The Impact of Outdoor School Environments on Students' Overall Development: A Review of Current Knowledge

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Abstract

Outdoor environments of schools (SOE) are potential instructive spaces where thoughts and ideas imparted within the school buildings can come alive to students. The impact of these spaces on students' overall development needs better understanding, even though their relevance has been acknowledged. However, outdoor environments of schools have received less attention than indoor environments. Understanding these factors provides a step forward in developing interventions to increase students' learning. Nevertheless, there has yet to be an integrated review of SOE and students' overall developments in primary schools.

This paper critically evaluates recent research on outdoor environments in primary schools and their effects on students. It examines twenty journal papers from 2011–2021. The review has examined four aspects related to students' overall development, i.e. physical, mental well-being, and social and cognitive aspects.

The findings suggest a strong relationship between SOEs and students' overall development. This review also highlights and documents several methods and practices in these distinct domains, provides an overview of different SOEs and addresses knowledge gaps. The research can be used as a framework by investigators analyzing and exploring SOE and its impacts on students in terms of architectural aspects.

Keywords: Schools outdoor environment, primary school, physical development, cognitive development, social development

Introduction

Students spend most of their early years in school buildings, and the educational environments have been connected to various aspects of their development and learning. Many international studies and publications have responded to the growing awareness of school design and recognition that physical environments impact students' experiences. According to recent studies, the physical environments of schools substantially impact the students' attitudes and learning behaviours. Students spend most of their lives in school buildings and are

undoubtedly sensitive to their surroundings since they are immediate and visible (Weinstein, 1979).

Understanding the nature of these outdoor spaces is made more accessible by the detailed conceptual and practical examination of their use (Bhat, 2022). The school outdoors and play areas are neglected and forgotten spaces (Baines and Blatchford, 2010). In fact, the outdoor areas for school students should be planned and designed for different ages and needs. Though there has not been much thought put into creating outdoor spaces for students, studies point out the fact that we can improve students' learning and overall well-being (McIntyre, Blacher and Baker, 2006). Better learning outcomes can be achieved by involving students in active learning, utilizing play as a learning tool and using outdoor spaces more frequently in daily lessons.

According to Blatchford (1989), SOEs have been the forgotten spaces of schools. Although school grounds are increasingly crucial for students' environmental education, schools frequently neglect the design and expansion of green spaces, calm natural places, and play areas (Malone and Tranter, 2003). Giving priority to outdoor school spaces is one method to reconnect students with the outdoors. An integrated review covering the school outdoor environment and students' progress in physical, social, mental well-being and cognitive development of primary school students is still to be done.

In this context, based on twenty journal papers from 2011-2021, this study aims to critically review the recent studies on primary schools' outdoor environments and their impacts on students' overall development. The terms "children" and "students" are synonymously used in this paper.

Types of Outdoor Spaces in School Settings

The school's outdoor environments (SOE) can include a large area ranging from the school grounds to the in-between outdoor spaces (Aminpour, Bishop and Corkery, 2020) and any similar outdoor setting inside the school grounds where students actively use. They usually refer to the areas within the school grounds, excluding the school buildings under the school administration's control. The outdoors of a school include open spaces (Scholl and Gulwadi, 2015), green spaces (Dadvand et al., 2015; Baró et al., 2020; Anabitarte et al., 2021), play grounds (Malone and Tranter, 2003; Dyment, 2005), school-gardens (Mart, Alisinanoglu and Kesicioglu, 2015; Lohr et al., 2020), schoolyards (Cronin-Jones, 2000) and in-between spaces (Aminpour, Bishop and Corkery, 2020). Students love being outside and want to spend more time outdoors (Malone and Tranter, 2003; Stephenson, 2003). In fact, the outdoor areas are the most popular sites in schools (Einarsdottir, 2005, 2011). Physicians, educators, counsellors, and developmental psychologists have all recognized and advocated their values (Barros, Silver and Stein, 2009). Outdoor education has been linked to improvements in attention (Wells, 2000; Kuo and Faber Taylor, 2004), motivation (O'Brien, 2009), behaviour (Russell, 2003), self-esteem (Swarbrick, Eastwood and Tutton, 2004) and motor skill acquisition (Fjørtoft, 2001). The outdoor time spent during childhood has been found to have cognitive, social, physical, and emotional benefits. In fact, as Al-Nuaimi and Mohammed point out, the connectivity to the natural green environment must be the norm rather than the exception (Al-Nuaimi and Mohammed, 2022)

Table1: Definitions adopted for various School's outdoor spaces
Source: Author

S. No	School outdoor spaces	Definitions adopted
1.	Greenspace (Wells, 2000; Amoly *et al.*, 2014; Flouri, Midouhas and Joshi, 2014).	Greenspace is any open land partially or covered with grass, trees, or other vegetation. School green spaces are linked to higher concentration, attention and less hyperactivity in children.
2.	Green schoolyard, open spaces (Dyment and Bell, 2007)	The outdoor area of a school in which natural features (such as trees, flowers, sand, water, grass, hills, and bushes) are integrated to make a more appealing area and improve the students' (play) experiences.

3.	In-between spaces (Aminpour, Bishop and Corkery, 2020)	They are characterised as small spaces that allow unique experiences and use than the dominant landscape of larger areas. These spaces support the students in their self-directed play.
4.	Playgrounds with outdoor equipment (Delidou, Matsouka and Nikolaidis, 2016)	School grounds with play equipment for the students. Outdoor equipment in schoolyards can encourage students to be more physically active during recess.
5.	School Garden (Blair, 2009; Williams and Dixon, 2013)	School gardens are places where vegetable flowering plants are grown for study. They are learning tools and have been shown to have positive impacts on learning, curriculum, academic performance, student behaviour and social development.

School Outdoor Environment (SOE) and Students' Outcomes

Schools, as societal institutions can affect behaviour, change attitudes, and teach students about issues that will improve their decision-making abilities. Outdoor experiences can impact students in cognitive and affective domains (Orion and Hofstein, 1994; Meredith, Fortner and Mullins, 1997). Outdoor spaces in schools assist students, instructors, and the larger community and show that the students who participate in outdoor learning display more improved abilities to think creatively and critically. The effectiveness of teaching ecological principles to students in the schoolyards and cultivating more favourable attitudes toward natural habitats and their inhabitants have shown that primary school students are taught better outdoors than in traditional classrooms (Cronin-Jones, 2000).

Indeed, the presence of natural elements in school outdoors inspires students to be physically active, providing opportunities for imaginative, constructive and be engaged in socio-dramatic play (Dyment and Bell, 2007; Lucas and Dyment, 2010; Mårtensson *et al.*, 2014; van Dijk-Wesselius *et al.*, 2018; Raney, Hendry and Yee, 2019). Compared to other school ground areas, outdoor classrooms have shown lower levels of distraction among many students. Their varied interests and abilities are also supported in natural settings (Largo-Wight et al., 2018). Literature highlights four significant aspects of students' overall development in the school's outdoor environment, as shown in Fig. 1. These four aspects, i.e. physical and mental well-being and social and cognitive development are further described in the subsequent discussions.

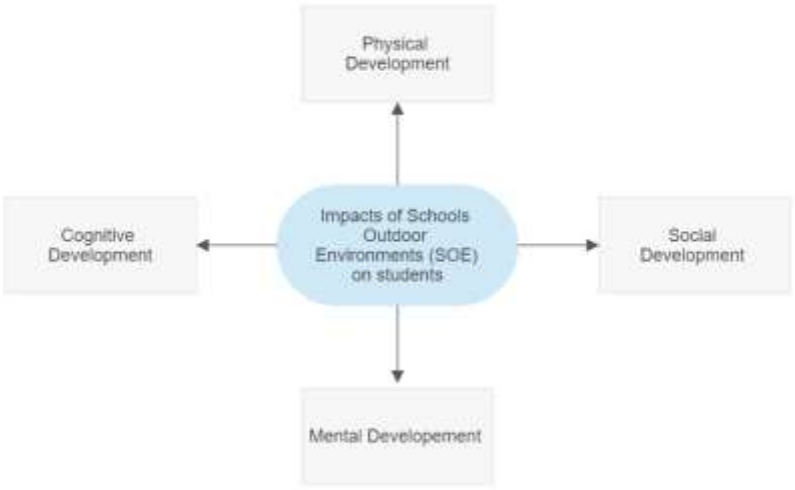

Fig. 1: SOE's Impact on students' overall development
Source: author

Research Methodology

This research employed a document survey sourcing them using keywords. Schoolyards, school grounds, green spaces, open spaces and playgrounds are part of the outdoor environments of schools. Accordingly, following were used as keywords for identifying literature: primary school outdoor environment, primary school outdoor spaces, primary school green spaces, primary school open spaces and primary schoolyards. The search rule used on the document database was ("primary school outdoor environment" OR "primary school outdoor spaces" OR "primary school outdoor areas" OR "primary school green spaces" or "primary school open spaces" OR "primary schoolyards" OR "primary school Grounds") and ("primary school students' development" OR "primary students Outcomes" OR "primary school student's development" OR "primary school student's outcomes").

Documents were searched in the SSCI database. Further, the following procedure was adopted to retrieve the papers. Fig. 2 shows the study search and the selection procedure, the numbers for each stage and the exclusion criteria after the comprehensive paper screening.

1. Papers were limited only to the English language, spanning 2011 to 2021.
2. Conference proceeding papers were also included.
3. Each paper's abstract was reviewed, and only the pertinent ones that fit the adopted definition were included.
4. Considering the importance, two highly cited papers (cited more than 200 times) from 2008 were included.
5. Finally, 20 papers were selected for developing the comprehensive review.

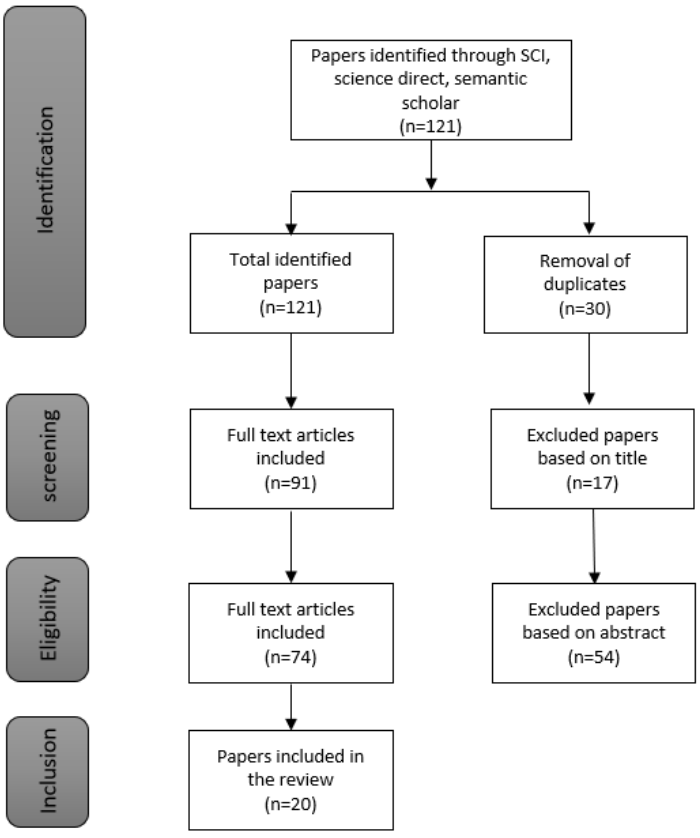

Fig. 2: Overall procedure adapted for the retrieval of the papers
Source: Author

An Overview of the Selected Papers

The documentary survey across the various databases turned up 121 possibly relevant publications after eliminating direct duplicates. Seventy-four, full-text studies were retrieved after screening titles and abstracts. Twenty studies met all of the criteria for inclusion. Two highly cited papers (cited more than 200 times) from 2008 were included based on the reference lists and citations. A synopsis of the selected 20 papers was made.

Table 2: Overview of selected journals and papers
Source: Author

Journal title	No of papers selected
Journal of Environmental Psychology	3
Health education research	1
Asia-Pacific Forum on Science Learning and Teaching	1
International Journal of Play	1
The Journal of Environmental Education	1
International journal of environmental health research	1
Journal of Environmental Psychology	1
Proceedings of the National Academy of Science of the United States of America.	1
Procedia - Social and Behavioural Sciences	1
Health & Place	1
International journal of paediatrics	1
New Zealand Geographer	1
Frontiers in Psychology	1
Landscape Research	1
Environment and Behaviour	1
European Journal of Education Studies	1
Landscape and Urban Planning journal	1
Urban Forestry & Urban Greening	2
Total	20

Characteristics of the Studies Examined

Out of the twenty papers retrieved, nine were on cognitive development, five analyzed datasets concerning students' physical development, three were on mental development, two were on overall students' development, and one was on social development. Four studies were conducted in the USA, two in New Zealand and Sweden, and one in Turkey, Norway, Australia, Denmark, the UK, Malaysia, Spain, Iran, Italy, Bangladesh, Greece and the Netherlands. The sample sizes of the studies ranged widely. Further, eight of the studies were defined as case studies; eight used quantitative design and one was based on experimental, quasi-experiment and mixed-method designs.

Table 3: Conclusions derived from the 20 selected papers
Source: Author

S.No	Author/year	Conclusions
1	(Ozdemir and Yilmaz, 2008)	The landscape features and physical aspects of schoolyards engage students in various play activities.
2	(Haug *et al.*, 2010)	Outdoor infrastructure is linked to students' participation in daily physical activities. Students are likely to be physically active than those with fewer facilities.
3	(Mårtensson *et al.*, 2014)	The students with access to much greenery at school are more physically active.
4	(Aminpour, Bishop and Corkery, 2020)	The in-between spaces, such as small enclosures, edges, and natural settings with affordances support children's self-directed play.
5	(Aminpour, 2021)	Primary school students use natural settings more extensively than older students. These settings are more beneficial and essential to the younger age.
6	(Gustafsson *et al.*, 2011)	Significant decrease in mental health problems for boys in the Intervention group
7	(Largo-Wight *et al.*, 2018)	Outdoor classrooms foster child health and well-being while meeting academic demands.
8	(Harvey *et al.*, 2019)	Mood and well-being of the child improves when exposed to natural settings.
9	(Hartmeyer and Mygind, 2016)	Outdoor nature classes improve the social relations among the students. Interaction, participation, engagement being the outcomes of increased social relations.
10	(Dhanapal and Lim, 2013)	Outdoor learning provides more effective and influential impacts on students' academic performance in understanding science
11	(Dadvand *et al.*, 2015)	Exposure to green space impacts the cognitive development in children.
12	(Hodson and Sander, 2017)	Tree cover has a positive relationship between students reading performance.
13	(Gilavand, Espidkar and Gilavand, 2016)	Schools' open space significantly impact learning and academic achievement of elementary school students.
14	(Kweon et al., 2017)	Schools with more trees have a higher percentage of advanced scores in Mathematics and Reading tests.
15	(Beere and Kingham, 2017)	Green space has weak associations with academic achievement, gender, and ethnicity.
16	(Amicone *et al.*, 2018)	There is a significant increase in concentration, when students are exposed to natural environment conditions.
17	(Khan, McGeown and Bell, 2019)	Teaching in the outdoors increased student's science scores.
18	(Khan *et al.*, 2019)	The school grounds offer more opportunity for play and learning.
19	(Ward *et al.*, 2016)	Physical activity and greater emotional well-being of the student are positively associated with exposure to green space
20	(J. E. van Dijk-Wesselius *et* 2018)	Schoolyards stimulate physical activities of the girls and have a positive impact on student's social well-being.

Outcomes on Student's Physical Development and SOE

Ozdimir and Yilmaz (2008) have investigated SOE and physical activities in Ankara, Turkey. They have surveyed the physical parameters of school outdoors and physical activities of third and fourth-grade students in five primary schools. Data gathering methods included interviews with children, teachers and administrators, as well as behaviour mapping during the break and physical examinations of the schoolyards. The findings demonstrate that students are fascinated and attracted to the landscape elements in the schoolyards, especially with the types of play and activities that students engaged in (Ozdemir and Yilmaz, 2008). In a study conducted in Norway by Haug et al. (2010), the physical activities and the characteristics of the

SOE have been examined. Their findings imply that the students' daily physical activities and engagement during school breaks are related to SOE characteristics (Haug *et al.*, 2010) Martensson et al. (2014) has conducted research with 197 students who took part in a one-week field study that recorded their self-reported use of the school grounds, favourite locations, and favourite activities, as well as the number of steps they took using pedometers. The significance of green school grounds for physical activities has been investigated in this study at two schools.

One has been surrounded by greenery, while the other not at all. The most popular schoolyard games, sports and different types of play had involved using balls in various activities. Students' preferred locations have had more significant green areas but were seldom used, whereas sites with a blend of green and built features near buildings had been chosen (Mårtensson *et al.*, 2014).

Despite the significance of SOE for children's recess, Aminpour (2021) has found that school grounds were only sometimes successful at encouraging children to play independently. These spaces allowed students to solve gender imbalances and lessen the effects of crowding, both of which were issues that frequently hampered the students' self-directed play in the past. He argues that in-between spaces are vital because they provide students with the support required to engage in self-directed play. While having vegetation on school grounds is beneficial, Aminpour argues that more is needed to boost students' engagement with just natural environments (Aminpour, 2021). To promote the students' interaction with Nature's design and management of school grounds, it is also essential to consider the natural environment's type, setting and state.

Outcomes on Student's Mental Well-being and SOE

Gustafsson et al. (2011) has conducted research at two elementary schools using 230 samples to investigate the impact of outdoor learning on children's mental health. One was an experimental school for the intervention and the other was a school used as a control case. The experimental school introduced an outdoor educational intervention, and data was collected again after a year. The parents responded to demographic questions and completed the strengths and difficulties through questionnaires.

In this experiment, the boys fared better than the girls compared to the reference school. The findings suggest that decision-making should address gender-related factors (Gustafsson et al., 2011). Likewise, Largo-Wight et al. (2018) have studied the impact of natural elements on students' well-being at an elementary school. Two teachers divided the classes into control (indoor classroom) and Nature treatment (outdoor classroom) groups for the six-week daily language arts session. The well-being of the children under the two scenarios have been compared. There was no discernible change in the students' happiness reports between the two settings. Teachers, however, noted a slight improvement in children's well-being while they were in their natural environment, suggesting that the outdoor classroom is a promising method (Largo-Wight *et al.*, 2018).

Harvey et al. (2019) have assessed a programme of biodiversity-related exercises on school grounds for one academic year to see whether exposing students in school (ages 8 to 11) to Nature could result in the long-term, sustained benefits in mood and well-being. This approach significantly improved students' attitudes and well-being throughout the academic year (Harvey *et al.*, 2019).

Outcomes on Student's Social Development and SOE

Hartmeyer & Mygind (2016) have conducted a study where factors that influenced the social relationships among the students in Udeskole (outdoor school) were studied. It was discovered that students seem to benefit in terms of social competency and interactions, such as self-esteem, self-confidence, trustworthy relationships and a sense of belonging. Examples of students' social interactions that have been researched include play, interaction, involvement, pupil-centered tasks, cooperation, and engagement. These conditions appear to result from increased social contacts during the 'Nature class' phase, which positively impacts the students' cooperative abilities and strong motivation in learning (Hartmeyer and Mygind, 2016).

Outcomes on Student's Cognitive Development and SOE

Dhanapal & Lim (2013) have conducted a comparative study on students' indoor and outdoor learning perceptions in the science classroom. The study has examined and contrasted the effects of indoor and outdoor learning on increasing students' academic performance. In addition, students' perspectives on integrating both indoor and outdoor education in science have been identified. The data has revealed that indoor and outdoor learning complement one another in increasing students' academic performance and positive responses from students who prefer to learn science outside rather than indoors (Dhanapal and Lim, 2013). Similarly, Dadvand et al. (2015) have discovered a high correlation between green spaces and primary school students' cognitive development. In this study, which took place in Barcelona, Spain (2012–2013), 2,593 students in the second, third and fourth grades across thirty-six primary schools have participated. The working memory has been tested to determine their developmental trajectories and interaction (Dadvand *et al.*, 2015).

Hodson and Sander (2017) have examined the relationship between Minnesota's green urban environments and academic achievement at the school level. The results show a robust and favourable correlation between tree cover and reading ability, suggesting that initiatives to improve tree cover in learning environments may help the pupils achieve academic success. Two vegetative land coverings (grass, shrub) and water bodies did not significantly correlate with reading and math achievement (Hodson and Sander, 2017).

Gilavand et al. (2016) have conducted a cross-sectional study with 210 students in Iran to investigate the impact of open spaces in schools on primary students' learning and educational attainment. Data was gathered using a questionnaire (an observation checklist to examine the physical attributes of learning schools' open space) and student interviews. They found that empty spaces in schools significantly impacted primary school students' learning and academic progress (Gilavand, Espidkar and Gilavand, 2016).

Similarly, Kweon et al. (2017) have examined 219 District of Columbia (DC) public schools. They observed that schools with even more trees had a more significant percentage of proficient or progressive scores in reading and math tests (Kweon *et al.*, 2017). Large outdoors, often referred to as "featureless landscapes" such as campus lawns and sports fields negatively impacted academic attainment. Landscape architects may find the findings helpful when making decisions based on evidence.

In New Zealand primary schools, Beere and Kingham (2017) have looked at the association between green space and academic achievement and have discovered that it was not strong. Multivariate linear regression has been used to analyse the connections between exposure to greenspace and the proportion of students outperforming educational attainment. Socio-economic status has been a noteworthy component of academic achievement. Academic success, gender, race, and green spaces all have had shaky correlations. Unexpectedly, there has been a negative relationship between academic achievements and green spaces (Beere and Kingham, 2017).

Field studies in two Italian primary schools have examined the positive effects of break time spent in a natural environment on students' cognitive performance and restorativeness. After evaluating each team's playtime in a natural (vs built) environment, the perceived restraint of each break time has been investigated (Amicone *et al.*, 2018). Researchers have been able to compare the psychological recovery of the students before and after the morning recess. Higher levels of concentration, sustained and selective attention and perceived restraint have been discovered in the study.

A study by Khan et al. (2019) provides empirical support for using outdoor classrooms as a successful teaching and learning environment. The impact of the outdoor classrooms on students' interest in learning has been evaluated using achievement assessments, a questionnaire and focus groups with thirty students and teachers. Students had performed significantly better when science was taught outside as opposed to inside.

According to research, students have been motivated to engage with Nature, discover their environment, push themselves, engage in physical activities, and interact with their peers.

Additionally, they have wanted more attractive school grounds. While parents had preferred gardening, teachers had preferred spaces with loose materials where the children could learn independently (Khan *et al.*, 2019; Khan, McGeown and Bell, 2019).

Outcomes on Student's Overall Development and SOE

Exposure to green spaces positively correlates with moderate-to-vigorous physical activities in students. In this respect, an intermediate school in Auckland has looked at students' growth to examine possible connections between physical activities and green spaces and body composition, emotional health, emotional inclinations, risk assessment skills, and cognitive development. The study had involved 108 students (11 to 14 years old) (Ward et al., 2016). Similarly, A longitudinal prospective study has been done to investigate the influence of green SOEs on school children's appreciation and their physical, cognitive, and social-emotional welfare. The study had conducted its investigation with a two-year follow-up. The data has been obtained from approximately 700 youngsters in nine primary schools in moderate-to-high-urbanised areas of the Netherlands. According to the findings, greening school outdoors increases girls' physical activities. These findings have confirmed the importance of green SOEs that have helped guide the future growth of schoolyards that promoted students' well-being (van Dijk-Wesselius *et al.*, 2018).

Discussion

The purpose of this paper was to review the present state of research on outdoor spaces in primary schools and their impact on students' physical and mental well-being and social and cognitive development. Only twenty studies have been relevant and assessed in the current research. Fewer studies are partly explained by the fact that the outdoor environment in primary schools is a relatively new field of research. Many factors contribute to the limited number of studies considered. The inclusion criteria covered publications in English between 2011 and 2021 and pertained only to primary students between ages 5-12. There is a critical need for more studies of the highest caliber to examine the potential impact of outdoor settings on students' physical development.

According to the results, students benefit from outdoor spaces in their physical development. Future research might look into the outdoor school environments in various geographical contexts and see how supportive they are to children's physical development. The primary goal of the designers should be to enhance the school's outdoor learning spaces in terms of both their physical and aesthetic aspects. Increasing awareness of the importance of the natural environment and more importantly, their impact on the student's health and physical activities in the outdoor environments must be promoted.

The spatial significance of these areas for students' play should be considered in school design and policy. Research on environmental behaviour also needs to be more applicable to architectural practice (Dayaratne, 2016). There is a need to study different types of SOEs and how they have social impacts on students. More high-quality studies are required to understand how regular outdoor environments affect students' cognitive development. Future studies should examine the potential benefits of an outdoor classroom on student engagement, attendance and retention. However, a growing body of research covers how outdoor environments impact school students, i.e. secondary school and high school students. Less is known about the overall development of primary school students aged 5-11 years and their relationship with SOEs.

Conclusions

To conclude, the examined papers exhibit significant variability in their objectives, participant populations, typologies of outdoor spaces, methodological qualities and reported outcomes. However, similarities were discovered that suggest different outdoor settings benefit students' physical, mental, cognitive, and social development.

This research discovered that the landscape elements of the school help the students to engage in physical activities and keep the children physically active. The in-between spaces

support self-directed play and the students with access to much greenery are more physically active. Outdoor classrooms foster children's health and well-being while meeting academic demands. Mood and well-being of the children are improved and schools' open spaces significantly impact learning and academic achievements.

The number of studies identified and examined on the relations between the outdoor environments of schools and students' overall development is relatively low and hence, these conclusions may not be generalizable.

This shows that there is a need for additional research studies to assess these suggestions further. The outdoor spaces of the schools have an impact on student's development and papers reviewed here talk about how each aspect of the outdoors impact students' outcomes at various levels. In spite of all the benefits that the outdoor spaces offer, these topics are under-represented in the evaluated studies, and future studies should pay particular attention to the features of school outdoor environments and children' overall development. In fact, most studies concentrate on one or two independent variables rather than the overall development.

As Dayaratne points out, the design of locations for people could be considerably aided by environmental behaviour studies (Dayaratne, 2006), as SOE are essential aspects that support the student's development. Therefore, they should be given utmost importance as the places that aid in the overall development of a child. Future studies should focus on aspects of students' overall development related to primary school-level SOEs. Changes in school outdoor areas may be realized for the benefit of students if practitioners, researchers, and policymakers collaborate more closely, in dialogue and in partnership, and with a strong focus on what is required.

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