Sensory Integration - Incorporate nature into child's sensory integration therapy for sensory processing input: A case study in SRK Bukit Payung, Terengganu

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Abstract. This study investigates the number of special needs students and how a sensory garden can Incorporate nature into a child's sensory integration therapy for sensory processing input. The case study was conducted at Sekolah Rendah Kebangsaan Bukit Payong which offers specialized classes for students with special needs. The objectives of this study are to identify types of special needs students in this school and to provide or design an environment that incorporates natural elements as a therapeutic approach by engaging students in physical activities that facilitate the management of sensory input. Method used in this study are content analysis to understand sensory integration and sensory garden, semi structured interview identified the numbers of special needs students in this school. The outcomes of this study entail the identification of distinct types of special needs students present at Sekolah Rendah Kebangsaan Bukit Payong This information serves as a foundation for developing learning spaces that are tailored to the specific needs of these students, thereby improving their focus and concentration in the classroom by providing a sensory garden. Additionally, the study introduces a sensory integration design that incorporates activities aimed at assisting children in mastering the more challenging learning tasks. Such activities contribute to the development of cognitive abilities, language skills, gross motor skills, and social interaction that is facilitated through the transfer of expert knowledge.

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1 Introduction

Concentration is generally considered a mental exercise requiring students to pay attention when the teacher teaches a lesson. Lack of concentration when educating teachers also includes working on other things like incomplete schoolwork, talking to friends, and other things [1]. According to D. Lase [2], maintaining focus in the classroom is crucial since doing so will help children develop their intelligence and prepare them for success in life and society. future of today. Other than that, those who have different special needs are also one of the factors that make it difficult for them to focus. The objectives of this study are to identify the types of special needs students in this school and to propose list of plants that incorporates natural elements as a therapeutic approach by engaging students in physical activities that facilitate the management of sensory input. To clarify this statement, SRK Bukit Payong has been chosen because it is one of the schools that provides learning and special classes for special needs students.

2 Literature review

2.1 What is Sensory Integration

Sensory Integration was created more than 20 years ago, according to Shah M A [3], an occupational therapist with a deep understanding of neuroscience and educational psychology.. The idea is used to explain how sensory input affects behavior and how the brain and behavior are connected, as well as why different people respond differently to sensory input . The five main senses are as follows; touch – tactile, sound – auditory, sight-visual, taste – gustatory, and smell – olfactory [4].

There are two more significant senses:

a. Vestibular (movement and balance sense)-provides information about where the head and body are in space and its relation to the earth's surface [5].
b. Proprioception (joint/muscle sense)-provides information about where body parts are and what they are doing [5].

2.2 VAKT (Visual, Kinaesthetic, Audio, Touch)

A multisensory approach is known as Visual, Auditory, kinesthetic, and tactile (VAKT). Visual elements are represented by the presentation of images, posters, photos, movies, keywords and colorful writing. Auditory elements are equipped with presentation presentations, loud reading, discussions, audio recordings, and music. Kinesthetic elements by moving position, movement, acting, role-play, and tactile elements involving touch.VAKT (Visual, Audio, Kinaesthetic and Tactile) model was used by Neil D. Fleming in his study by applying sensory garden using five multisensory basic senses of touch, smell, taste, vision, and hearing [6].

2.3 Categories of special needs students in Malaysia

1. Down syndrome
   Down's syndrome is caused by chromosome 21 trisomy; in simple words, down syndrome is a disease in which an individual possesses an extra chromosome. Characteristics of Down Syndrome can be recognized by their physical features; flat face particularly the bridge of the nose, small ears, and a short neck [7].
2. Autism

Autism Spectrum Disorder (ASD) is a neurodevelopmental disorder characterized by social communication difficulties as well as limited interests and repetitive behaviors. The characteristics of autism are avoided to do eye contact, difficulty in social interaction, stress, anxiety, or over-worrying [7].

3. Mental retardation
   Mental retardation is known as an intellectual disability. Intellectual disability is when a person's ability to learn at an anticipated level and function in everyday life is limited. Some of the common signs of intellectual disability are sitting, crawling, and walking delayed, having trouble speaking, having difficulty resolving problems, and finding it difficult to remember things [7].
4. Dyslexia
   Dyslexia is a learning impairment characterized by trouble reading as a result of difficulties detecting speech sounds and understanding how they connect to letters and words (decoding). Dyslexia, sometimes known as a reading disability, is caused by individual differences in the parts of the brain that process language. Some of these symptoms are spelling difficulty, difficulties recalling what was recently spoken or read, and avoiding reading-related activities [7].

2.4 Sensory garden design

The sensory garden encourages visitors to experience the garden by using all their senses namely smell, sight, touch, taste, and hearing. By designing based on these five senses, it provides educational and recreational services[8]. Sensory gardens originate from gardens for the blind. The idea behind the design of a sensory garden is that the garden should aim to stimulate the senses of the users and improve their physical capabilities. By applying elements of nature, this design can contribute to improving the health of users in fact, environmental education, can help the mental development and the emotions of users regardless of normal users and also disabled people [9]. Table 1 show the previous study regarding sensory gardens that can stimulate children's learning process.

Table 1. Previous study on sensory garden

Author	Findings
Pauline's (2013)	The activities provided in the sensory garden can stimulate multisensory and direct experiences as one of the learning processes for children, in fact, this is more beneficial than reading books in class.
Linda Balode (2013)	The five basic human senses: hearing, sight, touch, smell, and taste can be enhanced by adding aesthetic pleasure and functioning as a therapeutic tool in the sensory garden.
Hazreena Hussein's (2014)	Physical mobility, social skills, and sensory stimulation among children with special needs can be explored by children while playing in the sensory garden
Blakesley, Rickinson and Dillon (2013), Blakesley and Payne (2012) The Need of Sensory Garden Outside the Autism Centre's Classroom (2014)	Children with autism can benefit from seven outdoor learning opportunities, including gardening and horticultural work, landscape design, summer camps, physical activity, farm experiences, animal therapy, and hands-on learning in natural settings.
Halimah	The physical characteristics, garden structure, and the preparation of both soft- and hard-scaping materials can affect how hyper- and hyposensitive people behave.

2.4.1 Plant selection

A key component of landscape design was plant selection. The following uses of plants were listed :

1. Structural material: Creating space, obstructing undesired views, and providing a feeling of direction.
2. Environmental element: erosion control, climate control, and air pollution reduction.
3. Color: Creating visual aspect by establishing connections between the design elements, and creating focal points.

3 Methodology

An interview was conducted to identify the numbers and type of special needs students in this school. Secondary data collection analysis refers to using existing research data to identify a definition of sensory integration, Sensory gardens, type of special needs, and plants suitable for disabled students. Site inventory and analysis was conducted to identify the existing plants that can be used for the sensory garden and complying with the list of proposed suitable plants for special needs student.

3.1 Semi-structured Interview

The research employed a case study as an explorative approach for interpretivism research to understand the adaptation of resilience strategies in a place-specific context [10]. The selected case study is Sekolah Rendah Kebangsaan Bukit Payong, Marang, Terengganu. This school was chosen because it provides special education classes .This semi-structured interview contained 3 sections and 6 questions were built to identify how many types of disabilities are found in this school.

3.2 Characteristics of plants

Table 2 shows the characteristics of plants that are suitable for a sensory garden and especially for special needs students from secondary data analysis.

Table 2. Characteristics of plants

Type	Characteristic	Function
Harmless plants	Long-lasting, low-maintenance plants and right combination of color, texture, and fragrance	To appeal to users' senses, plant selection for them must be extremely precise and careful
Sight	Variety of each colour, variations in shade and light, and reflections of color and light	For understanding the universe during the cognitive learning process since it offered information on which to base human perception.
Size and Shape	Human scale	Humans are likely to feel out of place and dangerous in landscape architecture projects if there is no gradually change in scale
Sound	The sensation of hearing is influenced by a variety of elements for example wind-blown leaves, hanging branches	To stimulate users' senses
Smell	Scented plants	Smell can improves visual perception by making what is viewed clearer.

Touch	*Plants with* unique shape and texture (i.e. fruitful, soft , firm; needle-leaved,and fan-shaped,	Add to the tactile or touch experience in sensory gardens
Taste	Edible plants and flowers	The tongue's different areas can differentiate between sweetness, bitterness, sourness, and savoury tastes.

3.3 Site Inventory and Analysis

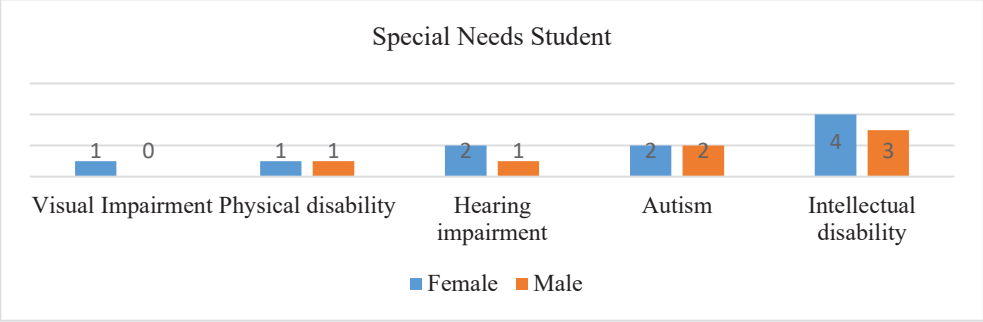
The second method is using observation to identify the existing trees that can be used as sensory plants. The selection of trees is done based on the five senses which are sight, taste, touch, sound, and smell. In addition, a collective and mutual practice among teachers and students could result for better understanding, creativity, and interest in the design of Sustainable School (*Sekolah Lestari*)[10].

4 Result

4.1 Type of disabilities

There are a total of 17 students with disabilities in this school. The types of disabilities available are visual impairment, physical disability, intellectual disability, hearing impairment, speech and language, and autism. Autistic students are among the most numerous in this school which is 5 people. While students with visual impairment, physical disability, and hearing impairment have the same number of 2. And for intellectual disability as well as speech and language, there are 3.

Graph 1. Special Needs Student social demographic



4.2 Characteristics of plants according to special needs students and sensory garden design

Table 3. Proposed plants for Sensory Garden

Characteristic of plants	Plant Types	Function
Visual Stimulation		

Flowering Plants Colourful foliage plants Ornamental grasses	*Bougainvillea* 'Tomato Red', *Bougainvillea glabra* 'Magnifica', *Hibiscus rosa-sinensis* cultivars, , *Ixora* 'Compacta *Cassia fistula, Lagerstroemia speciosa,*	The stimulation of senses is influenced by a variety of psychological effects of each colour, variations in shadow and light, and reflections of colour and light.
Aromatherapy		
Plants with fragrant improve vision by making what is seen more clear.	*Jaminum sambac* 'Grand Duke of Tuscany' *Cananga odorata*	Create scent when leaves are rubbed between the fingers. Release a scent when leaves are rubbed between fingers.
Tactile Stimulation		
Needle-leaved, fan-shaped, peeling bark, coniferous, seedy, evergreen, and semi-evergreen varieties.	*Sansevieria trifasciata, Areca catechu var. alba, Cyrtostachys renda*	The stems and foliage's soft, fluffy texture are tactilely appealing.
Auditory Stimulation:		
Plants that produce sound while they move and can stimulate people's senses	*Areca catechu var. alba, Cyrtostachys renda, Bamboo* *Impatiens balsamina*	Inflated buds make a popping sound when squeezed Seed pots create a rattling sound when shook.
Gustatory Stimulation:		
Edible plants that could stimulate a person's sense of taste	*Mentha spp.*	Edible plants

4.3 Existing plants in this school

List of existing plants locates in this school. Some of the plants are the potential to become part of sensory plants

1. Shrubs : *Bougainvillea* 'Tomato Red', *Bougainvillea glabra* 'Formosa', *Bougainvillea glabra* 'Magnifica', *Hibiscus rosa-sinensis* cultivars, *Hibiscus schizopetalus* 'Pagoda', *Ixora* 'Compacta Orange', *Cordyline fruticose* 'White' , *Dieffenbachia* 'Galaxy', *Excoecaria cochinchinensis* 'Firestorm'
2. Trees : *Cassia fistula, Lagerstroemia speciosa*
3. Palms : *Areca catechu var. alba, Cyrtostachys renda*
4. Grass : *Axonopus compresus*
5. Climbers: *Telosma cordata*

5 Discussion

As for the types of disabilities, there are 6 types of special needs: visual impairment, physical disability, intellectual disability, hearing impairment, speech and language, and autism. The number of autistic students is among the highest among other special needs students. There are several types of plants in this school area and these plants have the potential to be part of the sensory garden design. However, the existing trees need to be added by following the types of trees that are compatible with the five senses as in Table 3.

6 Conclusion

Among the activities that are appropriate for these students are those that involve psychomotor. Examples involve tactile, body position, sight, sound, smell, touch, and balance. By using environmental sounds, it can be considered a meaningful resource that gives acoustic comfort to people [11]. Other than that, the use of softscape elements in designs such as tree-planting created an interesting environment that gave pleasant scenery and shade to people [12]. Apart from providing space and activities for these students, this can also reveal to the teacher the types of activities and facilities that can be produced independently and also psychomotor activities [13]. A natural learning environment is one possible technique to reduce the inequitable aspect of the typical classroom. Given that exposure to nature improves behaviour and increases self-efficacy, sociality, and overall motivation in children with intellectual disabilities [14] natural learning environments are deserve of consideration by educators.

7 Implication

Understanding the types of special needs students in this school can change the way of teaching and learning for students and focus more on the special needs experienced by the students by providing teaching aids, experienced teachers, facilities, and teaching materials for the students according to their categories of special needs. Moreover, a special or more focused teaching method can increase students' focus and attention to learning, and also this design can also be used for normal students who have difficulty focusing or paying attention in class.

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