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Landscape Architecture Planning Proposal for Visually Impaired in Cluj-Napoca

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Abstract

The five senses of the human body (sight, smell, taste, touch and hearing) were integrated in the landscape architecture planning aimed to improve the life quality of over 200 youngsters who suffer of visual impairment by redesigning the green space of the local educational institution they attend. Inside of this learning institution located downtown, it is proposed to design a green space applying the principles of horticultural therapy to create a sensory garden. Based on the five senses, this type of outdoor therapy provides distinct opportunities to experience a variety of stimuli, giving a detailed perception of the environment, helping also visually impaired people to develop and improve their own spatial orientation capacity. The purpose of the overall design is to maximize the intensity of the interaction with the plant material in the garden by combining a variety of plant species with different striking characteristics like texture, scent and color. The pathways through the garden are sensory designed to guide the visually impaired person in their way using texture changes to indicate change in direction. The design of the sensory garden does not keep into account only the aesthetics, but the therapeutic aspects as well.

Keywords: horticulture therapy, visually impaired, sensory garden, senses, plants

1. Introduction

In the beginning defying horticultural therapy seems to be a very simple task but going deeper into it, the words `horticulture` and `therapy`suggest a complex interdisciplinary area of study and research. Horticultural therapy is an activity through which people can improve the health of their body, mind and soul. As Eckerling said, "a garden in a healing setting that is designed to make people feel better; the goal of a healing garden is to make people feel safe, less stressed, more comfortable and even invigorated" [4].

Although is a new field the concepts on which they are founded are older than the ancient pyramids. It is well known for a long time that there is a tight connection between plants and people. It was confirmed that the health recovery process is faster when people come in contact with the plants through a variety of gardening activities like planting and caring for plants [17].

These suggest that horticulture can be a support in therapy, because working with plants is a sensory stimulation. Like Davis S. said "horticultural therapy is a process in which plants, gardening and connection to nature are tools in the healing process" [3]. People have found solace in nature from beginnings of time, the first dating about horticulture that would have been used for therapeutic purposes goes back to ancient Egypt.

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In those times, it was recorded that physicians prescribed walks in the gardens of the royal palaces for people suffering from mental disorders. And even during the time of Christ, physicians knew that the peacefulness of the garden has a relaxing effect on people.

However, this approach didn't progress much over the next centuries and evolved methods have not been developed. But in the late 1700s and early 1800s, in clinics across the United States, Great Britain and Spain, the understanding of the concept "connection between human being and plant" expanded until it became generally accepted as therapeutic treatment [11].

A specialist in this field, Dr. Benjamin Rush, professor at the Institute of Medicine and Clinical Practice in Philadelphia, Pennsylvania, is considered to be the first psychiatrist who used the concept of horticulture therapy to treat mental illness. In 1798 Rush, based on his practice makes the announcement that after the gardening experience the health conditions of patients with mental disorders was improved [1].

His beliefs were received with interest by his colleagues in the United States and Europe, and the personnel of a Spanish hospital, in 1806 introduced agricultural and horticulture activities in treatment programs for the patients with mental disorders.

In 1817, another important step was made towards the evolution of horticultural therapy when the first private psychiatric institution in the Unites States, Philadelphia, continued the improvement of this method through the design of a vast green area specifically destined to its patients.

In this institute, the green area was arranged in such a way to provide a greater variety of landscape types, with shaded areas for walks, paths through trees and lawn. The main goal of this landscape design was to have a calming effect on the patients, like the natural landscape does on people. Few years later, in 1899, a scientific article was published in the Journal of Psycho-Asthenics by E. R. Johnston, where he described that the sensory stimulation which occurs in children suffering from mental disabilities after doing gardening activities. Thus he observed that the learning capacity increased, using this type of practice.

These discoveries were reinforced a few years later by G. Lawrence M. who published his findings in a scientific article called `Principles of Education for the Feeble Minded` [11].

The concept of using nature to improve human health further developed in the 70s and 80s, when Rachel and Stephen Kaplan found out that specific types of landscapes can generate a feeling of comfort and peace on people [8].

The research of Roger Ulrich showed in 1984 that when patients view arboreal vegetation require a shorter period of hospitalization and less medication treatment to recover.

Later documents published in the Journal of Therapeutic Horticulture continue to demonstrate the link between welfare and nature [1].

In Romania, the first attempts in using the concepts of horticultural therapy appeared in 2008 in Timisoara County, where a landscape architectural project for The Center of the Visually Impaired People Association was initiated for the design of a sensory garden for all of the five senses.

After this, in 2014 at Sibiu in the Psychiatric Hospital courtyard it was initiated a therapy garden making use of the restorative benefits of nature [12].

The first sensory gardens were often located in public parks. Following his findings the great Greek philosopher, Aristotle, was the first to identify the existence of the five senses: hearing, smell, touch, taste and vision. Using these categories of senses, it is possible to analyze the impact of certain environmental factors in the life of each individual including in the people with visual impairment.

The idea of a sensory garden that inspired the present project came from the notion of horticultural therapy which developed in Great Britain in the 1970s making use of the five senses.

When taking into consideration the target group (the visually impaired), it must be said that some of their sensory capacity is better than of the average person, this due to a mechanism of compensation of the other senses (Fig. 1). A positive aspect of sensory landscaping is the perception of the environment in a different way, being a tool in spatial orientation.

Figure 1. The sensory design notion written in Braille style

The sensory gardens are public or private green spaces that appeal to all five senses. This type of garden is often designed for people suffering from different forms of disability so that they can take advantage of all the joys of the natural environment [17]. Creating a natural ambiance for the modern human is a complex issue, which cannot be achieved without aesthetic elements yet although the gardens and landscape architecture design are resulting from a creative process by using certain principles and criteria giving birth to aesthetic compositions, they are not limited to this. When the natural landscape is completed harmoniously with plant elements - flowers, trees, shrubs and herbs it produces delight and pleasure [7].

2. Material and Method

The field that was studied in order to elaborate the landscape architectural project proposal, as a sensory garden, is located at the Special High School for Visually Impaired from Cluj-Napoca, on Calea Dorobanților Street, Number 31 [14].

Because the institution is situated downtown, offers an easy way to came by from any direction.

At first look around the site, it was settled that land occupancy percentage for the undeveloped green space is about 26% out of the whole area.

More detailed information about the land occupancy can be seen in Table 1.

Table 1. Percentages of Land Occupancy, Special High School for Visually Impaired Cluj-Napoca

No. Crt.	Space function	Surface (m^2)	Land occupancy percentage %
1.	Plot	7.000	100
2.	Built area	1.950	28
3.	Green space	1.800	26
4.	Pavement	2.050	30
5.	Sport field	800	16

Description of (outdoor) space

This educational institution is part of the old street network of Cluj-Napoca, aspect that can be noticed from the facade arrangement of the building, which is on the same line as the limits of public space (street). To the south across the road is located the High School for Visually Impaired, while on the other three sides are only private constructions.

From the start it was noted that there are some areas and specific aspects to address considering that is a different institution meant to be specifically designed for young people with special needs, and thus some particularities need to be addressed: firstly in regards with platforms, then circulation area (pedestrian and auto), and in the end with the sitting area, plants and existing vegetation.

The main circulation area consists of a surface of 2.050 m^2 that is been used both by vehicles and people without any delimitation. The surface is covered by concrete and prefabricated paving, and near the main entries there are sensory spots.

According with the Romanian regulations [15] in regards with the utilization and planning of the buildings destined for educational activities (schools), it is mentioned at article 4.2.2.1. paragraph 2 that "platforms that serve the access to the buildings need to be equipped with protection balustrade regardless of the height of the change in level", and at paragraph 4 "in case of areas with level differences, it is prohibited to be equipped with less than 3 stairs". It was noted that at the time of the observations these regulations were not met. Also, the official regulations specify that ramps cannot have more than 5% inclination angle, and this criteria is generally available for buildings and urban design that needs to comply with requirements for people with disabilities.

The green area presents a deficient accessibility from the private patio, with ledges that act as an obstacle from crossing from one area to another, and the lawn also presents some obstacles that are not marked accordingly with special warnings. The lawn is not properly maintained by mowing and this makes it less appealing.

Philosophy of the design

The sensory garden concept is applied by choosing carefully the plant selection that is aimed to stimulate five senses of the human body. The purpose of plant selection is to offer a conscious and deeper perception of the outdoor space to the people who are walking through the garden, as well as having a therapeutic role.

However, there may be other specific objectives, such as encouraging the development of certain sensory abilities, like smell or touch, or to create a safe environment in which disabled people can experience outdoor socializing easily.

Essentially, all the gardens are places where senses are stimulated. What distinguishes a sensory garden from a traditional and usual one, is that the sensory characteristics of the plants used, that are meant to create a stimulating environment beneficial for people with various disabilities. The natural elements are just sensory clues that help people with special needs to understand and use better the outdoor environment.

The creation of a therapeutic and sensory garden, must attempt to achieve the stimulation of all five senses. For example, when we want a visual stimulation it is recommended to choose robust and colorful plants. All selected plants must be tolerant to direct human handling. When addressing a garden design for visually impaired it must be said that there needs to be strong color contrast between the plants, vibrant colors like yellow being a very inspired choice.

When it comes to sound, many gardens include elements like waterfalls and bells especially to stimulate this sense. But plants can have a significant contribution in bringing sounds to the new designed garden areas, like various trees that produce a murmur from the rustling leaves or plants that produce pods with seeds that make a sound in the slightest breeze (*Catalpa bignonioides* or *Wisteria sinensis).*

The sense of touch

Blind and visually impaired people use the sense of touch to explore and search for more information about the objects around them, using it as a navigation tool it the absence of sight. Extensive research showed that visually impaired people have a higher sensitivity to touch than the average individuals [7]. Daniel Goldreich, published in 2006 an article named Performance of blind and sighted humans on a tactile grating detection task (AP&P - Attention, Perception & Psychophysics journal) a study in which he compared the abilities of blind and sighted humans in distinguishing grooved surfaces from smooth surfaces using the index fingertips. The blind subjects were able to perceive significantly thinner grooves than were their sighted peers. The blind Braille readers performed no better than the blind non-readers, and the congenitally blind subjects performed equivalently to those with adult-onset blindness [5].

In the plant kingdom, there are many types of foliage texture: soft, bristly, leather-like or smooth. Touching the leaves is a great way to appreciate the various textures and their differences. Each of them has their way to produce an interesting feeling when they are touched, like: lamb's ear (*Stachys byzantine*) is soft, silver sage (*Salvia argentea*) is a soil covering plant with a cotton texture, Jerusalem sage (*Phlomis fruticosa*) has a smooth surface and yellow flowers. Of course the list goes on, but with these groups of plants it can be made a sensory garden planting design, structured by using all the senses, which can acquire an educational function as well. In this case, the students can be involved in gardening, where, for example, at biology courses the study models can be replaced by real plants.

Using touch in landscape architecture can be the most simple challenge, because plants have a variety of textures. The bark of tree is so different in feeling than a smooth leaf surface. But not every texture types are suitable for use in a sensory landscape, like cacti, thorny plants, herbs with a sharp leaf edge.

The sense of smell

The sense of smell is an amazing but in most cases underestimated sense. Studying this, Juhani Pallasmaa said in his book, first published in 1997, that "the human body needs 80 particles of a substance to detect a specific smell, and it is able to detect more than 10,000 different scents" [10]. According to "Orientation and Mobility Training", the smell can be used to indicate to the visually impaired the place where they are. For example, a garage is generally smelling different than a library or a restaurant [17].

A specific odor can determine people to remember things, places, paths etc. A smell used correctly and with a specific topology of space, helps blind people in orientation [6]. The wonderful scents released by flowers in the environment have different purposes: the fragrance of flowers can attract insects for pollination, while fragrant leaves deter insects who would like to consume them. There can be identified various plants that give off different types of perfumes: *Helichrysum italicum* has leaves that give a spicy flavor, lavender (*Lavandula angustifolia*) exudes a relaxing aroma, *Cosmos atrosanguineus* presents a smell of chocolate and vanilla and pelargonium (*Pelargonium crispum)* is leaving a lemon scent.

The scents that a garden is able to release are of great interest for the public while their number is very large giving a wide palette of choice in landscaping [16].

The visual sense

There are different degrees of severity in visually impairment. While blindness is the inability to distinguish light from dark, most people with visual impairment are not completely blind, having like glimpses of view. Considering this, the visual sense can be used like a navigation tool as well. This

can be done by using the specific colors in the landscape architecture design.

When a particular color is seen, are automatically recognized the shades or the tones of it, like it`s yellow, blue, orange etc.

When it comes with finding the best combination of colors for the visually impaired, the best association of colors is that of complementary colors.

When it is attempted to increase the contrast between different colors, light becomes the most important quality of the colors. It must be specified that the relationship between the colors and the way in which they are associated can increase the perception and the way they are distinguished by the target group [17].

The sensory garden can stimulate the visual sense by using colorful plants. Their color while having the ability to attract birds and insects, induce delight in humans as well.

The appropriate choice of architectural plants has beneficial effects in the perception of space and accentuates the composition of the garden. For example, using sun flower (*Helianthus annuus*), with a strong vibrant yellow color and imposing and vigorous growth that can reach 30 cm in a week under favorable conditions, can offer the expected effect for such a setting.

The sense of taste

Besides using the senses listed above there can be used plants that appeal to the sense of taste that is also usually more pronounced in the visual impaired than in ordinary people.

While the other senses help in getting information through identification of shape, intensity, scent or sound, there are many delicious plants usually used in culinary arts, that can provide a good spatial orientation through their easily recognizable and familiar flavors: peppermint (*Mentha spicata*) presenting a fresh and minty taste, rosemary (*Rosmarinus officinalis*) has very strong aromatic leaves and sharp perfume, chives (*Allium schoenoprasum*) leaves with a flavor resembling onions and decorative globular purple inflorescence, nasturtium (*Tropaeolum majus*) has orange flowers used in salads due to strong taste of onions and garlic, oregano (*Origanum vulgare*) presents aromatic leaves, marigold (*Calendula officinalis*) petals are used in salads and basil (*Ocimum basilicum*) is showing a sweet taste of fresh spice.

In the end, the taste can be stimulated by incorporating in the garden design some plants that produce edible fruits such as blueberry bushes, trees or species with various spicy aromatic leaves [16].

The acoustic sense

In the absence of sight, sound can become an invaluable resource with which the visually impaired can gather information about the surrounding world. Some studies proved that blind people have a much better hearing than most people do. Psychologist Franco Lepore describes an experiment in which blind and normal sighted people had to identify the source of certain sounds using only their hearing, obviously the blind people identified more accurately the origin of the sounds, this because visually impaired have developed more their capacity to process auditory stimulus [9].

The direction from which the sound is coming from can be a useful tool in providing guidance for the visually impaired. A simple sound stimulation can help them to locate and often to find the right direction [7]. John Blackstone, reporter at CBS U.S.A. television, made a documentary about Ben Underwood, a remarkable young blind boy who has learned to experience the world around him through echo location, method similar to the one used by dolphins [13]. On the other hand, J. Pallasmaa argued that the sound makes the eye to see and remember [10].

During the time spend in a green space there are many sounds generated by plants that can be perceived. For a sound effect there can be used species like shelly grass (*Briza maxima*) and small Japanese silver grass (*Miscanthus oligostachyus*) which generate a strong rustling sound in the wind.

3. Results and discussions

After the preliminary analysis, it was determined the necessity to approach the particularities of the visually impaired group, when it comes to exterior design.

This institution that is attended daily by a number of over 200 children and teenagers some of them identifying it with their temporary home, does not present and area designed specifically for their necessities, aspect that was reported at the time when the observation of actual situation was carried out.

The proposed landscaping plan of the studied green area takes into consideration the Romanian and European regulations regarding the judicious planning of the spaces dedicated to special needs individuals, especially those visually impaired.

The concept of the project was based on the principles of sensory garden design, more exactly on an ascertainment from the observation made after the analysis, and that is the necessity of the visually impaired to walk or engage in activities always accompanied, because only a small part from them

are able to manage by themselves in the modern anthropic environment.

The landscape planning addresses the free style, because the curved lines suggest continuity in movement and exploration. The starting element was the human eye, that organ of so much importance to the society in so much that life cannot be comprehended without its proper functioning. Although the purpose of the eye is not used in the proper sense, the concept of its shape helps a much better and more real perception of the surrounding space, through which if they pass will perceive with "the eyes" of other senses.

It is known that only a part of visually impaired people suffer of blindness and the majority have only decreased visual capacity, so even the visual perception it is proposed to be stimulated and used at its maximum capacity. The colors that designate this proposed landscaping are a complementary pair: violet and yellow. Yellow because this is the most favorable color to these people having the longest light wave length. The design approach of berms with vegetation raised from the soil level is meant to welcome the visually impaired visitors that do not have to bend down to it, but the vegetation is rising towards them.

The elaboration of the landscape project concentrated on three main focal points, each having a different approach when it comes to functionality, the plant material used, and the emotions and senses that these influence (Fig. 2).

The sensory landscaping presents a particular approach because it has as the main tool the five senses which interconnect into the three areas elaborated in the composition. While the color can be a landmark, the scents and textures are helpful instruments in following the trail. The olfactory sense is often stimulated in the seating areas, offering scents that favor the calm state and relaxation of the garden visitors.

Figure 2. General landscaping plan

1st Area

In elaboration of this focal point destined for socializing, it was taken into account the proximity location in relation with the access towards the school building (Fig. 3).

It is a space that can be used as seating area for short times and hosting the meeting of some larger pupil groups with teachers due to its ellipsoid shape that represent raised beds (h 90 cm).

Even the raised vegetation beds are designed in such a way to accommodate the meeting and socializing of pupils.

The tall arboreal vegetation was chosen to offer different leaf shapes (the fan shaped leaves of the four *Gingko biloba*), that in the autumn offers a color spot of intense yellow that functions as orientation and focal point.

The group of flowers chosen is meant to stimulate both visually and tactile, thus the following species are proposed to be used: for texture (*Stachys hyzantine, Thymus vulgaris, Origanum vulgare, Mentha spicata, Salvia argentea)*, for color (*Achillea filipendulina, Allium schoenoprasum, Lavandula aufostifolia*, *Euonymus fortunei*) [7].

Figure 3. Area 1 - socializing, sensory design utilizing textures and colors

2nd Area

This area represents the transition from the two important focal points: that of school entrance and of the lawn that is more distanced from the main access.

The vegetation in jardiniere planters placed at 90 cm height guides the visitor and is constituted of plants that stimulate the senses.

To emphasize both the visual and olfactory senses, the following species were associated: *Achillea filipendulina, Lavandula aufostifolia, Mentha spicata, Pelargonium odoratisimum, Tulipa gesneriana.*

For stimulating the gustative sense the following species fulfill their role perfectly: *Allium schenoprasum, Thymus vulgaris, Origanum vulgare, Mentha spicata, and Tropaeolum majus.*

The third planter stimulates through its special texture and intense color of the following combined flower species: *Stachys hyzantine, Achillea filipendulina, Helianthus annus, Salvia argentea, Tulipa gesneriana* [17].

3rd Area

This space is designed as a lounge area destined for sitting and recreation for longer time periods, and is addressed to different age groups, more exactly the western part is destined to preschool and primary school children (Fig. 4) while the eastern part is destined for middle and high school pupils (Fig. 5).

The area destined to kids has different sensory games, while the area destined for teenagers includes an area for sitting and walking with a vegetation area destined to grasses that stimulate the acoustic sense.

Figure 4. Area 3 - recreation segment destined to children

Figure 5. Area 3 - recreation segment destined to teenagers

4. Conclusions

In accordance with facts analyzed, studied and proposed in the present work, the idea of a sensory landscaping for the visually impaired persons brings a series of advantages through the adequate replanning of the green space of the Special High School for Visually Impaired from Cluj-Napoca that would allow all visitors to equally enjoy the landscaping.

The readjustments presented are on a limited area that would enable the future development in accordance with the necessity.

The lawns properly designed are an attraction in themselves and present access of the visitors for a sensory experience. The combination of transit and relaxation sectors located in both shade and sunny areas enables easy access to disabled individuals that use wheelchairs. In order to ensure an easy maintenance it was opted for the use of predominantly perennials as plant material.

The use of warm, vibrant colors like yellow as focal points generates stimulative areas of orientation. The use of different textures and colors, materials as well as plants, serves as landmarks in the orientation process.

To facilitate the interaction with the natural and plant environment, the positioning of the raised beds arranged at the adequate height enables an easy access to all visitors. This arrangement is very appreciated by the target group.

The presence of interesting trails through the garden stimulates a feeling of discovery and increased orientation capacity through the inclusion of the interactive character of promoting education, learning and socialization.

Thus, it is important the involvement of the local community with the purpose to integrate the disabled people into society, and to improve their capacity to manage on their own in a safe environment.

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