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The role of school gardens in supporting teachers' psychological well-being and landscape development in special education schools: A systematic literature review

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ABSTRACT

Teachers in special education schools face complex emotional and occupational challenges that can compromise their well-being and the quality of teaching. Growing evidence suggests that exposure to green environments, particularly school gardens, may support psychological restoration and promote healthier educational settings. This systematic literature review aimed to synthesize existing studies on three main aspects: (1) the sources and types of psychological stress experienced by special education teachers, (2) the documented functions and restorative value of school gardens, and (3) the current research progress on landscapes in special education schools. Following the PRISMA 2020 framework, studies published between 2005 and 2025 in English and Chinese were identified from databases such as Scopus, Web of Science, ERIC, ProQuest, and Google Scholar. A total of thirty-three studies met the inclusion criteria and were analyzed through thematic synthesis. The results indicated that emotional labor, behavioral management, parental communication, and role ambiguity were the primary sources of stress among special education teachers. School gardens were found to serve educational, restorative, and therapeutic functions that foster experiential learning, reduce stress, and strengthen teacher–student relationships. Recent research trends revealed an increasing integration of psychological and spatial perspectives; however, there remains a lack of validated frameworks for restorative design in special education campuses. This review concludes that well-designed school gardens can play a critical role in supporting teacher well-being and inclusive education. Future research should focus on combining psychological, spatial, and ecological indicators to develop evidence-based restorative landscape frameworks tailored specifically for special education schools.

Contribution/ Originality: This review is the first to systematically connect the psychological stress experienced by special education teachers with the restorative functions of school gardens. It offers an interdisciplinary perspective that integrates educational, psychological, and landscape research. The study establishes a foundation for evidence-based restorative design frameworks within special education school environments.

1. INTRODUCTION

In recent decades, the professional well-being of teachers has gained increasing attention in educational research and policy. Teaching, by its very nature, presents significant occupational demands, including classroom

management, curriculum adaptation, and high levels of emotional labor (Agyapong, Obuobi-Donkor, Burback, & Wei, 2022). Within this occupational group, special education teachers those working in special education schools or with students with disabilities face unique and heightened pressures. Empirical studies have shown that special education teachers experience greater job-related stress than their general education counterparts, as well as an elevated risk of burnout and attrition (Adigun, Tijani, Nzima, & Vivekanantharasa, 2021). For instance, a meta-analysis indicated that special education teachers are particularly vulnerable to burnout, emphasizing the need for targeted research on their psychological health (Park & Shin, 2020). However, most studies still focus on general education settings, overlooking the unique challenges faced by special education schools. Meanwhile, research in environmental psychology and landscape studies demonstrates that natural outdoor spaces can support mental health and facilitate attentional restoration (Kaplan, Kaplan, & Brown, 1989; Ulrich, 1984). In school contexts, school gardens have been shown to foster positive emotions, social skills, and attentional restoration for students and teachers, thereby enhancing well-being and fostering a connection to nature. However, quantitative evidence supporting these benefits remains limited (Askerlund, Almers, Tuvendal, & Waite, 2024; Ohly et al., 2016). Furthermore, horticultural therapy and structured nature activities for students have been shown to reduce stress and anxiety, suggesting that campus green spaces provide a "low-cost, high-benefit" form of psychological support, especially meaningful for stressed special education teachers (Pollin & Retzlaff-Fürst, 2021). Given the intersection of these two strands, the elevated stress and occupational demands on special education teachers and the restorative potential of school garden landscapes, there emerges a compelling rationale for investigating how school gardens within special education school settings may support teacher well-being and the broader landscape functions of special schools. However, to date, research on special education school landscapes remains fragmented, with limited evidence and contextual focus (Hussein, 2017). Most studies rely on general school cases and lack systematic evaluation of accessibility, sensory adaptation, safety, and teacher–space interactions (Akoumianaki-Ioannidou, Paraskevopoulou, & Tachou, 2016). Comprehensive reviews linking nature, psychology, and teaching are scarce. Although some inclusive design studies provide useful frameworks, they rarely address how school gardens specifically relieve teachers' psychological stress (Brown et al., 2021). Since COVID-19, rising teacher stress and isolation have highlighted the urgent need for environment-based interventions, such as school gardens (Aziku & Zhang, 2024). To visualize the research landscape underpinning this topic, a bibliometric keyword co-occurrence analysis was conducted using VOSviewer based on initial search results related to special education schools, landscape design, and teacher well-being (Figure 1). The visualization reveals four major thematic clusters: (1) intervention and child development (green), (2) learning and teaching engagement (red), and (3) spatial and environmental impacts (blue). These clusters highlight the interdisciplinary nature of the field but also demonstrate the absence of integrated studies linking restorative landscape design with teachers' occupational health, thereby reinforcing the rationale for this systematic review.

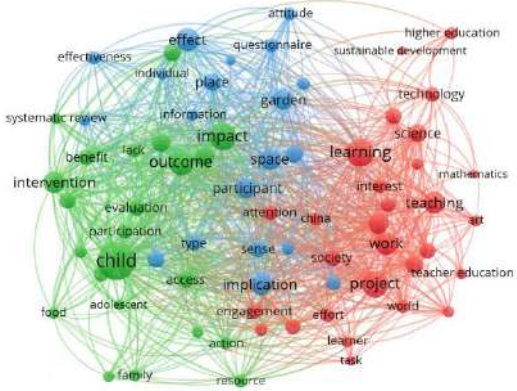

Figure 1. Keyword Co-occurrence Network of Research on Special Education School Landscapes and Teacher Well-being (2005-2025).

Considering this gap, this systematic literature review aims to address three key questions: (1) What are the main sources of psychological stress among special education teachers? (2) What roles do school gardens play in education? (3) What is the current state of research on campus landscapes in special education schools? By integrating findings across these questions, this review seeks to build an evidence-based foundation for improving teacher well-being and inclusive school landscape design.

2. METHODS

2.1. Review Protocol

This systematic review followed the PRISMA 2020 guidelines (Page et al., 2021) to ensure transparency, reproducibility, and methodological rigor. The review process comprised four standard stages: identification, screening, eligibility, and inclusion, implemented through a structured protocol. Additionally, the procedural framework proposed by Tranfield, Denyer, and Smart (2003) was adopted to align with best practices in social and environmental science reviews. The review was designed to systematically synthesize literature at the intersection of special education, teacher well-being, and school landscape design. The time frame was set from 2005 to 2025, capturing two decades of growth in research on school gardens, restorative environments, and teacher mental health. Studies published in English and Chinese were included to ensure cultural and contextual breadth, particularly given the increasing contributions from East Asian scholarship. The review encompassed peer-reviewed journal articles, doctoral theses, conference papers, and institutional reports that met the inclusion criteria outlined in the following sections.

2.2. Search Strategy

A comprehensive multi-database search was conducted between July and September 2025 to ensure full coverage of relevant interdisciplinary literature. The selected databases included Scopus, Web of Science Core Collection, Education Resources Information Center (ERIC), ProQuest, and Google Scholar. These sources were chosen for their strong representation of educational, psychological, and environmental design research across both English- and Chinese-language contexts. The search strategy employed Boolean operators (AND, OR) and wildcards (*) to capture conceptual variations across three thematic domains: (1) psychological stress and well-being among special education teachers, (2) functions and restorative values of school gardens, and (3) landscape and spatial research in special education schools. Searches were restricted to studies published from 2005 to 2025 in English or Chinese and applied to titles, abstracts, and keywords (see Table 1).

To complement database searches, snowballing techniques were applied by reviewing the reference lists of included papers to identify additional eligible studies. All retrieved records were imported into EndNote 21 for duplicate removal and preliminary screening. The subsequent sections describe inclusion and exclusion criteria and the stepwise screening process following the PRISMA 2020 framework (Page et al., 2021).

Table 1. Search keywords and database overview.

Research Theme	Example Search String	Databases
RQ1: Psychological stress of special education teachers	("special education teacher" OR "special needs educator" OR "SPED teacher") AND ("stress" OR "burnout" OR "mental health" OR "wellbeing")	Scopus, Web of Science, ERIC, ProQuest
RQ2: Functions and value of school gardens	("school garden*" OR "healing garden" OR "therapeutic landscape") AND ("education" OR "teacher wellbeing" OR "psychological restoration" OR "green space")	Scopus, ERIC, Google Scholar, ProQuest
RQ3: Landscape research in special education schools	("special education" AND ("landscape design" OR "green space" OR "campus environment" OR "inclusive design")	Web of Science, Scopus, Google Scholar

2.3. Inclusion and Exclusion Criteria

To ensure methodological consistency and focus, a set of inclusion and exclusion criteria was established prior to the review process (Table 2). These criteria were informed by the PRISMA 2020 statement (Page et al., 2021) and adapted from best practices for evidence-based environmental and educational research (Hallinger & Nguyen, 2020; Ohly et al., 2016).

Eligible studies were selected based on their relevance to the research questions. The inclusion criteria were intentionally broad to encompass both quantitative and qualitative evidence across disciplines, including environmental psychology, landscape architecture, and special education. Conversely, exclusion criteria were applied to eliminate purely technical horticultural research and non-educational case studies that lacked relevance to teacher well-being or campus design.

Table 2. Inclusion and exclusion criteria.

Criterion	Inclusion	Exclusion
Population	Studies focusing on *special education teachers*, *special education schools*, or *inclusive education staff*	Studies on general education teachers or non-school populations
Concept / Topic	Research addressing *psychological stress*, *burnout*, *mental health*, *well-being*, *school gardens*, *healing/therapeutic landscapes*, or *campus environment and design*	Studies unrelated to teacher well-being, nature-based interventions, or school environments.
Context	Educational settings, including *special schools*, *inclusive schools*, or *school campuses* with natural or outdoor spaces	Non-educational or clinical settings (e.g., hospitals, rehabilitation centers, public parks)
Outcome	Studies reporting *psychological*, *behavioral*, *environmental*, or *restorative outcomes* linked to teachers or school environments	Purely technical, horticultural, or botanical studies lacking psychological or educational outcomes
Study Type	Peer-reviewed journal articles, theses, conference papers, and institutional reports (empirical or conceptual)	Opinion pieces, media reports, or unpublished manuscripts without an empirical basis
Language & Period	English and Chinese publications from 2005 to 2025	Publications in other languages or prior to 2005

2.4. Screening and Selection Procedure

All search results were compiled from Scopus, Web of Science, ERIC, ProQuest, and Google Scholar. Duplicate records were automatically removed, followed by manual verification to ensure accuracy. Titles and abstracts were independently reviewed to determine relevance to the predefined inclusion criteria, which included the teacher population, school garden or landscape context, and well-being outcomes. Studies that did not meet these conditions were excluded at this stage. Full-text screening was then conducted for potentially relevant studies. Only those meeting all inclusion criteria were retained for final synthesis.

A total of 252 records were initially identified, of which 29 were removed as duplicates. After screening titles and abstracts, 111 papers remained for full-text review, and finally, 33 studies were included in the systematic synthesis. The detailed flow of study selection is illustrated in Figure 2, following the PRISMA 2020 template.

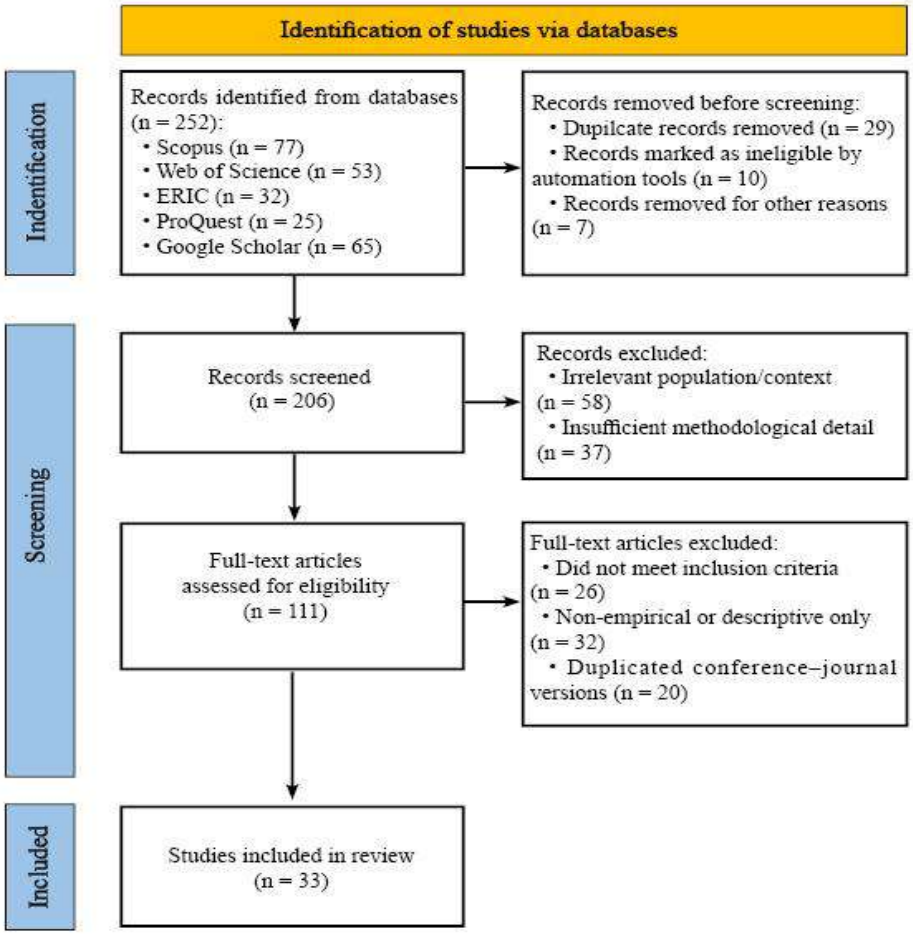

Figure 2. PRISMA 2020 Flow Diagram of the Study Selection Process.

3. RESULTS

3.1. Overview of Included Studies

A total of 33 studies met the inclusion criteria and were included in the final synthesis, encompassing publications between 2005 and 2025. As shown in Figure 3, the number of publications exhibited a steady increase over the past two decades, with a noticeable surge after 2015, reflecting growing interdisciplinary interest in the intersection of teacher well-being, school gardens, and special education environments.

Geographically, most studies were conducted in East Asia (33%), followed by Europe (24%), North America (21%), and the Middle East (21%), with a small number of contributions from developing regions (6%). The spatial distribution of research indicates that studies conducted in the United States, China, the United Kingdom, and Malaysia dominate the field. Chinese-language studies have increased significantly since 2020, primarily focusing on the design and therapeutic value of special education school campuses and restorative landscapes.

Regarding the methodology, quantitative studies accounted for approximately 45% of the reviewed literature, often employing survey-based or experimental designs to measure teacher stress, burnout, or perceived well-being. Qualitative approaches represented 35% of the studies, typically utilizing interviews, case studies, or ethnographic observations to explore the lived experiences of special education teachers or perceptions of garden use. Mixed-method studies, comprising 20%, have become increasingly prominent in recent years, integrating psychological measures with spatial or environmental assessment tools.

Several studies (e.g., Batman, Altay, Şengül, & Yıldız, 2024; Friedman & Morrison, 2021) demonstrated a growing convergence between occupational stress research and environmental psychology, revealing an emerging trend toward multi-layered frameworks that connect teacher well-being to the physical and social characteristics of educational environments.

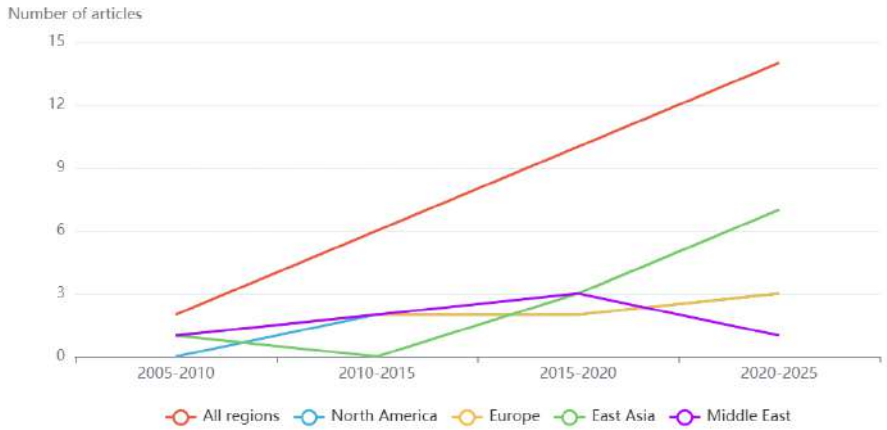

Figure 3. Publication trend of included studies, 2005–2025.

3.2. Psychological Stress of Special Education Teachers

The first research question addressed the psychological stressors experienced by special education teachers and their implications for occupational well-being. Across the reviewed studies, several recurrent stress dimensions emerged, echoing patterns consistently reported since the early 2000s.

The predominant stressor among special education teachers is emotional labor, involving the constant regulation of empathy, patience, and affective expression when working with students with diverse disabilities. Such emotional demands, particularly in managing challenging behaviors, have been shown to predict burnout and emotional exhaustion (Cancio et al., 2018; Hester, Bridges, & Rollins, 2020). Meta-analyses further confirm that emotional strain, role overload, and limited institutional support are major sources of stress in this field (Park & Shin, 2020). Teachers also experience stress from behavior management, including aggression, classroom disruption, and individualized intervention plans, which often lead to fatigue and reduced teaching efficacy. Parental communication difficulties, such as inconsistent collaboration or mismatched expectations, further heighten stress levels (Adigun et al., 2021). In addition, role ambiguity and conflict, driven by overlapping responsibilities, administrative demands, and limited autonomy, frequently intensify professional pressure, especially in inclusive or resource-limited schools (Agyapong et al., 2022; Aziku & Zhang, 2024).

Despite these insights, the review identified substantial research gaps in how institutional or environmental interventions mitigate teacher stress. Few studies have empirically evaluated school-based restorative environments or nature-based interventions as structured coping mechanisms for special education teachers (Brown et al., 2021). Existing evidence tends to focus on psychological interventions (e.g., mindfulness, cognitive-behavioural training) rather than spatial or environmental supports, revealing an underexplored opportunity for integrating school garden design and green space exposure into teacher well-being frameworks (Chen & Hamel, 2023).

Overall, findings from RQ1 highlight that stress among special education teachers is multidimensional, encompassing not only pedagogical demands but also environmental and organizational factors. This underscores the importance of examining how restorative spatial design, such as school gardens, can buffer these stressors and enhance resilience.

3.3. Functions and Values of School Gardens

The reviewed studies consistently highlight the multifunctional role of school gardens in educational and psychological contexts, especially within special education settings. Three major categories of functions have emerged: educational, psychological-restorative, and therapeutic-social.

First, the educational function of school gardens lies in their capacity to provide hands-on, experiential learning environments. Teachers reported that gardening activities enhance students' sensory awareness, responsibility, and social interaction, while offering alternative pathways for learning beyond the classroom (Kuo, Klein, Browning, &

Zaplatosch, 2021). Several studies emphasize that school gardens help foster social and emotional skills, teamwork, and empathy among students with special needs, aligning with principles of experiential learning and inclusive pedagogy (Akoumianaki-Ioannidou et al., 2016; Naim, Felix, Khalifa, & Najjar, 2025).

Second, the psychological restorative function of gardens has been widely discussed in environmental psychology. According to Ulrich's Stress Recovery Theory Ulrich (1984) and Kaplan's Attention Restoration Theory Kaplan et al. (1989), exposure to natural environments can restore directed attention, reduce stress, and improve overall well-being. Empirical research in educational settings supports these theories: teachers and students who spend time in school gardens report lower perceived stress, greater concentration, emotional stability, and satisfaction with their surroundings (Bernardo, Loupa-Ramos, Matos Silva, & Manso, 2021).

Third, the therapeutic and integrative function of school gardens extends beyond psychological benefits to social inclusion (Sills, Stapp, Lambert, & Wolff, 2024). Gardens serve as shared spaces that encourage communication between teachers and students, and between schools and communities (Cañón-Vargas, Melo-Mora, & Sosa, 2025). They promote emotional connection, inclusivity, and positive teacher–student relationships, which are particularly important in special education contexts where emotional support and trust are essential. Corbacho-Cuello and Muñoz-Losa (2025) reported that school gardens can serve as structured horticultural therapy environments, enhancing students' sensory regulation and teachers' emotional resilience.

Overall, the findings suggest that school gardens are not only pedagogical tools but also restorative landscapes that support mental health and social cohesion within schools.

3.4. Current Research Progress on Special Education School Landscapes

The third research question examined the broader progress and characteristics of studies related to the landscapes of special education schools. Throughout the reviewed literature, three primary research themes were identified: the benefits of outdoor environments, the design of school gardens, and the evaluation of gardens after use (see Appendix A).

Early studies (before 2015) were mainly descriptive, focusing on case studies of campus greening and rehabilitation gardens (Pedersen, 2013). Between 2016 and 2020, research gradually shifted toward behavioral observation and qualitative user studies, documenting how students and teachers interact with outdoor spaces (McCree, Cutting, & Sherwin, 2018). More recent works (post-2020) increasingly employ quantitative and mixed-method approaches, such as perception mapping, environmental behavior tracking, and psychometric evaluation, reflecting a methodological shift from purely design-driven projects to evidence-based inquiry (Fahy, Delicâte, & Lynch, 2021; Voola & Kumari, 2022). Table 3 shows the thematic evolution and methodological trends.

In terms of geographic distribution, the most active research areas include China, the United States, and the United Kingdom, where inclusive education reforms and therapeutic landscape research have both advanced rapidly. Since 2018, Chinese studies have integrated concepts from landscape ecology, accessibility design, and restorative environment theory into the analysis of special education campuses (Liu, 2024; X. Wang, 2020).

Despite this progress, the review reveals a critical gap: the absence of a systematic "restorative landscape framework" specifically tailored for special education schools. Existing research often remains fragmented, focusing either on design aesthetics or user perception, without integrating psychological, ecological, and pedagogical dimensions (Guardino, Hall, Largo-Wight, & Hubbuch, 2019). Future studies should therefore aim to develop interdisciplinary frameworks that connect environmental design principles with teacher and student well-being outcomes, supported by longitudinal and cross-cultural evidence.

Table 3. Thematic evolution and methodological trends in the special education school landscape research, 2005–2025.

Time period	Main research themes	Methodological trends
2006-2010	■ Early case studies on therapeutic gardens in special schools ■ Focus on accessibility and rehabilitation spaces ■ Attention to inclusive playgrounds and sensory design	Descriptive design reports; qualitative observations
2011-2015	■ Expansion of Environmental Perception and Behavior Studies ■ Integration of educational psychology concepts	Case comparison; user interviews
2016-2020	■ Emergence of "restorative landscape" terminology ■ Studies on plant attributes, shading, and comfort	Behavioral observation; teacher/Student perception surveys
2021-2025	■ Shift toward evidence-based and user-centered design frameworks.	Mixed-methods designs; quantitative evaluation; psychometric scales.

4. DISCUSSION

The review reveals that special education teachers experience persistent psychological stress due to intensive emotional labor and behavioral management demands, yet school gardens and green campus spaces can offer restorative and pedagogical benefits that help mitigate such strain. This finding aligns with previous evidence that natural environments support emotional balance and cognitive recovery through restorative mediation mechanisms involving sensory engagement, reflection, and contact with nature (Friedman & Morrison, 2021; Kaplan et al., 1989; Ulrich, 1984). While most prior studies have focused on students or general school greening (Bernardo et al., 2021; Cañón-Vargas et al., 2025; Fahy et al., 2021), the current synthesis highlights teachers' psychosocial experiences, showing that interaction with greenery enhances calmness, attentional focus, and professional connectedness (Askerlund et al., 2024; Bucher, Moriarty, Lazarchak, & McIntire, 2025).

In special education settings, where psychological pressures are particularly intense, restorative outdoor spaces emerge as accessible, low-cost supports for teacher well-being. This perspective aligns with studies indicating that horticultural or nature-based environments enhance emotional resilience and reduce occupational fatigue (Corbacho-Cuello & Muñoz-Losa, 2025; Guardino et al., 2019). By integrating evidence across educational and environmental psychology domains, this review underscores the strategic potential of school gardens as everyday therapeutic landscapes that foster both teacher wellness and educational sustainability.

From a theoretical standpoint, these findings resonate strongly with both the Stress Recovery Theory (Ulrich, 1984) and the Attention Restoration Theory (Kaplan et al., 1989). Exposure to natural scenes and multi-sensory environments supports physiological relaxation and cognitive renewal, explaining why teachers perceive gardens as tranquil and restorative. The outcomes also align with Environment–Behavior Theory (Homburg & Stolberg, 2006), which emphasizes reciprocal relationships between human experience and spatial design: the garden's spatial configuration, vegetation density, and accessibility shape behavioral patterns and emotional responses. Integrating these frameworks, school gardens in special education settings function as restorative micro-environments that mediate the relationship between occupational stress and professional resilience.

Practically, the review identifies several design and management principles. Effective special-education gardens should offer sensory diversity through varied textures, colors, and scents, alongside optimal shading and multi-layered vegetation that enhance comfort and safety. Ensuring accessibility with barrier-free paths, interactive seating, and activity zones encourages teachers' restorative use. Regular maintenance, seasonal renewal, and teacher involvement in design foster emotional attachment, transforming gardens from decorative spaces into essential elements of a supportive learning ecosystem.

Despite increasing attention to this topic, several research gaps remain. First, few studies have conducted cross-cultural or longitudinal comparisons to examine how socio-cultural factors influence the restorative effects of school gardens. Second, existing research rarely employs standardized quantitative design-evaluation frameworks or expert validation methods, such as the Content Validity Index, to systematically assess spatial quality. Therefore, future studies should integrate a psychological–spatial–ecological analytical model that combines physiological indicators, spatial metrics, and ecological performance data. Such interdisciplinary approaches will enable more robust evidence linking landscape design to teacher well-being and contribute to the development of a comprehensive restorative landscape framework for special education schools.

5. CONCLUSION

This systematic review synthesizes two decades of research on special education teachers' psychological stress, the functions and values of school gardens, and the development of special education school landscapes. The findings reveal that teachers in special education settings experience multiple sources of stress, including emotional labor, behavioral management, parental communication, and role ambiguity, which collectively contribute to burnout and emotional exhaustion. Simultaneously, school gardens and green campus spaces demonstrate significant potential as restorative and pedagogical environments that can alleviate stress, enhance attention, and strengthen teacher–student relationships. By integrating evidence from environmental psychology and education, this review emphasizes the crucial role of restorative landscape design in supporting teacher well-being and promoting innovative, experience-based teaching practices.

Future research should advance along three directions: first, by incorporating psychological restoration assessments, using both self-reported and physiological indicators to measure the effects of green environments on teacher well-being; second, by conducting empirical evaluations of landscape-based interventions, testing how design changes—such as vegetation structure, sensory elements, and spatial layout—affect stress recovery; and third, by developing a validated design framework for restorative school gardens in special education contexts. This framework should integrate psychological, spatial, and ecological dimensions to guide evidence-based planning, ensuring that every green space on campus contributes to both teaching quality and human well-being.

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Institutional Review Board Statement: This study was approved by the Institutional Review Board of Research Involving Human Subjects (JKEUPM) Universiti Putra Malaysia, Malaysia, under protocol number [IRB No. JKEUPM-2025-504], dated [24 September 2025]. Informed verbal consent was obtained from all participants, and all data were anonymized to protect participant confidentiality.
Transparency: The authors state that the manuscript is honest, truthful, and transparent, that no key aspects of the investigation have been omitted, and that any differences from the study as planned have been clarified. This study followed all writing ethics.
Competing Interests: The authors declare that they have no competing interests.
Authors' Contributions: All authors contributed equally to the conception and design of the study. All authors have read and agreed to the published version of the manuscript.

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Appendix A. Included Landscape Research within Special Education Schools.

Theme	Participants	Method	Conclusion	Country/Authors
The benefits of outdoor environments for students with special needs	Children with ADHD aged 6–12	Control experiment	The combination of nature-based Sensory Garden and indoor Sensory Integrated represents a more effective therapeutic approach for enhancing functional behaviors in children with ADHD.	India. Voola and Kumari (2022)
	14 students and 6 staff	Interview, observation	Outdoor learning can help children with special educational needs and disabilities improve their comprehension skills and create opportunities to develop social skills and independence.	UK. Glanville (2023)
	Children with autism	Interview	Horticultural therapy programs enhance emotional intelligence in students with ASD.	India. Beela and Thankappan (2021)
	2 teachers and 5 autistic students	Interview, observation	Outdoor learning effectively supports the developmental progress of autistic children toward their Individualized Education Plan goals while also benefiting special education teachers; even with limited experience, it remains a feasible and beneficial approach for all participants.	USA. Friedman and Morrison (2021)
	37 students and 2 teachers	Observation, interview	During outdoor classroom sessions, students reported heightened perceptions of happiness, enjoyment,	USA. Guardino et al. (2019)

			and interest. Additionally, children with disabilities experienced fewer distractions and demonstrated greater focus on their work.	
	11 children with special needs	Interviews, painting	Compared to their peers who did not participate in outdoor activities, children who did participate showed improved attendance rates and academic performance.	USA. McCree et al. (2018)
	Individuals with autism	Examine the physiological characteristics of crops	Establishing rehabilitation gardens helps protect local biodiversity while enhancing social skills in individuals with ASD.	Italy. Scartazza et al. (2020)
	Students with disabilities	Literature review	Nature-based learning approaches have a positive impact on students with disabilities.	USA. Newman (2020)
	10 students with learning disabilities	Control experiment, semi-structured questionnaire	Students participating in the school environmental education program are more familiar with environmental concepts and possess skills directly related to environmental education. They view school outdoor activities as an integral part of the learning process within formal education.	Greece. Stavrianos and Spanoudaki (2015)
	9 children with autism	Observation, structured interviews	The sensory garden approach can enhance language and communication skills in students with autism, modify behaviors, and strengthen learning focus.	Malaysia. Yusop, Yassin, and Tahar (2020)
	Children with special needs, teachers, therapists	Interviews, observation, behavioral mapping	The sensory garden's features challenge students' perceptual abilities and encourage the practice of motor skills.	UK. Hussein (2009)
	Parents, teachers, administrators, and alumni	Interview	Using the forest for both teaching and play further enhances students' sense of connection and confidence within the specific play environment.	USA. Stanley (2011)
	5 children with autism	Interviews, visual inspiration, observation, behavioral mapping	Children with ASD show a stronger preference for active play involving diverse sensory elements, including running, jumping, swinging, climbing, and sliding. They also favor imaginative play, activities incorporating natural elements, and social interaction. Furthermore, their engagement in play is most pronounced in environments offering higher	UK. Fahy et al. (2021)
			play value.	
	51 children aged 3 to 7 with ASD	Control experiment	Outdoor activities enhance interpersonal skills in children with ASD and reduce the severity of autism symptoms.	Israel. Zachor et al. (2017)
Garden design for special education schools	ASD children	Literature review	Design guidelines for gardens for children with Autism include: design elements, visual principles, physical landscape features, landscape resources, and materials.	Egypt. Barakat, Bakr, and El-Sayad (2019)
	Special education students	Literature review	A qualified special education school garden should include: open lawns, playgrounds, music areas, outdoor classrooms, vegetable gardens, small enclosed quiet rooms, paths and seating areas featuring seasonal plants, and a soccer field.	USA. Gilbert (2021)
	Students with special educational needs	Literature review	Using recycled materials for gardening in sensory gardens, collecting rainwater to irrigate plants,	Indonesia.

			and developing bird-friendly parks, these initiatives support stimulating activities for children with special needs, thereby enhancing their quality of life.	Setyabudi, Alfian, and Hastutiningtyas (2018)
	Deaf and blind students	Literature review	Design Guidelines for Deaf Space: Sensory Range, Space, Mobility, Light and Color, Acoustics.	USA. Pedersen (2013)
	School administration and teachers	Interview	After examining the landscape design process and applicable standards for gardens in special education schools, the garden underwent landscape design. The study area encompassed the greenhouse and the olive grove in front of it, designated for agricultural education.	Turkey. Batman et al. (2024)
	Parents and teachers of students with orthopedic disabilities	Questionnaire, interview	Design an optimized plan for the garden at the Du'anchalar Special Education School to promote children's educational development and social interaction.	Turkey. Pouya, Bayramoğlu, and Demirel (2017)
	Teachers, caregivers, children with learning disabilities	Questionnaires, interviews, and observations	Campus groups favor outdoor environments that are attractive, safe, encourage interaction, and provide transitional spaces.	Malaysia Aziz and Said (2017)
	Children with Down syndrome and their parents	Questionnaire, observation	Landscape features preferred by parents can be incorporated into therapeutic garden designs, benefiting children with Down syndrome.	Malaysia. Shukor (2007)
	Teachers, Caregivers, Students with Special Needs	Questionnaires, interviews, and observations	Designing green outdoor environments based on user needs to support learning for children with special needs in Malaysian primary schools	Malaysia. Aziz and Shukor (2015)
	Children with ASD	Physiological measurement	The creation of water landscapes using plants with effective water purification capabilities, along with related horticultural therapy activities, has a positive impact on the physical and mental health of children with ASD.	Wang (2020)
	Students	Observation, interview	The landscape design of most schools for the visually impaired still has numerous shortcomings. Implementing interactive design can enable students to connect with their surroundings on multiple levels.	Liu (2024)
Post-use evaluation of the garden	Students, teachers, landscape architects	Interviews, observation, behavioral mapping	The combination of soft and hard landscaping with outdoor furniture, situated near continuous main pathways and easily accessible settings, demonstrates the highest preference.	UK. Hussein (2012)
	Students, teachers	Observation, Behavior Mapping	The frequency of actual availability reflects the number of users, but does not reflect the time of user access.	UK. Hussein (2012)
	Students with special needs, teachers, sensory garden designers	Interviews, observation, behavioral mapping	Compared to high-traffic areas, sensory zones play a more crucial role in the overall experience, as reflected in the amount of time users spend in the garden.	UK. Hussein (2017)
	Parents, teachers	Questionnaire, Interview	The campus suffers from a scarcity of outdoor activity spaces, a lack of human-centered and rehabilitative	Cui (2022)

			design, and inadequate accessibility features.	
	Students with special needs, teachers	Questionnaire, observation	Students currently express high satisfaction with walking environments, play spaces, and plantings, while satisfaction with water features, public signage, athletic fields, and playground equipment remains an area for improvement. The lack of water features, outdoor lighting, seating, and public signage in outdoor areas are factors contributing to user dissatisfaction.	Wang (2020)