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Virtual teaching and learning for autistic students amidst the pandemic: a systematic literature review

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Article Info

ABSTRACT

Teaching and learning for autistic students during the COVID-19 pandemic pose challenges for educators. This systematic literature review (SLR) aimed to explore the effectiveness of virtual teaching and learning (VTL) by employing the reporting standards for systematic evidence syntheses (ROSES) framework. Articles from databases like Scopus, Web of Science, and Google Scholar were systematically examined, focusing on themes such as support, coping strategies, teaching methods, flexibility, and communication. The review identified 14 sub-themes within these categories, providing tailored coping and teaching strategies for parents, teachers, and caregivers working with autistic students. From 706 initially identified articles, 376 were selected, with 17 specifically relevant to virtual teaching for autistic students during the pandemic. These findings contribute insights to the existing literature and offer practical implications to enhance VTL experiences for autistic students facing pandemic challenges.

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1. INTRODUCTION

The COVID-19 pandemic necessitated a shift to virtual teaching and learning (VTL), impacting autistic students significantly. To address this, a systematic literature review (SLR) was conducted using reporting standards for systematic evidence syntheses (ROSES) standards and articles from Scopus, Web of Science, and Google Scholar. Thematic analysis, guided by framework [1], [2], identified five main themes: support, coping strategies, teaching strategies, flexibility, and communication. Within these themes, 14 sub-themes were identified, covering aspects such as parental involvement [3]–[6], assistive technologies [7]–[12], individualized instruction [13]–[19], and virtual social interactions [20]–[26]. Practical implications for educators, policymakers, and researchers in special education are highlighted, offering evidence-based strategies for optimizing VTL experiences for autistic students. Research gaps and limitations underscore areas requiring future investigation.

The transition to VTL posed unique challenges for autistic students, who often require specialized support and accommodations to thrive academically and socially [14]. Without the familiar structure of in-person classrooms, many autistic students faced heightened anxiety and difficulties in adjusting to virtual

learning environments [27]. Consequently, there was an urgent need to explore effective strategies that could bridge this gap and ensure equitable access to education for autistic learners. By systematically reviewing existing literature, this study aims to shed light on the diverse needs of autistic students in the context of VTL and to identify evidence-based practices that can facilitate their learning and development.

Moreover, the findings of this SLR not only inform immediate instructional practices but also contribute to the broader discourse on inclusive education in the digital age. As the prevalence of online learning continues to grow, it is imperative to address the unique needs of diverse learners, including those with autism spectrum disorder (ASD) [24], [28]. By synthesizing empirical evidence and identifying key factors influencing the VTL experiences of autistic students, this study lays the groundwork for designing more inclusive educational policies and interventions. Ultimately, by leveraging the insights gleaned from this review, educators, policymakers, and stakeholders can collaborate to create supportive and empowering learning environments that cater to the diverse needs of all students, including those with autism. In conclusion, this SLR enriches our understanding of VTL effectiveness for autistic students during the pandemic, providing valuable insights for inclusive and effective education.

2. METHOD (SYSTEMATIC LITERATURE REVIEW)

This study applied the SLR method to assess the effectiveness of VTL for autistic students during the pandemic, involving planning, searching, selecting, analyzing, and reporting key steps in the process.

2.1. Reporting standards for systematic evidence syntheses

ROSES, focusing on the early and intermediate review stages like searching, screening, data extraction, and critical appraisal, offers adaptability for various synthesis types [29]. It combines reporting demands with methodological recommendations, emphasizing "gold standard" techniques for higher-quality reviews and protocols [29]. Tailored for the interdisciplinary nature of conservation and environmental management, ROSES provides clear and specific instructions for planning, conducting, and reporting at each review step [29]. This specificity ensures thorough and unbiased information presentation, enhancing the reliability and practicality of articles within the study's context.

2.2. Formulation of research question

The study's research question, formulated using the PICo framework, aligns with the population or problem, interest, and context elements (refer Table 1) [29]. This commonly used tool facilitated the identification of key concepts, with a focus on autistic students (population), VTL assistance (interest), and the pandemic context [29]. The main SLR research question emerged from these elements: Does VTL enhance the learning experience of autistic students during a pandemic?

Table 1. PICo framework

Population	Interest	Context
Autistic student	Autistic student who are assisted by VTL	During pandemic

2.3. Searching strategy

The SLR encompassed five essential stages, illustrated in Figure 1, with the initial three focusing on systematic searching: identification, screening, and eligibility. These stages were meticulously executed to ensure a comprehensive and rigorous review. The identification stage involved systematically searching for relevant articles, followed by screening to assess suitability based on predetermined criteria. Eligible articles underwent quality appraisal, and the final stages involved data abstraction and analysis to extract and synthesize pertinent information from selected studies. The systematic searching strategy's three stages are further discussed in subsequent sub-sections.

2.3.1. Identification

The identification process involved searching for synonyms, related terms, and variations of main keywords (autistic students, VTL, effectiveness, pandemic) to expand options for finding related articles. Keywords were developed based on the research question [30], utilizing an online thesaurus, previous studies, Scopus suggestions, and expert recommendations. Using Scopus and Web of Science databases, comprehensive search strings were developed with Boolean operators, phrase searching, truncation, wildcards, and field code functions (see Table 2). These databases were chosen for their advanced search functions, comprehensiveness, quality control, and multidisciplinary focus [31], [32]. Google Scholar, included for additional qualified articles, employed a combination of keywords like VTL, online learning,

pandemic, autistic children and effective, with phrase searching and boolean operators. Google Scholar's selection aligns with suggestions for its supporting role in systematic reviews [29], and its vast document database [32] and efficacy in retrieving scholarly items [33]. The search across these databases yielded 706 articles [31], [32].
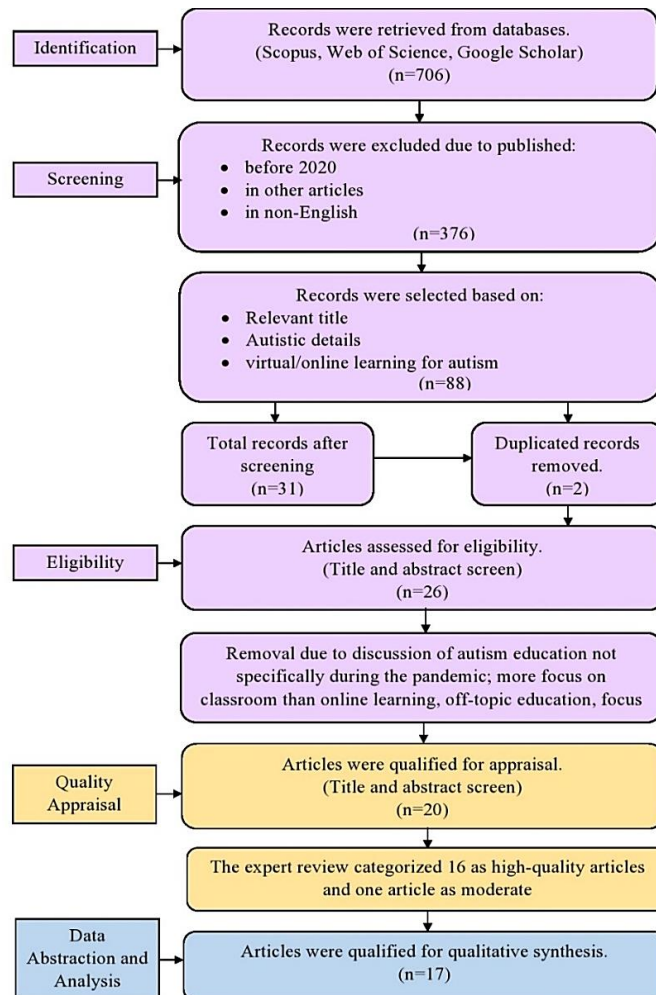

Figure 1. SLR process (adapted from [6])

Table 2. Search string used in selected databases

Database	Search string
Scopus	TITLE-ABS-KEY (effective* AND (online AND learn*)) OR (distance AND learn*) AND (autism OR autistic* OR (autistic AND student*) OR (autistic AND disorder)) AND (pandemic OR COVID*)
Web of Science	TS= (effective* AND ((virtual* AND teach* AND learn*) OR (distance AND learn*)) AND (autism OR autistic* OR (autistic AND disorder)) AND (pandemic OR COVID*))
Google Scholar	("virtual teaching and learning,") AND ("online learning," OR "virtual learning,") AND ("pandemic,") ("autistic children,") AND ("effective")

2.3.2. Screening

During the screening stage, 706 articles were evaluated based on the study's selection criteria. The initial screening, performed within database interfaces, considered criteria proposed by Kitchenham and Charters [34], including alignment with the research question and a publication timeline ranging from early 2020 due to the pandemic. Searches, starting in December 2022, were limited to articles published between 2020 and 2022 (see Table 3). To maintain quality, only directly relevant articles in English were included, limiting the subjects covered to 31, as per the study scope. Out of 706 articles, 675 were excluded for not meeting the criteria, and duplicate articles across databases were identified and removed, leaving 26 articles for the eligibility process [30], [34], [35].

Table 3. Inclusion and exclusion criteria

Criteria	Inclusion	Exclusion
Timeline	2020 – 2022	< 2020
Document type	Journal articles (empirical data)	Article review, books, book series, conference and proceeding
Language	English	Non-English

2.3.3. Eligibility

In the third stage, the authors manually reviewed remaining articles after the screening process, ensuring alignment with criteria by examining titles and abstracts. Six articles were excluded for discussing general barriers and expectations of autistic children's educators, not specific to the pandemic focusing on classroom learning rather than online learning; heavily emphasizing perspectives of parents and families addressing broader topics related to autistic children rather than educational purposes discussing lifestyle issues faced by families of autistic children instead of educational aspects and concentrating on life skills of autistic children rather than educational aspects.

2.4. Quality appraisal

After the eligibility process, two experts conducted a quality assessment, classifying articles into three levels: high, moderate, and low, following [36]. Only articles rated high or moderate were considered for inclusion. The assessment primarily focused on methodology, requiring both experts to agree on at least moderate quality for an article to be considered. Discrepancies were discussed before making final decisions, resulting in 16 high-quality and one moderate-quality article for qualitative synthesis [36]. See Table 4 for the articles checking table used by the experts.

Table 4. Article checking table

Article ID	Paper title	Year	Country	Paper quality by panel 1			Paper quality by panel 2			Remarks
				High	Moderate	Low	High	Moderate	Low	
A1	Using Embedded Trials and Systematic Prompting to Promote Tacted and Intraverbal Responses for Students with Developmental Disabilities [37]	2022	US	/			/			
A2	"This will likely affect his entire life": Parents' views of special education services during COVID-19 [38]	2022	US	/			/			
…An	Exploring the Effect of Robot-Based Video Interventions for Children with Autism Spectrum Disorder as an Alternative to Remote Education [39]	2021	Peru		/			/		Related to teaching ASD using robot

2.5. Data abstraction and analysis

Thematic analysis, a qualitative technique developed by [1], [2], was employed for identifying, analyzing, and reporting sub-themes in this study. Initial immersion in the data through active reading allowed capturing meanings and patterns. Generating preliminary codes involved organizing relevant data into meaningful groups, resulting in 200 initial codes. A "peer debriefing" process followed, sharing codes with co-authors to verify and avoid bias, with feedback leading to corrections and amendments. This process yielded 14 sub-themes. Searching for overarching themes involved sorting through the derived sub-themes, facilitating the thematic analysis [1], [2].

3. RESULTS AND DISCUSSION

Through identification, screening, eligibility, quality appraisal, and data abstraction, five themes emerged in VTL practices for autistic students during the pandemic: support, coping strategies, teaching strategies, flexibility, and communication (see Table 5).

The analysis revealed subthemes within each of these overarching themes. Under support, subthemes include adult support, teacher support, and parent support. Coping strategies encompass various strategies employed by both parents and teachers, such as social coping strategies and authority coping strategies, to navigate the challenges presented by VTL for autistic students. Teaching strategies involve

facilitation, audio/video methods, the use of teaching aids, monitoring, and mentoring, highlighting the multifaceted approaches educators employ to cater to the diverse needs of autistic learners in virtual settings.

Table 5. Themes and subthemes

Theme	Subtheme
Support	– Adult support
	– Teacher support
	– Parent support
Coping strategies	– Parent coping strategies
	– Teacher coping strategies
	– Social coping strategies
	– Authority coping strategies
Teaching strategies	– Facilitation
	– Audio/video
	– Teaching aid
	– Monitoring
	– Mentoring
Flexibility	– Location flexibility
	– Time flexibility
Communication	–

Flexibility, as identified in the analysis, is characterized by location flexibility and time flexibility, underscoring the importance of adaptable practices that accommodate the unique circumstances and preferences of autistic students in the virtual learning environment. Lastly, communication emerged as a critical theme, though no specific subthemes were identified in the provided table. Effective communication channels between educators, students, parents, and support professionals are essential for fostering collaboration and ensuring that the needs of autistic students are met effectively in VTL settings.

Further analysis identified 14 sub-themes from the 17 selected articles, with studies conducted mainly in the United States (7), Australia (2), and various countries (1). The selected articles spanned publication years, with five in 2022, eleven in 2021, and one in 2020, contributing to the SLR results presented in Table 6 [27], [28], [38]–[51].

The geographic distribution of the studies underscores the global impact of the COVID-19 pandemic on virtual learning experiences for autistic students. While the majority of studies originated from the United States and Australia, the inclusion of research conducted in diverse international settings offers valuable insights into cross-cultural variations in educational practices and support mechanisms.

By encompassing a range of cultural and socio-economic contexts, the findings of this SLR provide a more comprehensive understanding of the challenges and opportunities associated with VTL for autistic students worldwide. Additionally, the distribution of publication dates highlights the timeliness of this review, reflecting the rapid expansion of research efforts to address the emergent needs of autistic learners in the wake of the pandemic.

3.1. Theme 1–support

The first sub-theme, adult support, emphasizes the importance of continuous support for autistic students during online learning [38]. Online support groups, suggested by Daulay [40], provide a virtual community for students and families, addressing social isolation and offering emotional support. Facilitators, including teachers and school organizations, play a pivotal role in adapting teaching methods and training caregivers, highlighting the need for professional development in virtual environment adaptation [28], [45], [46], [48]. Averet [44] emphasizes the significance of establishing strong connections between autistic children and their caregivers, requiring a comprehensive educational strategy that considers social and emotional connections. Termine *et al.* [27] underscores the importance of understanding children's emotions to create an effective online learning environment.

The second sub-theme, teacher support, highlights the flexibility and responsiveness required from educators in virtual environments, customizing assistance to fit specific needs [43]. Stenhoff *et al.* [43] notes the importance of providing training to caregivers on instructional, communication, and behavioral support to actively engage in their children's education. Collaboration among teachers and school organizations addresses a variety of needs, ensuring students with autism receive complete support, including academic, emotional, and behavioral support [28], [44]. Teachers acting as a connection between home and the classroom support continuity in learning and psychological wellness [25]. Daulay [40] finds that teachers supporting families reveals a promising development in establishing a strong support network.

Table 6. Result of thematic analysis

Studies	Year	Region	Support			Coping strategies				Teaching strategies					Flexibility		COM
			AS	TS	PS	PCS	TCS	SCS	ACS	FC	AV	TA	MT	MN	LF	TF	
Sonnenschein et al. [38]	2022	United States	/													/	
Daulay [40]	2021	Indonesia	/	/		/											
Bailey et al. [41]	2022	Australia	/							/	/		/				
Aloizou et al. [42]	2021	Greece								/		/	/				
Stenhoff et al. [43]	2020	United States		/			/			/	/	/	/				/
Averett [44]	2021	United States	/	/	/						/	/					
Heyworth et al. [45]	2021	Australia				/									/	/	
Alarcon et al. [39]	2021	Peru								/	/						
Genova et al. [46]	2021	United States	/					/		/							
Cameron et al. [47]	2022	Norway				/		/	/	/	/	/	/	/			
Padillo et al. [48]	2021	Philippines	/	/		/				/	/	/	/				
Lambert and Shuck [46]	2021	United States		/								/	/				/
Al-Mamari et al. [49]	2021	Saudi Arabia						/	/		/		/				
Roitsch et al. [50]	2021	United States			/						/						
Termine et al. [27]	2021	Italy	/								/						/
Yakubova et al. [51]	2022	United States								/		/					
Yahya et al. [28]	2022	Malaysia	/	/	/	/	/			/	/	/	/				

Support	Coping strategies	Teaching strategies		Flexibility
AS=Adult support	PCS=Parent coping strategies	FC=Facilitation	MT=Monitoring	LF=Location flexibility
TS=Teacher support	TCS=Teacher coping strategies	AV=Audio/video	MN=Mentoring	TF=Time flexibility
PS=Parent support	SCS=Social coping strategies	TA=Teaching aid		
	ACS=authority coping strategies			

The third sub-theme, parental support, emphasizes the vital role of parents in adapting to the home learning environment [44], [50]. Parents became co-educators, actively participating in their children's education, monitoring compliance, and offering support for special education and related activities [44]. Collaboration with teachers and therapists was crucial in providing a holistic approach to education, with parents acting as co-educators becoming more prevalent [28], [48]. Parents played a significant role in customizing educational strategies and interventions to match the unique requirements of their children, bridging the gap between the virtual educational and home learning environments.

3.2. Theme 2–coping strategies

Coping strategies, the identified theme for dealing with home learning challenges, encompass four sub-themes: parent's coping strategies, teacher's coping strategies, social coping strategies, and authority's coping strategies. In Indonesia, [40] suggests mothers allocate time alone to manage stress from home education challenges, emphasizing self-care. In [44], [47] highlight the role of parents as co-educators, actively participating in their children's education and providing emotional support. Parents collaborate with teachers, ensuring students stay on task and understand concepts, revealing the collaborative nature of home education.

The second sub-theme, teacher's strategies, emphasizes the importance of effective strategies for addressing challenging behaviors in autistic students [28], [43]. Teachers play a crucial role in developing instructional support tailored to unique needs, involving varied instruction and individualized educational plans [28], [43]. Padillo et al. [48] suggests considering practical skills beyond the classroom, aiming to educate students for active involvement in daily lives and communities. Evidence-based practices form the foundation for effective teaching strategies, ensuring accuracy and positive outcomes. Teachers' roles in online learning for autistic children highlight the importance of regulating behavior, providing individualized instruction support, fostering practical skills, and using evidence-based practices.

The third sub-theme, social coping strategies, addresses the social and emotional well-being of autistic students during the pandemic [46]. The prolonged duration of the pandemic and the shift to virtual have long-term negative impacts, requiring adjustments in therapy aims and a flexible approach [46]. Social

interaction is crucial for learning and development, and the limitations on face-to-face communication during the pandemic accentuate the difficulties for students with autism. Social coping strategies emphasize a comprehensive approach beyond academic instruction, recognizing the crucial role of social and emotional development in overall well-being. Strategies encompass social skill development, peer interaction, and emotional regulation to support autistic students comprehensively.

The last sub-theme, authority's coping strategies, underscores the crucial role of national authorities in providing guidance on homeschooling and supporting students in need [47]. In Saudi Arabia, [49] emphasizes organizing training workshops for special education to facilitate e-learning implementation, suggesting the importance of pre-service preparation and specific training programs for special education teachers.

3.3. Theme 3–teaching strategies

Teaching strategies, including facilitation, audio/video, teaching aids, monitoring, and mentoring, are pivotal for creating inclusive and engaging virtual learning environments for children with special needs. Facilitation involves telehealth, aiding caregivers and educators remotely [41]. User-friendly methods for organizing and presenting resources are crucial [28], [39], [42]. Telemedicine and tele-education are recommended to continue post-pandemic for their suitability and high acceptance [46]. Variety in approaches, such as text messages and attending professional courses, highlights teachers' flexibility in addressing students' needs [47], [49]. Ongoing training is emphasized for efficient technology use in data gathering, analysis, and instruction [49]. Intervention effectiveness is highlighted [51]. Audio/video underscores the significance of visual elements in engaging special needs children [28], [41]. Visual stimuli play a crucial role in making learning appealing and maintaining focus. Teachers design personalized instructional materials, including videos of role models, to support caregivers [43]. Asynchronous video and posting assignments virtually offer flexibility, particularly beneficial for varying paces and individualized timetables [47]. Audio-video supplementary instructions for teaching functional skills at home are recommended [48].

Teaching aids stress autonomous learning with appropriate goals and intervention frequency [42]. Online sharing of resource s for further practice or homework enhances the learning process [43]. Teachers prepare materials for autistic students, involving educational, communication, behavioral, and organizational support, and seek input from caregivers [28], [43]. Synchronous remote services are crucial for maintaining attention and engagement, providing real-time interactions [44]. Personalized learning strategies, new tools, and techniques contribute to tailored instruction [48]. Simulated learning environments through virtual platforms, like virtual reality, benefit people with autism [50]. Individualized solutions for remote learning are crucial for special needs children [27]. Stand-alone manipulative-based interventions in mathematics are beneficial for tactile learning experiences [51].

Monitoring requires precision in home learning programs, monitoring usage and progress, and manipulating resources [28], [41], [42]. Ensuring each student demonstrates understanding is crucial, with adaptations to behavior intervention plans for contextual fit [43]. Feedback to caregivers and examining experiences from previous crises aid in anticipating needs during the pandemic [44]. Teacher training on using digital technology is recommended [48]. Policies and practices ensuring safe and effective transitions to online learning are crucial, with ongoing support for special education students [47]. Training and seminars on new approaches and strategies for teaching exceptional-education students are beneficial for both teachers and parents [52].

Mentoring involves teachers providing training for caregivers, crucial partners in the education of children with special needs [41]. Mentoring programs encourage collaboration between teachers and caregivers. Policies ensuring safe transitions to online learning are crucial, requiring ongoing support for special education students [47]. Training on new approaches and strategies for both teachers and parents is recommended [48]. Professional development opportunities are crucial to stay updated on the latest findings and methodologies [49], [52]. Teachers have the opportunity to teach families self-regulation strategies [49], [52]. The collaborative nature of special education, where educators, parents, and professionals team up to fulfill each student's requirements, is highlighted [49], [52]. In conclusion, these strategies collectively contribute to the creation of inclusive, efficient, and engaging virtual learning environments for children with special needs, ensuring their ongoing growth and development.

3.4. Theme 4–flexibility

Flexibility in the context of home education for special needs children during the pandemic encompasses two sub-themes: location flexibility and time flexibility. According to [45], location flexibility involves adjusting learning places and environments for special needs students, emphasizing the importance of home as the best learning place. This setting enhances comfort, prevents physical exhaustion, and considers the unique needs and preferences of these students. Customizing educational strategies to align with their learning preferences is essential.

Time flexibility, as mentioned by [41], [45], focuses on awareness of flexibility in assignment timelines. Special needs children and parents reported feeling less restricted by fixed timetables, emphasizing the importance of a flexible schedule not strictly structured by others. This autonomy in managing learning schedules independently gives special needs children and their caregivers greater control, recognizing that certain students thrive when given the freedom to organize their time according to their requirements and learning preferences. Both location and time flexibility facilitate a more tailored approach to learning, acknowledging the diverse learning profiles of special needs children. This adaptability emphasizes the significance of customizing instructional strategies to accommodate the unique needs of these children during the pandemic. Flexibility in both location and time contributes to a more customized and productive learning experience for special needs children, supporting their success in educational settings [45].

3.5. Theme 5–communication

The theme of communication between parents and teachers in home learning during the pandemic is crucial, emphasizing a collaborative and supportive approach. Stenhoff [43] emphasizes the importance of regular direct contact between teachers and caregivers, serving multiple purposes. This communication allows teachers to provide parents with guidance on supporting their childrens home learning, share updates on students progress, and exchange insightful information about the child's requirements and development. These skills are essential not only for academic achievement but also for fostering resilience and adaptation during disruptive periods like the pandemic.

Additionally, [52] emphasizes clear communication between teachers and parents regarding the significance of fostering independence and self-regulation during the pandemic. These skills are vital for academic success and crucial for developing resilience, especially in disruptive periods. Establishing constant collaboration between families and teachers, involving ongoing communication and one-on-one remote support from special education teachers [27], goes beyond occasional updates. This collaborative system ensures that children with special needs receive continuous direction and assistance throughout their home-learning journey, with remote support tailored to individual needs.

In conclusion, effective communication between parents and teachers is essential for successful home learning for special needs children during the pandemic. This theme highlights the importance of consistent, understandable, and continuous communication, emphasizing the supportive role of special education teachers in providing specialized support [43].

3.6. Teaching strategies model

The main theme derived from the findings is teaching strategies, encompassing six elements that collectively form a model (depicted in Figure 2). This model is designed to provide high-quality instruction and support to students with diverse learning needs, especially in the context of challenges posed by the pandemic. The model serves as a valuable reference for teachers, caregivers, and policymakers, ensuring optimal educational outcomes for students with special needs.
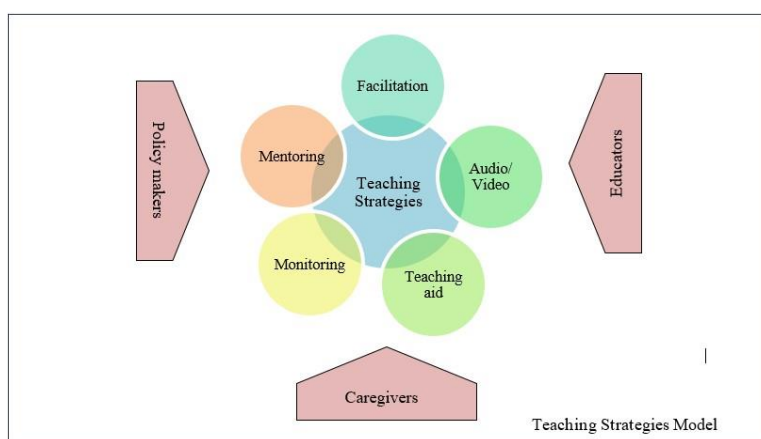

Figure 2. Teaching strategies model

3.6.1. Facilitation

Facilitation in education involves employing various methods and tools to enhance effective instruction. It encompasses user-friendly systems for resource organization, telehealth, telemedicine, and tele-education. In inclusive education, facilitation utilizes diverse tools, technologies, and approaches to

make educational materials accessible for all learners, including assistive devices, adaptable instructional methods, and accessible learning materials. Facilitation ensures equal opportunities for all students, promoting their participation and success in the learning process. For instance, providing captioned videos, using screen readers, and offering flexible seating options are examples of facilitation that support students, considering their individual needs and abilities.

3.6.2. Audio/video
Audio and video in education involve using multimedia tools like audio recordings, videos, and interactive media to enhance the learning process. These components cater to diverse sensory preferences and learning styles, making educational materials more engaging and accessible, especially for children with varying needs. Examples of audio/video solutions include sign language videos for students with communication difficulties, audio descriptions for visual content to assist visually impaired students, and interactive simulations for hands-on learning experiences.

3.6.3. Teaching aids
Teaching aids encompass a variety of educational tools, including textbooks, software, instruments, and communication tools, available in tangible, digital, or interactive forms. These aids provide additional support, visual cues, and alternative learning methods to address the diverse needs of students. Examples of teaching aids include tactile diagrams for visually impaired students, interactive apps for those with ASD, and adaptive reading materials for students with dyslexia. Teachers and caregivers can utilize these examples as effective teaching strategies.

3.6.4. Monitoring
Monitoring involves ongoing assessment of student behavior, participation, and progress, incorporating data collection and analysis to enhance instruction and offer prompt feedback. This process is essential for educators to comprehend individual student needs, tailor instruction, and effectively track progress. Techniques for monitoring include consistent data collection on student performance, formative assessments to identify learning needs, and the use of technology-based tracking systems for data analysis.

3.6.5. Mentoring
Mentoring involves providing guidance, support, training, coaching, and resources to enhance teaching and learning practices in virtual environments. This support empowers educators, caregivers, and students to meet diverse educational requirements, fostering teamwork and professional growth. Techniques include educating educators on universal design for learning (UDL), providing caregivers information on VTL, and incorporating peer mentoring for students to assist each other. Figure 2 visually captures the key research findings, presenting a resilient teaching technique that serves as a reference for educators and decision-makers striving for optimal educational outcomes for students with special needs amid the uncertainties of the pandemic.

4. CONCLUSION
The SLR indicates that VTL has the potential to enhance the learning experience of autistic students during a pandemic. However, comprehensive support for autistic students, parents, and teachers is crucial. Collaboration between families and teachers, along with remote support from special education teachers, is vital for VTL success. Implementing coping strategies is essential for both teachers and parents. Teachers need diverse instructional strategies, and parents require management strategies to facilitate their children's learning. Technology, such as audio-video methods, can engage students and improve focus during virtual lessons. Clear communication channels, collaboration, and emphasizing independence and self-regulation contribute to a supportive and inclusive learning environment. Lastly, incorporating flexibility in time and location is essential in designing VTL for autistic students. Further research is needed to enhance the understanding of the experiences of children with disabilities in times of crisis and to inform strategies for supporting their educational needs.

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