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A Critical Review on the Impact of Combining Outdoor Spaces and Nature with Learning Spaces on Students' Learning Ability

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Abstract

The human innate tendency to interact with the natural environment has been proven by psychologists. This interaction should be placed in educational environments (schools). Unfortunately, interaction with nature is not considered in schools today, and the schoolyard, a place where students can interact with open space and nature, is designed to be completely separated from the classrooms. That means the schoolyard and the classrooms should be designed in harmony with each other. Students spend a majority of their educational period in classrooms, so to create diversity and increase student's productivity, it is necessary to combine outdoor natural spaces with indoor educational areas. So, the schoolyard plays a complementary role to the classroom. Additionally, the natural environment can be considered as another educational setting option.

The major goal of this review paper is analyzing the impact of the school's outdoor and natural spaces on enhancing students' learning abilities. Accordingly, first, the landscape architecture theories related to individuals and the natural environment, the importance of nature in learning spaces, and its impacts on students are presented. Then, the outcome of designing learning spaces in combination with outdoor spaces is displayed. Finally, the results can provide guidelines to education stakeholders, designers, and policymakers focused on creating more encouraging environments for students' learning.

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1. INTRODUCTION

Since the beginning of creation, humankind has lived in nature and evolved through coexistence. Living in and interacting with nature have been considered as their constant needs. Natural environments help people to evolve, satisfy their mental and spiritual needs, and make them lively. In contrast, absence of such environments brings worry, anxiety, disability, fear, panic, and pessimism (Kondo, Fluehr, McKeon, & Branas, 2018; Silva, Rogers, & Buckley, 2018). Studies have demonstrated that linking to natural environments can improve mood and awareness, reduce the levels of stress, and conduct many restorative and healthy consequences (Bratman et al., 2019; Hartig, Mitchell, De Vries, & Frumkin, 2014). To this end, in order to increase the quality of education and learning process, educational environments must provide conditions for students' mental tranquility when interacting with their surrounding environment (Burt, Koch, & Contento, 2017). Unfortunately, in undeveloped countries, only classrooms are considered as the most important part of a school, and schoolyards are designed as a large abandoned space, covered with asphalt, having limited equipment for playing and physical activity. In many schools all over the world, the importance of open spaces and schoolyards is neglected.

However, it is more than two decades, some developed countries, particularly the United States, England, and Australia, have emphasized the importance of "environmental education in schools' open spaces" in students' educational and learning processes at different levels, especially in primary schools. Exploring the experiences of these countries indicates that there is a positive direct relationship between increasing the students' learning quality and increasing the environmental quality of schoolyards (Stevenson, K. T., Moore, Cosco, Floyd, Sullivan, Brink, Gerstein, Jordan, & Zapalatosch, 2020). In Washington D.C., scholars examined the relation between different green spaces within schools and schoolyards of numerous campuses, to determine green space thickness. Spaces that were covered by trees received an advanced experiment score or useful predictor of expertise. Current research performed in the United States has explored direct relations between natural environment in school surroundings and elementary school function (Kweon, Ellis, Lee, & Jacobs, 2017). Wu et al. (2014) made use of 905 public elementary schools in Massachusetts and realized the greenery thickness of school surroundings presents direct relationships with school-wide math and English scores (Wu et al., 2014). In Minnesota, the Twin Cities Metropolitan Area, a study examined school-level performance, and the result was that considerable canopy density was directly related with reading scores (Hodson & Sander, 2017).

Although, more recent research aimed at reproducing Wu and his team's discoveries (Browning, Kuo, Sachdeva, Lee, & Westphal, 2018) announced indirect connections between plant presence and students' performance in the third grade. Another experimentation presented in New Zealand also realized an indirect connection among green spaces within school buffers and elementary school performance (Beere & Kingham, 2017). Overall, though almost all proof indicates so, the relationship between greenery in school surroundings and performance is not always direct (Li, Chiang, Sang, & Sullivan, 2019).

Therefore, educational professionals and executive managers should revise the design of closed and open spaces in schools and create an integrated area for closed spaces (classrooms) and open spaces (yards). Accordingly, the science of architecture, particularly landscape architecture, can play an essential role in empowering and designing the schools' open spaces, with the aim of increasing the students' learning ability (Beere & Kingham, 2017; Browning et al., 2018; Burt et al., 2017; Jauslin, 2019). With aesthetic, social, and environmental approaches, the landscape architecture attempts to create dynamic environments in schools' open spaces, and designs part of the educational setting as a combination of open and closed spaces. This is because research has shown that teaching certain courses outdoors leads to better learning (Bølling, Otte, Elsborg, Nielsen, & Bentsen, 2018; Bølling, Pfister, Mygind, & Nielsen, 2019; Jauslin, 2019; Kweon et al., 2017).

In general, the main goal of this study is examining the importance of schools' open spaces in students' learning and knowledge acquisition. Therefore, the human-nature connection and the effect of landscapes and open-natural spaces on humans are first mentioned. Then, the literature review and the major theories about the following four subjects are presented: "the importance of landscape in educational spaces," "designing the open space of educational environments," "fundamentals of designing landscapes and schoolyards," and "the effect of schoolyards and natural environments of schools on students' learning capability."

2. BACKGROUND

2.1. The Human-Nature Relation and the Effect of Landscape and Open Spaces on Individuals

Scholars have divided the relationship between human and nature into three levels: 1) Looking at natural landscapes or their pictures, 2) Being in nature, and 3) Interacting and getting involved with nature (Bratman et al., 2019; Hartig et al., 2014; Hinds & Sparks, 2008). They believe that, not only being in nature, but also looking at nature or even its images and movies, could reduce stress and eye fatigue (Shibata & Suzuki, 2004). Merely viewing greenery from a window of a classroom, or even photos of a natural environment can have quantifiable positive outcomes (Grinde & Patil, 2009; Honold, Lakes, Beyer, & van der Meer, 2016; Meidenbauer, Stenfors, Bratman, Gross, & Berman, 2019; Stevenson, K. T., Moore, Cosco, Floyd, Sullivan, Brink, Gerstein, Jordan, & Zapalatosch, 2020). Furthermore, the 0.5-1-mile spaces around schools have been described as critical spatial ranges for many of the studied schools (Li et al., 2019).

Other studies have shown that looking at nature, hearing nature sounds, and generally experiencing it in any way decreases tension and stress (Bonnell, Hargiss, & Norland, 2019; Kellert, 2006). For

example, individuals working in environments decorated with natural plants are more efficient, comfortable, healthy, and creative than others, and have lower tension and stress. Aesthetically, they perceive their offices as more pleasant and they are more enthusiastic to do their tasks (Bratman et al., 2019; Grinde & Patil, 2009; Hartig et al., 2014). That means, apart from physical factors like the activity level (stimulation of exercise) and enhanced air quality, psychological systems reap the benefits of natural environments (Van den Berg, Agnes E, Joye, & Koole, 2016).

2.2. The Importance of Landscape in Educational Spaces

In the book Design for Learning: Values, Qualities and Processes of Enriching School Landscapes, Julie M Johnson explains three basic approaches proposed in the following books: Natural Learning: The Life History of an Environmental Schoolyard (1997), Landscapes for Learning: Creating Outdoor Environments for Children and Youth (1996), and Special Places; Special People: the Hidden Curriculum of School Grounds (1994). She propounds four experiences, six environmental qualities, and five primary items forming the conception of landscape in educational spaces through the landscape architecture approach. They are summarized as follows (Johnson, 2010; Moore & Wong, 1997; Stine, 1996; Titman, 1994).

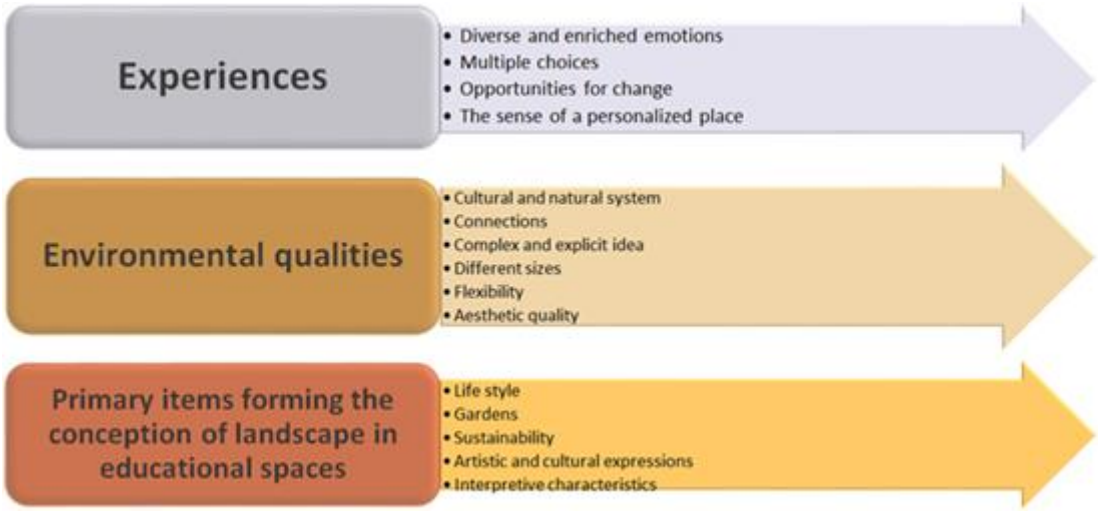

Figure 1 - The items which form the concept of landscape in educational spaces (Johnson, 2010; Moore & Wong, 1997; Stine, 1996; Titman, 1994)

In order to demonstrate the importance of landscape in learning environments, two new agendas were proposed by Nancy Takahashi in 1999 for schoolyards based on the landscape architecture approach. She proposes the use of educational landscapes as both outdoor classrooms and as educational resources. She also presents seven design considerations for schoolyards of the world community.

- Moving beyond a building-centered concept of school
- Linking schoolyards to the curriculum
- Seeking an evocative and memorable landscape identity

- Using the natural ecology of region and site
- Adopting regional vernacular models
- Examining models of landscape design
- Incorporating the perspective and desire of children (Takahashi, 1999).

Other studies examining the effect of open spaces on students were also conducted. Some of the results are presented here:

- Students who can view natural landscapes from their room window achieved higher scores in direct focus tests, compared to those viewing artificial or semi-artificial landscapes (Determan et al., 2019; Gillock & Reyes, 1999; Tennessen & Cimprich, 1995).
- Being in nature and observing it increases attention and focus – two parameters affecting creativity. Therefore, such presence plays an important role in enhancing the students' creativity (King & Gurland, 2007; Kondo et al., 2018; Silva et al., 2018).
- Linking with nature has a positive effect on creative activities, increases the rate of generating different responses and ideas, and plays an significant role in improving the students' memory (Bingley, Greenaway, & Fielding, 2019; Bringslimark, Hartig, & Patil, 2007; Burt et al., 2017; Determan et al., 2019; Grinde & Patil, 2009).

Titman is one of the prominent theorists of unofficial, hidden curriculums in schoolyards. He emphasizes that it seems to be necessary to design the schoolyards for unofficial, hidden curriculums such as training through nature, teamwork, etc. (Titman, 1994). Furthermore, applying natural ventilation through open windows instead of HVAC systems enhances students' learning ability by increasing the classroom quality. Overall, interaction with nature in all dimensions substantially improves students' mental and physical health (Kouhirostami, 2018; Kouhirostami, Kouhirostamkolaei, Sam, & Asutosh, 2020).

Some research tries to determine the students' preferences on the school playground. For most students, the school playground is the first and easiest available space to interact with the outdoors. Furthermore, students are the primary occupants of the schools. However, schools have been designed based on adults' interests and priorities (Lindemann-Matthies & Köhler, 2019). For example, they considered neatness, safety, simplicity of maintenance and the demands of team sports without adding the importance of biodiverse greenery. Thus, evaluating the students' preference is one of the significant steps of playground design (Cheskey, 1996; Khan, McGeown, & Bell, 2019; Samborski, 2010). Lindemann-Matthies (2019) studied the difference between a traditional playground and the green playground based on students' attitudes. He mentioned three main objectives to investigate the students' preference between naturalized and traditional playgrounds. The first objective is to find the effect of natural elements on increasing the attractiveness of school playgrounds or in the general school environment. The second objective is finding the features that students describe as a different playground scenario. Then, the last objective is defining the impact of age and sex on students' preferences. The results show that

greenery and biodiversity in green space can significantly enhance the aesthetic of traditional schoolyards (Lindemann-Matthies & Köhler, 2019). Furthermore, students are interested in creating their environment and discover it, hence some built structures like paths and benches would provide those opportunities. This concludes that playground gardening could be a learning environment as well to teach students social behavior, food behavior, and environmental attitudes (Borsos, Patocskai, & Boric, 2018; Broda, 2007; Lane, Ateşkan, & Dulun, 2018; (Ohly, Gentry et al., 2016).

2.3. School's Open Yards and Natural Environments Impacts on Students' Learning Ability

In previous decades, societies have considered classroom-based teaching activities to have most favorable outcomes for kids. However, nowadays, using cultural and natural environments as context for curriculum-based learning has received international attentiveness (Beames, Higgins, & Nicol, 2012; Becker, Lauterbach, Spengler, Dettweiler, & Mess, 2017). In Primary schools in Scandinavian countries, the systematic relocation of teaching to areas out of schools has enlarged from a grassroots motion to a progressively widespread activity (Barfod, Ejbye-Ernst, Mygind, & Bentsen, 2016; Bentsen, Mygind, & Randrup, 2009; Waite, 2011). The other study demonstrated this activity as a disciplined education outside the classroom (EOtC) and conceptualized it as a mandatory educational practice out of school on a structured foundation, for example one day weekly or every two weeks (Bentsen, Schipperijn, & Jensen, 2013; Bentsen et al., 2019).

Independent motivation has been discovered to be a powerful predictor of participation in learning practices, and is related to higher school attainments, greater perception of taught idea, enhanced school pleasure, and a lower nonconformist rate (Deci & Ryan, 2016; Gottfried, 1985; Gutman & Vorhaus, 2012; Ryan, 2009). In contrast, controlled types of motivations have been related to pupils' experience of diversion, negative emotions, and underneath grades (Guay et al., 2010). Unluckily, students' description of stimulating and enjoyable school days reduces with age and their pleasure with school declines, especially between 11 and 15 years old (Gutman, Brown, Akerman, & Polina, 2010). Therefore, it is critical for school managers and teachers to establish and develop a learning atmosphere that brings up independent motivation and stop controlled kinds of motivation (Gottfried, 1985; Guay et al., 2010; Liu, Wang, Tan, Koh, & Ee, 2009; Ratelle, Guay, Vallerand, Larose, & Senécal, 2007; Ryan, 2009).

One of the essential parts of the process of improving mental health, mental clarity, self-knowledge, self-confidence, and independence is to be exposed to nature. Getting involved in nature reduces stress, increases individual efficiency, and reinforces emotional relations between people (Hartig et al., 2014; Tennessen & Cimprich, 1995). Therefore, focusing on nature and natural environments is an essential requirement of schools. The research results show that students prefer to be allowed to intervene and understand the natural environment and get involved in it. On the other hand, one of the school design requirements is the visual relation with the natural environment (Bentsen et al., 2013; Bentsen et al., 2019; Borsos, Patocskai, & Boric, 2018).

A research has, according to Dymnet's (2004) analysis, examined the effect of open, green schoolyards on students' educational progress, behavioral and social growth, playing,

environmental awareness, health, and safety (Dyment, 2004). Other studies examined the students' social behaviors and actions in schoolyards (Rickinson, 2004). Moreover, regarding learning through playing and designing playgrounds for students, theorists propose two theories:

(A) Preparing for adulthood: playing offers opportunities for achieving the skills and functions required in adulthood. According to the theory, playing is a unique phenomenon in childhood, developing the children's physical and mental capacities(Darling-Hammond, Flook, Cook-Harvey, Barron, & Osher, 2020); (B) The sociocultural theory: playing is a way of using things and accomplishing tasks symbolically, which encourages imagination in children. Through acting out the social characters such as a doctor, mother, etc., playing helps children to mentally recognize social roles and rules. Furthermore, many scientific reports and papers studied the effect of several criteria such as the sense of place, health, security, and safety in schoolyards on students, and finally considered how to enhance them (Russ, 2016; Stagnitti & Unsworth, 2000).

Education outside the classroom (EOtC) is an instructing way in that instructors in secondary and primary schools move part of their curriculum-based instructing practices from the class to areas out of the building of schools (Becker et al., 2017; Bentsen et al., 2009; Bølling et al., 2018; Waite, 2011). Many issues can be taught in this method, so EOtC can be widely the concept of school-based learning in outdoor areas (Beames et al., 2012; Bølling et al., 2019). This term is identified as place-based and inquiry-based teaching and is an addition to indoor lessons in the class. It frequently provides pedagogy like cooperative learning activities, group-work, focus on practical-skills, student-led approaches, play and games in its application, and physical activities. It happens in remote areas which require transportation such as museums, forests or factories, or close by places like parks; though, it is mainly managed in green and natural environments. EOtC is experienced in almost all issues and is frequently interdisciplinary. The learning practices in EOtC are frequently conducted by pupils, who utilize their physical bodies and emotions in collaborative activity in "real-world" backgrounds with the aim of getting private experiences (Bentsen et al., 2009; Bentsen et al., 2019; Bølling, Pfister, Mygind, & Nielsen, 2019; Otte, Bølling, Elsborg, Nielsen, & Bentsen, 2019; Sjöblom & Svens, 2019; Waite, 2011; Waite, Bølling, & Bentsen, 2016).

Other explorations announced that general subjection to EOtC among two and seven hours weekly is directly related to reading presentations of Danish public-school students who are between 8 to 13. The discovery shows the latest quantitative experimental research and qualitative case studies. The relation did not relate to sex, or previous reading ability and amount of achieved EOtC lessons in national language. Further large-scale experimental research is essential to toughen deduction on that issue (Nielsen et al., 2016; Otte et al., 2019).

Few exploratory research have explored the relation between regular exposure to EOtC and students' connections to their classmates (Becker et al., 2017; Otte et al., 2019b; Rickinson, 2004) and the outcomes are variable. A non-compared case study of a middle school class in three years regularly revealed to EOtC in a forest system (equivalent to submission on a weekly basis and to 20% of their lessons during any school years), demonstrates that students extended the groups they played in to provide new classmates when in the EOtC system (Mygind, 2009).

Based on previous literature review the positive impact of open space, natural environment, and green schoolyards on students' mental and physical health are clearly proven. Hence, the question is: how can designers bring nature and greenery to the schoolyards? The question shows that in the next step, landscape architects and designers play a significant role to design a functional and dynamic schoolyard. The next section presents the theories, strategies, and methods of designing schoolyards.

3. DISCUSSION

3.1. Theories of Designing Open Spaces in Educational Environments

3.1.1. Attention restoration theory

In an educational site, landscape provides the spectator a setting with two physical and visual functions. The physical function pertains to components such as accessing closed architectural spaces, a preliminary to going back and forth from these spaces, having communication and free reading on the devised furniture, and the grass covered area. The visual and perception-making functions are related to imprinted objects on the observer's mind. The events that are engraved in the spectator's mind while looking at a landscape create a perception of the environment and landscape. This will be used as the basis for many case studies of landscape (Crossan & Salmoni, 2019; Joye & Dewitte, 2018; Ohly, White et al., 2016; Stevenson, M. P., Schilhab, & Bentsen, 2018).

The attention restoration theory is related to the branch of landscape architecture. Focus (directed attention) plays a vital role in information processing. In educational environments, students' minds are constantly filled with a large volume of information. Therefore, in order to enhance their ability to collect and perceive the received information, it is necessary to increase their focus and attention. Mental clarity and attention are among the most effective factors in the development of self-confidence and independence (Crossan & Salmoni, 2019; Joye & Dewitte, 2018; Tennessen & Cimprich, 1995).

Moreover, the natural environment plays a considerable role in the development of mental clarity. As a result, the use of nature in educational environments increases students' attention, and consequently their self-confidence and independence, and induces a sense of a safe place in them. The attention restoration theory consists of four components (Kaplan, 1995; Moreno, Baker, Varey, & Hinze-Pifer, 2018).

Figure 2 - The attention restoration theory elements (Kaplan, 1995)

Therefore, by identifying and enriching these components in educational spaces, the schools' open spaces, school grounds, and educational environments can be considered as supplementary, interconnected spaces. The combination of educational closed and open spaces can be used for reinforcing the students' attention and learning (Wilson, 2018).

3.1.2. Psychological evolution theory

The theory indicates that natural environments are effective in reducing stress and providing peace for individuals. Offering a visually pleasant physical environment, nature reduces stress and enhances health through generating positive feelings and restricting negative thoughts (Hodson & Sander, 2017; Li & Sullivan, 2016; Matsuoka, 2010; Norwood et al., 2019).

3.1.3. James Gibson's ecological capabilities theory

The theory explains the functions, merits, and physical capabilities of the environment and landscape. While each element in nature is functionally responsive, it possesses capabilities and capacities beyond its function. According to the theory, a tree, for instance, is not merely used for visual delight and shadowing; rather, it induces the sense of climbing up the tree, catching the branches and leaves, touching the bark furrows, leaning on it, etc. The hypothesis considers environment from a psychological perspective, though a direct perception of the environment has influenced it, and it has commingled the psyche and environment as the spirit and matter, body and meaning, and view and landscape. Extending the Gibson's theory, it is believed that environmental capabilities are not limited to environmental elements; it rather encompasses human elements such as culture and community (Araújo, Brymer, Brito, Withagen, & Davids, 2019; Costall, 1995; Gibson & Pick, 2000; Wagman, 2019). Therefore, these meta-physical capabilities of the natural environment can be used for motivating students and making them interested in studying outdoors. For example, grass covered areas tempt students to sit over the grass and learn their lessons.

3.2. Impact of Outdoor Learning on Stress Reduction

Stress is anticipating lower performance for kids and teenagers. Research has repeatedly indicated that children who describe lower personal and school-related stress achieve higher scores and GPAs (Determan et al., 2019; Gillock & Reyes, 1999; Khatoon, 2019) present more academic attainment (Grannis, 1992; Subotić, Lovrić, Gajić, Golubović, & Sibinčić, 2019). They are less likely to be involved in behaviors that conduct to lower performance (e.g., dropping out of school, truancy) (Hess & Copeland, 2001; Pascoe, Hetrick, & Parker, 2020). So, decreasing the students stress may be a way through which greenery affects student performance (Li & Sullivan, 2016; Li et al., 2019). The results add to the proof announcing that the view of plants have strong impacts on the efficiency of students at different ages (Donovan, Michael, Gatziolis, & Hoyer, 2020; Guardino, Hall, Largo-Wight, & Hubbuch, 2019; Matsuoka, 2010; Taylor, Kuo, & Sullivan, 2002; Wu et al., 2014). Because cognitive functioning is essential to knowing, performing and learning various activities, views to green areas may also influence the efficiency of students. In this study the significance of boosting students' mental and cognitive health by considering classrooms with green window views is mentioned. The research demonstrates class views to green landscapes have important, positive effects on recovery from stress, and psychological fatigue(Bingley, Greenaway, & Fielding, 2019; Bringslimark, Hartig, & Patil, 2007; Li et al., 2019; Sadick & Kamardeen, 2019) (Bingley, Greenaway, & Fielding, 2019; Bringslimark, Hartig, & Patil, 2007; Li et al., 2019; Sadick & Kamardeen, 2019).

In general, natural environments have different effects on individuals. For example, parks, gardens, seashores, and rivers invoke the sense of happiness, amusement, tranquility, comfort, and communication. Mountains and forests create the perception of solitude, liberality, and vitality. Water areas are considered as important sites for entertainment, communication, and social activities. Looking at enjoyable artificial spaces compared to merely green spaces has equal positive effects (Hinds & Sparks, 2011; Mena-García, Olivos, Loureiro, & Navarro, 2019; Nartova-Bochaver & Muhortova, 2019).

More than two decades, some countries such as the US, Australia, and England have indicated the significance of "environmental education in schools' open spaces" (Stevenson et al., 2020). Researchers have examined some concepts and subjects such as learning the sciences, mathematics, arts, English language, history, geography, and botany. These studies and the experiences of the mentioned countries show that increasing the quality of schoolyards has a positive direct relationship with increasing the quality of students' learning ability (Barrett, Treves, Shmis, Ambasz, & Ustinova, 2019; Khan, McGeown, & Islam, 2019).

In this regard, some research has been done on improving the greenery of schoolyards and learning in outdoor classrooms. In the education and learning environment, current studies have announced a restorative impact related to direct or indirect submission to trees and other forms of greenery on students across age categories (Guardino et al., 2019; Williams, Rose, Olsson, Patton, & Allen, 2018). For elementary school students, the recognized restrictiveness of school playgrounds is positively related to naturalness and vegetation volume (Bagot, Allen, & Toukhsati, 2015; Collado & Corraliza, 2015; Khan, Bell, McGeown, & Silveirinha de Oliveira, 2020). This paper summarizes the major theories about the following four subjects: "the importance of landscape in educational

spaces", "designing the open space of educational environments", "fundamentals of designing landscapes and schoolyards", and "the effect of open yards and natural environments of schools on students' learning."

3.3. Fundamentals of Designing Landscapes and School Grounds

Sustainable and environmental perspectives are of much importance in today's world. Schoolyards are no exception and much research has been conducted on the subject (Sjöblom & Svens, 2019). After proposing Takahashi and Titman's related theories, designing, managing, and monitoring outdoor classrooms were regarded as remarkable issues throughout the world (Billmore, Brooke, Booth, Funnell, & Bubb, 1999; Takahashi, 1999; Titman, 1994). Moreover, protecting and managing the natural and artificial landscape of schools are studied in some of the articles (Bell, 2019; Bentsen et al., 2013; Johnson, 2010; Khan, Bell, McGeown, & Silveirinha de Oliveira, 2020). Accordingly, the Learning through Landscapes (LtD) Charity, UK, builds each year several landscaped school grounds, and then presents the experiences and proper basics of landscape design by evaluating them (Richardson, 2017).

Skamp suggests that school grounds development should be holistic, sustainable, and participatory (Skamp, 2000). Focusing on a comprehensive process of school design in which all design, planning, management, control, and maintenance principles of schoolyards are embedded, requires conducting fundamental research (Takahashi, 1999). Some of the studies have examined several cases of students' participation in school design (Dyment, 2004). In order to increase the educational and learning quality of schools, Boston Educational Institution presented, in 2001, six features for the grounds of such schools (Ferguson, Kozleski, & Smith, 2001).

- Learning through playgrounds
- Learning through landscapes
- Experience-oriented learning
- Community-oriented learning
- Environment-oriented learning
- Location-oriented learning

Research conducted in several US schools examined the effect of education in natural environments and outdoor classrooms. In this study, the term EIC (Environment as an Integrating Context for Learning) is introduced; it can change the schools' curriculum and markedly expand the education. In the table below, the effects of EIC on students and teachers, which were reported by instructors, teachers, and managers, are mentioned (Lieberman & Hoody, 1998; Wilson, 2018).

Table 1 - The effects of EIC on students and teachers (Lieberman et al, 1998)

Intrapersonal skills	· Improving the teamwork ability · Enhancing the communication skills · Increasing the students' courtesy towards others
Students' intellectual skills	· Increasing the creative thinking ability · Increasing the problem-solving skills and strategic thoughts · Improving the students' intellectual system
Students' learning	· Increasing the knowledge of sciences, concepts, processes, and principles · Improving the ability to exploit science in real world opportunities · Increasing enthusiasm for gaining knowledge
Students' mathematical skills and knowledge	· Improving the learning of mathematical concepts · Increasing the students' ability to master mathematical skills · Encouraging students to learn mathematics
Learning the language arts	· Developing the language arts skills · Encouraging the language arts · Increasing success in communicating with other people
Instructors	· Increasing the students' enthusiasm and commitment towards teachers · Better workplace relations with students and colleagues · Creating more opportunities for discovering new subjects · Providing constant opportunities for utilizing creative educational strategies

4. CONCLUSION

Overall, in this study, the importance of schools' open spaces in students' learning and knowledge ability is evaluated. Encountering a suitable nature and landscape can help increase, improve, and enhance mental health, reinforce mental clarity, and achieve self-knowledge, self-confidence, and independence. Therefore, combining learning spaces with nature and landscape should be one of

the most important requirements of schools and educational environments. Also, using landscape as an educational resource would be effective on education quality. To form the concept of landscape in educational spaces, designers and planners should focus on some items such as experiences, environmental qualities, and primary items. In addition, scholars present some design solutions for schoolyards. Thus, paying attention to how and what to view from inside the classrooms and educational closed spaces towards the schoolyards and outdoor spaces, as well as exploiting nature to free students' minds from steady frustrating conditions of classrooms, are noteworthy in designing the educational and learning environments. It is also necessary to create an extensive landscape and properly utilize the natural elements.

An attractive landscape with high visual potentialities consistent with students' morale, such that it can satisfy their mental and physical needs, is another feature of pleasant landscapes in educational environments. Multilevel investigations demonstrate that general exposure to education outside the classroom (EOtC) is related to progress in innate motivation and was grown less by prior innate stimulation in favor of students with better previous natural motivation. Outcomes were autonomous of sex and socio-economic-status. Furthermore, the EIC (Environment as an Integrating Context for Learning) has many effects on students' interpersonal skills, intellectual skills, learning, mathematical skills and knowledge, learning the language and arts, and even on instructors. The key findings of this research can be summarized in four highlighted points:

- Schools' open spaces and natural environment has positive impacts on students and instructors in many ways.
- Designing a dynamic natural environment in the schoolyards for teaching and learning purposes decreases student' stress, thus it can increase students' independence, confidence, motivation and learning ability.
- Adding greenery to the schoolyard, providing view to a natural environment from classrooms, and designing a creative natural environment in schools are some methods to improve the quality of schools.
- A successful and sustainable design should increase the interaction and relationship between students and nature by encouraging students to feel and touch nature, creating a playable and walkable environment, and providing a direct view from classrooms to schoolyards.

In general, considering these points and features related to the landscape and open space of schools' educational environments can enhance the students' focus and directed attention, and consequently improve the education, learning, and the educational quality of schools in general. In addition, it is significantly important for decision makers and school administrators to know the impact of nature on students' physical and mental improvement and use that information in their decision-making process.

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