



## Autism, Technology, and Prospective Special Education Teachers

Esra Macaroğlu Akgül\*

### Abstract

Autism is a pervasive developmental disorder which causes deficits in social interaction. Individuals with autism sometimes may not be able to talk or may choose not to talk. Therefore; there needs to be some other ways to communicate with children with autism. Presently, technology, specifically educational technology comes to the scene to help this communication problem. Individuals' definitions of technology may confuse with their definitions of science. Although technology is neither the same nor the product of science, people sometimes use these terms interchangeably. Children with autism, as well as other special needs children, need highly qualified teachers to help them communicate the world. Based on the explanations above, this research study examines prospective special education teachers' understandings of technology and its use in interventions for children with autism. Thirty prospective special education teachers from a big scale university located in Marmara region participated in this research study. Data were collected through a questionnaire developed by the researcher and a series of semi-structured interviews. Questionnaire includes open-ended questions to examine participants' understandings of autism, technology, and use of technology in interventions for autism. Interviews are also structured around these three issues. Data gathered from questionnaire and interviews were analyzed qualitatively. Open coding is used in the analysis part. Based on the analysis, three assertions about participants' understandings of autism, technology, and the use of technology for autism were generated and presented in the paper.

**Keywords:** Autism, technology use in special education, prospective special education teachers.

## Otizm, Teknoloji ve Özel Eğitim Öğretmen Adaylarına Dair

### Öz

Otizm kendini sosyal iletişimde kopukluk olarak gösteren yaygın gelişimsel bir bozukluk olarak tanımlanabilir. Otizimli bireylerde bazen konuşma hiç gelişmez bazen de gelişse bile birey konuşarak iletişim kurmayı tercih etmez. Böylece otizimli bireylerle iletişim kurmak için başka yollara ihtiyaç duyulur. Günümüzde bu yollardan en önemlisi teknoloji ve hatta eğitim teknolojisidir. Teknolojinin nasıl tanımlandığı ise bu noktada daha çok önem kazanır. Bireylere teknoloji tanımı sorulduğunda zaman zaman bilim tanımı ile karıştırdıkları görülür. Aslında teknoloji ne bilim ile aynı ne de onun bir

\* Prof. Dr., Fatih Sultan Mehmet Vakıf Üniversitesi Eğitim Fakültesi Temel Eğitim Bölümü Okul Öncesi ABD, İstanbul/Türkiye, emakgul@fsm.edu.tr

ürünüdür. Bilim ve teknoloji terimleri sık sık birbiri yerine kullanılarak hata yapılabilir. Diğer tüm özel gereksinimli çocuklar gibi Otizmli çocuklar da dünya ile iletişim kurmalarına yardımcı olacak kaliteli öğretmenlere ihtiyaç duyarlar. Bu açıklamadan yola çıkarak yapılan bu arařtırmada; özel eğitim öğretmen adaylarının otizmi ve teknolojiyi nasıl tanımladıkları ile otizmli bireylerin eğitiminde teknoloji kullanımını hakkındaki görüşleri arařtırılmıştır. Nitel desende hazırlanan arařtırmaya Marmara Bölgesinde bulunan büyük ölçekli bir üniversitenin eğitim fakültesi özel eğitim bölümüne devam eden 30 öğretmen adayı katılmıştır. Arařtırma verileri arařtırmacı tarafından hazırlanan bir anket ve yarı yapılandırılmış görüşmeler yoluyla toplanmıştır. Söz konusu anket katılımcıların otizm, teknoloji ve teknolojinin otizmlilerin eğitiminde kullanılması hakkındaki görüşlerini belirlemeyi hedefleyen açık uçlu sorulardan oluşturulmuştur. Görüşme formları da yine otizm, teknoloji ve teknolojinin otizmlilerin eğitiminde kullanılması konularını içeren sorular ile hazırlanmıştır. Anket ve görüşmelerden elde edilen veriler nitel yöntemlerle analiz edilmiştir. Analiz açık kodlama tekniđi ile yapılmış ve katılımcıların otizm hakkındaki tanımlamaları, teknoloji hakkındaki tanımlamaları ile teknolojinin otizmlilerin eğitiminde kullanılması hakkındaki görüşlerini içeren 3 sav oluşturularak makalede sunulmuştur.

**Anahtar Kelimeler:** Otizm, özel eğitimde teknoloji kullanımı, özel eğitim öğretmen adayı.

## Introduction

The National Autistic Society (NAS) in the United States is among the most prestigious institutions for autism throughout the world. NAS addressed the following difficulties as the impairments for children with autism: difficulty with social relationship, difficulty with verbal, non-verbal communication, and difficulty in the development of play and imagination. Additionally, there could be repetitive and stereotypical behavior patterns and resistance to change in daily routine. Schlosser and Blischak<sup>1</sup> reported the estimation of various studies that 25% of 61% of children with autism remain essentially non-speaking. This estimation underlines the importance of finding communication ways other than speaking. Dautenhahn<sup>2</sup> discussed two ways of connecting individuals with autism to non-autistic world. One way of communication is to teach individual with autism necessary skills to survive in the world outside. The other way is to let them live in their own world which will make them happier. Before making a choice, it is important to understand what autism is and how these people feel.

One of the ways to understand how they feel about the world and people is to use an interactive technology in education and rehabilitation of individuals with autism. Using more interactive rather than remote-controlled technology for rehabilitation is a recent approach for communication. In this approach, learning about social-emotional cues of children with autism is supported by technology embedded to instruction.

Goldsmith and LeBlanc<sup>3</sup> mention about several research studies investigated diverse applications of technology-based interventions for children with autism. These diverse applications include two types of designs. Some interventions are designed for indefinite use and they are called assistive technology, like augmentative communication devices, and some are designed for a specific purpose and once the purpose is reached the intervention, temporary instructional aid, is removed. This second category includes tactile and auditory prompting devices, video-based instruction and feedback, computer-aided instruction, virtual reality and robotics.

Mirenda<sup>4</sup> provided a review of the empirical literature on the number of topics related to Augmentative and Alternative Communication (AAC) and assistive

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- 1 Schlosser, R.W., Blischak, D.M., "Is there a role for speech output in interventions for persons with autism?", *Focus on autism and other developmental disabilities*, V.16(3). pp: 170-178, 2001.
  - 2 Dautenhahn, K., "Design Issues on Interactive Environments for Children with Autism", *Proceedings International Conference on Disability, Virtual Reality and Associated Technologies*. <http://homepages.feis.herts.ac.uk> 2000
  - 3 Goldsmith, T.R., LeBlanc, L.A., "Use of technology in interventions for children with autism", *JEIBI*, v.1(2). 2004
  - 4 Mirenda, P., "Autism, augmentative communication, and assistive technology: what do we really know?", *Focus on autism and other developmental disabilities*, V.16(3). Pp:141-151, 2001.

technology used in supporting communication and learning of individuals with autism. In this review, it was argued that AAC interventions included wide range of strategies whose common goal is either to help in communication with others or to understand communication from others. These strategies could be classified support for input and support for output. Input strategies might include schedules, visual symbols for choice making, and aided language stimulation. Stromer, Kimball, Kinney, and Taylor<sup>5</sup> identified activity schedules, which mentioned in Miranda as the means of promoting independent execution of previously learned responses by using mostly pictures. Stromer et al report preliminary studies illustrate how activity schedules delivered on the computer may engender new learning with the use of videos, sounds, dialogues, images and the words as instructional stimuli. Computer activity schedules might be used to teach academic skills like reading, writing and math. Stromer et al. also reported a research study in which a computer program made in power point was used to teach a seven-year old girl with autism. They also proposed that money and number skills might also be taught as tasks embedded in computer activity schedules.

Output strategies might include visual-spatial symbols, picture exchange communication system (PECS), and functional communication training. Miranda also emphasized VOCA, which was a portable, computerized device to produce synthetic or digitized speech output when activated, and an empirical study to demonstrate the potential use of VOCA to support the communicative interactions of children with autism. Schlosser and Blischak also talk about the empirical studies in which teachers' and unfamiliar persons' ratings about children's VOCA communication. Ratings provided social validation support for contextual appropriateness of VOCA.

Although VOCA and PECS are both output strategies, VOCA is a pointing-based system, whereas PECS is exchange-based system.

Other than teaching academic skills, Schreibman, Whalen and Stahmer<sup>6</sup> investigated the use of video priming to reduce disruptive transition behavior in children with autism. This is another example for the use of technology in teaching children with autism.

Lastly, collaborative virtual environment (CVE) is another use of computer technology for people with autism. Moore, Cheng, Mc Grath and Powell<sup>7</sup> de-

5 Stromer, R., Kimball, J.W., Kinney, E.M., Taylor, B.A., "Activity schedules, computer technology, and teaching children with autism spectrum disorders", *Focus on autism and other developmental disabilities*, V.21(1). pp:14-21, 2006

6 Schreibman, L., Whalen, C., Stahmer, A.C., "The use of video priming to reduce disruptive transition behavior in children with autism", *Journal of positive behavior interventions*, V.2(1), 2000.

7 Moore, D., Cheng, Y., Mc Grath, P., Powell, N.J., "Collaborative virtual environment technology for people with autism", *Focus on autism and other developmental disabilities*, V.20(4), 2005.

signed an empirical study to determine if children with autism could understand basic emotions by interacting with collaborative virtual environment. CVE is a software program designed to evaluate participants' ability to identify and make inferences from facial expressions.

The review of the literature cited above displayed that technology use in interventions for children with autism is not new in Europe and US. Although the number of people with autism is increasing rapidly in Turkey, there is a limited number of research study focused on different interventions to teach social and academic skills to children with autism. The use of technology, specifically computer technology, is a new concept for professionals and academicians in Turkey. Therefore; this research study is focused on prospective special education teachers' understandings of technology and its use in interventions for children with autism. Following research questions were investigated in this research study:

1. What is participants' understanding about autism?
2. What is participants' understanding about technology?
3. What is participants' understanding about use of technology in interventions for people with autism?

## **Method**

### **Research Participants:**

Research study is designed in a qualitative manner. The researcher is an instructor in the elementary education department of a faculty of education located in Marmara Region, Turkey. Research participants were students of special education department of the university in which the researcher was working. Thirty prospective special education teachers, at their sophomore level, were participated in this research study. As gender or age is not the main factor in this research study, participants' demographic values are not cited here in paper. The research participants were attending a course named "teaching science for special education children" and instructed by the researcher.

### **Data Collection:**

Data collection process took place within the framework of the course mentioned above. A questionnaire designed by the researcher and semi-structured in-class interviews were data collection techniques used in this research study. The questionnaire includes seven open-ended questions to examine participants' understandings of autism, technology and use of technology in interventions for autism as described in the research questions above. Interviews were also structured around these three items.

### Data Analysis:

Data gathered via questionnaire and interviews were analyzed qualitatively. First; participants' responses to each item in the questionnaire were open-coded separately. Open coding of the responses to seven questions resulted in three categories: autism, technology, technology use in autism. Then, in-class group interviews were open-coded and codes from interviews were used to support the three categories cited above. The researcher generated three assertions based on these categories. These assertions are presented in the findings and conclusion section below.

### Findings and Conclusion

The research questions were revisited and assertions related to research questions were generated at the end of data analysis. In the section below, each research question identifies an assertion. Each assertion explains how participants responded to research questions. Due to ethical considerations participants' names were not used in the excerpts. Instead, abbreviations like Q1 and I1 are used. Q1 shows data from questionnaire of the first participant and I1 shows data from interview of the first participant.

#### Assertion 1a): how participants define autism:

Prospective special education teachers define autism as a developmental disorder which shows itself generally with the lack of social communication skills and limited language use before age 3.

Almost all participants defined autism as a developmental disorder. Following excerpts from questionnaire and interviews illustrate examples to their definitions.

“...is a social developmental disorder which limits the social communication skills of the individuals...” (Q1).

“...it [autism] occurs before 3 years-old. Sometimes language does not develop...” (Q2).

Following excerpt from interview support the excerpts from questionnaire above.

“...well...it [autism] is a disorder which prohibits to communicate with others...I think...it must be either before age 3 or around 3 I think so...” (I3).

Although most of the participants define autism as developmental disorder, only one used the term illness for the definition of it.

“[autism] is an illness then there is no recovery for it...” (Q5).

A literature review focused on people's definition of autism support data for both of these ideas. Broderick and Ne'eman<sup>8</sup> worked on autism as metaphor in their research study. They reported two metaphors consistent with our research participants' definitions: "autism is being different" and "autism is an illness". First metaphor put emphasis on the differences among people and counts this developmental disorder as a difference. This metaphor was created by people with autism. The second metaphor counts autism as an inborn illness and created by people without autism. Broderick et al defined autism as decreasing the communication with people and the world outside and start to communicate with the self.

Assertion 1b): symptoms of autism:

Prospective special education teachers cited lack of speech, eye contact, and imitation skills among the symptoms of autism as well as citing no reflection to their names when called, stereotypical hand motions and attention deficits.

All research participants were aware of the basic symptoms of autism as cited in the assertion above. The following excerpt displays the point.

"...[their] attention span is too short, there are lack of eye contact, lack of speech and they cannot imitate what you do...even if you call their names, they do not look at you..." (Q27).

The following excerpt from interviews supports the issue above.,

"I know people with autism cannot develop eye contact with the others and they have limited language ability.....they make something typical with their hands...stereotypical I think..." (I5).

Special education departments are not the places which were facilitated to raise teachers for people with autism. Although it is the case, prospective special education teachers participated in this research study, have adequate understandings about autism and its symptoms.

Assertion 2: how participants define technology:

Prospective special education teachers define technology as devices helping people to reach the information resources and making life easier.

The word technology makes participants to think about computers, TV, video and overhead projectors. Therefore; it can be concluded that participants have very limited understandings about what technology is. They also cited some devices like audiometers, machines for magnetic resonance among the technology used in medicine.

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8 Broderick and Ne'eman, Autism as metaphor: narrative and counternarrative, *International Journal of Inclusive Education*, V.12(5), 2008.

Followings are the excerpts supporting their understandings about technology.

“...[technology] is designed with the purpose of making life easier for human being...” (Q13).

“...[technology] helps us to reach resources of information...TV, computers, overhead projectors are the technologies in education” (Q22).

“..audiometers, tomography devices, MR devices are examples of technology in medicine I think...nothing for education I know other than computers and videos...” (I3).

Three excerpts presented above display participants’ limited understandings about technology. Technology needs not to be an electrical device as participants emphasized. This is consistent with what Aydın and Tasar<sup>9</sup> argue about the prospective teachers’ definitions of technology. Functional definition of technology is “changing natural world to fulfill our needs”. This definition includes something more than electronic devices and computers.

#### Assertion 3: what participants know about the use of technology in autism:

Prospective special education teachers do not have adequate information about the use of technology in interventions for children with autism.

Although there is an increasing number of research studies in countries located in Europe and US, as cited in the introduction part of this paper, prospective special education teachers participated in this research study were not well informed about the technology available for people with autism. Only two of the participants emphasized video modeling, voice recording, and activity schedules among the technology used in the interventions for autism as displayed in the following excerpt.

“I attended a seminar a week ago...talked about the activity schedules but I am not sure...” (I7).

“I only know three things, activity schedules, video modeling and recording the voice of person with autism...you can make him to listen to his own voice then...don’t know anything else...” (I4)

The excerpts above illustrate these two participants’ limited knowledge about technology use. They have heard the names but they did not really understand how it works.

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9 Aydın, F., Tasar, M.F., “An Investigation Of Pre-Service Science Teachers’ Cognitive Structures and Ideas About The Nature Of Technology”, *Ahi Evran Üniv. Kırşehir Eğitim Fakültesi Dergisi*, V. 11,(4). pp.209-221, 2010.



Three assertions for the three categories informed researcher that research participants were good enough in understanding what autism is and what are the symptoms. They do not show the same level of understanding about what technology is and how it is used in autism. Literature review in the introduction part of the paper informs us in dealing with more technology in the interventions for people with autism. Assistive technologies for special education classrooms include tools for augmenting student communication, game learning or development of social skills. All these need to be well known and used by special education teachers when needed.

Based on the findings of this research study and literature reviewed, it is necessary to inform instructors and teachers of special education children to use more technology in their teaching process. In the universities, there need to be more courses focused on how to use technology in teaching social and academic skills to children. At the graduate and in-service level, there also need to be in-service training courses and programs designed with the same purpose. Tondeur, Braak, Siddiqq and Scherer<sup>10</sup> support this need by stating that helping pre-service teachers to design technology-rich lessons and providing adequate feedback need to be considered in teacher training institutions. Additionally, if educators focus on the strengths and interests of youth with autism, rather than on remediating deficits, it is possible to see increase in self-esteem and confidence for youth, enhancement in social engagement with peers and family members, and the acquisition of computer skills for future vocations<sup>11</sup> All of the above citations and results of this research study require teachers of special needs students know and use technology in teaching.

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10 Toundeur, J., Braak, J., Siddiqq, F., Scherer, R., "Time for a new approach to prepare future teachers for educational technology use: Its meaning and measurement", *Computers and Education*, V.94, 2016

11 Diener, M. L., Wright, C.A., Wright, S.D., Anderson, L.L., *Tapping into Technical Talent: Using Technology to Facilitate Personal, Social, and Vocational Skills in Youth with Autism Spectrum Disorder: Technology and the Treatment of Children with Autism Spectrum Disorder*, Springer, 2015.

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