

## INCLUSIVE SCHOOLS FOR CHILDREN WITH AUTISTIC SPECTRUM DISORDER: AN APPRAISAL ON BUILT ENVIRONMENTAL CHALLENGES OF EXISTING SCHOOLS

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**Abstract:** Majority of the school-aged children with Autistic Spectrum Disorder (ASD) are excluded from education, globally. And those who are engaged in education, are being educated separately confronting social segregation. Education is a fundamental human right that highlights the importance of promoting inclusive schools, enabling education for differently abled children in typical schools. This study investigates the appropriateness of the built environment and available facilities of existing local schools imposed on students with ASD. Thus, four schools were evaluated; two with autistic students and two without them. A photographic survey was conducted as the methodology to evaluate the presence of the relevant spaces and their qualities. Five types of spaces were identified of which 12 spatial qualities were examined in each school. The results of the study demonstrate that the built environment of both existing special and mainstream schools consist a significant level of required spatial availability in three of the identified spatial categories while the availability of relaxing and treatment spaces to facilitate students with ASD are considerably low. Thus, the findings insist on the necessity of improvements in local school environments focusing on crucial space categories to educate students with ASD by making the schools inclusive.

**Keywords:** *inclusive schools, mainstream schools, Autistic Spectrum Disorder, physical impairments, spatial qualities.*

### 1. Introduction

Children living with disabilities account for 93 to 150 million and the prevalence of Autistic Spectrum Disorder (ASD) is 1 per 100 children, globally (WHO, 2008), (United Nations, 2009), (UNICEF, 2005). Among them 5.1% are characterized as children suffering from moderate to severe disabilities where 0.7% are experiencing extreme disabilities (UNICEF, 2021).

The national demographic overview informs 2.1% of the population is composed of differently-abled persons of which 0.7 % are children aged 0–14 years (UNESCAP, 2012). Moreover, 78.7 of 10,000 children are suffering from ASD (World Population Review, 2022) where almost one quarter of the differently abled children are not associated with learning and educational engagements (UNICEF R. O., 2016) in Sri Lanka.

Education is considered as a fundamental right and the students with special needs carry equal rights to be educated (Jazeel, Hanees, & Sarawanakumar, 2013). The special educational need of a child is related to four basic areas of disability, such as physical, sensory, mental health, and disability associated with learning (NCSE, 2014). One-third of the students with ASD are suffering from intellectual disability, which cause complications in learning. But the remaining two third of the students are affected with health or medical related difficulties, only (Marilyn Augustyn, L Erik von Hahn, 2022). Hence, the phenomenon of learning for all could be facilitated by understanding the differences between students, and these diversities are considered effectively in implementation of inclusive practices (Pérez, 2014). Moreover, proves that the Autism prevalent students in inclusive classrooms demonstrate “better cognitive and adaptive characteristics” (Beghin, 2021). Thus, informs the importance of practicing the holistic concept of inclusion in schools which integrates the curriculum design and built environment. Thus, inclusive schools’ portrait a conducive and barrier free setting for Children with different levels of disabilities (UNICEF, 2021).

#### 1.1. BUILT ENVIRONMENTAL ATTRIBUTES OF AN INCLUSIVE SCHOOL

In order to achieve the fundamental right to education, creating a safe and comfortable school atmosphere for all is important (NCERT, 2016). Such safe school atmosphere includes the inclusive friendly curriculum design, assessments, pedagogy, assistive technology, infrastructure and built environment which ensures education for all

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(UNICEF, 2021). Therefore, among the other aspects, the built-environment of inclusive schools supports the practice of creating safe and accessible physical environments for students in the society despite their differences (LLDC, 2013).

Thus, by focusing on classroom to playground designing, a common design criterion was identified to establish inclusive school environments. Thereby, providing adequate spaces and area, introducing sensory or soothing environments, clarity in the material usage, using fewer details, creating spaces within spaces, enabling physical movement, and supporting wayfinding are the most referred built environmental aspects considered in designing inclusive schools (Abouelsaad & Shafik, 2017), (Uherek-Bradecka, 2020), (Owen, 2016).

Thus, referring to the criterion above, it is evident that the inception of physical inclusion makes a place barrier-free for its user. Hence, inclusion is identified as a strong weapon against social discrimination (Abouelsaad & Shafik, 2017) where the inclusive built school environments enable the students with disabilities, to be accepted and included in schools (Stubbs, 2008).

1.2. BEHAVIOUR OF STUDENTS WITH AUTISTIC SPECTRUM DISORDER

Autism is identified as a disorder of language, communication and social development, where the children with autism have difficulties in controlling their behaviors. As shown in table 01, they are sharing difficulties in expressing themselves, and maintaining stereotypical behaviors such as the inability to adapt to rapid environmental changes. Though they are sharing the same interests as the other students of their age, due to the functional impairment of certain parts of their brain and the neural transmitter malfunction, they pose difficulties in concentrating on their activities (Nipattha Noiprawat, 2010). And these difficulties share a wide range of behavioral characteristics in them including learning difficulties.

Table 01: Behavioral concerns of the students (Pratt, 2017)

Type of skill	Behavioral characteristics
<b>Social communication</b>	<ul style="list-style-type: none"> <li>- Demonstrating appropriate play skills</li> <li>- reject or ignore the social approaches of others</li> <li>- lack of interest in conversations</li> <li>- Using and interpreting body language.</li> <li>- Taking their communication partner's perspective</li> </ul>
<b>Speech/Language Impairments</b>	<ul style="list-style-type: none"> <li>- Delayed or immediate echolalia</li> <li>- Use of idiosyncratic speech</li> <li>- Delayed vocabulary development</li> <li>- Difficulty following directions</li> <li>- Difficulty understanding abstract concepts</li> </ul>
<b>Restricted, repetitive and stereotyped pattern of behavior</b>	<ul style="list-style-type: none"> <li>- Stereotype or repetitive motor movements</li> <li>- Excessive adherence to routines</li> <li>- Ritualized pattern of behaviour</li> <li>- Sensitivity to excessive sounds and lights</li> </ul>
<b>Executive function impairments</b>	<ul style="list-style-type: none"> <li>- Difficulty to sequence order</li> <li>- Rigid, inflexible thinking</li> <li>- Difficulty dividing attention to two tasks at once</li> </ul>
<b>Common learning characteristic</b>	<ul style="list-style-type: none"> <li>- Process information better when presented visually</li> <li>- Addicted to schedules and checklists</li> <li>- Difficulty in generalizing learning skills from one setting to another</li> </ul>

Children with autism spectrum disorder may demonstrate different methods of learning, and thus the pattern of their behavior in specific situations cannot be fully predicted. Therefore, designing for children with ASD requires a high level of individual approach with adequate attention to their daily routine (Uherek-Bradecka, Barbara, 2020). Thus, an attentive study on their behavioral characteristics is essential when designing schools for all.

1.3 SPATIAL QUALITIES OF AUTISM-FRIENDLY EDUCATIONAL SPACES

A 'six feeling framework' has been introduced to assess the quality of the spaces to accommodate autistic population (The Ohio State University , 2018). Since this framework represents the quality of spaces required by the whole autistic population, the same scenario was identified viable to determine the requirements in educational institutes. Table 02 below represents the nature of these feelings and their impact on autistic children imposing possible spatial characteristics that can be used to ensure the emotions, connectivity, and closure in designing schools.

Table 2: Nature and characteristics of the required spaces (The Ohio State University , 2018).

The feeling	Nature of the feeling	Recommended characteristics of the quality
<b>feeling connected</b>	The connectivity of spaces needs to be maintained, as they are easily reached, entered, and/or lead to destinations.	<ul style="list-style-type: none"> <li>-Provide contrasting colors and textures on the surfaces of the buildings</li> <li>-Include reflective surfaces such as mirrors</li> </ul>

<b>Feeling free</b>	Sense of freedom is essential as they offer relative autonomy and the desired spectrum of independence.	-Finish indoors with natural-looking finishing materials such as wood, stone, or grass.
<b>Feeling clear</b>	To avoid being confused is necessary since they cannot clarify many things at once. Simplicity needs to be maintained.	-Provide unobstructed view towards outdoors Use images or drawings of nature where fenestration is not possible
<b>Feeling private</b>	They offer boundaries and provide retreat. Personal space is often appreciated.	-Create personal spaces
<b>Feeling safe</b>	Since they can be easily injured the spaces should compromise safety.	-Use curved edges and surfaces
<b>feeling calm</b>	They mitigate physical sensory issues associated with autism. Thereby the spaces need to be calm.	-Keep plants indoors

Thus, the qualities and the nature of the feeling of the space are considered critical aspects in designing spaces for the students with ASD. Moreover, these qualities are assured comfortable and safe for all students including the mainstream students since they are to be applied in designing inclusive schools.

### 1.3.1. An assessment criterion for spatial qualities of inclusive schools

Considering the design requirements of students with special needs (Abouelsaad & Shafik, 2017) and the design guidelines for inclusive designs (Owen, 2016), a common framework was introduced to monitor the spatial availability to educate autistic students in mainstream schools. Thereby, as shown in table 03, three essential built environment parameters were identified to access the quality of spaces at schools. These parameters consist of a total of twelve spatial characteristics, whose availability proves the presence of the required spatial quality. Thus, the zoning of a space can be monitored under five scenarios, sensory approach in a space in four scenarios, and individual space appreciation in three scenarios.

Table 03: Criteria for spatial quality assessment

	<b>Built environment Parameters</b>	<b>Spatial characteristics</b>
<b>1.Zoning</b>	The zoning and the transitional spaces required in the spaces are being evaluated under this category.	i) Physical zoning ii) Visually screening iii) Sensory zoning iv) Gradual progressions v) Clear Boundaries
<b>2.Sensory approach</b>	The space requirements in wayfinding and the support given through sensory approach are being monitored.	vi) Visual cues vii) Favorable Color palette viii) Healthy shape and proportions ix) Physical comfort
<b>3. Individual Space Appreciation</b>	The concept of spaces within spaces and appreciation of 'my space' or the individual space allocation for children is being evaluated.	x) Prospect and refuge xi) Tones and connectivity xii) 'My space'

Thus, a space within the school which appreciates the above qualities can be identified as inclusive where spaces as such may welcome students with special needs to engage in the mainstream school activities.

### 1.4 INCLUSIVE SCHOOLS IN SRI-LANKA:

The latest published statistics of Sri Lanka in the year 2012 reveals that 1,617,924 people out of 20.4 million are suffering from a disability. And the number of students with disabilities who has access to schools is reported as 54,311, which is 4.6% of the disabled student population (Department of Sensus and Statistics, 2012), (UNICEF, 2021).

At present, there are 10,194 Government, 98 private, and 300 international schools in the country. Apart from that, there are 25 schools designed only to educate differently-abled students. Among the government schools of the country, there are 525 schools with especial classroom provisions for differently-abled students and one school with a separate unit for these students only (UNICEF, 2021).

Under this situation, it is evident that the students with special needs are being educated separately, though it is established that Sri Lanka adopts an inclusive educational policy, which requires that all children be afforded an equal opportunity education. Hence, integrating these students with SEN into mainstream classrooms (Wijesinghe, 2019) is yet to be practically achieved. Thus, this study introduces a framework and lays key foundation to identify the challenges and difficulties the mainstream schools have confronted in including students with SEN in existing mainstream schools.

## 2. The method of study

The objective of the study was to map the challenges in the built environment of the existing schools to explore the possibility to include students with an autistic spectrum disorder in them. Therefore, both existing special and

mainstream schools were selected for the study; two from each category. Thereby, the availability of the spaces was explored through a photographic survey done in the selected areas of the schools.

2.1 METHODOLOGY

A pilot walk through survey was conducted in all four schools to obtain initial details and to familiarize with the basic layout of the case studies. Thereby, the spaces to monitor the relevant spatial qualities were identified. Then all four schools were visited separately to obtain the details regarding the structure and the background of the school.

Since the active communication and obtaining personal opinion of the students regarding their personal perceptions was challenging, obtaining data was predominantly conducted through observations and a photographic survey. Thereby, the extent of the availability of required quality in spaces visually and physically fulfilling the six feelings were observed.

The methodology which is shown in figure 01, was carried out to observe the comfortability and safety for the current students who are already being educated in the special schools. Further, the mainstream schools were explored to monitor the prospects of capability in enrolling students with autistic behaviors in the future.

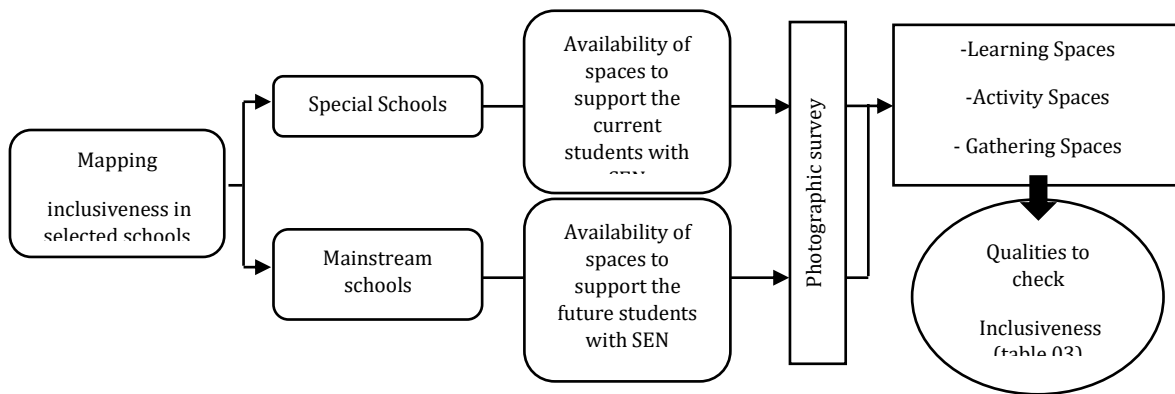


Figure 01: Methodology

Thereby, the identified twelve qualities under the three spatial parameters (table 03) have been monitored in the five categories of spaces; learning, activity, gathering, relaxing and treatment spaces in each of the selected schools by capturing the relevant qualities. These spaces were identified as essentials that needed to be available in inclusive schools.

Table 4: The grading system of the spaces

The score card	Percentage of availability	The compatibility of the situation
●	100%	(Highly available) When the space carries the quality of space as recommended.
◐	75%	(Suitable) The situation where this space is usable by an autistic or a physically disabled student.
◑	50%	(Fine) When the required quality is slightly available
◒	25%	(Endeavored) The situation where the space is available and the authorities have endeavored to establish the required quality.
○	0%	(Non- available) A situation where either the recommended space is not available or the required quality of the space is not available.

According to table 04, the availability of the characteristics was graded by a scorecard assigning a percentage upon its availability on a scale of 100%. The full percentage of it being the highly available situation and 0% marking the non- availability of the required quality.

3. Case studies

The selected case studies are dispersed within the Western and North Western Provinces of the country. The two special schools were selected due to their type of cohorts and their administrative structure. The special school in Western province was a semi-government school while the school unit from North Western province is a government funded special unit in a government school. And the two mainstream schools were selected randomly.

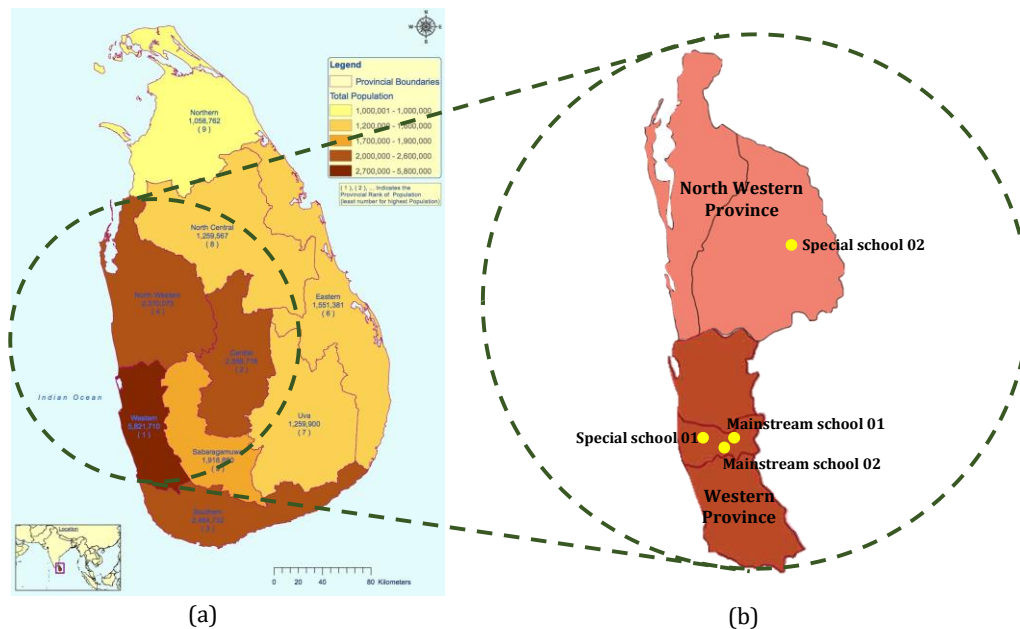


Figure 02: Distribution of the case studies (a) provincial population (b) locations of the case studies

Prior conducting the photographic survey, the basic structure of the school was identified analyzing the layouts and data obtained regarding the schools as presented in table 05. Thereby, school-built environment, student profile, teaching methodology, student daily activity profile and the structure of the management system of the selected cases were analyzed.

Table 5: Profiles of the selected case studies

School Profile	Special School 01	Special school (unit) 02	Mainstream school 01	Mainstream school 02
<b>Built environment</b>	-narrow location -inadequate spaces -compacted into one building	-spacious -adequate space for the functioning -barrier free	-comparatively a large school -compacted spaces	-intermediate type of school -spacious
<b>Student profile</b>	-191 students with special needs -educated in small groups	-20 students with special needs -all are educated together	-970 students with 03 special needs students	-548 students with no special needs students
<b>Teaching methodology</b>	-promote basic learning and skill development -individual attention to students	-similar to other government schools (following the common curriculum)	-Common curriculum is being followed -exam based education -more theoretical education	-Common curriculum is being followed -exam based education -more theoretical education
<b>Daily activity profile</b>	-starts daily to the normal time schedule -close at various times depending on the educating group of students	-begins and closes at the same time as schools in common -more engaged in practical works than theory	- begins and closes at the same time as schools in common (7.30 am- 1.30 pm)	- begins and closes at the same time as schools in common (7.30 am- 1.30 pm)
<b>Management structure</b>	-a semi-government school -director board manages the school -principal and teaching crew handle the curriculum	-a governmental school -administered by the principal and teaching crew	--a governmental school -administered by the principal and teaching crew	-a governmental school -administered by the principal and teaching crew

With the study of the schools, it is identified that the common curriculum is not being followed in the special schools or unit whereas the students have been given special individual attention compared to the mainstream schools. Moreover, the number of students in the special schools are comparatively less to the two selected mainstream schools. This could be either due to the lesser number of student population who requires special education or due to the lack of infrastructure and facilities to accommodate a larger number of the subject population in a school.

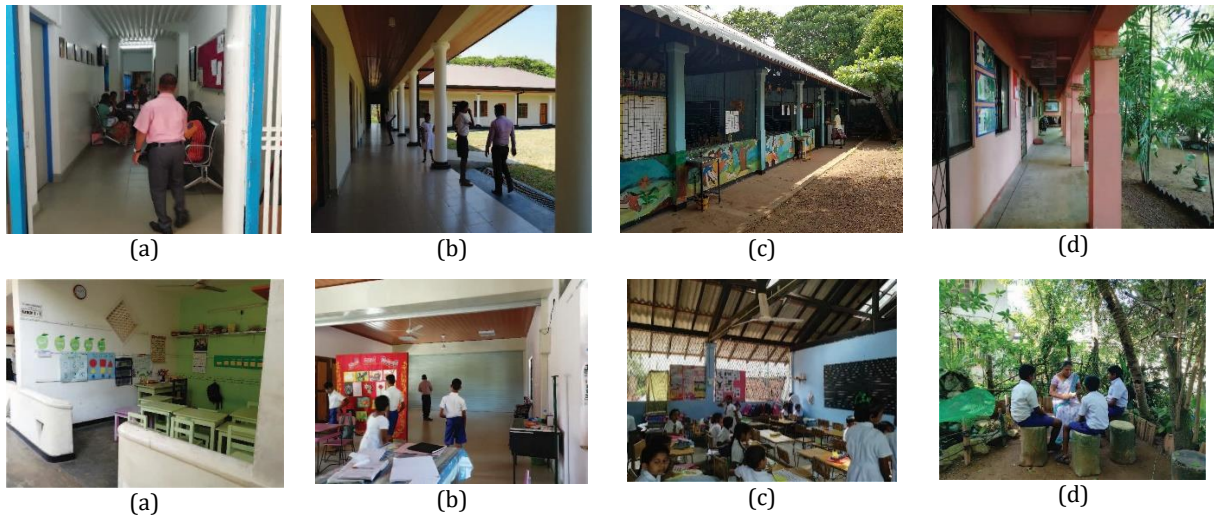


Figure 03: (a) special school 01, (b) special school 02, (c) mainstream school 01, (d) mainstream school 02  
Source: Author

### 4. Results and Discussion

The analysis of the data was conducted under the spatial quality assessment criteria introduced in the sub-section 1.3.1. Thereby, the availability of the required quality of the spaces was monitored in the five identified spatial categories. Then the availability analysis was performed on each of the space considering the three spatial parameters (table 03) monitoring its twelve spatial characteristics. The score card of percentages was used as the grading system (table 04). Thus, both special and mainstream schools were analysed and compared. The existing Special schools were analysed to identify whether they ensemble the qualities to educate the students who are already enrolled in them and the mainstream schools to assure the qualities for the future intakes of special students in case the concept of inclusion is to be adopted.

#### 4.1 ZONING

Under the zoning parameter, the five qualities of visual screening, gradual progression, clear boundaries, and physical and sensory zoning were explored. These qualities were identified as the key components that assure the clarity and connectivity of the spaces for autistic students.

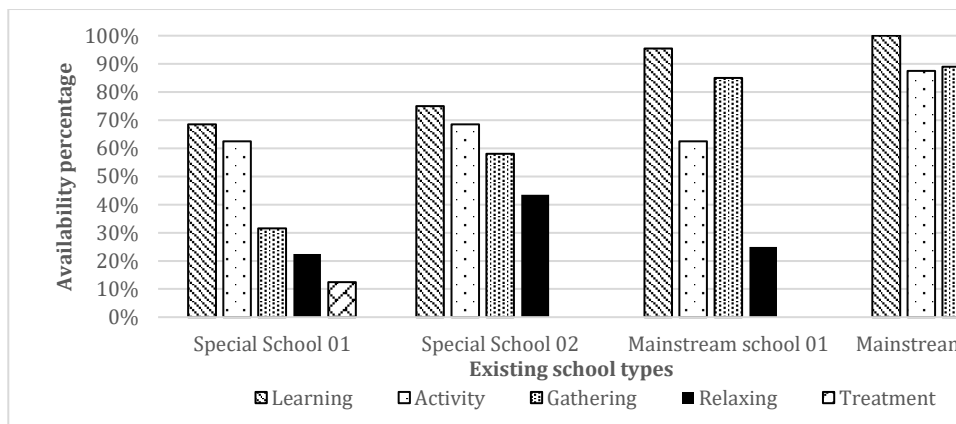


Figure 04: Availability of zoning

Figure 04 represents the percentage of availability of zoning in the four selected schools. It proves that the zoning in the two mainstream schools is comparatively high to the two special schools. Further, apart from the relaxing and treatment spaces, all the learning, activity and gathering spaces in mainstream schools have above 60% of availability of zoning where the overall availability in special schools is below 80%.

The only school available with required quality of treatment spaces is the special school 01, where the percentage of availability is less than one quarter of the total. This highlights the lack of zoning provisions in treatment spaces in the other three schools which is a critical situation when educating students with special educational needs. Since it is a crucial factor to monitor the health of the subject cohorts during the process of education, presence of treatment spaces in schools is essential.

### 4.2 SENSORY APPROACH

Under the parameter of ‘sensory approach’, the qualities of visual cues, favorable color palette, healthy shape and proportions, and physical comfort were evaluated. These qualities support the students feel free and calm during the process of education. Therefore, these characteristics were monitored in the identified five spaces in both the special and mainstream schools to record their level of availability.

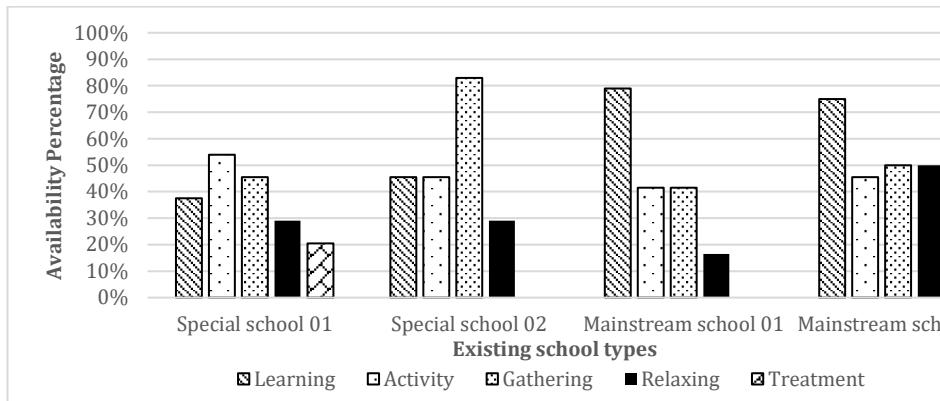


Figure 05: Availability of sensory approach

The quality of sensory approach is moderate in all four selected schools as shown in figure 05. The overall availability is below 50% in most of the spaces, except the activity spaces in special school 01, gathering spaces in special school 02, and the learning spaces in both mainstream schools. Similar to the zoning parameter, the availability of sensory approach in relaxing spaces in all four schools are low, where only the mainstream school 02 has 50% of availability. In the special school 01, the maximum availability of sensory approach is 55% in the activity space where all the other spaces lack adequate sensory approach.

The sensory approach in treatment spaces is only available in the special school 01, where all the other three schools do not have provisions for treatment spaces within them. As mentioned in 4.1, negligence in treatment spaces is clearly a threat and a barrier for allowing students with special educational needs to both special and mainstream schools since it may impact the continuance of their education. Thus, to ensure the student feel free and calm in their educational setting, it is essential that these qualities are properly adapted.

### 4.3 INDIVIDUAL SPACE APPRECIATION

The feeling of safety and privacy of the students are ensured under the parameter of ‘individual space appreciation’. Therefore, the characteristics of prospect and refuge, tones of connectivity, and the concept of ‘my space’ were assessed under this parameter. Since the whole education process and analysis of the school-built environment is focused of the students themselves, it is essential that they are being given adequate individual space to understand themselves. Thus, it is expected that the schools should comply this component to be inclusive.

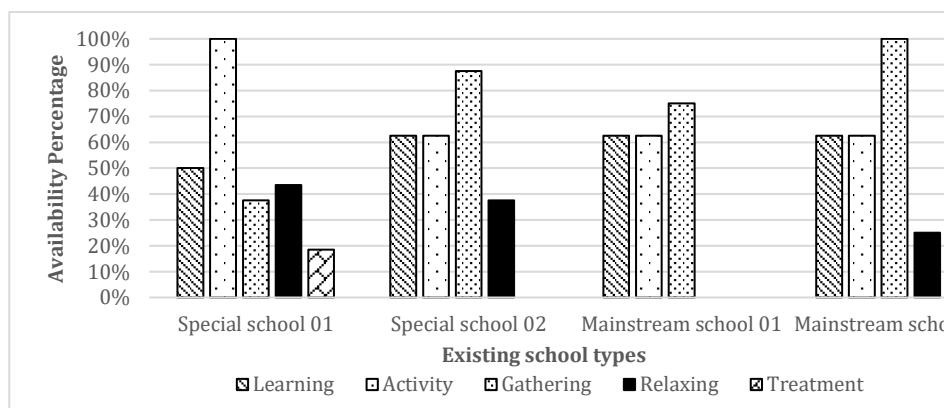


Figure 06: Availability of individual space appreciation

Figure 06 represents the availability of individual space appreciation in the selected case studies. It demonstrates that the most individual space appreciation is available in gathering spaces except in special school 01. Though it is evident that allowing individual territory during theoretical education is comparatively difficult, the availability of individual space appreciation in learning spaces in all schools are above 50%, which could be identified as a positive factor. But, the availability of this subject parameter in relaxing spaces is significantly less though it is one of the spaces where this parameter can be frequently established. Moreover, the availability of privacy and safety in most

of the treatment spaces in the schools appears to be non-available, where only the special school 01 shows provision of treatment spaces which is below 20%.

## 5. Conclusion

This study was conducted with the intention to examine the inclusiveness of existing school-built environments in Sri Lanka to monitor the challenges in their built environments. Having the students with ASD as the subject population, two types of schools were identified to monitor the availability of the required qualities and their limitations. Thus, two special schools and two mainstream schools were selected.

A photographic survey was conducted to capture the level of spatial availability and their quality to educate students with ASD in each of the selected school.

With the study it is identified, that the spatial availability of the schools is maintaining a high to low end profile where the intermediate level of availability of the qualities are less. Therefore, it is essential that the schools focus on improving the low end (0%) qualities either to high end (100%) or to an intermediate level (25% - 75%) to make the schools inclusive. Moreover, it is realized, that all the four schools should facilitate treatment spaces within the school premises and that they should be in the required quality. Since the students with ASD requires continuous health monitoring, unless the treatment spaces are available, facilitating them with proper education in the existing schools are unlikely. Further, as the students with ASD require activity related education and continuous resting during the process of education, adapting inclusive characteristics in activity and relaxing spaces is essential when preparing the school to educate students with autistic syndrome.

Moreover, it is identified that, apart from the existing mainstream schools, the spatial qualities in the existing special schools need to be improved as well. Though they do educate the students with autistic spectrum disorder at the moment, the quality and comfortability of the school-built environment raises issues.

Thus, it is concluded that though the existing schools do have a certain percentage of the required spaces by the students with Autistic Spectrum Disorder, yet, the percentage of non-availability of the qualities maintains an equal profile imposing limitations for the schools to become inclusive. But with the identification of these qualities and their limitations, the schools can be encouraged to uplift their conditions to address the needs of the differently abled students.

## 6. Acknowledgments

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