



EDUCATION FOR SUSTAINABILITY DEVELOPMENT VIA SCHOOL GARDEN

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Abstract:

The garden can be viewed as an imitation of nature in an urban setting. In past times, many educators aware of the importance of nature in the education process were avid supporters of the school garden. Many studies that examined the influence of the school garden in the education process have shown that it offers multiple benefits to the students, one of which is that it furthers experiential learning. Students involved in gardening improve their overall academic performance and increases their interest in learning. It also seems to have positive effects on their overall behavior and on their emotional and social health. In the results of studies, we can also see the students who participated in gardening showed remarkable improvement in their overall physical health, and that they often adopted better nutritional habits. Finally, the school garden can serve as a portal for the students and for the school in general, to introduce them to environmental education and to sustainability in both theory and practice.

Keywords: school garden, education, sustainability

1. Introduction

Taylor Hague et al. (2006) have maintained that in children, contact with the natural environment produces significant effects in their development, and also in the goals and ambitions that they will develop later. The natural environment also affects cognitive intelligence, since its complexity and variety induce increased neural synapses in children. Research has indicated that when individuals live cut off from the natural environment, they tend to display aggressive behavior while at the same time their way of life becomes passive (Dannemaier, 1998, referenced in Tampoukou, 2010).

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In a report by Zijlema et al. (2018) published in the "International Journal of Environment Research and Public Health" under the "Phenotype" program that involved 3,600 adults from many countries, participants who in their childhood had experienced real contact with the natural environment tended to exhibit greater psychological balance compared with subjects who lacked similar experiences. The results show that participants who did not have direct contact with the natural environment during their childhood, in their later life as adults did not regard contact with nature as being important, while as individuals they are afflicted with high incidence of nervousness, vexation, and depression. Presently more than 73% of the population of Europe lives in urban areas. As a result, children have no opportunities to understand the natural cycle of life, nor the extent to which human activities impact the environment (Boyle, 2013). For most children, the schoolyard is one of very few places where the child may experience contact with nature and the natural environment, and it also represents a safe space for play, where parents can entrust their children and feel safe for them (Ozer, 2006). The presence of natural surroundings within the school facility, whether in an urban or regional type school, seems to shape the relationship of children with the natural environment in general (Malone & Tranter, 2003).

2. Outdoor Learning

Outdoor learning is a holistic method aiming at the all-embracing development of children. It involves outdoor activities and can be illustrated in the form of a Venn diagram (Szczepanski, 2011).

1st circle: Outdoor Activities

2nd circle: Environmental Education

3rd circle: Personal and Social Development

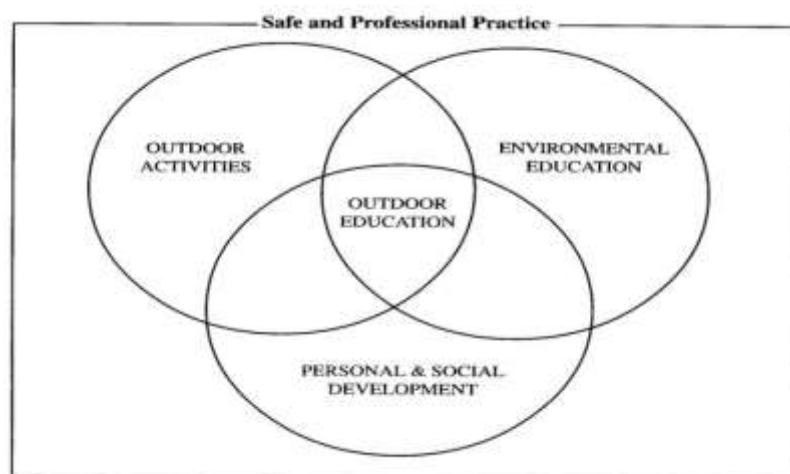


Figure 1: Outdoor Learning

Outdoor learning involves several activities including outdoor play, gardening, and environmental education. Those activities bring children into contact with the

natural environment and advance their personal and social development (Rickinson et al., 2004).

Many researchers have studied the utilization of the schoolyard for outdoor learning. They explored the effects on the students when the natural environment and more specifically the schoolyard were added to the core curriculum. The study in question was carried out in 40 schools in the US. Its results indicated that, in the schools that made that change, the students showed significant improvement in overall development, in observational skills, and in data collection and analysis. Improvements were noted in critical thinking, in teamwork, and their communication skills. Besides, the research showed that the application of outdoor learning in the educational process, not only made the students exhibit greater interest for the course involved, but also made them work better together, overcoming whatever problems they might have had in their behavior and interactions (Lieberman & Hoody, 1998).

3. The School Garden in the Educational Process

A garden is described as a designed space that includes natural and also man-made materials and accommodates both flora and fauna as their habitat (Mantouvalou-Kasidokosta, 2013). The Czech philosopher and pedagogue Jan Amos Comenius (1592-1670), one of the first advocates of Universal Education, maintained that every school ought to have a garden where children will have the opportunity to observe trees and flowers (Desmond et al., 2004).

In the sweeping urbanization that followed the industrial revolution, the school garden was for children the only way to have contact with nature. The very first compulsory schooling program, instituted in Prussia in 1811, included gardening as a course of study. Then in 1869, the school garden became part of the curriculum in Natural Sciences, Agriculture, and also vocational training (Sealy, 2001).

In Germany, the educator Fredrich Froebel (1782-1852) introduced the “Children’s Garden” as a formal part of schooling, aiming to connect pupils with nature and with the physical dimension of knowledge (Desmond et al., 2002). Swiss educational reformer Pestalozzi introduced the notion of gardening as a means for students to observe nature, arguing that practical education involves a combination of three elements, “*hands, heart and mind*” (Desmond et al., 2004).

In the 20th century US, the school garden was applied extensively to deal with pathologies such as childhood obesity and diabetes, caused by factors that include poor nutrition and lack of physical exercise (Ozer, 2006).

Another educator who spoke about the school garden at that time was Maria Montessori (1870-1952), who was also a medical doctor. She emphasized that children’s involvement in gardening at school produces significant effects on their health and also on their social, mental, and ethical development. Her view is that if a child could become aware of how much the growth and life of a plant depends on the child’s own care, then the child would become truly responsible and learn how to respect life (Waliczeck, 1997 referenced in Garitsis, 2016).

In 19th and 20th century Greece there were school gardens whose practical aim was to prepare pupils for work in agriculture, especially in rural regions, yet without acknowledging the significant contribution of the school garden in the educational process (Karolemea, Kalaitzidaki & Linardakis, 2015).

In 1935 Alexandros Delmouzos, one of the most prominent pedagogues of the Greek educational system, supervisor of the Experimental School operating under the University of Thessaloniki (E.S.U.T.) proposed that school gardens should be organized in the primary and secondary curriculum of the E.S.U.T., for scientific purposes (Vourdousi, 2019).

Today the educational value of the school garden seems to be broadly acknowledged. At the same time, as concern over the environment increases, it emphasizes the role of the school garden in the educational process, as an instrument for environmental education and for reconnecting children with nature. Its inclusion in school curricula has made the school garden an integrated learning environment (Sealy, 2001).

Europe, the US, and Australia have been witnessing greater interest in the role of the school garden in the educational process. Many new websites propose school garden activities along with advice and instructions for the creation and cultivation of school gardens: School and Preschool Gardens; School Gardens from USDA Farm to School; Children's Garden Network – A Garden at Every School; Garden-Based Education; GreenHeart Education; et al. (<http://libguides.lib.msu.edu/c.php?g=95377&p=623701>).

4. Methodology

The goal of this study is to stimulate interest and to raise questions concerning the role of school gardening in education—considering that school gardens can be viewed as innovative and highly useful instruments for environmental learning—and thus to contribute in reconnecting modern persons with nature, starting at a young age during the school years. Our study was driven by the following research questions:

Research Question 1: How we can use the school garden as a tool to teach the Concept of Sustainability?

Research Question 2: What are the effects of the school garden on student behavior and in the learning process?

Research Question 3: How does the existence of a school garden influence the students' mental and social health and well-being?

Research Question 4: Could the students adopt healthier nutritional habits because of their involvement in a school garden as part of their education?

The information provided in this review aims at educators, parents, mental health personnel, and the institutions involved in environmental, cultural, and educational programs, to inform them about the multidimensional role of the school garden in educational processes. The methods employed are:

- Review and utilization of written sources.
- Classification and categorization.

- Interdisciplinary approach.
- Review of bibliography.

5. Analysis-Discussion

5.1 School Garden, Environmental Education and Sustainable Development

Education for sustainable development is holistic and transformational education which addresses learning content and outcomes, pedagogy and the learning environment. It achieves its purposes by transforming society (Armakolas et al., 2019). As school gardening is a complex and multi-faceted process, students can be introduced to the concept of Sustainability and grasp its educational aims. Thus, the school garden can serve as an instrument to introduce students to the features of a sustainable way of life, and of converting the school to sustainable function (Garitsis, 2016).

The school garden contributes decidedly to improving sustainable school indicators according to the specification that Kalaitzidis introduced. Specifically, it greatly influences some of the educational indicators, such as (a) Alternative teaching methods or techniques employed by teachers to make the lesson more attractive and more productive; (b) Teaching methods and techniques utilized by teachers to develop critical, systemic and creative thinking among the students. Furthermore, the school garden contributes decidedly to environmental indicators such as (i) Creating and maintaining a vegetable or flower or roof garden in the school grounds; and also (ii) The students themselves planting trees, shrubs, and other local flora, in the school grounds or outside; after the grouping proposed by Kalaitzidis (2013).

School gardening can also make significant contributions to the student's awareness of ecology and sustainability. Through their acquaintance with recycling and composting, students can familiarize themselves with the ecological aspect of refuse management (Garitsis, 2010). Their exposure to composting, and to ecological weed and pest control measures to help plants, will acquaint students with sustainable cultivation and plant management, and help them develop ecological awareness and practical methods, crucial for the maintenance of natural habitats (Orr, 2004).

Skelly & Zajicek (1998) maintained that intensive use of the school garden, integral to the normal school curriculum, produces positive effects on the students' attitudes. The researchers investigated the environmental reflections of students who had participated in the "Green Garden Project", an environmental education program whose aim was to use the students' involvement in the school garden in order to help develop their environmental awareness even in the regular curriculum. The project involved second and fourth grade pupils in four schools. The results indicate that participating students showed greater interest and also concern for environmental issues, compared with non-participants. An additional important finding was that younger students displayed a more positive attitude for the environment, confirming the findings of previous studies, which maintain that small children have an easier time developing a positive attitude toward the environment (Bryant & Hunferford, 1977; Cohen & Horm – Wingerd; 1993, Jaus, 1982, referenced in Skelly & Zajicek, 1998).

The school garden can be the framework for the development of activities which, by changing the overall culture of the school, will allow the general change that is necessary for the school to integrate and assimilate the characteristics and principles of sustainable development that will transform it into a sustainable school, a school that will be a factor of change in society towards a sustainable / sustainable way of life (Sterling, 2001).

5.2 Influence of School Garden on Behavior and Learning

Among the primary reasons for creating a school garden is the support it lends to the students' experiential learning and knowledge. In order for students to acquire the ability to construct knowledge on their own, they need to learn to operate in a context that includes experiential learning. In their active involvement in the school garden, students learn to use their bodies, thus experiencing a different, more tangible type of contact with the learning object. Their active involvement results in "learning by doing" as described by Dewey (Garitsis, 2010).

A study performed at the Bethel Learning Institute showed that students grasp and absorb knowledge at a rate of 11% when they listen to lectures, 75% via practical learning, and 90 % when the students teach and exchange teaching among themselves. It follows that the school garden could be considered an activity that offers children an abundance of stimuli that involve all their faculties, making it a highly effective activity (Sealy, 2001).

Passy, Morris & Reed (2010) researched the influence of school gardening on the students' behavior and learning. Their qualitative survey involved ten schools, and its results showed that the school gardens are sources of social and emotional effects on the students. Their participation in school gardening enabled the students to broaden their scientific knowledge and their capabilities, and also improved their verbal ability and vocabulary. Growing vegetables allowed them to learn the natural variation of seasons, and the means of food production. Students also developed psychological resources such as trust, self-esteem, and responsibility. The schools employed school gardening as a means that enabled students to grow into active participants and citizens. The attitude about school and schooling changed not only among the students but also in the local community.

Lieberman & Hoody (1998) created a learning program where the lessons were held at the outdoor spaces of the school rather than inside classrooms as usual. The researchers found that the students who had participated in school garden learning programs exhibited significant improvement in cognitive skills such as reading, writing and mathematics. Besides those improvements, their contact with gardening increased their powers of attention and concentration in class, and also their attitude toward the lessons.

Taylor, Kuo & Sullivan (2001) explored the correlation between contact with nature and gardening on one hand and learning on the other. The subjects were students diagnosed with Attention Deficit Disorder (ADD). Their results showed that ADD symptoms became less intense and more manageable after activities in spaces with green

landscaping, compared with spaces without. The daily contact of students with gardening seemed to reduce the symptoms of attention-deficit.

Besides its positive influence on learning and concentration, the experience of school gardening seemed to shape the development of the students' critical thinking. Ernst & Monroe (2006) evaluated an educational program based on school gardening. Their results indicate that student participants in the program seemed to be far more familiarized with critical thinking, compared with non-participating students; to the extent that their performance often exceeded the norm for college students.

Another study by Graham & Zidenger-Cherr (2005) explored the views of educators concerning the influence of school gardens on teaching and learning, in a program named "A Garden in Every School", which involved all schools in California. A questionnaire was filled by 592 schools. The results indicate that the students' writing ability improved by 42%; their knowledge concerning healthy nutrition by 56%; and their nutritional habits by 43%. The students' awareness of and involvement in environmental matters increased by 43% and their actual performance in mathematics by 40%. Furthermore, the study indicates that the students' social aptitude improved by 41% and their physical activity by 57%.

5.3 School Garden, Psychological and Social Health

Many researchers have focused on the impact of the natural environment on children's psychological health. Psychologists Wells & Evans (2003) studied the effects of natural surroundings on children aged 6 to 11 years, regarding their psychological attitude and their ability to deal with stressful situations. Their results showed that students who had greater contact with nature in green landscaped spaces tended to be less anxious and dissatisfied, and their feelings of self-esteem were positively influenced.

Maller (2005) explored the effects on the children's psychological health from experiential learning and from activities in school gardens, and otherwise in schoolyard spaces with green landscaping. The results of that study showed that all those activities were very supportive for the children's psychological health and self-confidence. School garden activities encourage students to communicate and to function in teams toward common goals. As a result, children learn that actions that involve many participants are more satisfying, and they also experience feelings of higher self-esteem (Pivnick, 1994). Another study, by Waliczek, Bradley & Zajicek (2001) noted that after the students had participated in gardening functions, the relationships among them improved, along with their general attitude toward the school.

Many researchers maintain that the students' involvement in school garden activities can be correlated with other positive influences in the students' behavior, such as accepting diversity. Evidence to that came from a multicultural program where many schools with students from a variety of cultural backgrounds interacted and communicated in ways that were certainly multi-cultural. The students met and became familiar among themselves, exchanged information and were exposed to other cultural heritages (Cutter-Mackenzie, 2009 referenced on Garitsis, 2016).

The schoolyard and its design are a principal factor in the students' choice of play modalities (Garitsis et al., 2007). Frost & Wortham (1988) argued that schoolyards with green landscaping offering a variety of stimulation are favorable for play and for the children's social development, in contrast with the usual drab schoolyards that consist mostly of concrete.

Malone & Tranter (2003) studied schools with yards that varied in their overall configuration, the share of green areas, and the complexity of their spaces. The results of their study indicated that in the schools that had greener landscaping and presented a greater variety of stimuli, the students' interactions showed better qualities compared with other schools.

School garden activities allow students to learn how to interact not only among themselves but also with teachers, parents and with gardening advisors (Canaris, 1995). Students reach the point where they themselves highlight and propose their own ideas on how to create and maintain the school garden. In a study by Alexander et al. (1995), involving schools where parents participated in the implementation of school garden actions, it was noted that parents were quite pleased with this constructive means of cooperation and communication with their children. They showed up at the school most days, even during weekends.

5.4 School Garden, Physical Health, and Nutritional Habits

Many researchers have argued that school gardening makes students more aware of nutrition. Growing a school garden can result in the students adopting healthier nutritional habits and thereby also countermanding childhood obesity (Selly, 2012). Besides, nutrition all by itself relates closely to the environment, since the production, processing, packaging and distribution of food involve environmental impact (Selly, 2012).

Morris, Neustadter & Zidenberg-Cherr (2001) studied the effects of school gardening on the students' nutrition. Students who participated in activities involving the vegetable garden at school, exhibited greater ability to recognize different types of food materials and classify them into appropriate groups. They were also more interested to actually taste new vegetables previously unknown to them.

A similar investigation carried out by the British Psychological Society (2014), reported on students' attitudes about eating fruit and vegetables before and after they participated in a 12-week program to create a school garden. It is interesting to note that at the onset of this study, many among the students were unable to distinguish between healthy and unhealthy nutritional options. That largely changed by the end of this program. Participating students improved their nutritional habits, increasing their consumption of fruit and vegetables by 26%.

Mat Jones et al. (2012) studied 55 primary schools that had been involved in "Food for Life Partnership" (FFLP), a program that investigated food and nutritional habits. The primary goal of their study was to explore the role of the FFLP program in advancing a holistic approach toward food among the students. The results show that the students

who participated in the program developed an attitude that was twice as receptive *vis-à-vis* organic food and the holistic approach to food than before the program.

Besides the improvement of the students' nutritional habits, the school garden also improved their physical fitness, thanks to the digging, carrying and other physical activity necessary for plant care. Dymont & Bell (2007) studied schools that had applied gardening programs. A quantitative investigation in 56 schools in Canada showed that the students' physical activity had increased by 71%.

Ozdemir & Yilmaz (2008) confirm that the configuration of the school yard affects the quality of physical activity among the students. The results of their study indicate that in schools with spacious and green yards, which allow students to engage in physical activity, the body mass index (BMI) of students was lower than in schools that lacked such yards.

Likewise, a study by Boldemann et al. (2006) found that schools that had gardens with full growth, and with activities related to gardening, students walked about much more on a daily basis, and they were far less exposed to ultraviolet radiation compared with other settings lacking those specifications.

Fjørtoft & Sageie (2000) focused on the correlation between school gardening and the students' health. They examined to what extent a schoolyard with green landscaping, used in play, can contribute to physical health. Their results indicated that green landscaping allows children to engage in a broad variety of activities. It seems to improve the students' physical condition and also their overall health, which could be observed in the rates of absence from school due to illnesses, significantly lower than previously.

6. Conclusions

The results of our study show that for the students the school garden can be a space that will offer multiple benefits. It can provide an effective and easy approach to a matter that our societies are in desperate need to deal with, which is how to reconnect modern humans with nature.

The school garden can be the students' workshop or laboratory in nature, which can shape their attitudes toward both the natural and broader environment of their lives. By making the garden and tending to the plants, students learn the life cycles of plants; they become responsible and patient, and they acquire environmental awareness. It follows that the children's active engagement in nature seems to produce significant effects on learning, behavior, and attitudes toward the natural and broader environment in general. The school garden can be a means to introduce changes that will advance the school in the direction of sustainability.

Furthermore, there they will be able to cultivate practical and social skills, improve their cognitive skills, increase their interest in learning, and at the same time improve their performance in the courses of their base curriculum. The school garden improves not only their cognitive skills but also their social and psychological health and well-being. The children become more creative, learn how to interact better among themselves and with the natural environment, and to cooperate better toward a shared goal.

One additional positive effect of school gardening, among several others, is that the students learn elements of nutrition and improve their nutritional habits and thereby their physical health. The research we reviewed in this report indicates that the school garden enabled students to know about vegetables and their nutritional value, to taste previously unfamiliar vegetables, to classify them, and ultimately to improve their own nutritional habits. Furthermore, their involvement in the school garden allowed the students to participate in activities such as weeding and digging, running and otherwise playing, which in combination with the change of their nutritional habits, improves their overall health.

The results of the research show that the school garden as an educational instrument fortifies the school in the educational, social and ecological fields. The garden offers opportunities to play in a natural environment. The students run and play, combining recreation with learning in the context of outdoor education. Proper cooperation of the school with the local community, and well-organized actions, can make the school garden into an invaluable instrument for childhood development and for advancing the school on all levels.

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