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Teaching and learning strategies in remote education: A systematic review of the literature

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Remote education is an alternative delivery modality for digital environments, responding to several societal requirements and the needs of today's education. Although the term has been used since the early 2000s, the COVID-19 pandemic forced it to emerge as a temporary alternative to continue the educational processes during confinement. However, the research and interest have persisted. This research analysed the remote experiences reported in the literature, emphasising the teaching and learning strategies and the technologies used to support them. A systematic literature review using the PRISMA protocol identified 51 articles from the Scopus and Web of Science indexing databases. The analysis and synthesis involved categorisation and classification guided by research questions directed towards the review objective. The findings revealed that (a) remote experiences use diverse strategies, predominantly active methodologies that privilege the experiential; (b) technologies support the remote strategy development, but the use or intention of the technology is not always straightforward; (c) some studies note strategies mediated by remote and cyber-physical labs, artificial intelligence and teaching assistants; (d) general interest in the topic exists in all areas, disciplines and educational levels, predominantly higher education; and (e) it is necessary to follow up on remote experiences after pandemics. This research adds value through its observations that, more than an emergency alternative, remote education is a pillar of hybrid education and future education.

Implications for practice:
- Faculty designed remote experiences based on active methodologies and enabled by technologies, which impacted learning. This suggests that it is possible to carry out a quality educational process in remote.
- The COVID-19 pandemic accelerated the transformation of education in the multimodal forms of delivering learning experiences to meet the needs of contemporary society.
- Universities recognise the potential of remote learning to address issues of access and reach, while also enhancing hybrid and flexible learning models.

Keywords: learning strategies, teaching strategies, remote education, higher education, educative technology, digital education, systematic review

Introduction

Remote education, the most widely used alternative to continue educational processes during the confinements of the COVID-19 pandemic, was a remarkable feat of speed and efficiency. Notably, before its beginning, there was little th of remote education. In the mid-1990s, e-learning was discussed, and by the end of the same decade, a boom in online learning resulted from the increasing sophistication of the Internet, which allowed centralising and developing new educational modalities (Weller, 2020). Several decades of maturation and enduring criticisms about online education's legitimacy, effectiveness and perceived lower cost than face-to-face education (Noble, 1998) allowed remote education to be rapidly configured (Brianza et al., 2023). However, the pandemic overshadowed the discussions of which education was better (face-to-face, distance, online or electronic) because it necessitated a timely solution to the contingency interrupting education (Thulebona et al., 2021). Thus, remote education

strategies and delivery times were rapidly configured in synchronous, asynchronous or mixed modes, with a strong preponderance of the latter (Hadad et al., 2024). The elements to consider for continuing educational processes were the teachers, students, schedules, time available to perform the training, the supporting technology and the place. Physical spaces were not allowed due to the pandemic confinement, so education had to migrate to technological platforms that created virtual spaces to facilitate educational continuance.

Proposing online education or learning poses challenges because designing a course considering instruction, pedagogy and content usually requires months. During the pandemic, face-to-face education had to avoid physical contact; for that reason, remote education was considered because of its synchronous or blended characteristics (Lane et al., 2023). It was not the only strategy, because, in some cases, it was necessary to propose solutions using radio, photocopies, mobile learning and television within the available infrastructure and context (García-Aretio, 2022; Rivera, 2023).

The descriptions above led to the consideration of remote education, which could build on institutions' previous efforts in digital education, such as courses, technological infrastructure, resources and learning systems already facilitating the educational process (Alkhaldi et al.,2024). It is noteworthy to mention that remote education is not a new modality; it is an alternative characterised by the type of delivery it offers, which is framed in digital education and online learning but has particular characteristics that enable exploration, experimentation and possible constructions.

Considering the above, we found it necessary to conduct a systematic review of the literature that compiles the teaching and learning strategies proposed, identifies possible gaps and builds a quick historical framework that allows further consolidation of empirical remote education. Previous reviews, although contributing to the object of study, were oriented towards identifying the use of technologies during the pandemic, focusing on the years 2020 to 2021 and specifically on K-12 (Crompton et al., 2021). For example, the review by Bastos et al. (2021) aimed to recognise the solutions, facilitators and barriers to online learning implemented in the first year of the COVID-19 pandemic. The review by Nang et al. (2022) analysed teacher technostress during the pandemic. The differential value of this review is to show that the emergence of remote education in pandemics goes beyond its temporality or character. It could also have been called emergency online learning, not creating the concept of remote education or emergency remote education (Fernandes et al., 2024). This review allowed us to consolidate a framework facilitating a conscious, intentional remote education, distinguished from what was observed in the urgencies of the pandemic when it was an improvised measure that generated tensions; remote education also offers opportunities for transforming education.

Theoretical framework

Remote education

E-learning, computer-based learning, computer-based instruction, distributed learning, blended learning, mobile learning and distance learning are some of the terms referring to learning that happens online, terms that have been carefully defined, determining particular characteristics and elements that make them unique and differentiated from existing ones. Some authors have mentioned that emergency remote learning contrasts with what today is known as high-quality online education (Hodges et al., 2020). Lion et al. (2023) noted that emergency remote education spotlights a debate on post-pandemic hybrid education, which is the combination of modalities (face-to-face and virtual), times (synchronous and asynchronous) and strategies that transcend environments through technological tools. Thus, in remote education, the learning environment has no limits to the place where it occurs, only the time that delimits its synchrony or asynchrony; the latter allows greater control, monitoring and feedback through the configuration of workspaces, platforms and environments, for a better organisation of learning and student evidence (Balladares-Burgos, 2021; Engel & Coll, 2022). Remote education can have a short and temporary scope but trigger the hybridisation of education and extend learning environments through digital tools.

"Remote" became a helpful word to differentiate what was done in person or physically from what now can be done through information and communication technologies in different contexts, referring to remote work, factories, medical care or education. It is pertinent to emphasise that beyond emergency remote education is conscious remote education. Pardo and Cobo (2020) have divided them into categories: urgent non-adapted remote, urgent adapted remote, aspirational remote and post-confinement aspirational hybrid. There is a tendency to relate the remote to hybrid education that combines the physical with the virtual, an expanded hybrid university (Pardo, 2023). This juncture generates the possibility of creating memorable, previously unimaginable learning experiences that surpass the mere combination of the face-to-face with the remote and the synchronous with the asynchronous, where the subjects transition and immerse themselves in uncertain, complex and unpredictable learning scenarios that are the product of intentionality, planning, significance and orientation towards student preferences (Lion, 2021). Remote education during the pandemic was a pinnacle experiment for institutions, teachers and students to satisfy the need to transform specific processes and continue working for the benefit of learning.

A path to hybridisation: Education on demand

Despite distancing us physically, the pandemic allowed humanity to converge on a problem, need and reality through an opportunity to rethink what had been proposed for a long time. Although the concept of remote education gained strength during the pandemic, research had already suggested it (Temelta et al., 2006; Wang et al., 2004) and hybrid education as well (Canclini et al., 1995; Martín-Barbero, 2010). Slightly antagonistic proposals, such as those by Mascaró (2018), spoke of education without school, personalised education à la carte. The above denotes concern for what happens in education; for that reason, convergence must exist amid diversity in a complex, uncertain society when remote education has the potential to be a valid and quality type of delivery (Weng & Qin, 2023) as a fundamental part of hybrid education (Adam, 2022; Almusaed et al., 2023; Delgado et al., 2018). For these reasons, exploring and identifying the teaching and learning strategies teachers propose in remote education is necessary to build and enrich its scope beyond emergency or crisis delivery.

Remote education and online learning

A key characteristic of remote education is that, although it is developed through technology, it retains certain attributes of face-to-face education, mainly in terms of teacher and student arrangements, set schedules, number of students, among other elements. During the COVID-19 pandemic, educational institutions quickly adapted their traditional methodologies to the digital environment, maintaining familiar pedagogical practices and ensuring educational continuity (Toti et al., 2025). This process showed that, with proper planning, remote education can match online learning in terms of effectiveness and reach (Hodges et al., 2020).

Although remote education and online learning use digital platforms for interaction and content delivery, there are key differences between the two modalities. Online learning is often designed from the outset to be delivered in virtual environments, with meticulous planning that incorporates pedagogical strategies specific to the digital medium (Singh & Thurman, 2019). On the other hand, remote education, especially in emergency contexts, is implemented more quickly, adapting traditional content and methodologies to the digital format without thorough planning (Murphy, 2020). However, experience gained during crisis situations has allowed remote education to evolve, adopting online learning practices and leveraging technologies, resulting in a convergence between the online learning modality and the remote delivery format (König et al., 2020).

According to the review conducted by Singh and Thurman (2019) on the various definitions and synonyms used over the last 30 years in the literature, it is evident that the term *online learning* (1988–2018) is not associated with remote education. This distinction highlights the relevance of and need for this research. The terms that are most associated with online learning are detailed in Figure 1.

Figure 1. Terms related to online learning

Learning strategies

To classify the learning strategies related to these remote experiences that were collected in the literature, we decided to select the framework proposed by Ramírez-Montoya (2021), which presents a set of strategies to enhance the educational process in diverse environments, aligned with the needs of education in the digital era. These strategies are classified into analysis, reflection, construction, application, collaboration and digital, each with a specific purpose to impact learning. Analysis strategies enable students to critically examine information, decompose problems, and understand their fundamental elements. Reflection strategies foster metacognition and self-regulation, helping students identify their progress and opportunities for improvement.

As for construction strategies, they are oriented to the generation of knowledge, which encourages creativity and innovation in problem-solving. Application strategies focus on transferring knowledge to real contexts, allowing students to connect theory with practice. Likewise, collaborative strategies promote social learning and teamwork and facilitate the collective construction of knowledge through the exchange of ideas and experiences. Finally, digital strategies integrate technological tools in teaching and learning processes, favouring accessibility, personalisation and dynamisation of education (Ramírez-Montoya, 2022). The implementation of these strategies in learning environments not only improves the educational experience but also contributes to the development of key competencies for the 21st century and promotes innovative and flexible teaching models.

Information and communication technologies

Miranda et al. (2021) classified educational technologies within the Education 4.0 framework into two broad categories – technology-based; tools and platforms – both of which are fundamental to the transformation of teaching and learning. Technology-based technologies include innovations such as the Internet of Things, artificial intelligence, machine learning, cloud computing, cyber-physical systems, data science and data analytics, and mixed reality. These technologies enable personalisation of learning, predictive analytics of student performance and automation of educational processes, facilitating immersive and interactive experiences in learning environments.

On the other hand, tools and platforms encompass systems designed for communication, management and collaboration in digital educational environments. These include videoconferencing platforms, learning management systems, virtual collaborative platforms, massive open online courses (MOOCs), remote and cyber-physical laboratories, robotic teaching assistants and holographic teachers. These tools facilitate distance learning, enabling real-time interaction, access to global educational resources and the development of innovative learning experiences. The combination of these technologies and platforms not only optimises remote education but also enhances hybrid and flexible models that respond to the demands of the digital society and the laboor market of the 21st century (Miranda et al., 2021).

Method

The central purpose of this study was to develop a systematic literature review to compile empirical evidence, identify gaps in current research and provide a background framework for the proposed topic (Fink, 2019; Kitchenham et al., 2009). To structure the review, we developed two phases (Review Planning and Review), with their respective activities, as seen in Figure 2 (Kitchenham & Charters, 2007). In Planning, we defined the research questions, considering the objective set for the systematic literature review. In this review, we decided to use the PRISMA protocol (Moher et al., 2009) to address the dimensions and characteristics on which this type of study is based, such as systematic, complete, explicit and reproducible (Codina, 2020).
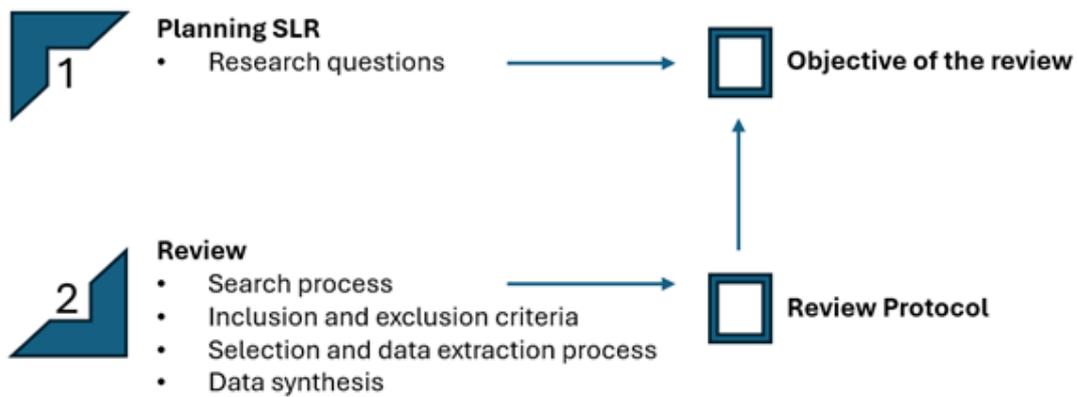

Figure 2. Structure of the systematic review

Research questions

To identify the teaching and learning strategies used in remote education at all educational levels, we designed five research questions: The first three aimed at characterising the publications, authors, years of publication and quartiles, to identify the disciplinary areas where they have been applied and the educational level where the remote educational experience was carried out and among others. The remaining two questions enabled us to go deeper into the teaching and learning strategies proposed and the technological mediations used, which allowed us to build a frame of reference and to respond to the objective of this research. Table 1 details the questions and the response categories.

Table 1

Research question and response categories

Research question (RQ)	Response categories
RQ1. What is the educational level, subject or area and keywords of the study, and the geographical distribution of the authors?	Keywords author, geographical location of the first author and the topics were classified according to the subject area of the Scimago Journal & Country Rank. The educational levels were primary, secondary, higher education, continuing education and lifelong learning.
RQ2. In which database is the journal where the article was published and indexed, and which year and quartile?	Web of Science (WoS) and Scopus, year of publication of the article, quartile
RQ3. Which journals have the most publications on the topic, and how many citations have they received?	Journals with the most publications and most cited articles
RQ4. What are the learning strategies used in the study?	Analysis, reflection, construction, application, collaboration and digital strategies
RQ5. What information and communication technologies were used in the study?	Technology-based, tools & platforms

Review protocol

The methodology used the PRISMA diagram (Moher et al., 2009). This made it possible to structure the systematic review protocol (see Figure 3).
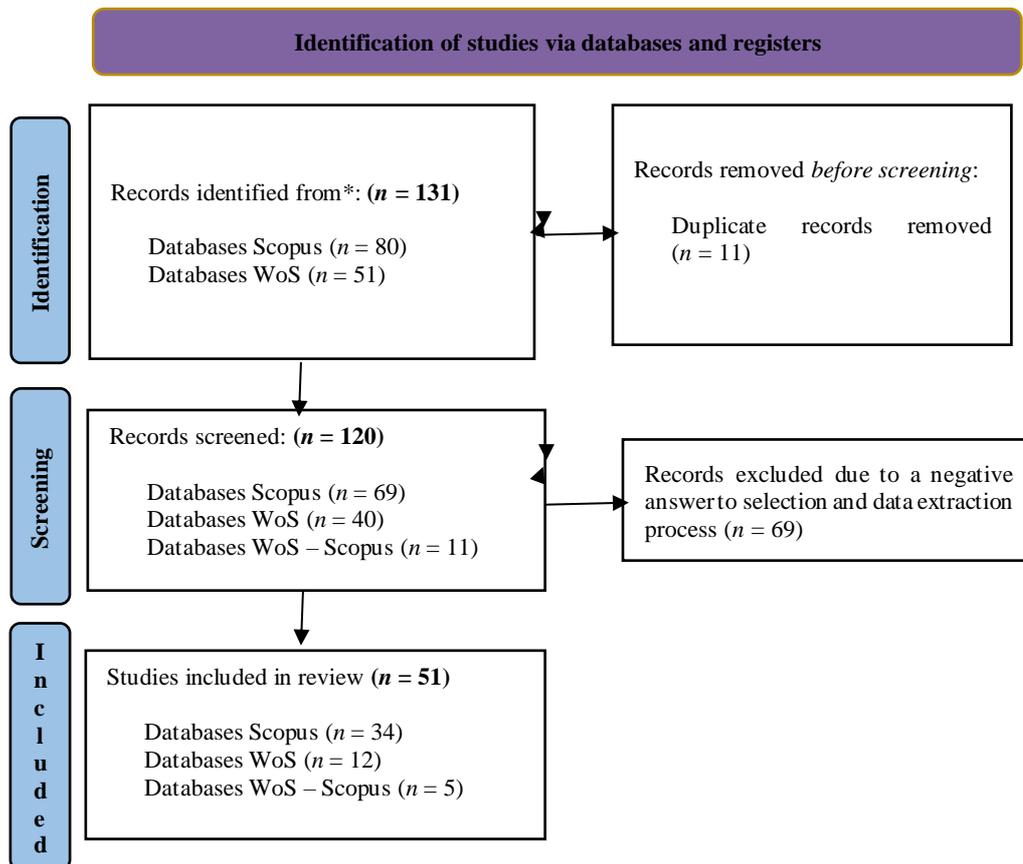

Figure 3. Prisma diagram

Search process

The search process started by defining the terms and keywords that allowed the search equation to be built, including the respective filters and the selection of the databases (Khalil et al., 2016). Considering the above, two broad and sufficient search equations were built, mainly including two concepts with their synonyms to retrieve a complete documentary corpus and avoid bias (see Table 2). This phase and its iterations determined that the most relevant bibliographic databases were Scopus and WoS, considering the scope and coverage of both.

Table 2
Search equations

Scopus search equation	WOS search equation
(TITLE-ABS-KEY ("remote education" OR "remote learning") AND TITLE-ABS-KEY ("learning strategies") OR TITLE-ABS-KEY ("teaching strategies") OR TITLE-ABS-KEY ("teaching and learning strategies")) AND (LIMIT-TO (DOCTYPE, "ar")) AND (LIMIT-TO (LANGUAGE, "English") OR LIMIT-TO (LANGUAGE, "Spanish"))	"remote learning" (Title) and "strategies" (Abstract) or "remote education" (Title) and "strategies" (Abstract) or "remote education" (Title) and "teaching strategies" (Abstract) or "remote education" (Title) and "learning strategies" (Abstract) or "remote education" (Title) and "teaching and learning strategies" (Abstract) or "remote education" (Title) and "teaching strategies" (Author Keywords) or "remote education" (Title) and "learning strategies" (Author Keywords) and Article or Early Access or Editorial Material (Document Types) and English or Spanish (Languages) and Article or Early Access (Document Types)

Inclusion and exclusion criteria

Within the same search process, filters were applied according to the inclusion and exclusion criteria for a narrow and relevant search (Ferreras-Fernández et al., 2016). Therefore, the results were limited to articles indexed in Scopus and WoS, and the proposed search equations in both cases searched the title, abstract and keywords, seeking articles directly related to remote education published in English and Spanish, as seen in Table 3.

Table 3
Inclusion and exclusion criteria

Inclusion criteria	Exclusion criteria
Studies that are directly related to remote education	Studies that will not address teaching and learning strategies in remote environments
Scientific journal articles	Review articles, conference papers, books, book chapters, reports, working papers or articles not published or indexed in Scopus or WOS
Articles published in English and Spanish	Articles published in languages other than English and Spanish
Articles published on any date	

Selection and data extraction process

The extraction process was carefully performed according to the PRISMA flowchart, as required by the systematic literature review (Petersen et al., 2015). Before data extraction, several iterations with different search equations were performed to identify through the title and abstract (Abstracting), the coherence of the results with the equation proposed and the respective objective of the systematic literature review, defining a group of control articles of interest to the review and observed in the searches to cover the existing literature on the subject. When the two search equations were defined, we

considered that the selection had been narrowed down through the "best tests" of the equations, in accordance with Kroll et al. (2018), ensuring the best selection of the articles.

The final data extraction was on 13 April 2024, when the metadata were downloaded through the functionalities of the two databases and imported into Mendeley and Microsoft Excel. This identified 11 duplicate articles; there were 69 articles in Scopus, 40 in WoS, and 11 in both Scopus and WoS, for a total of 120 articles comprising the review's initial data set.

At that time, it was necessary to read the articles to answer "Does the study present the results after remote implementation or delivery?" It was a selection or exclusion question dichotomous per the review objective. This resulted in 51 articles with affirmative responses, which defined the sample of the documentary corpus considering the synthesis and results of the systematic literature review. The distribution was 34 from Scopus, 12 from WoS, and 5 in both databases.

Data synthesis

To carry out the synthesis, the data were downloaded into Microsoft Excel, where all the information was organised per specific fields; the compilation included the answers to the systematic literature review's research questions. To answer the questions focused on learning strategies and the technologies used (RQ4 and RQ5, the core of this review) to compile and associate the results, some response categories were proposed for learning strategies based on the work of Ramírez-Montoya (2022) (see Table 4).

Table 4
Response categories RQ 4

4a. Learning strategies	4b. What does it include?
Analysis strategies	Problems, debates, argumentation
Reflection strategies	Cases, metacognition, electronic portfolios
Construction strategies	Experience, games, projects
Application strategies	Challenges, evidence, research
Collaboration strategies	Open educational resources, MOOCs, open innovation labs
Digital strategies	Open educational resources, MOOCs, Open innovation labs

For RQ 5 related to the information and communication technologies used to support the learning strategy, the categories proposed by Miranda et al. (2021) were used (see Table 5).

Table 5
Response categories RQ 5

5a. Mediation and support	5b. What does it include?
Technology-based	(Internet of things, artificial intelligence, machine learning, cloud computing, cyber-physical systems, data science & data analytics, mixed reality, others)
Tools & platforms	(Web conference platforms, learning management systems, collaborative virtual platforms, MOOCs, remote and Cyber-physical labs, robot teaching assistants, hologram teachers)

The synthesis matrix can be consulted at https://doi.org/10.6084/m9.figshare.25856194.v1.

Results

The Excel matrix, in which the entire extraction process was carried out, was fundamental to the analysis process. Each answer was compiled there, and the data were processed with the help of different tools and software, such as Tableau and VosViewer. This section presents the results for each research question described previously.

RQ 1. What is the educational level, subject or area and keywords of the study, and the geographical distribution of the authors?

Of the 51 articles examined in this review, 42 corresponded to experiences developed in higher education, which shows a predominance at this educational level {3},{9},{44}, although experiences in secondary education {18},{37}, and in lifelong learning {28},{5}, including business training {7}, were also collected. Remote education has emerged in much of 21st-century society because of COVID-19. This study's results show the prevalence of remote education topics in science, which is natural, as health areas and university research centres promote scientific development (Bayne et al., 2021; Gomez et al., 2020, Rossi et al., 2021). However, this study's value also lies in showing the interest in this topic in other disciplines such as arts and humanities {4},{28}, business {8}{30} and engineering {19}{49} and in levels other than higher education, such as secondary {20}{37} and lifelong learning {7}{24}, all contributing to the object of this research from practice and theory.

To answer this question, 314 keywords reported in 45 studies were analysed; six articles did not have them [3],[8],[28],[40],[43],[51]. Figure 4 shows that the keywords identified by the authors are strongly related to COVID-19, online learning, teaching strategies, remote teaching and higher education, and in only one case are related to e-learning and in two cases to distance education. This is evidence that the authors sought to make their studies independent of what was already being done as distance education, virtual education or e-learning, and rather, they sought to characterise remote experiences in recent years.

Figure 4. Educational level, subject or area, keywords and geographical distribution of authors

Considering that the COVID-19 pandemic was global, it is evidenced in publications in several countries. Our review identified 25 countries, with the United States of America predominating, followed by China; the other countries reported one or two investigations. Notably, each continent had at least one publication.

RQ 2. In which database is the journal where the article was published and indexed, and which year and quartile?

Figure 5 shows that the articles were published in a short period, specifically from 2020 to the present, with a higher number of articles in 2023 in both databases (16 articles). Interestingly, a single publication appeared before 2020, dating to 2006 [51]; it discussed remote education, presenting data from a simulation through remote laboratories in a robotics and mechatronics course. Figure 4 shows that most articles appeared in Quartile 1 and Quartile 2 journals, totalling 38 of the 51 papers selected for this review (74%).
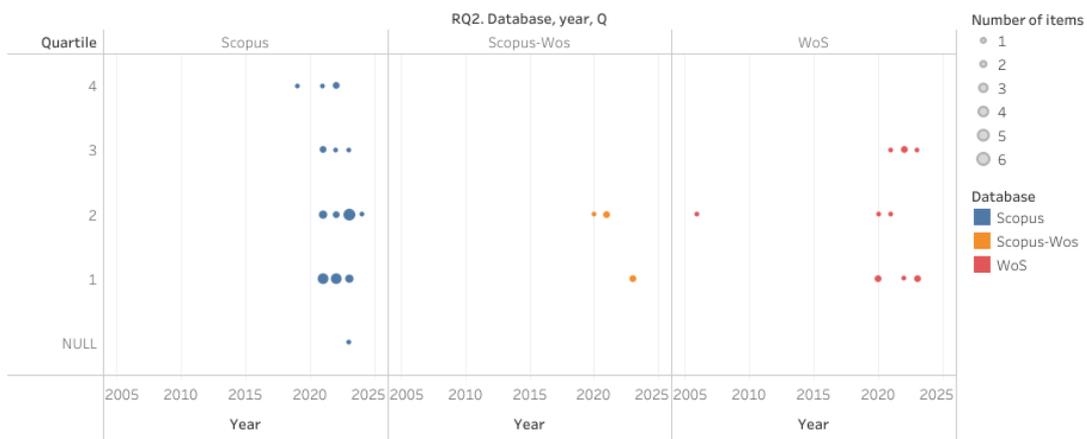

Figure 5. Database, years and quartile

Although the review did not emphasise emergency remote education, it can be understood that the concept of remote education is immediately associated with the pandemic period of COVID-19. The last publication selected within this systematic literature review from 2024 presents the challenges and successes of an emergency educational intervention [1]. The publications have been maintained; time will tell if remote education is a concept that has emerged to stay and differentiate itself from what has been called distance education, e-learning, virtual learning or any other synonym that describes the construct of digital education.

RQ 3. Which journals have published the most on the subject, and how many citations have they received?

Considering the findings in the previous question, no journal currently groups a large number of articles on remote education for comparative purposes. The 51 selected articles were published in 45 different journals. Most journals are specialised in their subject, such as the European Journal of Physics, Architectural Science Review or Pharmacy. In contrast, others have an educational slant, such as the top three shown in Figure 6. These 51 articles have received 438 citations; only seven have had none.

Figure 6. Journals with the most publications and citations received

This shows that the COVID-19 pandemic accelerated digital transformation in all sectors, and education was no exception. The articles present the results of innovations that took place during the pandemic [36],[32],[15]. In addition to the above, the diversity of implementations by discipline can be seen through the review of journal titles, where words related to chemistry {31}, radiology {46}, music {34}, engineering {18}, health sciences {29}, among others, are observed.

RQ 4. What are the learning strategies used in the study?

Based on the previous question, it could be assumed that the 51 studies should clearly express the strategies followed. This was not the case because some studies described changes in activities, technologies and pretensions without clarifying the strategy. This was the case of 10 documents in which it was not possible to determine the strategy category or subcategory {4},{23},{24},{27},{33},{34},{36},{39},{41},{42}. It is preferred that this result be presented and inferences not be made that could bias this review. In the case of these 10 documents, they did respond to the technologies question, so they were included in the review.
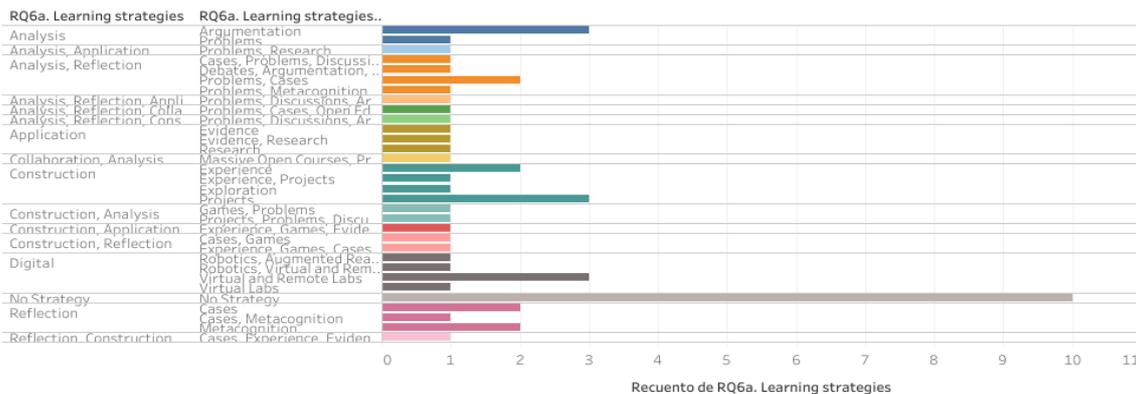

Figure 7. Teaching and learning strategies

The data presented in Figure 7 highlight those studies that do not have a clear strategy, which may be for two main reasons: The first is that various activities are proposed that, although they have a common thread, are not part of a whole, and for this reason, it is complex to categorise them {42}. The second reason is directly related to the emphasis on the technological element on which the research revolves. Therefore, the strategy is unclear since technologies can be used in different ways and forms {36}. On the other hand, we observed that the strategies of analysis, construction and digital are not relevantly highlighted; the last two are related to active methodologies and privileging the experiential within the remote experiences. Finally, we also found that most strategies are combined to favour different competencies in the student.

RQ 5. What information and communication technologies were used in the study?

As in the previous question, Figure 8 shows some studies that emphasise the strategy and activities proposed without mentioning the use of technologies; this was the case of five studies {10},{11},{22},{38},{43}. In these articles, it was possible to identify the strategy but not the mediation technology, similar to what happened in the previous question but now with the technology. According to the data, it can be seen that most strategies involve combining tools and platforms in different ways according to the proposed activities, using web conferencing platforms with a learning management system {42},{13}, or in other cases, web conferencing platforms with collaborative virtual platforms {47}.
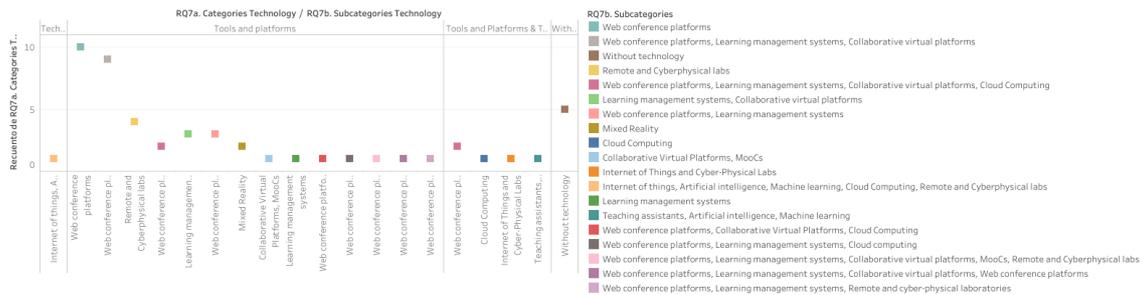

Figure 8. Information and communication technologies implemented

In addition to the above, it can also be inferred that remote education is associated with synchronous since the most used tool was the web conferencing platforms {5},{23},{35}. Notably, six articles report the practical use of technology, referring to using artificial intelligence and remote and cyber-physical labs {28} or a combination of teaching assistants, artificial intelligence and machine learning {36}, which, for now, although not a trend or strength, portend the future of education in these digital environments.

Discussion

Remote education is much more than what was experienced during the COVID-19 pandemic; the latter was the catalyst that strengthened a type of delivery that still requires exploration in education. The above can be evidenced in the data on the practical use of technology and the incorporation of different tools and platforms that enrich and make possible synchronous and asynchronous remote encounters (Figure 8). This requires the student to develop the self-regulation and self-efficacy capabilities that this environment requires, improving attitudes and acceptance towards technology, triggering better academic performance, and impacting perceived learning (Navarro et al.,2023). In addition, Carter et al. (2020) affirmed that self-regulated learning can guarantee the effectiveness of online learning; they selected strategies that favour it from the framework proposed by Zimmerman (2012). Thus, it can be seen that a vital protagonist in these digital environments is the student, who must assume a leading role, supported by a scaffolding that includes teaching and learning strategies, available technologies, support and the appropriate context.

Many elements mentioned above were unforeseen; it became necessary to implement emergency remote education that obviated some factors and largely remedied the situation. What is striking is that at least 39% of the articles studied proposed active strategies focused on the digital learner, which is a relevant advance revealing the potential of these environments (Figure 7). In addition, some studies focusing on measuring the perceptions of remote education mentioned that online teaching has worked well, even better than traditional approaches (Banack et al., 2021; Osborne & Hogarth, 2021; Rondina et al., 2021). It could be the education of the future because of the attributes and advantages it represents (Wahid et al., 2021). Even so, it is clear that there is a lack of theoretical and empirical evidence of remote education consciously intended as a possible type of delivery in education. Therefore, it is necessary to continue researching and not make assumptions from previous educational experiences that blur or increase misconceptions.

Although the COVID-19 pandemic was the ideal catalyst for iterating various educational strategies mediated by digital technology, it also noted that teachers still lack the skills to fully realise and reach the right pedagogical integration of technology in education and fully exploit all its potential. Figure 8 shows the use and integration of different technologies that enrich online educational processes, considering that the actors appropriate them, allowing them to interact, learn and use them. However, several studies have claimed the need to increase teachers' digital literacy (Alves et al., 2024; Gunasekara et al., 2022; Nandlall et al., 2022; Rwodzi & De Jager, 2021) and warn about the digital divide (Cochrane, 2020; Rondina et al., 2021). The truth is that the scenario was not ideal for determining whether remote education works or not, as there were other challenges, such as the home environment where the student was connected to the Internet (Barrot et al., 2021), the general mental health of the population (Chiwandire, 2022), issues related to student attention and engagement (Karcher et al., 2022), long hours of class preparation (Biasutti et al., 2021) and generalised stress due to the situation (Hu et al., 2022). Even with all this panorama, it was possible to create digital educational experiences that made a difference and, perhaps, mark the beginning of what may be one of the education trends of the future.

Emergency remote education has once more revealed that educational processes are susceptible to changes. In this particular case, questioning face-to-face is necessary, and whether virtuality as it had been approached was the only possible way. It is precisely at this intersection where remote experiences take place between the face-to-face and the virtual and are positioned as a new form of teaching or delivery of educational processes (Figure 4). It dialogues and enriches face-to-face, distance and virtual modalities but has characteristics that make it different, although some educators assimilate it with e-learning, which would not be entirely incorrect, since they share elements, but also have characteristics that make them unique (Singh & Thurman, 2019). The point here is that the strategies carried out in the face-to-face classroom need to be rethought for implementation in digital environments, promoting cohesion among students through innovative, collaborative strategies (Wohlsifer et al., 2022) that transform educational methodology, benefiting students experiencing this digital modality (Paradeda & Santos, 2022). This also suggests that for educational institutions, moving to the digital environment (Camacho-Zuñiga et al., 2023) is a fantastic opportunity to design the education of the future: a broad and diverse education in its forms, strategies, methodologies and deliveries, which benefits the particularities of the students and their training needs.

This study evidences the potential of these remote learning experiences through the information identified, constituting a relevant input to name remote education as an existing and possible educational alternative, which is connatural to digital education, but which retains certain elements and attributes of face-to-face education. In this sense, and according to Rozo-García and Ramírez-Montoya (2024), remote education is a hybrid that enhances educational transformation, as it makes use of technologies to enable new learning experiences that enrich strategies and enable new learning scenarios based on a traditional classroom concept, but maximised by technology, which gives it a certain flexibility, agility and relevance to the current scenarios demanded of education in today's society.

Conclusion

Remote education as an alternative to solve a global crisis such as COVID-19 confinement presents a diverse and influential panorama of teaching and learning strategies. It represents a restructuring of digital education and the educational landscape. Leaving aside the simple perspective of a temporary and low-quality solution in emergencies, remote education could consolidate as a valid and effective educational delivery in the future. Its success depends mainly on the effective integration of technology and, above all, on rethinking pedagogical practices natural in these digital environments. We must be able to create learning experiences previously unimaginable, responding to diversity, particularities, complex environments, and uncertainty. Despite the challenges, remote education promises to democratise access to education and expand the reach of educational institutions, requiring continuous research and evaluation to understand and address its long-term implications in the teaching-learning process. The above suggests provocations and potential tensions for academic institutions, teachers, students and policymakers.

The main limitation of this review is that the literature reports those strategies that generally propose changes and transformations. Undoubtedly, many remote experiences during the pandemic did not lead to fundamental changes; it was simply a change to a videoconferencing platform without considering the content, strategies, digitalisation and time, among other elements. This significantly affects its quality and perception. For this reason, Pardo and Cobo (2020), Lion et al. (2023) and Rozo-García and Ramírez Montoya (2024) have urged discussing post-pandemic education, collecting the lessons learned and mistakes made, to build meaningful learning experiences to manage the changing digital environments confronting society.

Author contributions

Author 1: Conceptualisation, Investigation, Writing – original draft, Formal analysis, Writing – review and editing; **Author 2:** Conceptualisation, Data curation, Writing – review and editing.

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