

# Architecture and Students with Autism: Exploring Strategies for Their Inclusion in Society Mainstream

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**Abstract**—Architecture, as an art and science of designing, has always been the medium to create environments that fulfill their users' needs. It could create an inclusive environment that would not isolate any individual regardless of his /her disabilities. It could help, hopefully, in setting the strategies that provide a supportive, educational environment that would allow the inclusion of students with autism. Architects could help in the battle against this neuro-developmental disorder by providing the accommodating environment, at home and at school, in order to prevent institutionalizing these children. Through a theoretical approach and a review of literature, this study will explore and analyze best practices in autism-friendly, supportive, teaching environments. Additionally, it would provide the range of measures, and set the strategies to deal with the students with autism sensory peculiarities, and that, in order to allow them to concentrate in the school environment, and be able to succeed, and to be integrated as an important addition to society and the social mainstream. Architects should take into consideration the general guidelines for an autism-friendly built environment, and apply them to specific buildings systems. And that, as certain design elements have great effect on children's behavior, by appropriating architecture to provide inclusive accommodating environments, the basis for equalization of opportunities is set allowing these individuals a better, normal, non-institutional life, as the discussion presented in this study would reveal.

**Keywords**—Architecture, inclusion, students with autism, mainstream society.

## I. INTRODUCTION

ARCHITECTURE could be defined differently by each Architect, but basically, it is the art and science of providing the built environment that caters to the needs and performance limitations of all its users. Architecture - as studies have revealed - affect its users' mood, health and behavior. By creating a sense of security and coherence, and through responding to the user's specific needs, architecture could have a tremendous effect on their psychological state, while also affecting their performance and behavior [1]. As these users could be physically, cognitively or developmentally challenged, architects should make sure that their built environment should fit with the way society manifests its values, beliefs and attitudes towards different causes, as a non discriminatory society that takes care of its vulnerable minorities. Among those users are the individuals on the autistic spectrum disorder who need an environment to enhance their development by increasing their abilities, in order to overcome the shortcomings of their cases, and help to

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mainstream them into society social life. Therefore, this study aims at exploring various ways to accommodate students on the Autism Spectrum disorder into the educational environment, and that in order to prevent institutionalizing this group's members, and allow providing the schooling and knowledge, and enhancing the skills that help to include them into mainstream society.

## II. AUTISM

### A. What Is Autism?

“Autism spectrum disorder is a serious neuro-developmental disorder that impairs a child's ability to communicate and interact with others. It also includes restricted repetitive behaviors, interests and activities. These issues cause significant impairment into social, occupational, and other areas of functioning” [2].

Autism is considered “the most severe developmental disability. Appearing in the first three years of the life of a child, it involves impairment in verbal and nonverbal communication. Some people with autism have limited interests, strange eating or sleeping behaviors or a tendency to do things to hurt themselves, such as banging their heads or biting their hands” [3]. As autism “affects individuals differently and to varying degrees” [4], “some may have poor motor skills and poor sensory sensitivity, while others on the same spectrum could have difficulty making eye contact, holding a conversation or difficulty with executive functioning related to reasoning or planning. It also includes restricted repetitive behaviors” [2].

### B. Signs of Autism

There are signs that could guide parents to their child's status:

- “Lack of or delay in spoken language,
- Repetitive use of language and/or motor mannerisms (e.g., hand-flapping, twirling objects),
- Little or no eye contact,
- Lack of interest in peer relationships,
- Lack of spontaneous or make-believe play, and
- Persistent fixation on parts of objects” [5].

### 1. Causes of Autism

According to the various study as the Mayo Clinic explanation there is no single cause for autism. And as this disorder manifests a variety of severe symptoms, there should be many causes among which genetic and environmental factors have a major role to play [2]. “Genetic problems: Several different genes appear to be involved in autism

spectrum disorder. For some children, autism spectrum disorder can be associated with a genetic disorder, such as Rett syndrome or fragile X syndrome. For others, genetic changes may make a child more susceptible to autism spectrum disorder or create environmental risk factors. Still other genes may affect brain development or the way that brain cells communicate, or they may determine the severity of symptoms. Some genetic problems seem to be inherited that while others could happen spontaneously" [2].

- **Environmental factors.** "Researchers are currently exploring whether such factors as viral infections, complications during pregnancy or air pollutants play a role in triggering autism spectrum disorder" [5].

There has also been a great controversy on whether vaccines, especially, the measles-mumps-rubella (MMR) vaccine was suggested to be linked to children contracting this disorder. However, extensive research revealed that "no reliable study has shown a link between ASD (Autism Spectrum Disorder) and the MMR vaccine" [6].

#### *C. Autism: Data and Statistics*

Although studies considered Autism to be a rare disorder [7], its prevalence rate has increased significantly. From 4 Cases in 10000, it reached 1 in 68 in the US, as the Center for disease control (CDC) [8] has revealed. The incidence rate is more than four times, i.e. (4.5) "common for boys, 1 in 42, than for girls, 1 in 189" [8]. It has also revealed that, the worldwide incidence is estimated at 1%, for both children and adult population [8].

According to the CDC released data, the increase in the number of detected children with Autism that was based on "a standardized assessment of descriptions of behaviors" raise the question of whether "more children are affected or more detected? Does the increase reflect a growing problem, or do these new numbers reflect an improvement in our ability to diagnose and serve those affected?" [8]. Whatever could be the reason of these data, this needs raising awareness and taking necessary action to help these children and allow them to live as independently as possible a relatively normal life with the help of provided therapies and supports [9].

#### *D. Autism and Education*

As the law in advanced countries, as in the United States, has enacted the Individual with Disabilities Education Act, since 1975, and revised it 2004, mandating the state's responsibility to provide every child with free and appropriate education that meets his needs, therefore, "children with disabilities, including autism are entitled to early intervention and special education" [10].

Additionally, there has been agreement between experts that early intervention with education and support programs has a positive outcome on children with autism. This would, hopefully, help them improve their social skills, their verbal and non-verbal communication and improve their challenging behavior [11]. And as the goal of education for each child is to gain personal independence and to assume social responsibility, "these goals imply continuous progress in

social and cognitive abilities" [11], "in addition to the amelioration of behavioral difficulties and generalization of abilities across multiple environments" [11]. In some cases, reports have suggested that particular treatments can foster permanent "recovery". While other reports state that, in most individuals, we find the persistence of "the core deficits of autistic spectrum disorders" [11].

Whatever could be the reports results, the main issue is the need to provide educational interventions that would be tailored to the child specific needs. Specially that, there has been documentation of single-subject research demonstrating that there has been "substantial progress in individual responses to specific intervention techniques in relatively short periods of times (e.g., several months) in many specific areas, including gains in social skills, language acquisition, nonverbal communication, and reductions in challenging behaviors" [11].

Among the factors affecting the successful outcome of educational programs, for children with autistic spectrum disorders are their participation in regular classrooms. Although "the usefulness of this placement may have a limited outcome measure", as it could be related to variables different from the child's characteristics [10], studies reported that among the commonly reported outcome there "has been changes in IQ scores" [11].

#### *E. Autism and Educational Inclusion*

Through Education, students with special needs, including those with autism, could be educated in regular classes "during specific time periods based on their skills" [12]. This means "regular education classes are combined with special education classes" [12]. This is the basis of the inclusion concept that "is about offering the same activities to everyone, while providing support and services to accommodate people's differences" [13], so that every child feels he is an equally valued member of the school [14].

The advocates of the education inclusion philosophy affirm that [12] allowing children with special needs to be included and mainstreamed in ordinary schools, and to learn with their non disabled colleagues, would prepare them for better functioning in the world and better integration in society [11]. And that as their non disabled peers would "serve as role models" [14], who would help them to acquire social and communication skills. Thus they "receive preparation for adult life in the community" [14].

Additionally, inclusion benefits not only students with autism but also their non-disabled peers. It allows those peers "to begin to see people first and the disability second, and to become comfortable in their interaction with persons with disabilities" [14]. It also allows them to see similarities between them and to appreciate the "unique strengths the autistic persons have to face the challenges imposed on them as a result of their unique conditions [14].

#### *F. Architects and Autism*

As architects have been entrusted by society to provide the environments that allow the inclusion of all its members in its

social life, they have the duty to facilitate mainstreaming the persons with special needs as well as the developmentally disabled, as the ones on the autism spectrum disorder.

Studies and researches manifested various strategies aiming at the provision of educational autism friendly environments that fulfill the needs of the members of this group of individuals.

Among these strategies are the following:

### III. STRATEGIES FOR MAINSTREAMING STUDENTS WITH AUTISM

#### A. What Is Mainstreaming?

Mainstreaming is sending to the mainstream or causing to join the main force. In this situation, it alludes to the act of integrating students with special educational problems into conventional classes and school activities [15].

#### B. Autism and the Friendly Built Environment

##### What is the Autism Friendly Environment?

According to the UK Government Building Bulletin 102 (BB102), *Designing for Disabled Children and Children with Special Educational Needs the Design for ASD children*

should be as follows:

“Simple layout: calm, ordered, low stimulus spaces, no confusing large spaces; indirect lighting, no glare, subdued colors; good acoustics, avoiding sudden/background noise; robust materials, tamper-proof elements and concealed services; possibly H&S [health and safety] risk assessments; safe indoor and outdoor places for withdrawal and to calm down” [16].

#### C. Mainstreaming Strategies

##### 1. The Enabling Therapeutic Environment:

Lisa Marchi

“Since ASD create a range of challenges, it is important that design focuses on common fundamental issues, found in individuals along the entire spectrum. By addressing these issues, we can begin to design facilities that are both therapeutic reducing behavioral outbursts, improving quality of life and enabling and that would improve their skills and increase community Integration” [16].

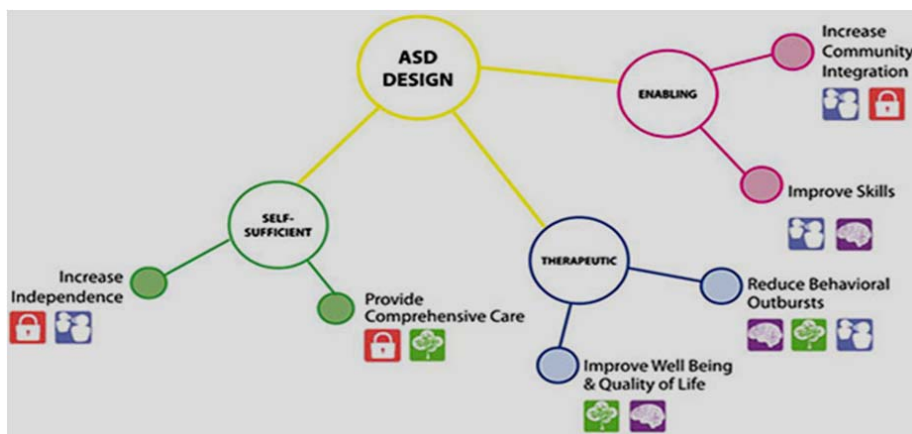


Fig. 1 Aim of the Design for ASD Individuals [16]

- The first commonly shared issue is in the executive function system of the brain. This impairment limits the ability to carry out tasks such as eating, walking, focusing, discerning stimuli, creating perception hierarchies, and concentrating (Ozonoff 1082) [17]; Sanchez 368, [18]). The built environment has the potential to aid those with executive functioning deficits by reducing distractions, simplifying way-finding, increasing consistency, and easing transitions where spaces change drastically with light, color, or sound [16].
- The second most common impairment is with Sensory Integration dysfunction (SID) that causes either hypo- or hyper- sensitivity to sensory stimuli (Vincenta 2) [19]. The built environment can respond to both hyposensitive and hypersensitive individuals by providing a variety of spaces with different sizes, shapes, colors, lights, sounds,

materiality, that would become “small escape spaces and alcoves that can act as womb-like retreats, void of all stimuli” [16].

- The third most common impairment amongst individuals along the autism spectrum is cognitive mapping, which is the technique the brain uses to navigate the physical environment, linking our senses to memories (Zeisel 148) [20]. Cognitive mapping deficits...require that a building should be designed in such a way that the environment is simple and easily navigated with obvious architectural way-finding systems and good signage with symbols [16]. Suggested strategies designers should take into consideration when shaping the environment to enable ASD individuals [16].



Fig. 2 Strategies to enable individuals along the ASD [15]

## 2. Autism ASPECTSS™ Index

Magda Mostafa

Magda Mostafa, a pioneer in Autism design and Associate Professor at American University in Cairo, developed the ASPECTSS Index. It is based on the concept assuming the effect of the sensory environment on the perception and behavior of individuals with autism. Most interventions through architectural design are to adjust the sensory malfunctions related to autism. The Sensory Environment has a “stimulatory input that results from the physical architectural surroundings of color, texture, ventilation, sense of closure, orientation, acoustics etc., (Mostafa, 2014) [21].

According to (Mostafa, 2014), the ASPECTSS Index has seven principles as a design development tool:

- \* Acoustics: was ranked as the most influential feature of the sensory environment affecting autistic behavior. By reducing noise level and echo in educational environments attention spans, response times and behavioral temperament are all improved by 60% [21].
- \* “Spatial Sequencing: requires that areas be organized in a logical order” [21]. “Spaces should flow from one activity to the next” through one-way circulation without distraction [21].
- \* “Escape Space: is a partitioned or a crawl space, located in a quiet part of the room, and which is sensory neutral with minimal stimuli” [21].
- \* Compartmentalization: aims at defining and limiting the sensory environment of each activity by organizing a classroom or a building into compartments [21]. Each includes a “defined function with consequent sensory quality” [21].
- \* Transition zones that help the user recalibrate his senses while moving from one level of stimulus to the next. These could take the form of a distinct node or a full room [21].
- \* Sensory Zoning proposes that when designing for autism, spaces should be organized in accordance to their sensory quality, rather than the typical architectural approach of functional zoning. Spaces should be grouped into high stimulus as physical therapy and low stimulus speech therapy and computer skills [21].
- \* “Safety is more of a concern for children on the autistic spectrum, using fittings to protect them from hot water and avoiding sharp harmful edges or corners” [21].



Fig. 3 Sensory Garden at the Advance School for Children with Special Needs, Qattameya, Egypt [22]. View of the sensory garden with water feature and expression walls in the Advance School for Developing Skills of Special Needs Children in Qattameya, Cairo, the first building worldwide to be designed using the Sensory Design Theory and its consequent Autism ASPECTSS Design Index. Image courtesy of Progressive Architects, Cairo

## 3. The Classroom Design Kit

The McAllister - Maguire Strategy

This strategy was developed by Keith McAllister and Barry Maguire, both from Queen's University Belfast, who worked closely with teachers, as they are the experts of the case of students with autism. Instead of basing their design on the conventional drawing method, they provided a design model that would be the kit for studying and providing the needs of these students. Thus, more understanding and the possibility of conversation between the architect and the teaching staff could happen for the benefit of (ASD) students on the Autism Spectrum Disorder.

Additionally, the performance indicators outlined by the department of education in Northern Ireland and the equivalent An Roinn Oideachais in the Republic of Ireland would set the stage for a more autism-friendly environment for these students. These indicators, published in the “Evaluating Provision for Autistic Spectrum Disorders in Schools, 2005” are the following [23]:

1. The learning environment is supportive of the child with autism: lighting, sound and coloring are sufficient to encourage the child to relax and settle to work [23].
2. There is sufficient personal space for the child with autism to find comfort and to de-stress when necessary [23].
3. The learning environment contains areas of high interest to reflect the particular interests of the child with autism [23].

## IV. CONCLUSION

This study has stressed the importance of the inclusion of students on the Autism spectrum in general education environments. This inclusion, that is their integration and participation to attend the same classes with non disabled students, would not be achieved without providing the necessary support. This support includes a quiet distraction free learning environment with sufficient personal space that could allow them to recalibrate and readjust their senses. That in addition to the high interest areas that conform to these students' statuses, and that would make their inclusion a

successful experience [24].

## Sensory Zoning and Circulation Schemes

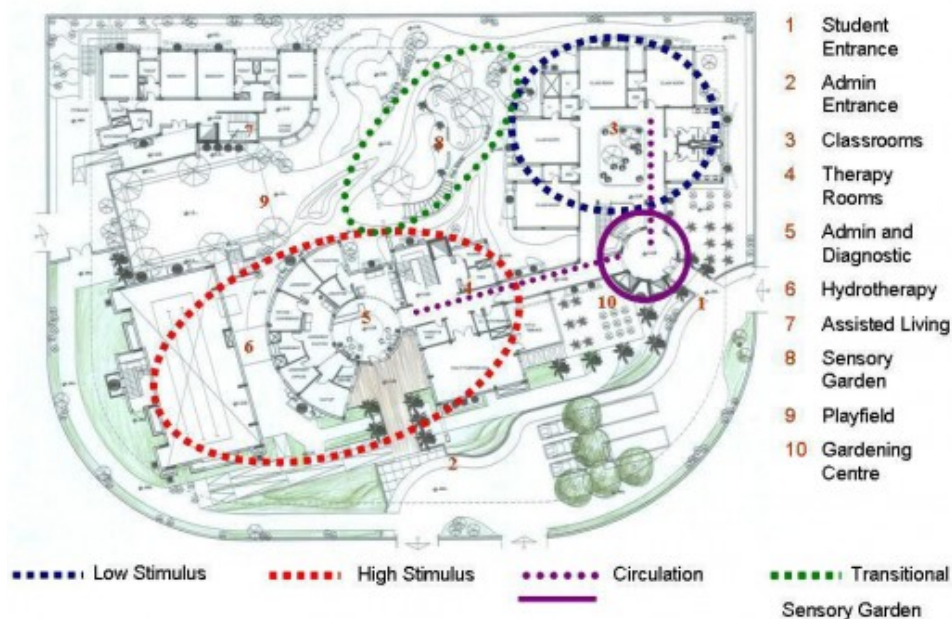


Fig. 4 Plan for the Advance School for Developing Skills of Special Needs Children in Qattameya [22]

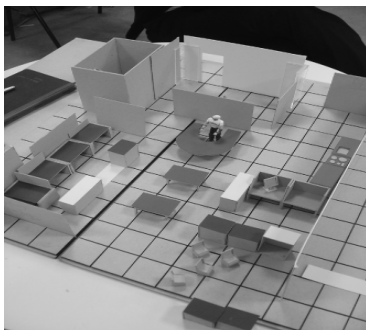


Fig. 5 The model used to produce the Educational Environment [23]

The various strategies presented in this study reveal the importance of the role of architects in providing these inclusive environments that should guarantee equal opportunities for all society members, and help mainstream students with autism into society social mainstream. Therefore, the study presents the following recommendations:

- \* Raising the awareness of professional architects and designers of the importance of providing inclusive autism-friendly environments, especially educational ones, in order to prepare the members of this group for better community integration and a higher quality of life.
- \* Teaching the next generation of architects, through adjusted curriculum and prepared courses, the performance needs of Autism Spectrum Disorder (ASD) students.
- \* Raising community awareness of the importance of

accommodating ASD individuals into social mainstream, by changing the negative attitudes towards this group's members. This could be achieved through the participation of media campaigns.

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