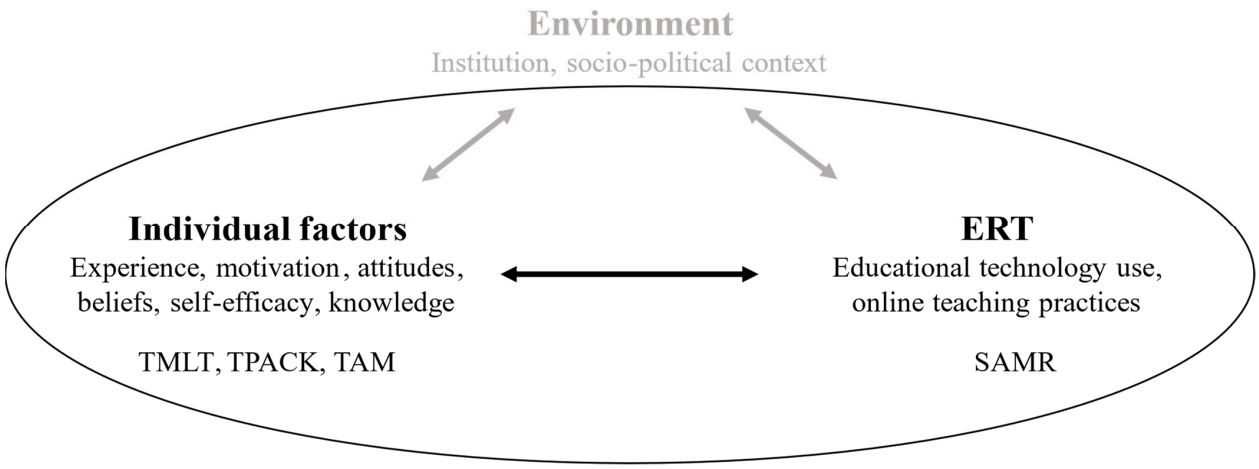

Figure 1. Three determinants of triadic reciprocity on individual factors and ERT.

4. Purpose of the Study and Research Questions

Lecturers, facing exceptional demands [40] and personal stress [41], have been key in enabling students to continue education through ERT [42]. This study therefore aims to synthesize key findings from qualitative evidence on ERT, providing a comprehensive overview to researchers and offering practical implications for university practitioners. The findings from this study are anticipated to inform future policies, institutional strategies, and individual practices for successful ERT implementation under various circumstances, extending beyond emergency situations as in the case of the COVID-19 pandemic.

Bandura's [16,27] model of triadic reciprocity serves as a heuristic model to capture pertinent factors within the ERT context. By further drawing on the TMLT [3], TPACK model [29], and TAM [32,43], a robust theoretical framework underpins this systematic review. The combined use of these models will help to identify and articulate the individual factors influencing university lecturers' ERT and their educational technology use. The following research questions will be addressed with the narrative synthesis of qualitative evidence:

RQ1. What individual factors facilitated or hindered university lecturers' switch to ERT during the COVID-19 pandemic?

RQ2. How was educational technology used for ERT during the COVID-19 pandemic?

5. Methodology

This systematic review employs a research methodology designed to systematically identify, appraise, and synthesize existing research studies to address specific research questions. This approach facilitates a comprehensive, unbiased, and reliable summary of the current evidence on a particular topic [44]. To ensure a rigorous methodology, this narrative synthesis adheres to the guidelines set forth by Petticrew and Roberts [45] and Gough et al. [46]. Additionally, this systematic review aligns with the PRISMA 2020 statement [47–49], a standard that enhances the quality, transparency, and replicability of systematic reviews. This adherence guarantees that the review upholds the best practices for conducting and reporting systematic research, enabling others to reproduce or build upon the work in future studies.

5.1. Inclusion and Exclusion Criteria

This systematic review concentrates on qualitative research examining lecturers' use of educational technology during ERT and the factors that facilitated or hindered them to use educational technology. To be considered, the studies had to clearly differentiate between lecturers and other participant groups, including students, lecturers, and administrators, in their data analysis and discussion of results.

The included publications had to be peer-reviewed, ensuring they were thoroughly scrutinized by experts in the field, and they had to be published in English or German no earlier than 2020. The language selection was based on the researchers' proficiency, although it introduced potential language bias. To ensure high-quality articles were included, the author employed APA Journal Article Reporting Standards [50] for qualitative research to evaluate methodological rigor.

Excluded from this review are studies whose data stem from the authors themselves, opinion pieces, editorials, reflections, and non-peer-reviewed works e.g., books, book chapters, and conference papers. An overview of the inclusion and exclusion criteria is provided in Table 2.

Table 2. Criteria for inclusion and exclusion in the systematic review.

Criterion	Inclusion	Exclusion
Focus of study	ERT	Conventional teaching
Population	Lecturers	Other participants
Publication date	2020 and up to April 2022	Prior to 2020
Publication language	English or German	Other languages
Publication type	Peer-reviewed scholarly articles	Books, reviews, reflections, opinions, book chapters, grey literature, and non-peer-reviewed articles
Study context	Higher education	K-12 and other contexts
Study design	Qualitative: in-depth enquiry	Quantitative and mixed methods
Study information	Empirical research that meets APA Journal Article Reporting Standards	Reflective, theoretical, conceptual articles, systematic reviews, and articles that do not meet APA Journal Article Reporting Standards

5.2. Search Strategy and Data Sources

In collaboration with a certified data information specialist, the search strategy was developed in line with PRISMA-S guidelines [49]. The search string included various terms related to teaching during the COVID-19 pandemic, higher education, lecturers, and technology:

- (COVID-19 OR pandemic OR "emergency remote");
- AND ("higher education" OR universit* OR college* OR "tertiary education");
- AND (faculty OR lecturer* OR teacher*);
- AND (technolog* OR ICT OR computer* OR tool*).

To account for the specific features of each database and to ensure accurate search results, database-specific search syntaxes were developed. These syntaxes are provided in Appendix A.

Seven scientific databases were selected for the systematic literature search due to their relevance to the field of education and their extensive coverage of scientific literature: Scopus (n = 1932), Web of Science (n = 1793), COVID-19 Global Literature (n = 1617), Education Resources Information Centre (ERIC, via Ovid, n = 841), PsycINFO (via Ovid, n = 146), Teacher Reference Centre (n = 22), and PSYNDEXplus (via Ovid, n = 8). The initial search on 22 December 2021 yielded 4899 publications, of which 2179 duplicates were removed. An additional corpus was built up to 6 April 2022 via an automated alert set for the databases. After removing 179 duplicates, 1287 publications, including 6 articles from citation searching, were added to the pool (n = 4007). In total, the two searches yielded n = 6365 articles before removing duplicates and n = 4007 after removing duplicates. A detailed PRISMA flow chart is attached in Appendix B.

5.3. Screening

The screening process was performed using the free version of the web application Rayyan [51]. After the title and abstract screening, 1038 articles underwent full-text screening. After checking for eligibility, a corpus of 49 articles was further analyzed.

To ensure consistency in the screening process, the author and two assistant reviewers conducted a series of blind screenings. Ten studies were randomly selected and reviewed independently according to the inclusion and exclusion criteria. If the first criterion was not met, the publication was immediately excluded, and so on. This training continued until full agreement on the screening decisions was reached among the three reviewers. This process was repeated before the full-text screening. Cases that were unclear were marked as such and discussed and decided upon at a later date.

5.4. Analysis and Synthesis

The qualitative research software, MAXQDA 2022, was employed for data extraction. The coding system was deductively derived from the theoretical framework. The codes were split into two poles—facilitators and barriers to ERT—based on the presence or absence of individual-level factors delineated in the theoretical framework (see Appendix C).

Both the author and an assistant rater performed line-by-line coding of the results sections of the articles. Prior to this, descriptors including author count, publication year, article title, journal name, author keywords, sample size, population, country, discipline, theory/model, data collection method, and data analysis method were compiled.

To confirm inter-rater reliability, the coding outcomes of five randomly chosen articles were examined using Cohen's kappa (κ) [52], a coefficient used to assess the agreement among raters' decisions. Coding consistency between rater A and rater B for content analysis of the result sections was $\kappa = 0.72$. This indicates good inter-rater reliability, according to Landis and Koch [53].

6. Findings

6.1. Description of the Included Studies

In the final corpus of 49 qualitative studies, data obtained from multiple disciplines was 53% ($n = 26$); data from single disciplines (for example English as a Foreign Language (EFL) ($n = 8$), teacher education ($n = 5$), or health sciences ($n = 4$)) made up the remaining 47% of the corpus (Table 3). In terms of the sample size, 19 studies reported interviewing fewer than 10 lecturers, 20 studies reported interviewing 10 to 20 lecturers, and 10 studies reported more than 21 lecturers (Table 4). The data originated from diverse locations, including four studies each from China, Türkiye, and the USA, and three studies each from South Africa and Vietnam (Table 5). The most common method of data collection (more than half of the studies, $n = 28$) was semi-structured interviews, followed by in-depth interviews ($n = 9$) and open-ended surveys ($n = 8$) (Table 6). The most common method of data analysis was thematic analysis ($n = 35$), while fewer studies used methods like content analysis ($n = 6$), interpretative phenomenological analysis ($n = 4$), and Grounded Theory ($n = 3$) (Table 7).

Table 3. Disciplines of data origin.

Discipline	# of Studies	% of Total Studies
Multi-disciplinary	26	53
EFL	8	16
Teacher Education	5	10
Health Sciences	4	8
L2	1	2
Chemistry	1	2
Economics	1	2
Mathematics	1	2
Social Work	1	2
Sport Sciences	1	2
Total	49	100

Table 4. Sample sizes.

Sample Size	# of Studies	% of Total Studies
1–5	6	12
6–10	13	26
11–20	20	40
21–40	8	16
>40	2	4
Total	49	100

Table 5. Geographic location of data origin.

Country	# of Studies	% of Total Studies
China	4	8
Türkiye	4	8
USA	4	8
South Africa	3	6
Vietnam	3	6
Others	31	63
Total	49	100

Table 6. Method of data collection.

Method	# of Studies	% of Total Studies
Semi-structured Interview	28	56
In-depth Interview	9	18
Survey	8	16
Structured Interview	2	4
Focus Group	1	2
Unstructured Interview	1	2
Total	49	100

Table 7. Method of data analysis.

Method	# of Studies	% of Total Studies
Thematic Analysis	35	71
Content Analysis	6	12
Interpretative Phenomenological Analysis	4	8
Grounded Theory	3	6
Phenomenography	1	2
Total	49	100

The sample in 36 studies was composed solely of lecturers, while 13 studies reported findings from multiple data sources, namely lecturers, students, and administrators. The theoretical underpinnings of the articles were somewhat ambiguous, with 24 studies not identifying a theoretical reference. The remaining studies each employed a different theoretical framework. The absence of theory in studies investigating ERT during the COVID-19 pandemic has been noted before [22,54–56]. See Appendix D for an overview of the included articles.

6.2. Individual Factors That Contributed to Lecturers Transitioning to Emergency Remote Teaching

The question under exploration is as follows: what individual factors facilitated or hindered university lecturers' switch to ERT during the COVID-19 pandemic? In addressing RQ1, this systematic review focuses on individual factors construed as lecturer characteristics that, to some extent, exert influences on teaching. The findings are conveyed through a narrative synthesis, adhering to the standards for qualitative research publications. In the following section, individual factors that either facilitated or hindered the transition to ERT are presented.

6.2.1. Prior Experience

Twelve studies reported on lecturers' previous experiences with technology or online teaching. Most of this experience came from using an LMS [57–59]. Sederevičiūtė-Păciauskienė et al. [60] highlighted how lecturers perceived their conventional teaching experiences as good preparation for ERT, and how lecturers with varied experiences found

it easier to navigate changing conditions. In contrast, significantly more studies (n = 21) underscored the lack of experience among lecturers, which is also reflected in the frequency of the coded segments (Figure 2). This lack of experience was commonly portrayed as a challenge, leaving many lecturers feeling overwhelmed and powerless [57,61–66]. One lecturer quoted by Roy et al. [67] experienced this new situation as a learner, and thus in the ranks of his students, stating, "This is the first time I have learnt a new way of teaching and passing a new journey of learning with my students" (p. 5).

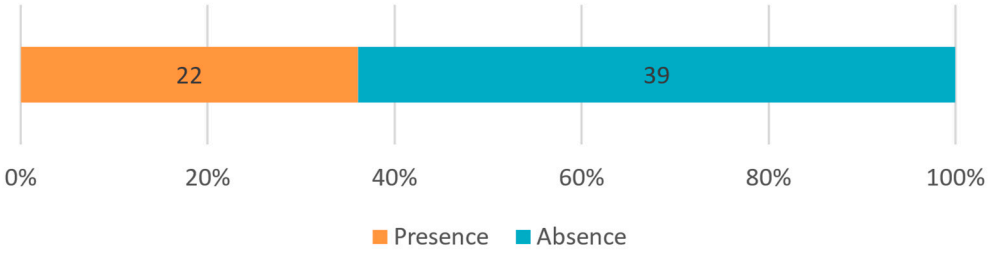

Figure 2. Coding frequency of prior experience. Note: presence in 12 articles; absence in 21 articles. Total: 61 codings. In the figures of this section, the facilitators are in orange on the left of the graphs; the barriers are in blue on the right of the graphs. Number in the bar: coding frequency.

6.2.2. Motivation

The lack of experience was often offset by lecturers' motivation to adapt to ERT. In 21 studies, lecturers recognized the extraordinary circumstances and the accompanying challenges, such as additional (uncompensated) work hours. Yet, ensuring the continuity of quality education emerged as a significant motivating factor to learn online teaching methods and integrate technology (Figure 3). Consequently, lecturers often explored new technologies and teaching practices via trial and error [61,62,68–70]. The studies also highlighted extrinsic motivational factors, primarily the subjective norm, referring to behavior adaptation based on perceived social pressure. This factor is considered a predictor of behavior intentions, confirming the theoretical assumptions in the TAM [71].

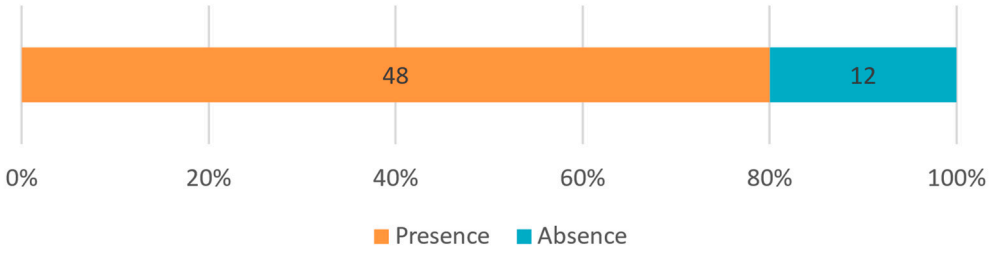

Figure 3. Coding frequency of motivation. Note: presence in 21 articles; absence in 7 articles. Total: 60 codings.

However, at the heart of lecturer motivation was student learning, as noted by Plummer et al. [72]: "… the real driver was that participants cared about the student experience and expectations…" (p. 8). Some lecturers perceived the situation as a window of opportunity for self-transcendence and the development of teaching practice, while others, finally able to use their digital and online teaching competence, felt invigorated [67,73,74]. Infrastructural and technological barriers, however, undermined motivation [57,75]. And some lecturers resisted the switch to online teaching, doubting its efficacy compared to conventional teaching practices [59,63,76,77].

6.2.3. Attitudes and Beliefs

Although attitudes and beliefs are somewhat intertwined, they can be distinguished. Attitudes indicate a favorable or unfavorable disposition; beliefs refer to conceptions that can be true or false. The frequency distribution of codes regarding lecturers' attitudes (see

Figure 4) and beliefs (see Figure 5) indicates a general negative sentiment towards ERT and teaching with technology. In terms of positive attitudes towards technology in teaching, some lecturers had already developed positive attitudes prior to the pandemic. For the majority, however, it was the positive experiences with ERT, including the diverse tools and enriching opportunities, that fostered their acceptance [57,68,78,79]. For a few, the implementation of ERT was the culmination of a planned improvement of their techno-pedagogical knowledge [62,80–82].

What lecturers valued most was the temporal and spatial flexibilities that came with ERT, adapting synchronous and asynchronous teaching phases to suit their own and students' needs and circumstances [66,72,83,84]. Additionally, lecturers reported that ERT enhanced their connectedness with students in novel ways; for example, the enabled cameras made individuals and their surroundings more tangible than teaching in the campus classrooms, thereby breaking down social barriers [85,86].

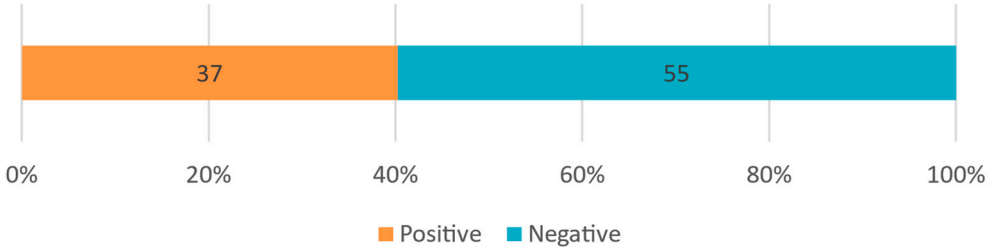

Figure 4. Coding frequency of attitudes. Note: positive in 22 articles; negative in 24 articles. Total: 92 codings.

Negative attitudes towards ERT primarily stemmed from two concerns. Firstly, lecturers worried that students would be unprepared for the transition, thereby resulting in lower learning outcomes [61,62,64,68,87]. This dovetailed with a perceived loss of control over student achievement and assessment [78,79,83,88]. Secondly, some believed that ERT could not replicate the effectiveness of a conventional learning environment: "Two professors (. . .) expressed purely negative views of online learning. (. . .) referred to online learning as a "disservice to our profession" and "not the true way of learning"" [89]. Another perspective was added by studies with lecturers from disciplines with work practice: they found ERT frustrating due to the loss of the hands-on practice, which students needed to achieve learning progress and set teaching goals [67,90].

Regarding beliefs, lecturers reported various views on the relations between student achievement and ERT effectiveness. Lecturers posited that—with all necessary resources readily accessible—students were well equipped to meet learning outcomes and enhance their digital literacy [66,82,91–93]. In addition, the connection between lecturers and students became more transcendent as chat applications were established. The virtual distance was seen as beneficial for introverted students, reducing classroom exposure [66,80]. Other studies suggested that lecturers believed that ERT and, more broadly, educational technology, could enhance student learning [61,64,78,88,94].

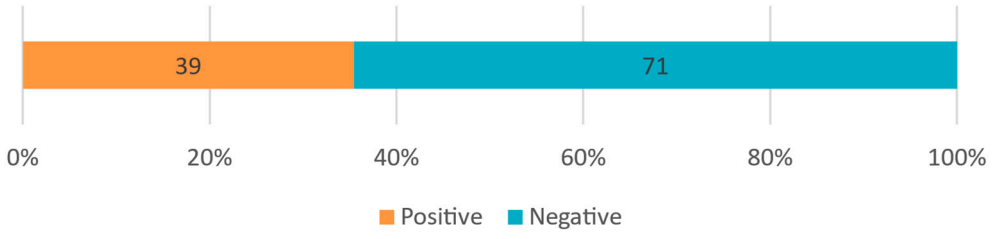

Figure 5. Coding frequency of beliefs. Note: positive in 23 articles; negative in 25 articles. Total: 110 codings.

However, as Figure 5 illustrates, over 60% of the coded segments revealed negative beliefs about ERT and technology-infused teaching. Lecturers feared that the student learning outcomes would deteriorate under ERT due to the loss of interpersonal classroom interaction that limited immediate feedback as well as tailored responses to individual student needs. Feeling that they were teaching a black box, lecturers were uncertain of student cognitive engagement [61,65,68,82,93]. In addition, they doubted the reliability of assessment scores, believing that online teaching could not yield comparable results to conventional teaching and suspecting potential student dishonesty [65,66,81].

6.2.4. Self-Efficacy in Emergency Remote Teaching

In addition to positive and negative subcodes on self-efficacy in ERT, an "adaptability" subcode emerged, accounting for 86 of 175 coded segments across 27 articles. Lecturers leveraged diverse strategies to maintain lessons in ERT, drawing on a variety of resources. Accordingly, they reported being inquisitive and self-taught when it came to using online teaching tools and pedagogies. This autodidactic drive focused on the discovery, implementation, and evaluation of suitable tools [57,63,69,72,74,91,94–96]. Other studies reported that lecturers swiftly changed their attitudes to overcome reservations towards educational technology and ERT [67,74,94,97]. Further, their confidence in online teaching grew with accumulated ERT experience [66,82].

Thirty segments from 14 studies showed lecturers' positive self-efficacy beliefs, displaying readiness and confidence to surmount pedagogical and technological barriers and to sustain education [58,65,68,70]. Positive experiences with online teaching and new technology bolstered self-efficacious teaching, which was often boosted by supportive student and peer feedback [69,84].

Conversely, 21 studies highlighted lecturers' lack of self-efficacy related to ERT (59 coded segments). These studies reported lecturers' difficulties in transitioning to ERT and their anxieties about using technology, with a lack of mastery experiences causing emotional and professional strain [58,62,63,69,78,91,98]. Lecturers who lacked self-efficacy felt that their teaching quality and the learning outcomes significantly suffered, with studies also highlighting lecturers' struggles to adapt to ERT, evolve their teaching practices, and develop personal competencies for online teaching [66,72,83].

6.2.5. Pedagogical and Technological (and Content) Knowledge

Pedagogical knowledge accounted for 18% of the total coded segments (192 of 1097, as shown in Figure 6). Most articles reported that lecturers had the pedagogical knowledge that was necessary to switch to ERT, including knowing how students construct knowledge in a social context and how to achieve learning goals with the most appropriate teaching methods [30]. Lecturers compared conventional and ERT practices to discern student needs. These were manifold, as students not only faced struggles with technological hindrances and demanding requirements regarding self-regulated learning, but also the compatibility of the promptly coalesced studying and private life. Lecturers demonstrated flexibility, offering guidance beyond regular working hours. They rebuilt relationships with students in the online space to mitigate anxiety and enhance well-being. Web-conferencing platforms emerged as crucial, facilitating communication, fostering a classroom-like atmosphere, and encouraging more authentic social interaction than in asynchronous settings [61,68,78,85,94].

Lecturers reported a perceived decline in student engagement, which they addressed by adapting their teaching strategies. They fostered cognitive activity during synchronous sessions by introducing real-life problems, by establishing a multimodal approach to activate multiple cognitive channels, and by simplifying content into digestible chunks, supplemented with humor, storytelling, and concise explanations of key concepts. Additionally, lecturers began utilizing tools to augment their teaching and student learning, offering course materials in diverse formats, such as audio-visuals, educational videos, images, e-books, and open educational resources [64,69,82,91,95,99].

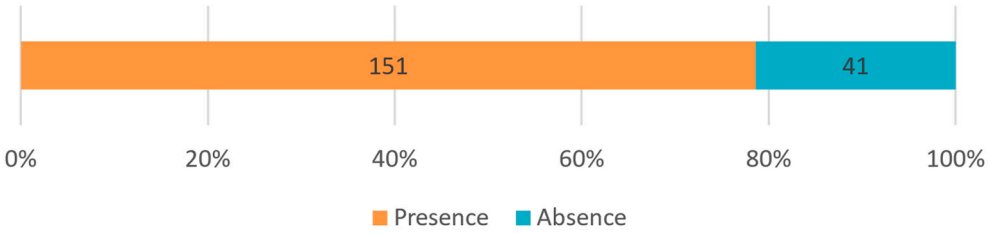

Figure 6. Coding frequency of pedagogical knowledge. Note: presence in 34 articles; absence in 19 articles. Total: 192 codings.

Furthermore, lecturers adapted their practices by implementing new strategies, like flipped classrooms and project-based approaches, aiming to center the students in the new learning environment. Lecturers would break down projects, enabling students to handle the work remotely while maintaining close guidance. Although the course objectives remained, lecturers began to offer differentiated or even individualized learning paths and began to encourage students to take an active role in their own learning [57,58,91,98,100].

Lastly, lecturers found new ways to monitor and assess students' learning progress. The use of student-centered methods prompted lecturers to reassess and facilitate social learning, particularly through peer feedback. Immediate student–student but also lecturer–student feedback was incorporated into synchronous sessions, allowing lecturers and students to track progress and understanding. Digital tools such as quizzes with automated scoring facilitated repeated and engaging summative assessments. Lecturers dealt with attempts to cheat by redesigning the assignments. They introduced open-book tests, allowed resource usage, imposed time limits, and changed the types of questions [76,91,93,95,100].

On the other hand, however, studies revealed that lecturers faced multiple challenges in adapting teaching practices due to a lack of pedagogical knowledge. Lecturers felt pressured to move to ERT quickly and therefore struggled to find effective teaching strategies, motivate students, and ensure active class participation, and they found it hard to provide timely feedback during synchronous sessions due to information overload. The online environment hampered some lecturers' abilities to monitor students' responses and adjust their teaching accordingly. In addition, reduced student feedback, through non-verbal cues and interaction, complicated ascertaining students' learning progress and psychological needs. In this vein, studies showed that a sense of personal connection was lost, leading to constraints such as reduced spontaneous discussions and peer collaboration compared to conventional settings [58,59,72,78,82,101].

Studies further exposed lecturers' struggles in adapting their classroom management to ERT. Organizing and conducting online classes with a large number of students presented hurdles to adapting and conveying syllabi, contents, and curricula. Changes in the institutional or classroom levels, for example course rules and regulations, expectations, or ethical considerations that accompanied ERT, were neither evaluated nor communicated sufficiently. Lastly, lecturers felt strained by an increased workload and complexity due to newly introduced educational technology and additional responsibilities [61,67,94].

In contrast to pedagogical knowledge, technological knowledge was frequently identified as deficient (see Figure 7). Notwithstanding this deficiency in technological knowledge, studies showed that lecturers successfully integrated a range of technologies into their ERT. These included web-conferencing platforms (e.g., Zoom and Google Meet), various LMSs (e.g., Moodle, ILIAS, Blackboard, Canvas LMS, and Microsoft Teams), Quizlet, Padlet, different social media platforms (e.g., Facebook, Instagram, LinkedIn, and Twitter), collaborative text production tools (e.g., Google Docs), virtual simulation applications, mobile device apps, educational videos, open educational resources, and learning analytic functionalities to assess student activity [57,61,100–102]. To achieve their teaching goals, lecturers combined technologies. They also utilized features to create an interactive and appropriate learning environment for the students [69,93,99].

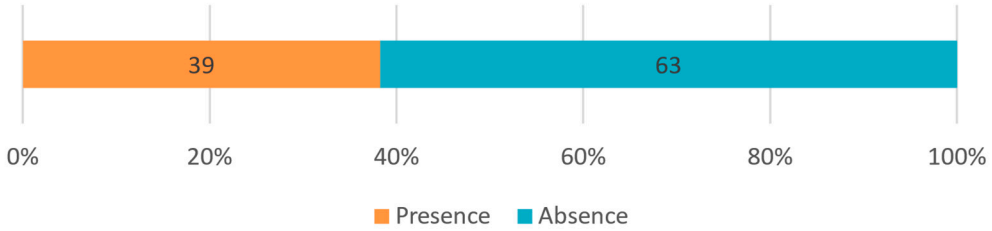

Figure 7. Coding frequency of technological knowledge. Note: presence in 17 articles; absence in 23 articles. Total: 102 codings.

However, lecturers reported challenges in identifying appropriate tools for ERT. The studies highlighted a lack of technological knowledge and prior experience with educational technology and online teaching [57–59,63,66,101,102]. Therefore, lecturers felt inadequately equipped for the switch to ERT, reporting insufficient training in online teaching and the use of their institutions' LMSs [59,64,75]. Their limited technological knowledge often led to a reliance on students for technical assistance and a dependency on familiar software [70,103]. Senior lecturers expressed higher levels of anxiety and dissatisfaction through ERT and grappled with the digital divide and a feeling of being left behind in technological advancement [67,77,102].

As for content knowledge, the corpus provided minimal to no evidence.

6.3. Use of Educational Technology for Emergency Remote Teaching

The question at hand is as follows: how was educational technology utilized for ERT during the COVID-19 pandemic? In addressing RQ2, the following section will detail the experienced effort and performance as well as the ways in which technology related to the substitution, augmentation, modification, and redefinition of teaching.

6.3.1. Experienced Effort and Performance

Although lecturers expressed concerns about the effort required to learn and understand new educational technologies, many studies showed that a diverse array of tools was adopted for ERT and were found to be user-friendly as well as accessible. This relative effortlessness made it easier for lecturers to swiftly familiarize themselves with these digital tools [69,93,101]. Lecturers highlighted the value of pre-existing educational materials that eased the use of technology, as this reduced workload and facilitated teaching strategies. Lecturers put to use videos that they recorded as a means to minimize repeated explanations of course content and to streamline teaching practices [64,101]. ERT was seen as advantageous because it saved time and energy that were previously spent commuting, thereby lowering the effort involved in their work [64,65,81]. Furthermore, lecturers reported that some learning objectives could be effectively fulfilled in online lab sessions or in patient care activities [64,65,81,93]. Overall, lecturers were reported to find online teaching technologically straightforward, and they found teaching platforms easy to navigate.

On the other hand, many studies also reported significant and diverse technological challenges that demanded considerable effort from lecturers. One such factor was the creation of online course material—including scriptwriting, multiple attempts at video recording, and redesigning assignments—which was perceived as excessively time-consuming. A further daunting task was integrating new tools, particularly if mandated by the administration and without prior training [59,91,101]. This added to daily screen time, resulting in cognitive overload, stress, and anxiety. Working from home often blurred work–life boundaries and extended working hours [63,65,77,101]. Lecturers also felt continuously connected, accessible through multiple channels [81]. Moreover, the lack of student feedback on teaching made it challenging to discern the impacts of their efforts on learning [65,93,95].

The performance experience codings (n = 126) substantially surpassed the effort experience codings (n = 72, see Figure 8). Positively, after extensively exploring tools for online teaching, lecturers selected those they deemed most conducive to their personal

teaching goals. This led to the use of various tools and platforms, including social media applications, traditional emails, and LMSs (notably Moodle). These platforms were commended for unique benefits that enhanced the performance experience, such as facilitated communication, efficient discussions, and stability [59,88,95]. Drawing tablets proved to be useful for creating educational videos [78,81,104], with platforms like Flipgrid used for sharing and discussion. Pre-recorded videos offered the advantages of flexible access and rewatching possibilities for students [64,81,82].

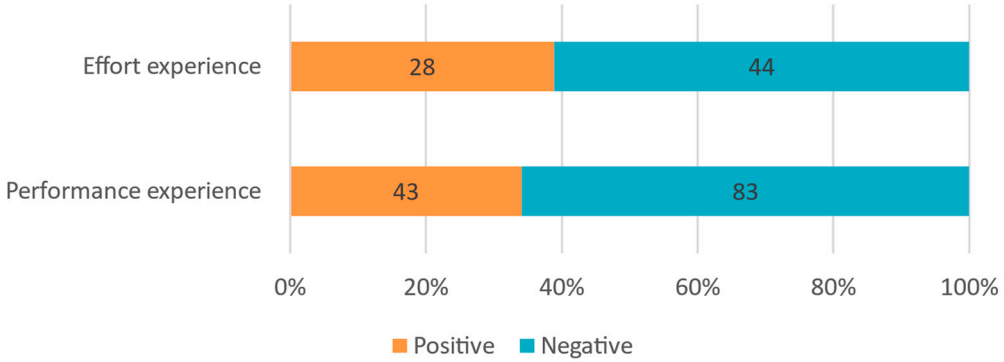

Figure 8. Coding frequency of effort and performance experiences. Note: positive effort experiences in 16 articles; negative effort experiences in 23 articles. Total: 72 codings. Positive performance experiences in 22 articles; negative performance experiences in 25 articles. Total: 126 codings.

Applications and platforms that were broadly used and freely available—such as WhatsApp and Facebook—were viewed as particularly effective due to their group and chat functionalities. Along with web conferencing platforms, these tools were reported to perform well in strengthening both lecturer–student and student–student communities. Lecturers noted enhanced affordances through informal online interactions, like post-lesson chats and office hours [63,65,68,84].

Negative performance experiences were reported for technical difficulties that hindered a switch to ERT, negatively impacting interaction and the dissemination of information. One particular negative performance experience concerned network instability, which would lead to connection losses among lecturers and students. It would take an unreasonable amount of time to upload material, and the infrastructure would be overwhelmed by the demand. In this aspect, lecturers reported on a digital divide, resulting in unequal and inappropriate conditions due to a lack and insufficiency of equipment, for both lecturers and students. Against this backdrop, lecturers found themselves in the role of a technician, troubleshooting and helping students [64,78]. A second theme, depending on the geographic region, was that lecturers struggled with the limitations of free or open-source platforms like Zoom, whose basic versions have very limited functionality. Generally, lecturers criticized the lack of functionality and the inefficiency of various LMSs [59,76,88,91,93]. Security and privacy concerns also emerged, along with fears of data exposure and malware in downloadable content [59]. Third, the studies showed that lecturers could not leverage the possibilities of the tools due to the lack of institutional techno-pedagogical support [59,75]. In sum, these barriers disconnected lecturers and students and eroded the sense of community. Students would vanish behind a black box, unreachable for lecturers to connect with, to assess progress in learning, and to deliver feedback and support in a timely manner [65,81,88,101,104].

Figure 9 provides an overview of the individual facilitators and barriers to ERT. Evidently, adaptability, pedagogical knowledge, and motivation emerge as facilitators. On the other hand, a lack of prior experience and technological knowledge, negative attitudes and beliefs, as well as effort and performance with technology are barriers to ERT and the use of educational technology.

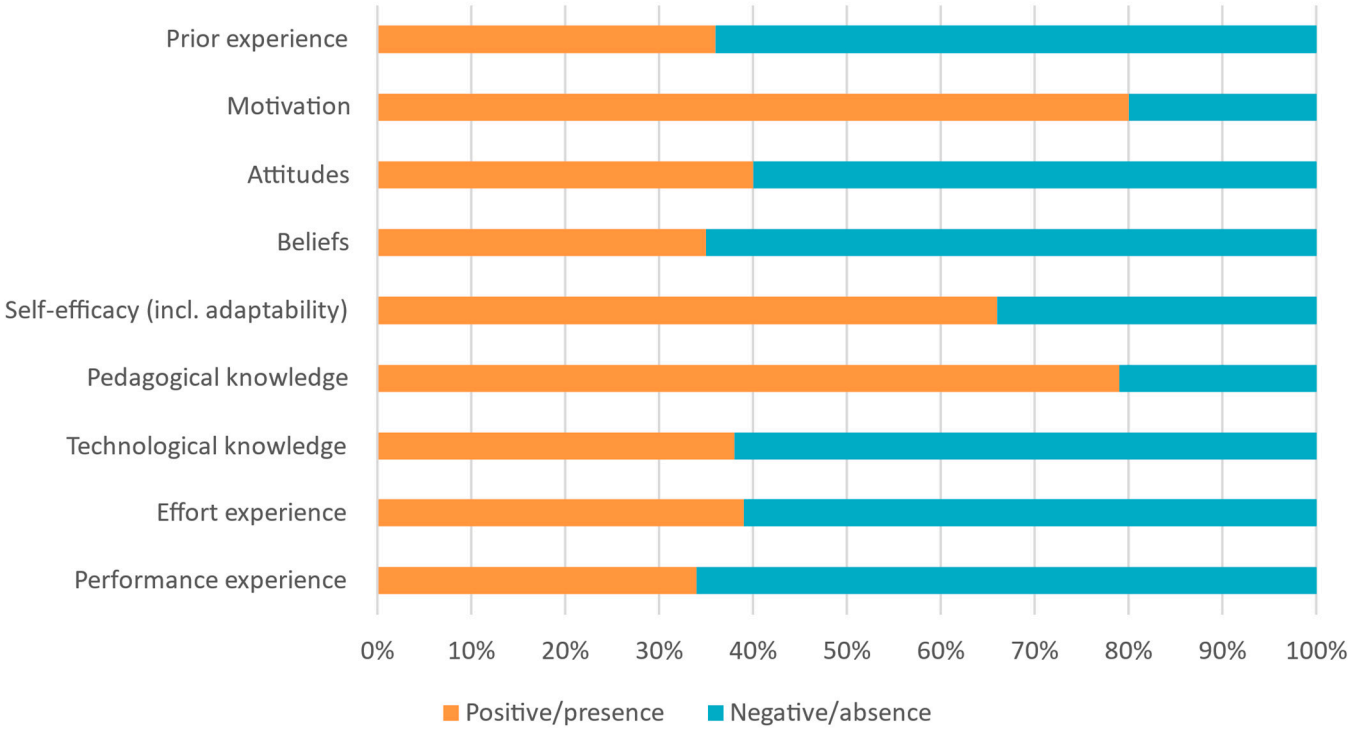

Figure 9. Overview of facilitators/barriers in percentages. Note: the percentages correspond to frequencies within a code.

6.3.2. Substitution, Augmentation, Modification, and Redefinition

Analyzing the integration of educational technology into ERT with the aid of the SAMR model delivered the following frequency codings: substitution (n = 39, in 17 articles), augmentation (n = 50, in 17 articles), modification (n = 3, in 2 articles), and redefining (n = 0) (see Figure 10).

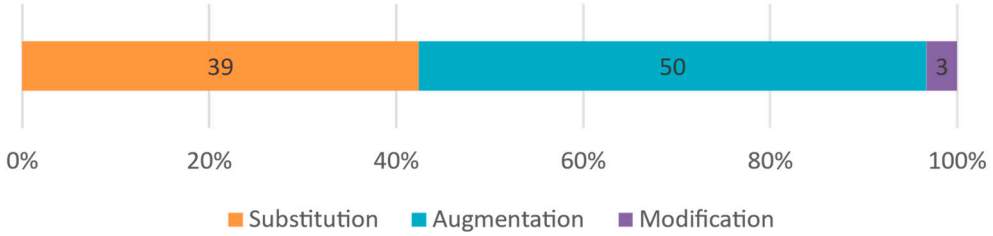

Figure 10. Coding frequency of SAMR. Note: substitution in 17 articles; augmentation in 17 articles; modification in 2 articles. Total: 119 codings.

Substitution: Lecturers primarily used educational technology to substitute previous teaching practices. Attempting to maintain continuity and familiarity, they transferred pre-pandemic modes of teaching to ERT with minimal alterations [68,69,89,98]. These lecturers used a limited variety of tools, primarily employing LMSs to upload existing materials and assignments, including lecture notes, presentations, and documents [58,59,88]. In the substitution mode, web-conferencing was used to simulate face-to-face interactions with students, replicating a conventional classroom [58,88,100]. The studies show that in many cases, lecturers merely transferred their conventional teaching practices, predominantly using presentation for lectures [67,78]. In a few instances, technologies like drawing tablets replaced traditional methods, such as chalkboard writing [78].

Augmentation: The augmentation of teaching via educational technology was the most frequently coded. The various tools that lecturers used to augment their teaching included podcasts, webinars, tutorials, and open resources for content delivery. Extending

the use of LMSs beyond conveying content, lecturers used these platforms to augment their teaching; they ensured continuous access to Supplementary Materials, and they fostered and enabled independent and individualized learning [61,68,82]. They innovatively created videos with in-video quizzes, links, and clickable content, showing their faces in a small frame [78,88,98,101]. Lecturers also used educational technology to create interactive environments, using real-time polling, encouraging discussions, and allowing for learning progress assessment. Forums, often integrated in the LMSs, promoted writing practice and peer feedback, enabling lecturers to adapt their teaching methods to students' needs [58,59,89,99]. Furthermore, lecturers used discipline-specific tools and applications: a science lecturer implemented a simulation software that allowed for the practice of laboratory work at home; a mathematics lecturer recorded his handwriting of mathematical equations while narrating and later uploading it for the students; and a language lecturer introduced an app for pronunciation practice [59,81,98,99].

Modification: Few studies showed lecturers modifying their teaching practices with educational technology. Alhawsawi and Jawhar [57] interviewed one lecturer who had leveraged learning analytics to monitor students' engagement with the course material in order to subsequently adapt their teaching and individualize instruction via feedback on progress. Zhu and Zhang [93] highlighted two cases in medical and public health disciplines that illustrate modification. In the first case, a lecturer used a virtual simulation software, Canadian Vista, to provide interactive educational videos. The students' performance would automatically be certified and graded by the time of completion. In the second case, despite the cost, a lecturer used 3D models to transfer laboratory learning into the online environment.

7. Limitations

As with any systematic review, the quality of synthesis heavily relies on the search strategy. Despite meticulous efforts in the selection of search terms and the development of the search string, relevant articles could be overlooked. To mitigate this limitation, an information specialist was consulted to appropriately adapt the search strategy, including field codes, to adhere to the specifics of each database [105].

The review included only blind peer-reviewed studies, thereby potentially overlooking high-quality original research or grey literature. Indeed, non-empirical discussions or reflective papers can also contribute significantly to the advancement of a research topic and knowledge generation, as illustrated in Hodges et al. [1]. Nevertheless, because it covered various databases, the initial corpus was comprehensive. Furthermore, the use of a highly sensitive search strategy aimed at capturing as many relevant publications prevented publications from falling through the cracks [45]. This sensitive searching strategy addressed the problems posed by imprecise terminology related to the ERT and to the use of educational technology in universities [55,106].

8. Discussion

8.1. Discussion of Results

This systematic review of qualitative evidence applied a comprehensive theoretical framework [3,16,29,32,38] to identify and discuss individual factors related to lecturers' use of educational technology in the context of ERT during the COVID-19 pandemic.

Relevant factors were identified through the theories induced to the model of triadic reciprocity [16] and categorized as facilitators or barriers to ERT. Overall, the individual lecturer's factors that were examined in this systematic review present an ambiguous picture of which factors can be classified as facilitators or barriers. Lecturer motivation, self-efficacy including adaptability codes, and pedagogical knowledge come forth as inherent facilitators for lecturers navigating the new ERT environment and using educational technology, as shown on the left side of Figure 11. Interestingly, these three factors may have been already at hand as resources for lecturers since no specific experiences or training in online teaching would be necessary to build up motivation to ensure education for students, self-efficacy in

terms of adaptability during uncertain times, and lastly, pedagogical knowledge, which functions as the basis for effective teaching.

Despite initial reservations and struggles with technology and pedagogical adaptations, a significant proportion of lecturers demonstrated remarkable adaptability, leveraging their pedagogical knowledge, and adopting new technologies to navigate this new educational landscape by self-learning and implementing online teaching tools. Interestingly, adaptability emerged as a significant aspect of self-efficacy in ERT [107,108]. Early positive experiences with ERT and the use of technology as well as positive feedback bolstered the self-efficacy beliefs of lecturers, thereby laying ground for effective teaching practices in the new environment [109,110].

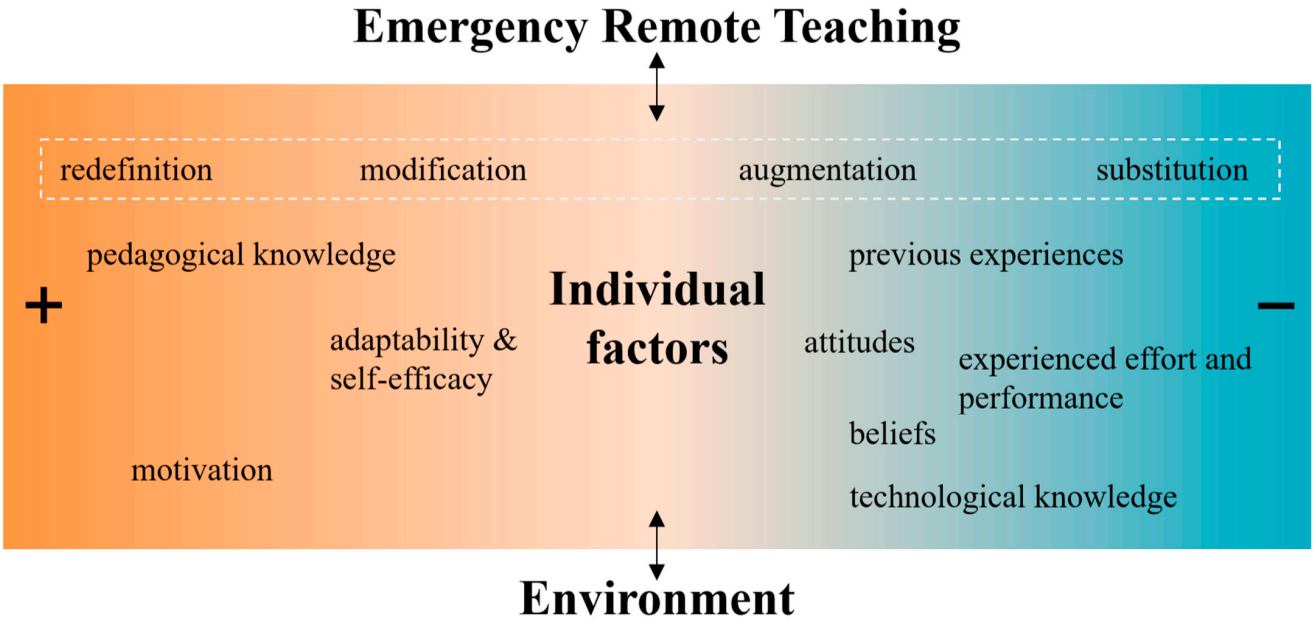

Figure 11. Overview of facilitating and hindering factors based on coding frequencies related to ERT on individual lecturer level within triadic reciprocity. Note: factors closer to the poles have greater positive/negative impacts on ERT and the use of educational technology, according to coding frequencies.

Barriers, illustrated on the right of Figure 11, had detrimental impacts on education during COVID-19. These included a lack of prior experience and technological knowledge, negative attitudes and beliefs towards educational technology, and negative effort and performance experiences with technology. Barriers were often reported in combination with more underlying factors, such as the time-intensive preparation of online course material, technological difficulties, concerns about student preparedness, and the (im)balance of work and personal life. Consequently, while most lecturers were able to substitute or augment their conventional teaching methods with digital tools, the potential for technology to fundamentally transform teaching practices remained largely untapped [28].

In the foreground, however, lie transformative barriers that concern negative attitudes and beliefs towards technology that are intertwined with the organizational and technological environment. Furthermore, the evident lack of previous experiences coupled with insufficient technological knowledge limited the adoption of educational technology for ERT. Lecturers doubted the effectiveness and quality of educational technology and online teaching [10,111]. Furthermore, the barriers appeared to be linked to prior experiences with online teaching and the use of educational technology. No or negative prior experience was reported to have a negative influence on the uptake of educational technology for ERT. According to Bandura [16], mastery experiences are the main source for positive self-efficacy beliefs. Therefore, with no experience at hand, lecturers had no chance to build up confidence in online teaching practices beforehand, depending on their institutions' digital capacities. The barriers are presumably intertwined to a large extent. With no

prior experiences and technological knowledge, the uptake of educational technology was reportedly a negative experience for lecturers [10]. This is reflected in the coding frequencies for experienced effort and the performance of technologies. Negative attitudes and beliefs towards technology contributed further to the spiral of reluctance of lecturers. As per the Technology Acceptance Model, this accumulation of negative views and experiences lowered the probability of lecturers' intentions to use educational technology in this extraordinary situation at all, and on another level, their actual usage [33].

In an online environment, insufficient learning affordances for students result from lecturers' individual factors [3]. The identified barriers above are therefore directly connected to the extent to lecturers' capacities to create engaging and effective learning affordances. Apparently, lecturers only made limited use of the available online teaching and educational technologies, as evidenced by the evaluation of the qualitative evidence with the SAMR model [19,38]. According to the results, lecturers resorted to substituting or augmenting conventional teaching activities for ERT. The latter may be attributed to the advanced basic functions of LMSs and web conferencing systems, allowing students, for example, to access recorded lectures at any time. Lecturers with prior experience and technological knowledge, however, were more likely equipped to utilize the full range of functions and tailor learning affordances in the ERT environment, resulting in a more personalized and stimulating learning experience for students.

In sum, lecturers transitioned to a unique teaching practice characterized by adaptability and transformation, known as Emergency Remote Teaching [1]. Initially, they sought to maintain functioning by establishing an online learning environment based on the available individual and environmental resources at hand. Secondly, the reviewed studies indicate that "nobody making the transition to online teaching under these circumstances will truly be designing to take full advantage of the affordances and possibilities of the online format", as accurately put by Hodges et al. [1]. Third, lecturers had to become learners themselves in order to provide quality education amidst the never-ending pandemic. This required them to transform through newly acquired knowledge and experiences, ideally leading to an enhanced self-efficacy in online teaching [4,27]. During the prolonged lockdown, lecturers demonstrated adaptability. At the beginning of the lockdown, there was a sense of disorientation as lecturers sought to maintain education with the substitution of traditional teaching practices. Eventually, once lecturers comprehended that a return to normalcy was unlikely in the immediate future, they shifted their focus towards augmenting and modifying their teaching techniques by integrating educational technology, with an increased emphasis improving teaching quality. ERT thus evolved into a highly flexible Modus Operandi with varying Opus Operatum, based on individual and institutional factors [16,27].

8.2. Discussion of the Theoretical Framework

The theoretical framework of this systematic review (see Figure 1) sheds light on the correlation between educational technology in ERT and lecturers' individual factors through the lenses of the TMLT, TPACK model, TAM, and SAMR model. Using the triadic reciprocity model as the foundational heuristic for this systematic review, which places individual behavior in a reciprocal relationship with individual factors and the environment, the incorporated theories shed light on how the pandemic affected teaching practices and educational technology use. This systematic review reinforces the heuristic significance of these theories while also spotlighting areas requiring further investigation.

- The emphasis of the TMLT on the interconnectedness between individual factors and the affordances technology can generate highlights the necessity of an institutional digital strategy in order to improve the quality of teaching and learning. The pandemic has revealed that individuals may become overwhelmed while navigating a new educational environment. This placed a burden on lecturers as they had to learn the bare tools to continue education, rather than being able to concentrate on creating inspiring learning environments by utilizing available resources.

- The triadic knowledge framework of the TPACK model revealed the strength (pedagogical knowledge) and weakness (technological knowledge) that lecturers had to juggle to create an online learning environment for their students. The model emphasizes the significance of possessing balanced and context-aware knowledge dimensions. Notably, the corpus lacked any reference to content knowledge. This suggests that practitioners were more concerned with continuing educational technology-based teaching than with the potential changes in the form of lecturers' content knowledge in the online space or that researchers were more interested in the above.
- Through the TAM, this systematic review aptly captured the pertinent experiences of lecturers using educational technology. In conjunction with the other theories, it enhances the understanding of how individual factors relate to the intentions and actual usage of educational technology. However, delving into the impact of intentions on teaching practices and learning outcomes would provide a more nuanced perspective.
- This systematic review underscores the utility of the SAMR model in identifying different levels of technology integration in teaching practices, with substitution emerging as a common initial step. Nevertheless, a more nuanced approach to adjusting teaching and learning during times of disruption may be required to encompass the strategies that guarantee high-quality education.

9. Conclusions

The pandemic acted as a window of opportunity for rapid change and adaptation in higher education, presenting both challenges and opportunities for lecturers, students, and institutions alike. The experience accelerated the digital transformation of higher education institutions beyond emergency conditions, which will continue to reshape teaching and learning [15]. At the same time, the pandemic has demonstrated that ERT is a viable contingency plan for unexpected educational emergencies. Unexpected educational emergencies (ranging from war-torn societies [112,113] to regions blighted by natural disasters [114]) are powerful examples of why continued research into ERT is crucial, as educational technologies could be a means of providing education where conventional methods are limited. Exploring and understanding ways to optimize ERT to ensure the best possible learning outcomes, regardless of the circumstances, is thus vital. As ERT may continue to be a substantial element of the education landscape, it is essential to conduct multimodal research to explore how students learn best during emergencies and how lecturers and institutions can facilitate learning through educational technology. Applied research should focus on issues of strengthening digital resilience through self-efficacy, given the burden that emergencies place on students and lecturers alike [115]. Lastly, this systematic review identified a research gap with regards to the significance of content knowledge in (emergency remote) teaching in higher education.

These findings and future perspectives underscore the importance of training and institutional support to equip lecturers with the necessary tools and skills for a smoother transition to ERT [111,116], not only in mastering new technologies but also in rethinking and reshaping their teaching practices to best leverage these tools. This kind of professional development programs that aim at lecturers' digital competence for teaching and that consider the individual readiness and backgrounds of lecturers could begin with a self-assessment of digital teaching competence. From conducting a self-assessment, lecturers and higher education institutions can identify areas that require improvement and capitalize on existing strengths to enhance the efficacy of educational technologies that contribute to the quality of ERT or education in general [117].

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Data Availability Statement: The data that support the findings of this study are available from the author upon reasonable request.

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Conflicts of Interest: The author declares no conflict of interest.

Appendix A

Table A1. Search syntaxes.

Databases and Specifics	Syntax
ERIC Ovid Advanced search	((COVID-19 or pandemic or "emergency remote").ti,ab. or (exp COVID-19/or exp Pandemics/or School Closing/)) and (("higher education" or universit* or "tertiary education" or college*).ti,ab. or (exp Higher Education/ or exp Universities/)) and ((faculty or lecturer* or teacher*).ti,ab. or (exp Faculty/or exp Teachers/)) and ((technolog* or ict or computer* or tool*).ti,ab. or (exp Educational Technology/or exp Information Technology/ or exp Electronic Equipment/or exp Computer Uses in Education/ or exp Technology Integration/))
PsycINFO Ovid Advanced search	((COVID-19 or pandemic or "emergency remote").ti,ab,id. or (exp Coronavirus/or Pandemics/)) and (("higher education" or universit* or "tertiary education" or college*).ti,ab,id. or (exp Higher Education/or exp Colleges/)) and ((faculty or lecturer* or teacher*).ti,ab,id. or exp Educational Personnel/) and ((technolog* or ict or computer* or tool*).ti,ab,id. or ((exp Information/and Communication Technology/) or exp Computer Assisted Instruction/ or exp Computer Applications/))
PSYNDEXplus Ovid Advanced search	((COVID-19 or pandemic or "emergency remote").ti,ab,id,fd. or (exp Coronavirus/or Pandemics/)) and (("higher education" or universit* or "tertiary education" or college*).ti,ab,id,fd. or (exp Higher Education/or exp Colleges/)) and ((faculty or lecturer* or teacher*).ti,ab,id,fd. or exp Educational Personnel/) and ((technolog* or ict or computer* or tool*).ti,ab,id,fd. or ((exp Information/and Communication Technology/) or exp Computer Assisted Instruction/ or exp Computer Applications/))
Scopus Advanced document search	TITLE-ABS-KEY (COVID-19 or pandemic or "emergency remote") AND TITLE-ABS-KEY ("higher education" or universit* or "tertiary education" or college*) AND TITLE-ABS-KEY (faculty or lecturer* or teacher*) AND TITLE-ABS-KEY (technolog* or ict or computer* or tool*)
Web of Science Advanced search	TS = (COVID-19 or pandemic or "emergency remote") AND TS = ("higher education" or universit* or "tertiary education" or college*) AND TS = (faculty or lecturer* or teacher*) AND TS = (technolog* or ict or computer* or tool*)
Teacher Reference Center EBSCO Advanced search	(TI (COVID-19 or pandemic or "emergency remote") OR AB (COVID-19 or pandemic or "emergency remote") OR KW (COVID-19 or pandemic or "emergency remote") OR ZU (COVID-19 OR "COVID-19 pandemic")) AND (TI ("higher education" or universit* or "tertiary education" or college*) OR AB ("higher education" or universit* or "tertiary education" or college*) OR KW ("higher education" or universit* or "tertiary education" or college*) OR ZU ("higher education" OR "universities & colleges")) AND (TI (faculty or lecturer* or teacher*) OR AB (faculty or lecturer* or teacher*) OR KW (faculty or lecturer* or teacher*) OR ZU (lecturers OR teachers)) AND (TI (technolog* or ict or computer* or tool*) OR AB (technolog* or ict or computer* or tool*) OR KW (technolog* or ict or computer* or tool*) OR ZU (technology OR "information & communication technologies" OR computers OR tools))
COVID-19 Global literature on coronavirus disease Title, abstract, subject	tw:((COVID-19 OR pandemic OR "emergency remote") AND ("higher education" OR universit* OR "tertiary education" OR college*) AND (faculty OR lecturer* OR teacher*) AND (technolog* OR ict OR computer* OR tool*))

Appendix B

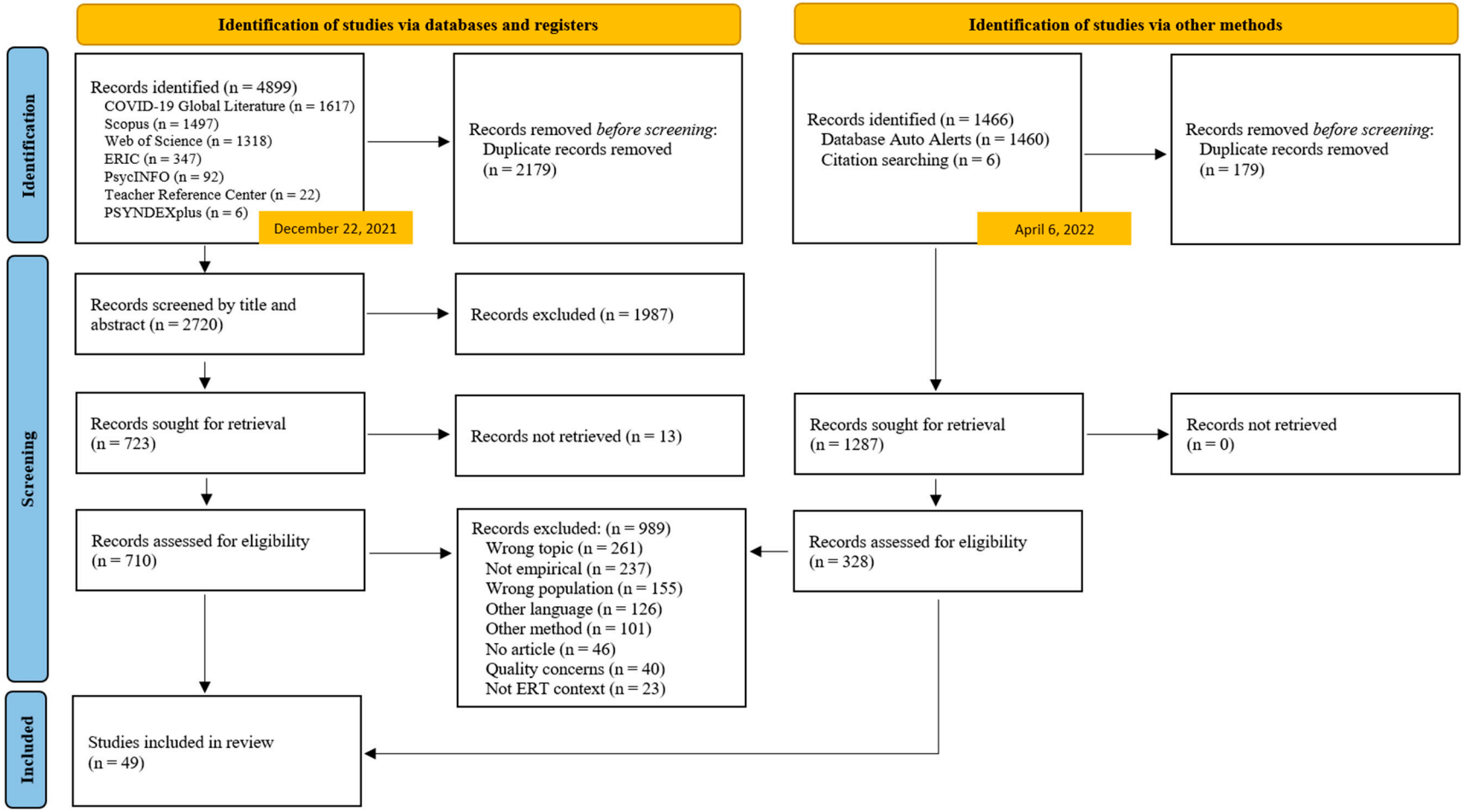

Figure A1. PRISMA 2020 flow chart.

Appendix C

Table A2. Coding scheme.

#	Codes (Subcodes)	Description	Theoretical Background
1	Technological knowledge (presence/lack thereof)	Lecturer's technological knowledge and skills in using technology	TPACK Mishra & Koehler, 2006 [29] TMLT Bower, 2019 [3]
2	Pedagogical knowledge (presence/lack thereof)	Lecturer's pedagogical knowledge and skills in online teaching and teaching with technology	
3	Content knowledge (presence/lack thereof)	Lecturer's content knowledge and skills in the respective teaching field	
4	Beliefs (positive/negative)	Lecturer's descriptive beliefs on technology use and online teaching	TMLT Bower, 2019 [3]
5	Expected/experienced effort (positive/negative)	Lecturer's expectancy/experience of effort to use technology	TAM Davis, 1986 [32]; Davis et al., 1989 [43] SCT Bandura, 1986 [16]
6	Expected/experienced performance (positive/negative)	Lecturer's expectancy/experience of performance of a specific technology	
7	Attitude (positive/negative)	Favorable or unfavorable attitude towards online teaching; technology use for teaching	
8	Self-efficacy (adaptability and presence/lack thereof)	Lecturer's belief of capability to achieve teaching goals in online teaching; adaptability	
9	Motivation (presence/lack thereof)	Lecturer's motivation to adapt to teaching online and with technology	
10	Experience (presence/lack thereof)	Lecturer's experience in technology use and online teaching	
12	Substitution	Lecturer substitutes conventional teaching practices with technology	SAMR model Puentedura, 2006 [38]
12	Augmentation	Lecturer augments teaching practices with technology	
13	Modification	Lecturer modifies teaching practices with technology	
14	Redefinition	Lecturer redefines teaching practices with technology	

Appendix D

Table A3. Corpus.

Reference	Country	Discipline	Participants	Sample Size	Theoretical/Empirical Background	Dana Analysis	Theme
Abid et al., 2021 [61]	Pakistan	mixed	lecturers	11	Instructional design	Thematic analysis	Cultural- and gender-related issues, teaching effectiveness, challenges, coping strategies for ERT
Al-Freih, 2021 [68]	Saudi Arabia	mixed	lecturers	5	Technology beliefs	Interpretative phenomenological analysis	Enhancing student engagement, technology affordances, and transition to blended learning
Alhawsawi & Jawhar, 2021 [57]	Saudi Arabia	EFL	lecturers	15	Bourdieu's Relationalism	Thematic analysis	The relation between institutional and individual challenges in ERT
Anh & Pang, 2021 [58]	Vietnam	EFL	lecturers	10	CIPP model	Thematic analysis	Teaching practices during ERT, difficulties and perceived effectiveness
Ardic, 2021 [78]	Türkiye	mathematics	lecturers	30	Not specified	Content analysis	Transition to ERT: support, beliefs, and skills
Badiozaman, 2021 [62]	Malaysia	mixed	lecturers	22	Readiness	Thematic analysis	OTL readiness through technological, course design, and communication competence
Beytekin, 2021 [94]	Türkiye	mixed	lecturers	10	Not specified	Interpretative phenomenological analysis	Perception of ERT: technology, sustainability, and support
Bote-Vericad, 2021 [101]	Spain	mixed	lecturers	29	Mobile learning	Thematic analysis	Development and implementation of educational videos in ERT
Carugati et al., 2020 [69]	Europe	mixed	mixed	21	Institutional theory	Thematic analysis	5-phase process model of IT adoption/adaptation for ERT
Castañeda-Trujillo & Jaime-Osorio, 2021 [63]	Colombia	teacher education	mixed	11	Sociocultural theory	Grounded Theory	Challenges for practical education of pre-service teachers during ERT
Chen, 2022 [95]	China	L2	lecturers	2	Teacher agency	Thematic analysis	L2 teaching: technology affordances, teacher agency, and social context
Christensen et al., 2022 [76]	Denmark	health sciences	lecturers	19	Teacher identity	Thematic analysis	Teacher identity in the online classroom through non- and paraverbal communication with students
Colclasure et al., 2021 [80]	USA	mixed	lecturers	14	Student engagement	Thematic analysis	Student engagement from the lecturer's viewpoint during ERT: pedagogical, individual, and technological challenges

Table A3. *Cont.*

Reference	Country	Discipline	Participants	Sample Size	Theoretical/Empirical Background	Dana Analysis	Theme
Durak & Cankaya, 2020 [88]	Türkiye	mixed	lecturers	18	Not specified	Content analysis	Lecturers' choice and perception of technology for ERT
Gao & Zhang, 2020 [91]	China	EFL	lecturers	3	Constructivism	Thematic analysis	Lecturer perception, readiness, and ICT literacy of/in ERT
Gyampoh, 2020 [102]	Ghana	teacher education	lecturers	24	Not specified	Thematic analysis	Individual and institutional resources for ERT in teacher education
Hadar et al., 2021 [85]	Israel	teacher education	lecturers	16	Social emotional learning	Grounded theory	Redefinition of teacher education with technology during ERT
Hadjeris, 2021 [75]	Algeria	mixed	lecturers	7	Not specified	Thematic analysis	Lack of technology and competencies for ERT
Jebbour, 2022 [64]	Morocco	EFL	lecturers	20	Not specified	Thematic analysis	Barriers, benefits for ERT, and technologies used in ERT
Joshi et al., 2021 [59]	India	mixed	lecturers	19	Not specified	Interpretative phenomenological analysis	Four types of obstacles that teachers face when teaching and evaluating online
Kanchai, 2021 [70]	Thailand	EFL	lecturers	3	ICT use	Thematic analysis	How EFL teachers learn to use technology for online teaching during COVID-19
Khan et al., 2021 [65]	United Arab Emirates	mixed	mixed	8	Not specified	Thematic analysis	Opinions of university students and lecturers on their experience with ERT
Khoza, 2020 [100]	South Africa and USA	mixed	lecturers	20	Knowledge-building	Thematic analysis	Lecturers' knowledge about practices that promote knowledge construction during COVID-19 and the 4IR
Khoza & Mpungose, 2020 [97]	South Africa and USA	mixed	lecturers	20	ICT use	Thematic analysis	Transformation experiences of lecturers during COVID-19 and the meaning of a digitalized curriculum
Kidd & Murray, 2020 [81]	UK	teacher education	lecturers	11	Initial teacher education	Thematic analysis	Modification of teaching methods in teacher education as the practicum was disrupted by COVID-19 lockdowns
Kovacs et al., 2021 [104]	Switzerland	mixed	lecturers	10	Not specified	Thematic analysis	Differences in primary, vocational, and higher education teachers' experiences with technology use and teacher–student connectedness in ERT
Landa et al., 2021 [118]	South Africa	mixed	mixed	15	Not specified	Thematic analysis	Intervention strategies of universities to face COVID-19 lockdown
Le et al., 2021 [77]	Vietnam	teacher education	mixed	150	Not specified	Thematic analysis	Changes in the perception, methods, and orientation of online learning of students and lecturers during ERT

Table A3. *Cont.*

Reference	Country	Discipline	Participants	Sample Size	Theoretical/Empirical Background	Dana Analysis	Theme
Lee et al., 2022 [98]	South Korea	mixed	lecturers	14	Activity theory	Thematic analysis	Changes in teaching activities in universities during COVID-19 ERT
Monjezi et al., 2021 [83]	Iran	EFL	lecturers	10	Computer-assisted language learning (CALL)	Content analysis	Problems with EFL ERT: technology, classroom atmosphere and classroom activity
Müller et al., 2021 [82]	Singapore	mixed	lecturers	14	Not specified	Thematic analysis	eLearning: lecturers' perspectives and practices during ERT and future intentions for eLearning
Nguyen & Nguyen, 2021 [99]	Vietnam	EFL	mixed	5	Not specified	Thematic analysis	Experienced teachers' use of technologies for online teaching
Omodan, 2020 [119]	South Africa	mixed	mixed	5	Assets-based approach	Thematic analysis	Challenges for rural and disadvantaged universities in South Africa during COVID-19 lockdowns
Özer, 2022 [92]	Türkiye	sport science	lecturers	14	Not specified	Content analysis	Lecturers' attitudes towards ERT and concerns in managing education
Plummer et al., 2021 [72]	international	health sciences	lecturers	16	Community of inquiry	Thematic analysis	Lecturers' adaptation of teaching practices with technology
Richter et al., 2021 [96]	USA	health sciences	mixed	22	Not specified	Thematic analysis	The role of community and technology in the switch to ERT in health sciences
Roy et al., 2021 [67]	Bangladesh	mixed	mixed	8	Not specified	Thematic analysis	Lecturers' immediate adaptation and readiness for ERT
Roy & Brown, 2022 [103]	India	economics	lecturers	6	ICT use	Thematic analysis	Teaching economics with a lacking infrastructure during ERT
Rupnow et al., 2020 [89]	USA	chemistry	lecturers	6	Teacher-centered systemic reform	Thematic analysis	Attitudinal, personal, and institutional factors affecting adaptation to ERT
Said et al., 2020 [73]	Pakistan	mixed	lecturers	7	Not specified	Interpretative phenomenological analysis	Lecturers' challenges with student motivation in Pakistani universities
Sales et al., 2020 [74]	Spain	mixed	lecturers	20	Digital competence	Thematic analysis	The importance of information and digital competencies for ERT
Sederevičiūtė-Păciauskienė et al., 2021 [60]	Lithuania	mixed	mixed	8	Not specified	Phenomenography	Communication and collaboration with technology

Table A3. *Cont.*

Reference	Country	Discipline	Participants	Sample Size	Theoretical/Empirical Background	Dana Analysis	Theme
Tanga et al., 2020 [87]	South Africa	social work	mixed	12	Not specified	Thematic analysis	Frustrated and unprepared social work lecturers during ERT
Tsegay et al., 2022 [66]	China	mixed	lecturers	13	Not specified	Thematic analysis	Relevance of prior experience and shift to student-centered ERT by Chinese lecturers
Ulla & Perales, 2021 [79]	Thailand	EFL	lecturers	6	Community of practice	Grounded Theory	Applying community of practice in ERT
Valsaraj et al., 2021 [90]	international	mixed	lecturers	23	Conscious competence learning model	Content analysis	The relevance of prior experience, skills, and support for ERT
Weldon et al., 2021 [84]	Hong Kong	mixed	mixed	48	Not specified	Content analysis	Benefits and difficulties with technology, online teaching, communication, and assessment
Zhang & Yu, 2021 [86]	China	mixed	mixed	28	Not specified	Thematic analysis	Innovation through technology: alongside safety concerns and support
Zhu & Zhang, 2022 [93]	USA	health sciences	lecturers	10	TAM	Thematic analysis	Perceived usefulness and ease of use of technology for ERT

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