

Conference Paper

The Importance of Design Elements in Special Education of Individuals with Autism and Learning Disabilities

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This study examines the fundamental relationship between design and special education. The paper presents a literature review on autism learning difficulties and special education, including the scope of sensors, training, accessibilities, learning methods and requirements, and their connection with design needs. According to the study, the benefits of using specially designed elements in special education can contribute to the student's learning and perception processes. A further recommendation is to develop more research in educational materials specially designed according to an individual's design needs in reading, acquiring essential life skills, and communication.

Keywords: Autism, design, special education

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1. Introduction

Autism Spectrum Disorder (ASD) has been defined as a developmental disability characterized by social communication and interaction deficiencies that affect basic human behaviors and can persist throughout life [1]. ASD is often associated with sensory processing difficulties, including excessive or under-sensitivity, to sensory stimuli in the environment [2]. There is no medical test that can diagnose people with ASD. However, when the necessary educational interventions are applied, it has been observed that they could overcome social and communicative problems. The findings obtained from many research [3]–[8] revealed that the education strategies for people with ASD should be developed according to their individual needs. Also, it states that early intervention is essential to develop education strategies as a treatment for autism.

Autism and learning disability are co-associated. Autism is prevalent among individuals with learning disabilities and increases accordingly with lower levels of IQ. Previous

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research has estimated that 30-50% of people with ASD were found with severe learning disabilities [9]–[11]. These numbers have indicated that the two conditions are so strongly connected that there has been some concern regarding whether they should be considered as different syndromes.

Effective educational strategies help these individuals with autism and learning difficulties to gain social and academic skills [12]. An interdisciplinary approach to education is critical in teaching people with ASD. This article explores the design relevance of these effective teaching strategies.

2. Method

The literature was gathered to create a resource of knowledge in several scopes, such as sensors, computer-based programs, visual strategies, accessibilities, and reading education. The literature was then reviewed to obtain essential information for developing a design approach in special education for individuals with autism and learning difficulties. The aim of the study is to draw attention to the necessity of specially designed products in special education and to reveal the need for specially designed products.

3. Sensor

Individuals with autism may have difficulty processing sensory information and may overreact to environmental stimuli such as noise, colors, and sunlight, while other individuals with autism may not notice or respond to such inputs [13], [14].

Since such emotional problems affect learning activity, different learning environment designs have been developed for such individuals to benefit [15]. A study on color perception of individuals with autism mentioned that they generally react to yellow color. Grandgeorge and Masataka [16] believed that this might be due to the fact that yellow is the brightest color. However, many designers are unaware of the sensory issues related to the built environment in the daily life of autism before the design phase. Any unwanted distraction could negatively affect children's learning ability [17].

The communication, cognitive, and focus problems of children diagnosed with ASD are frequently mentioned in the literature [18]. These problems can negatively affect the teaching processes of individuals. For this reason, many approaches have been developed to gain efficiency in children with autism education. One of these approaches is technology-based approaches [19].

4. Computer-Based Programs

Common attention skills in students with ASD could be controlled by giving them social and non-social cues such as social stimuli speaking, making eye contact, and distractor toys [20]. However, making eye contact negatively affects children's teaching processes [21]. Interactive teaching designs, game designs, computer-aided activities, and applications come to the fore within the framework of an individual's mental processes with autism [22], [23]. The research summary between 2010-2014 made by Omar and Bidin [24] showed that visual strategies and computer-based programs are essential for autism. It can improve the understanding of information when texts and images are presented with computer-based programs.

As a result, computer technologies specially designed for autistic children have content that focuses on eliminating problems such as deficiency in communication and inability to speak, which concurrently with autism. The computer is seen as an exciting object by autistic children, which has made the computer an easily used and useful tool in educational activities [25]. Moreover, using computer-based programs is proven helpful in improving literacy ability and understanding written texts on individuals with autism [26]–[29].

5. Visual Strategies

Visual communication strategies have been applied as the primary communication and education method in individuals with communication and language problems [30]. suggested that using visual strategies in the education of individuals with autism significantly affects the learning process. Similarly, other studies [31]–[33] have demonstrated that visual strategies enhance the daily routine and independent behaviors of people with autism [34]. Moreover, it is indicated that visuals increase reliability, predictability, and a sense of stability [35]. The most well-known visual communication technique used on individuals with autism is The picture exchange communication system (PECS) [12].

The study on autism and education with visual support emphasizes that children with ASD learn more visually compared to auditory or other alternative ways [36]. In addition, used colors in education can be beneficial for the education activities of individuals with autism [37]. Information technologies present visual, text, touch, and sound components with multimedia tools according to the user's preference. Therefore, individuals with autism enable to use these technologies easily [38]. For instance, One

computer application enables a child with ASD to make a few sentences to ask for food or toys, which express their daily needs [39].

6. Accessible Design

Accessible design is the concept of creating products, devices, services, or environments that can be used by all individuals (with and without disabilities) [40]. There are many studies of non-governmental organizations in countries around the world for accessible design [41]. However, the most striking of them is The World Wide Web Consortium (W3C) [42]. The Web is necessarily designed to work for all people, regardless of their hardware, software, language, location, or ability. Thus, in order to accommodate disabilities, the Web continually changes. Certain websites are designed for individuals with autism and learning disabilities, where design is prioritized and designed according to the perception and sensory characteristics of individuals. The most striking of these is the 'easy to read' web plugin, which includes easy reading and perception study designed by Autism Europe. The web plugin consists of a special web page made for an individual's design requirements. There are several options to change the website's visual, such as changing the text or the color of the website on the page. The examples of design changes in the website can be seen in Figure 1 [43].



Figure 1: From Left To Right The Layout Of Autism Europe Design: Normal Version, Black And Yellow Version, And Easy To Read Version

7. Reading Skill

Reading is an essential skill to be acquired in primary school [44]. It is expected from students that they will first learn to read and then read to learn [45]. The reading phase in the learning process is necessary and recommended for everyone, including people with ASD. A study investigating learning to read performance in people with autism reported that they might have difficulties learning letterform based on letter design. They may confuse letters that look similar to each other based on letterform design. The research resulted in a new font design adapting learning to read strategies for individuals with autism and learning difficulties [46]. Furthermore, easy to read

instructions were also provided for people with ASD. These instructions are adapted from the UK Department of Health [47], ILSMH European Association [48], and Ofqual [49].

8. Conclusion

Although the literature generally states that individuals with autism benefit from visual strategies [36] and special education strategies [12], the use of specially designed elements in special education and the evidence-based results of these design elements are limited in the literature.

Even though it is emphasized that visual strategies are essential for autism and learning disabilities, the quality of the visual or the effects of the specially designed visual strategies is not fully explained [30]. According to the results of evidence-based sensory sensitivity studies, it is stated what kind of color should be used for individuals with autism [16]. However, in the literature, it is not mentioned what kind of design elements should be used on the designed special education object for individuals with autism or learning difficulties except the color. It was seen in the emerging literature there were limited instructions to be able to design for visual requirements of individuals with autism and learning disabilities.

However, it was developed some customizable design tools according to individual characteristics in order to enable individuals with autism to comprehend better and contribute to their communication activities by using empirical knowledge, although it is not based on evidence, e.g., Europe Autism- Easy to read [43] and Open Book - First Project [50].

As a result, it is thought that specially designed educational materials should be designed according to the sensory needs and developmental disorders of an individual, and attention-increasing elements should be added to the design to contribute to the individual's educational activities. However, this judgment should be tested, and the contribution of design elements to individuals with autism and learning difficulties should be determined.

According to the review, There is still an inadequate design research approach to provide special education studies and products. Considering these factors, it is recommended to conduct more research on specially designed educational materials according to an individual's design needs in terms of reading skills, basic life skills, or communication skills.

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