

# School gardens and student engagement: A systematic review exploring benefits, barriers and strategies

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School gardens must overcome a range of challenges to be successful but are often lauded for fostering hands-on education and real-world learning. This thematic literature review synthesises 22 journal articles and two book chapters, extending on previous reviews by amassing their themes into one singular reference point for scholars, while simultaneously exploring ways to overcome the challenges associated with school gardens. Findings highlight that academic enhancement, environmental connection, and enhanced wellbeing (both physical and emotional) are the main benefits of school gardens, while the main barriers are time, funding, maintenance, and curriculum integration. Strategies for overcoming the challenges of garden spaces in educational contexts are identified which will be valuable to scholars and others seeking to establish and maintain gardens in schools.

## Introduction

School gardens provide valuable and opportune spaces for children to engage with the natural environment and learn. However, they are often hindered by significant barriers, including time constraints (Bucher, 2017), demanding curriculums (Christensen & Wistoft, 2019), and limited financial resources for additional expenses (Plaka & Skanavis, 2016). This literature review acknowledges the importance in recognising school gardens' potential challenges and beneficial values. Thus, we aim to address the following questions: (1) What are the benefits and barriers to school gardens? (2) How can barriers to school gardens be alleviated? By consolidating and extending on the various themes explored in existing literature on school gardens, this review serves as a comprehensive resource for future scholars. The last review to clearly explore the benefits and barriers was by Blair (2009), over a decade ago. As the field has moved forward and continued to gain interest and traction from the scholarly world, we wonder if much has changed. While there are many reviews since 2009, they focus on niche topics. Our objective is to create a singular reference point for scholars, teachers, and others interested in this area, to understand the significant benefits of gardens in schools, the barriers, and how to alleviate them. As such, our paper provides a valuable discussion to the literature on school gardens.

Despite an abundance of papers exploring school gardens (Burt et al., 2018; Datta, 2016; Hardy & Grootenboer, 2013; Hinton et al., 2018; Hoover et al., 2021; Malberg Dyg & Wistoft, 2018), existing reviews often lack a holistic understanding of both the benefits and the barriers to implementing such spaces. Those that explore either lack clarity in defining barriers or place too much emphasis on the benefits, resulting in an uneven overall understanding of the field (Ohly et al., 2016). Other existing reviews tend to focus on the use of school gardens within niche areas such as mathematics and science curriculum integration (Monferrer et al., 2022), emotional development (Lohr et al., 2021),

health and wellbeing (Holloway et al., 2023; Ohly et al., 2016), or physical health (Huelskamp, 2018). The lack of focus on the barriers to school gardens is disheartening because it creates a major hinderance to the success and longevity of these spaces. If the barriers to school gardens were more clearly defined and understood in the literature, scholars might be better prepared to explore their points of contention, or shortfalls.

Our review includes seven review papers focusing on school gardens. Of these, three focused specifically on the benefits of school gardens, with two of them having a narrower focus on niche areas like mathematics and science curriculum integration, or health outcomes (Holloway et al., 2023; Monferrer et al., 2022). The third paper provided a broader examination of all advantages of school gardens (Blair, 2009), but is now dated and limited in scope by its focus on the United States. Three additional reviews discussed both challenges and benefits of school gardens but had a limited focus on subject integrated learning (Christensen & Wistoft, 2019), the social and emotional impacts of gardens (Lohr et al., 2021), and their contribution to health and wellbeing (Ohly et al., 2016). One review concentrated explicitly on the challenges faced when integrating gardens into schools, but it was from the perspective of using gardens as spaces of learning for emotional wellbeing, healthy eating, and physical health (Huelskamp, 2018). As such, it overlooked the diverse range of logistical challenges gardens face, such as limited time for maintenance (West, 2022), or a lack of institutional support (Plaka & Skanavis, 2016). By simply brushing over the barriers to school gardens, existing reviews are missing the opportunity to communicate valuable insights.

## Method

This literature review draws on the method used in Huelskamp et al.'s (2018) systematic assessment to set parameters and criteria for what literature could be included. While not as well-known as the PRISMA method, leveraged by other scholars in the education field (e.g., Oo et al., 2022), our review was intentionally guided by Huelskamp et al.'s (2018) method for the same topic. We included peer reviewed papers and book chapters published since 2010, focusing explicitly on school gardens in primary schools (grey literature was not included). The search strategy used Boolean functions. The search string "community garden" OR "school garden" AND "school" AND "benefit" AND "barrier" set the parameters for searching *Google Scholar*, *Education*, *Scopus*, *Informit A+* and *GREENFile*. The databases reflect the two relevant disciplines of education and human geography, and the search words cover the narrow scope of this review: the benefits and barriers to school gardens. Only literature published after 2010 is included in our literature review as earlier research was covered in Blair's (2009) seminal review (see also Huelskamp, 2018; Ohly et al., 2016).

Unlike other reviews in this field (Huelskamp, 2018; Lohr et al., 2021; Ohly et al., 2016), the methods used for each study are considered irrelevant. Both qualitative and quantitative methodologies produce valuable data (Eyisi, 2016; Leung, 2015), capable of contributing multiple understandings to the benefits and barriers of school gardens. For example, qualitative work often helps scholars understand the social parameters

surrounding a phenomenon (Onwuegbuzie & Leech, 2005), and quantitative research is grounded in replicable evidence (Eyisi, 2016). The method is outlined in Figure 1, which depicts the steps involved in retaining and disqualifying research.

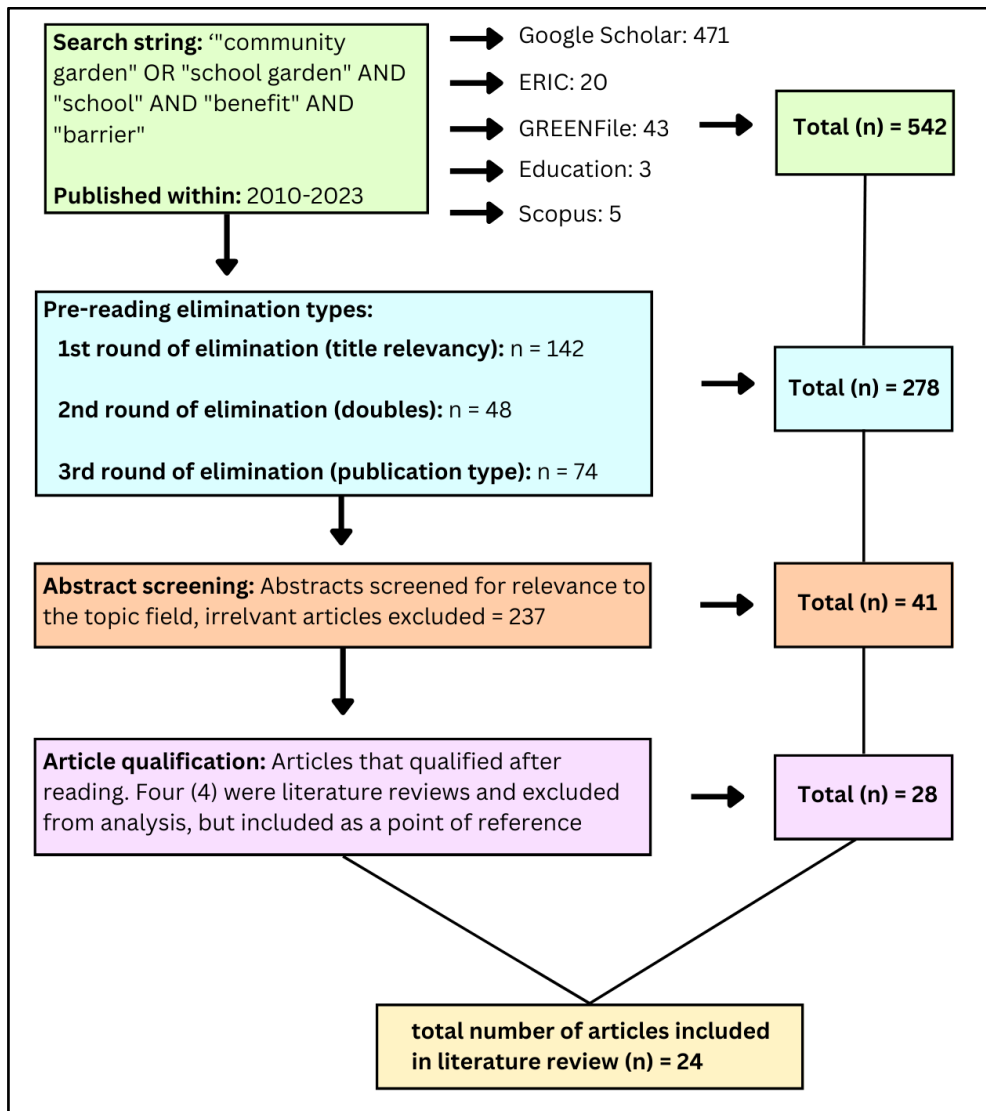


Figure 1: The methods used to eliminate and retain the literature

The 24 articles retained for our review were organised by title, author and year, method, location (country and region), benefits, and barriers. Identifying benefits and barriers followed techniques used by Soutter et al. (2012). First, explicitly mentioned benefits and barriers were recorded, followed by implicit themes. As an example:

Student wellbeing in the gardens appears to be associated with being outdoors and experiencing social interaction with peers, garden educators, and teachers offering them opportunities to participate actively in the garden activities (Malberg Dyg & Wistoft, 2018, p. 1188)

This quote can be coded explicitly under the theme of well-being and can also be thematically (implicitly) coded under the theme of community due to the diverse range of social interaction opportunities provided by the gardens. This paper was coded under both wellbeing *and* community. This technique was used because it provides clear instruction and a sound methodological approach to exploring literature (Soutter et al., 2012).

The next sections explore the most frequent benefits and barriers of school gardens after providing an overview of the literature.

### **Overview of literature**

This section provides an overview of literature that met the inclusion criteria, highlighting the methods and geographical scope of research included. Following, we will begin to present the benefits of school gardens. Most of the research occurred in the United States (11), followed by Australia (4), Europe (3), Canada (2), Ireland (1), New Zealand (1), England (1), Cuba (1), and Bangladesh (1). This suggests that the benefits and barriers explored here mostly relate to school gardens in the post-industrial West.

Researchers use different methods and methodologies to gather data regarding school gardens. Most used qualitative data collection techniques (12), with interviews being the most common. Mixed methods approaches were favored (5) over studies that used purely quantitative methods (3). The lean towards qualitative data collection techniques differs from a decade ago when Blair (2009) conducted her review, when quantitative design studies were the most prevalent across school garden literature. There also tended to be less 'pre and post program' reviews, which were common amongst the literature reviewed by Blair (2009).

Interviews were the most heavily relied on data collection technique and were especially prevalent with teachers as a first point of call for data collection. The interviews seemingly tell a rich narrative and yield valuable insight into the barriers of school gardens. Another method that was generally used to bolster interviews was observations, which in our opinion, are a valuable technique. Scholars who used observation as a form of witnessing were able to examine and corroborate teachers' experiences in real time, extracting more detail than their participants may have provided when recounting from memory during interviews (Malberg Dyg & Wistoft, 2018). In terms of the diversity of methods deployed, scholars drew on autoethnography (Datta, 2016), photography (Austin, 2022), focus groups (Huys et al., 2017), policy review (Viola, 2006) and surveys (Hinton et al., 2018).

## The benefits of school gardens

School gardens have long been explored for the benefits that they pertain. Figure 2 highlights the diverse array of benefits and depicts how often they occurred in the form of a bar chart. The most encountered themes were wellbeing (emotional) and academic benefits. Figure 3 (parts a, b, and c) extends this by further breaking down reoccurring themes into individual categories while also organising the data by author. These overarching themes shape the discussion of the benefits of school gardens presented below.

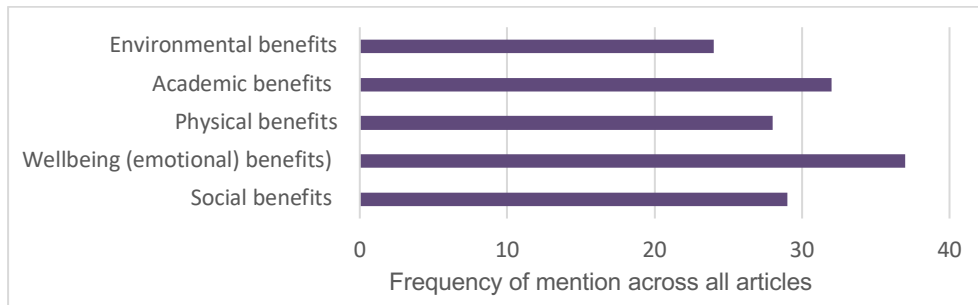


Figure 2: The main benefit themes and their frequency of mention across the literature

Author	Social Benefits				Wellbeing (emotional) Benefits					
	Teamwork	Engagement	Diversity	Community	Self-reliance	Self-esteem	Resilience	Empathy	Behaviour	Confidence
Austin	✓	✓		✓					✓	
Baker et al.				✓						
Bice et al.				✓						
Bucher				✓	✓		✓			✓
Burt et al.				✓						✓
Cairns				✓						✓
Carlsson et al.				✓	✓			✓		
Castro et al.				✓	✓	✓	✓			
Chawla et al.	✓			✓	✓	✓	✓		✓	✓
Datta			✓	✓	✓	✓	✓			
Day et al.		✓		✓					✓	
Greer et al.			✓	✓						
Hardy and Grootenboer		✓	✓	✓	✓	✓			✓	✓
Hinton et al.										
Hoover et al.										
Huys et al.										
Loftus et al.										
Malberg Dyg and Wistoft	✓			✓		✓		✓		✓
Nowak et al.				✓	✓					
Passy	✓	✓		✓	✓	✓			✓	✓
Plaka and Skanavis		✓							✓	
Reis and Ferriera		✓		✓	✓		✓		✓	
Wake and Birdsall		✓			✓				✓	

Figure 3a: Social and wellbeing benefits of school gardens

Author	Physical benefits					Academic benefits			
	Motor skills	Phys. activity	Obesity	Fruit and Veg ID	Healthy eating	Spontaneous	Hands-on	Knowledge	Curric. development
Austin								✓	
Baker et al.	✓	✓	✓					✓	
Bice et al.		✓	✓	✓				✓	
Bucher	✓	✓			✓		✓	✓	✓
Burt et al.									
Cairns	✓			✓					
Carlsson et al.				✓	✓				
Castro et al.				✓	✓				
Chawla et al.									✓
Datta					✓	✓	✓	✓	
Day et al.					✓		✓	✓	✓
Greer et al.				✓	✓		✓		
Hardy and Grootenboer						✓	✓	✓	
Hinton et al.				✓	✓		✓	✓	✓
Hoover et al.		✓		✓					✓
Huys et al.									
Loftus et al.									
Malberg Dyg and Wistoft							✓		
Nowak et al.			✓	✓	✓		✓	✓	
Passy	✓	✓						✓	
Plaka and Skanavis							✓	✓	
Reis and Ferriera							✓	✓	
Wake and Birdsall						✓	✓	✓	

Figure 3b: The physical and academic benefits of school gardens

Author	Environmental benefits		
	Nature connection	Environmental knowledge	Sustainability
Austin		✓	
Baker et al.			
Bice et al.			
Bucher	✓	✓	
Burt et al.			
Cairns	✓	✓	
Carlsson et al.	✓	✓	
Castro et al.			
Chawla et al.	✓		
Datta	✓	✓	
Day et al.	✓	✓	✓
Greer et al.			
Hardy and Grootenboer	✓		
Hinton et al.		✓	
Hoover et al.	✓	✓	
Huys et al.			
Loftus et al.			
Malberg Dyg and Wistoft	✓	✓	✓
Nowak et al.			
Passy			
Plaka and Skanavis		✓	
Reis and Ferriera		✓	✓
Wake and Birdsall	✓	✓	

Figure 3c: The environmental benefits of school gardens

## **The academic benefits of school gardens**

Gardens are widely acknowledged as valuable outdoor learning spaces where teachers can draw on various pedagogical approaches to enhance engagement with, and outcomes of, academic learning. School classes frequent gardens for a variety of learning purposes to help link subjects such as mathematics, science (Bice et al., 2018; Bucher, 2017; Passy, 2014), home economics (Bucher, 2017), English (Wake & Birdsall, 2016), and health and physical education (discussed in the physical health section below) to real-world settings. For example, in Passy's research (2014), one case study school conducted a mathematics project in the school garden that went for an entire week. The teachers noted to Passy that this project created links between maths and science. The students measured leaf size, collected data on plant growth and watched bugs and insects favour certain plants. Moreover, the students are said to have enjoyed their time learning in the real-world. This sentiment is reinforced by many scholars, and it seems that children generally enjoy learning in the school garden (Bucher, 2017; Wake & Birdsall, 2016). While this could be just because of the setting, it could also be because of the pedagogical approaches teachers deploy in the garden classroom.

School garden-based learning presents teachers with the opportunity to experiment with their pedagogical approaches. Witnessing students attempt to apply classroom-based concepts in a real-world setting helps educators discern what information is not translating well; encouraging them to review learning activities for the purpose of implementing a more relevant, engaging, or effective lesson (Hardy and Grootenboer, 2013). Thus, various pedagogical approaches are often trialed in the school garden to enhance the productivity of students' learning experiences. This includes, but is not limited to, culturally responsive pedagogies, experiential pedagogies, and pedagogies of reconnection (Hardy & Grootenboer, 2013).

The use of school gardens for academic learning is generally influenced by broader social contexts. For example, in high migrant and low socio-economic areas in Australia, school gardens are deemed beneficial spaces for teaching food growing and food security (Hardy & Grootenboer, 2013). They provide spaces where education can have a real-world influence on the student's material existence and bolster both their own, and their family's food security and connection to community. In another example, Bucher (2017) compared case studies in Philadelphia and Cuba, suggesting that school gardens are mostly beneficial for personal enjoyment and scientific education in Philadelphia. However, in Cuba, they are valued for their contribution to building agricultural knowledge and skills, contributing to food supply, and for real-world engagement. Cuban schools use gardens extensively and focus on agricultural endeavors – a direct result of the country's previous state of poor food security. This highlights how the school's wider social and economic context shapes favoured academic outcomes for students.

## **School gardens as healthy spaces**

Gardens play a vital role in promoting healthy eating and physical activity among children. Scholars including Day et al. (2022), Nowak et al. (2012), and Ohly et al. (2016) contended

that a primary objective of school gardens is to foster healthier eating habits in children. The underlying motivation behind using school gardens for health improvement lies in empowering children to make well-informed decisions regarding their food consumption. By equipping children with a diverse range of skills and experiences in identifying, preparing, and cooking healthy foods, it is believed that they will be more inclined to choose fresh and nutritious options (Hinton et al., 2018; Nowak et al., 2012; Viola, 2006). Another way school gardens help shape healthier children is through promoting physical activity. Gardening is a form of passive movement that encourages dynamic gross and fine motor skill development (Baker et al., 2015; Wainwright et al., 2020). Therefore, participating in gardening is a form of physical movement that helps tackle obesity (Baker et al., 2015; Bice et al., 2018). Even though some scholars contest their ability to establish healthy eating habits (Huys et al., 2017), gardens are useful in promoting physical activity and are recognised as healthy spaces.

### **School gardens enhance social-emotional wellbeing**

The value of school gardens extends beyond academic and physical health benefits, with scholars emphasising their role in promoting social and emotional wellbeing and recognising them as valuable spaces for personal development. Ohly et al. (2016) argued that students who may not typically thrive in a traditional classroom setting can experience emotional growth through active participation in school gardens. By providing an environment that allows for greater autonomy, gardens nurture children's confidence and self-reliance, ultimately enhancing their overall emotional wellbeing (Wake & Birdsall, 2016). This is particularly beneficial for students who struggle with conventional academic work, as the garden offers a framework where they can find success and feel a sense of belonging.

Personal resilience, a vital component of emotional wellbeing, is also cultivated by engaging with school gardens. Chawla et al. (2014) proposed that resilience is fostered in the garden through nature interaction and connection, which helps lower stress levels. Reis and Ferreira (2015) examined gardens as spaces for learning social and emotional resilience, emphasising how increased access to community gardens enhances a young individuals' ability to critically assess situations, leading to heightened resilience. These findings aligned with Viola (2006), who explored the impact of school gardens on remote Indigenous communities. Viola suggested that students with access to gardens in primary school had greater opportunities for cultural, country, and community connections, resulting in increased personal resilience in the face of adversity.

School gardens thus offer educational benefits but also serve as transformative spaces for emotional development and resilience. Through autonomy, confidence, and self-reliance fostered in the garden, students who may struggle in traditional classrooms can thrive. Additionally, the nurturing environment of school gardens promotes resilience through nature interaction, critical thinking, and community connections, allowing young individuals to develop a stronger capacity to navigate challenges and setbacks. These social and emotional benefits contribute significantly to students' overall wellbeing.



## **School gardens are social spaces**

School gardens are social spaces that can foster strong interpersonal relationships between the school community (staff and students), parents, and the wider surrounding community. Gardens not only enhance personal resilience, as highlighted above, but also contribute to social resilience. Throughout the literature, scholars demonstrate positive outcomes including heightened school engagement (Bice et al., 2018) and increased food resilience (economic and social access to food, building a complete nutritious diet (Tendall et al., 2015) within both the student body and the broader school community (Reis & Ferreira, 2015). Moreover children are exposed to the benefits of building multi-generational relationships, including exposure to different points of view (Hinton et al., 2018). Additionally, using school gardens to cultivate social capital is a particularly useful strategy to promote school engagement in communities with large migrant populations (Hardy & Grootenboer, 2013).

A compelling case study illustrating the capacity of a school garden to engage the broader community is found in Hardy and Grootenboer (2013). Their research focused on a garden in a primary school in a low socio-economic area with a substantial migrant population in Southeast Queensland, Australia. Their school garden was developed through collaborative efforts across both the school and the wider community. Hardy and Grootenboer argued this type of engagement can lead to the establishment of a sustainable, successful, and enduring community garden. Functioning as a communal meeting space, the school garden effectively addresses the food security needs of the community while catering to various community groups. Additionally, it serves as an educational tool, facilitating instructional activities and lessons. By actively involving residents in the garden's maintenance, the burden of time constraints on school staff, often regarded as a significant barrier to the success of such initiatives, is alleviated (Burt et al., 2018). Moreover, these school gardens promote the exploration of shared interests among children and the broader community, fostering a safer and more welcoming neighbourhood environment (Plaka & Skanavis, 2016), while also bolstering neighbourhood food resilience (Reis & Ferreira, 2015). Such initiatives contribute to an overall improvement in community morale and the cultivation of safer neighbourhoods. In the current context, and especially since Covid-19, schools are reticent to bring the wider community to campus. More on this barrier is found below.

## **School gardens enhance environmental knowledge and connection**

A child's connection to the natural realm is greatly enhanced by cultivating curiosity and developing awareness through school garden interactions. This theme is by far the most highly regarded benefit in the literature (Baker et al., 2015; Bucher, 2017; Hardy & Grootenboer, 2013; Ohly et al., 2016; Plaka & Skanavis, 2016; Reis & Ferreira, 2015). Bucher (2017), whose research explored the pedagogical and emotional differences between school gardens in Philadelphia and Cuba, found that the Cuban students had an increased understanding on the value of natural capital; that is, how important the environment is to humans. The Philadelphian students had a more fetishised and sterile understanding, possibly because their school gardens are used predominately for “science

curriculum” (Bucher, 2017, p. 15). Enhancing environmental knowledge and understanding increases children’s ability to deal with and recognise environmental changes and disasters, such as climate change (Reis & Ferreira, 2015).

Apart from simply connecting students to natural spaces, school gardens spark an innate sense of curiosity that children have towards wild spaces (Wake & Birdsall 2016). A school garden provides a wild space that children can explore within the safety of their everyday lives. Even though they are safe spaces on school grounds, Bice et al. (2018) suggested that time spent in the garden creates an enhanced capacity to engage with the outside, natural world. Christensen and Wistoft (2019) similarly suggested that children who garden develop a critical awareness of environmental problems and a sparked interest towards the natural realm. Developing and fostering that innate sense of curiosity towards the natural is important if we wish for children to gain a deeper appreciation for the environment, and the school garden, as scholars highlight are a perfect space to do so (e.g., Bice et al., 2018; Bucher, 2017; Christensen & Wistoft, 2019; Hardy & Grootenboer, 2013; Reis & Ferreira, 2015; Wake & Birdsall, 2016).

To summarise, school gardens lead to a myriad of benefits for both the school and broader community. School gardens can help children excel academically when integrated into the curriculum and enhance motor skills, physical health, and food, personal and social resilience. They can enhance a child’s connection to the natural realm by sparking curiosity and developing environmental awareness through nature-based practices. Moreover, children who garden in school have a prolonged sense of wellbeing, and a deeper connection to their neighborhood community. School gardens are vibrant social and academic spaces that can greatly enhance the whole school environment.

### The barriers to school gardens

Despite these crucial benefits, a diverse array of barriers prevent schools from initiating a garden on campus – and not just because they are difficult to maintain. Although literature on barriers is relatively limited, several studies suggest consensus regarding key limitations. These include, for example, a lack of funding and extensive time commitments.

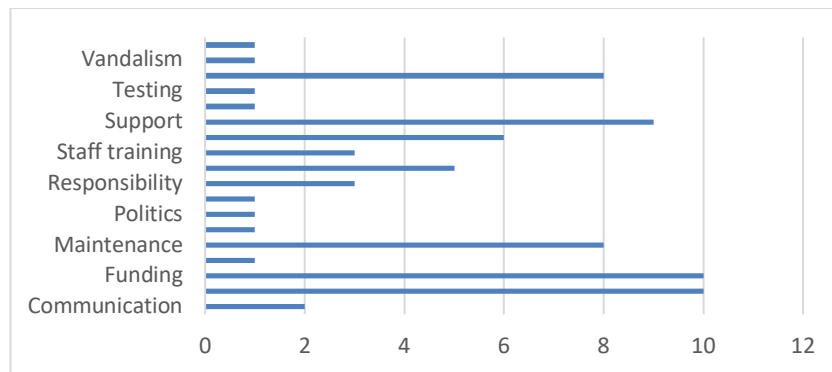


Figure 4: The main barriers and their frequency of mention across the literature

Figure 4 presents a range of barriers explored in literature in the form of a clustered bar chart, helping chart the most encountered barriers. Figure 5 (parts a, b, and c) extends Figure 4 to list barriers by author/paper. These visual aids shaped the breakdown of the thematic discussion below. Curriculum integration, time and staffing are highlighted as the main barriers to gardens in schools, followed by a lack of support from school administration.

Author	Barriers						
	Weather	Time	Supervision	Staff training	Space	Responsibility	Politics
Austin							
Baker et al.	✓		✓				
Bice et al.							
Bucher			✓			✓	
Burt et al.		✓		✓	✓		
Cairns							
Carlsson et al.		✓	✓				
Castro et al.		✓					
Chawla et al.							
Datta							
Day et al.				✓	✓	✓	
Greer et al.							
Hardy and Grootenboer		✓					
Hinton et al.		✓					
Hoover et al.							
Huys et al.		✓	✓		✓		
Loftus et al.		✓	✓	✓	✓		
Malberg Dyg and Wistoft		✓					
Nowak et al.					✓		
Passy			✓			✓	
Plaka and Skanavis							
Reis and Ferriera							
Wake and Birdsall							

Figure 5a: The main barriers and their frequency of mention by author(s)

Author	Barriers					
	Maintenance	Support	Curric. integration	Funding	Communication	Vandalism
Austin	✓	✓	✓			✓
Baker et al.		✓	✓			
Bice et al.			✓			
Bucher			✓	✓	✓	
Burt et al.			✓	✓		
Cairns						
Carlsson et al.	✓	✓		✓		
Castro et al.	✓	✓				
Chawla et al.						
Datta			✓	✓		
Day et al.	✓	✓	✓	✓		
Greer et al.	✓		✓			
Hardy and Grootenboer		✓		✓		
Hinton et al.	✓					
Hoover et al.						
Huys et al.			✓	✓		
Loftus et al.	✓	✓		✓		
Malberg Dyg and Wistoft					✓	
Nowak et al.		✓		✓		
Passy	✓	✓	✓	✓		
Plaka and Skanavis						
Reis and Ferriera						
Wake and Birdsall						

Figure 5b: The main barriers (continued) and their frequency of mention by author(s)

Author	Barriers				
	Disconnection	Sustainability	Intention	Resources	Testing
Austin	✓				
Baker et al.					
Bice et al.					
Bucher					
Burt et al.					
Cairns					
Carlsson et al.					
Castro et al.					
Chawla et al.					
Datta					
Day et al.		✓	✓		
Greer et al.				✓	✓
Hardy and Grootenboer					
Hinton et al.					
Hoover et al.					
Huys et al.					
Loftus et al.					
Malberg Dyg and Wistoft					
Nowak et al.					
Passy				✓	
Plaka and Skanavis					
Reis and Ferriera					
Wake and Birdsall					

Figure 5c: The main barriers (continued) and their frequency of mention by author(s) (use 'zoom in' function of web or PDF reader if needed)

### Limited time and funding

Finding adequate time to dedicate to school gardens is a challenge faced by the whole school community, as they juggle various responsibilities which often come before maintaining and integrating gardens. For teachers this can be for many reasons but, as Blair (2009) suggested, to engage effectively with school gardens, teachers need extra support from their administration staff (school board) to dedicate time to gardening initiatives. For Bucher’s (2017) participants, time was also the main barrier for teachers engaging in school gardens, with many abandoning gardens due to the heavy workload associated with simple but essential tasks such as weeding. Increasingly demanding curriculum requirements add to the problem, resulting in staff genuinely not having enough time to maintain the school garden, or plan for ways to integrate it into a lesson (Plaka & Skanavis, 2016). Ultimately, the challenge of finding sufficient time to dedicate to school gardens is a multifaceted problem. From what we can ascertain, there are limited expendable funds available in schools.

Limited time and funding restrict the availability of resources that encourage staff to participate in gardening (Blair, 2009). One study by Hoover et al. (2021) highlighted that many Principals were unlikely to attempt building school gardens due to lack of readily available funding. Greer et al (2019) suggested funding challenges are mostly recognised by principals rather than educators. Unless schools receive grants or have an active fundraising committee, school gardens are lower on the priority list for school budget allocations. Further complicating matters is that funding is an ongoing requirement involving an initial outset of costs and then expenses related to maintenance such as

fertilisers and weed killers. Different studies have all found that participants struggled with the associated costs of improving and maintaining soil quality (Carlsson et al., 2016; Plaka & Skanavis, 2016). This is an important consideration when building school gardens.

A lack of support from school administration boards (such as the principal, heads of departments, etc.) is identified as a major barrier across the literature. Researchers have suggested that administration board staff have an aversion to starting school garden programs; however, for school gardens to be successful, they require this base level of support (Burt et al., 2018). Participants in a Greek study (Plaka & Skanavis, 2016) suggested that push back from the board was a major cause for delays in building gardens and that inadequate support mostly manifests as an aversion to approving school garden programs and providing limited financial aid. Bucher (2017), on the other hand, suggested that school boards have an aversion to expecting too much from their educators and support staff, so approving gardens on campuses is a decision not taken lightly. Perhaps teachers are negotiating more challenges than they like to admit, which was also briefly acknowledged by Blair in 2009. Ensuring that teachers and school administration boards are engaged in transparent conversations about the financial feasibility of school gardens is one avenue towards rectifying this perceived barrier. We thus suggest that clear and effective communication between teaching and administration staff and the entire school community can contribute to the effective implementation of school gardens and help educators maximise their educational and environmental benefits.

### **Integrating school gardens into curriculum**

Teachers also raise concerns about the difficulty of integrating school gardens into curriculum and how to appropriately engage children in gardening. Christensen and Wistoft (2019) suggested teachers find it difficult to justify integrating school gardens into the curriculum due to the perception that students will not achieve the same academic outcomes. Greer et al. (2019) argued that standardised testing and requirements for students to achieve a base level of knowledge each successive year is a barrier to using school gardens as part of the curriculum. With testing benchmarks set, some teachers feel that straying from the textbook related content will hinder their students' outcomes, even though there are many school gardening programs aimed at helping integrate classroom content and gardening activities (e.g., the programs *Stephanie Alexander Kitchen Garden* by Block et al., 2012, or *Gardens for Bellies* by Malberg Dyg & Wistoft, 2018).

While there are many programs available to support curriculum integration, teachers often feel hopeless in the face of a seemingly overwhelming task of beginning a school garden program and attempting to make it work (Bucher, 2017; Burt et al., 2018; Huys et al., 2017; Plaka & Skanavis, 2016). This can be for many reasons but, as Passy (2014) explored in their article, it is partially driven by a limited understanding of pedagogies that can be used to deliver curriculum content in the school garden. Integrating curriculum and school gardens requires creative thinking, placing extra stress on the teachers (Austin, 2022). Moreover, Malberg Dyg and Wistoft (2018) argued that integrating school gardens into curriculum can be difficult because some children will not want to get dirty from

gardening. Thus, classes need to be planned accordingly with options for such children. The barriers outlined here are at odds with the benefits discussed above but needs addressing because it can create problems for teachers wishing to engage in school gardens as alternative learning spaces.

### **How can barriers to school gardens be alleviated?**

There are many considerations for those wishing to engage with school gardens. Expecting barriers, and finding ways to mitigate them, is imperative for success. In reflecting on the literature explored so far, we contend that although there is no simple way to overcome barriers, engaging with the broader community seems to be an effective avenue. Blair (2009) suggested that future scholars ought to investigate the barriers that hinder garden longevity, and based on our data we are able to make a small number of informed suggestions. First, however, we will underscore an important case study that informs our suggestions.

Hardy and Grootenboer (2013) underscored the capacity of school gardens to forge connections with the broader community, which in turn can address perceived barriers. While their study examined a school garden built to enrich student engagement, it also served as an example of how obstacles can be surmounted. By involving the surrounding neighborhood from the outset, the school created avenues for maintenance and sustainability. Notably, by enlisting community members or groups in the establishment of the garden, the school in Hardy and Grootenboer's (2013) investigation could pursue various grassroots grants, thus easing the financial burden often associated with school gardens. With increased funding and time at their disposal, teachers could then concentrate on devising suitable curriculum integrations. Approaching the garden challenge as an opportunity to cultivate a shared space—where gardening is a collaborative endeavour between the school and the community—rather than the sole responsibility of teachers proved instrumental to the garden's success. Echoing these findings, Hoover et al. (2021) suggested that augmented funding for additional staff and fostering broader community engagement can contribute significantly to garden upkeep.

This review has highlighted that time, maintenance, funding, and support are all barriers to school gardens. We thus recommend that the whole school community be involved in the process of starting school gardens from the beginning. When entrenched in community, school gardens are more likely to find success. Bice et al. (2018), Burt et al. (2018), Hardy and Grootenboer (2013), Plaka and Skanavis (2016), and Reis and Ferreira (2015) all highlighted that community support and engagement alleviated problems associated with the gardens. Time and maintenance can be overcome by volunteer support from engaging with the broader community (Burt et al., 2018; Hardy & Grootenboer, 2013). Engagement is enhanced if there are active members who regularly engage in the space (Bice et al., 2018; Reis & Ferreira, 2015), which can help to encourage further support from school administration board. While funding is a tougher barrier to overcome, with active support from the local community many school gardens can find success through donation systems or fundraising (Plaka & Skanavis, 2016). Different

grassroots community grants also become available if the broader community is involved, as in the case of Hardy and Grootenboer's (2013) study. We thus suggest that the current barriers to school gardens can be overcome by drawing on the surrounding community.

### Limitations

The scope of this review, like all reviews, was limited by the key words used in the search string as well as the thematic analysis undertaken. Different key words such as nutrition (Large et al., 2023), curriculum (Walshe et al., 2022), and sustainability (Prasetyo et al., 2020) may have yielded different discussions stemming from the inclusion of alternative school garden literature, and different scholars may have picked up or combined different themes (especially implicit ones). Similarly, our method (inspired by Huelskamp, 2018) produced different results to what other literature review methods might have yielded. The implicit coding may have been categorised differently by different disciplines. We did, however, find consensus on the benefits and barriers of school gardens, and trust our synthesis is useful for scholars researching the field (as well as practitioners beyond). We also understand that there may be many successful programs that are not documented in the academic literature. For example, the *Gardening Australia* television program showcased a garden where children learnt environmental awareness through outdoor garden interactions (*Gardening Australia*, 2021). By not including this type of grey literature, our review is limited.

### Conclusion and recommendations

While the benefits of school gardens are widely acknowledged, understanding, and addressing the associated barriers is key to their success. We recommend further investigation into why school gardens fail. Approaching schools that have had limited success with gardens provides one opportunity. Alternatively, approaching schools without gardens (Plaka & Skanavis, 2016) would provide deeper insight into what other barriers might be stopping schools from taking on such spaces. It is possible that a disproportionate focus on benefits in the literature reflects the participants' personal interests in gardening. Future research opportunities investigating challenges, such as interviewing school administrators who some claim push back against school gardens (Bucher, 2017; Plaka & Skanavis, 2016) would add valuable voices to the conversation and contribute to a more diverse perspective in the literature.

For teachers who are interested in school gardens, there are many opportunities in the establishment stages where they can solidify the success and longevity of the space. While the number of barriers might seem overwhelming, being aware of them from the beginning can help to mitigate the barriers to the success of the space. Exploring relevant case studies of successful school gardening programs is a good start. These can include scholarly documented programs, such as the Australian example mentioned by Hardy and Grootenboer (2013), or programs discussed in reputable news sources such as *Gardening Australia's* (2021) example featuring Ardross Primary school. Alternative means of sourcing inspiration for a successful program can come from drawing on strategies outlined by gardening focused organisations, such as the *Kids Growing City* in the United

States of America (2024), or government websites such as the Australian based *Central Coast Health Promotion Service* (2024) who also outlined successful school garden tricks. Government websites are particularly useful given they often advertise available grants and other local initiatives that schools can join (Central Coast Health Promotion Service, 2024).

Whichever case study or example used to guide the establishment of a school garden should be regionally relevant, as the local environment and socio-cultural surroundings are increasingly relevant for school garden programs (Walshe et al., 2022). This literature review has also highlighted valuable information to aid in alleviating barriers, such as gathering interest from students' parents to help manage the garden space. This can help teachers pre-emptively alleviate the barrier of time (Hardy & Grootenboer, 2013). Moreover, students are particularly keen to see the school garden succeed if they are involved in the planning and building of the garden spaces, as they feel a sense of personal responsibility toward the space (Wake & Birdsall, 2016). Therefore, using lesson time in appropriate curriculum areas such as mathematics, health and physical education, or science to plan, understand, and build a successful garden with the students can help to bolster engagement and success.

This review has synthesised the benefits and barriers to school gardens, and in doing so, provides future scholars with an insight into the most explored themes. It extends on and provides an updated synthesis and reflection on the common themes of school gardens, complementing Blair's (2009) review. It seems that while there is continued interest in school gardens from both educators and scholars, their challenges are still the same. This raises many questions and opens new avenues for continued research. By identifying the barriers that most often hinder success, this review will be particularly useful for scholars investigating school gardens or those wishing to build gardens in schools. The review differs from others in the field by exploring a broad range of benefits and barriers--not just ones relating to niche areas--thus contributing a valuable synthesis. School gardens are hard to maintain, integrate into curriculum, and fund, thus making them unmanageable without the support of the broader community. Most scholars argue school gardens are significant environmental, social, and educational spaces when given the opportunity to thrive. They provide real-world learning, contribute to emotional and physical wellbeing, enhance environmental connection, and increase the resilience of the school and broader community.

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