Education and Science

Original Article

Vol 46 (2021) No 207 203-230

The Effectiveness of Video-Enhanced Activity Schedules in the Teaching of Science Experiments to Seventh-Grade Students with Autism Spectrum Disorder Who Benefit from Inclusive Practices *

Ersin Elmaci [1], Özcan Karaaslan [2]

Abstract

Three students who were diagnosed with autism spectrum disorder (ASD) and continued their full-time inclusive education participated in the study. The purpose of this study was to determine whether using video-enhanced activity schedules is effective in teaching science experiments (mixture-separation experiments) to seventh-grade students with ASD who benefit from inclusive practices. A multiple-probe design across the participants, one of the single-subject research methods, was used in the study. While the dependent variable of the study was science experiments on the separation of mixtures, the independent variable was the use of video-enhanced activity schedules. In the teaching of some science experiments about the separation of mixtures through the method of video-enhanced activity schedules, baseline, instructional, maintenance, and generalization sessions were organized. The skill steps required for the teaching of the experiments were recorded with a camera, and then these videos were used in teaching sessions as materials. The findings of the study suggested that using video-enhanced activity schedules was effective in the teaching of science experiments about the separation of mixtures to seventh-grade students with ASD who were benefiting from inclusive practices. It was observed that the students retained the information on mixture separation experiments they had learned even after the teaching ended. It was also revealed that the seventh-grade students with ASD benefiting from inclusive practices could generalize the information they had learned from the science experiments to different media and practitioners.

Keywords

Autism Spectrum Disorder
Inclusion
Science Education
Video-Enhanced Activity Schedules

Article Info

Received: 01.24.2020
Accepted: 02.09.2021
Online Published: 03.25.2021

DOI: 10.15390/EB.2021.9394

* This article is derived from Ersin Elmacı's PhD dissertation entitled "Effects of video enhanced activity schedules on teaching science experiments to the inclusion students with autism enrolled in seventh grade", conducted under the supervision of Özcan Karaaslan. Additionally, it is orally presented at the "Uluslararası Öğretmen Eğitimi ve Akreditasyon Kongresi" and "2018 ICBTS International Multidiscipline Research Conference".

[1] Siirt University, Faculty of Education, Department of Mathematics and Science Education, Turkey, ersinelmaci@siirt.edu.tr
[2] Marmara University, Atatürk Faculty of Education, Department of Special Education, Turkey, ozcanka@gmail.com

Introduction

Autism Spectrum Disorder (ASD) is a neurobiological disorder that shows symptoms of inadequacy and reluctance in establishing eye contact, joint attention and pointing behaviors from infancy. It emerges before the age of three, manifests itself with serious social interaction and communication disorders as well as social behaviors, language, perceptual functions, repetitive behaviors and interests. It also lasts for a lifetime, differs from individual to individual in the appearance and severity of symptoms and varies from mild to severe in its characteristics (Çolak, 2016). Today, the diagnosis criteria of the International Classification of Diseases (ICD) maintained by the World Health Organization (WHO) and the Diagnostic and Statistical Manual of Mental Disorders (DSM-V), published by the American Psychological Association (APA), are widely used and accepted in the diagnosis and classification of children with ASD (Karaaslan & Karaaslan, 2016). According to the DSM-V in 2013, the entire diagnosis category of autistic disorder, pervasive developmental disorder (not otherwise specified), Asperger syndrome, childhood disintegrative disorder and Rett syndrome, which was included in DSM-IV, was removed; a single category was identified as "Autism Spectrum Disorder (ASD)," replacing pervasive developmental disorder (PDD). The symptom scale included in DSM-V indicates three different levels based on the severity of the effect experienced by the individuals with ASD: (1) "Level 1: Requiring support," (2) "Level 2: Requiring substantial support" and (3) "Level 3: Requiring very substantial support" (APA, 2013, as cited in Kırcaali-İftar, 2015). In addition, it is stated in DSM-V that individuals with ASD exhibit limited interests and repetitive behaviors, as well as insufficient social communication and interaction. However, it is argued that when these insufficiencies are not addressed with appropriate educational arrangements, they negatively affect their lives and the lives of those who are responsible for them; their insufficiencies last throughout forever in these cases. It is emphasized that a majority of individuals with ASD could experience the desired improvement and be part of society by taking certain measures, such as starting education early (minimum 20 hours per week), providing intensive education support, using a special curriculum and using visual aids and alternative/supportive communications (Güleç-Aslan, Kırcaali-İftar, & Uzuner, 2009).

According to DSM-V, it is observed that implementation of inclusive education have gained increasing importance in minimizing the limited fields of interest, repetitive behaviors and insufficiencies experienced in the social communication and interaction of individuals with ASD (APA, 2013), helping them to integrate into society and attain independent life skills (Erkaya & Gürsel, 2011). The main purpose of inclusive education, which started primarily in Scandinavian countries in the 1950s (Sucuoğlu, 2004) and inclusive education started in the United States of America (USA) in the 1970s, became a widespread over time and underpinned education policies of most countries (OECD, 1995, as cited in Yazıcıoğlu, 2018). The inclusive education, which has been used widely in recent years states that students who need special education as an educational approach provide students to become a member of society by gaining academic and social success in the same environment with their peers. The aim of the above educational approach is to accept each student in educational life with their individual characteristics and learning style (Sucuoğlu, 2006). Similarly, it is observed that inclusive education has become an important practice in Turkey as well as in the other countries and that 65% of the individuals who were enrolled in formal education and required special needs education continued their education in classes where inclusive education is practiced (Melekoğlu, 2013). According to the 2018 data of the Ministry of National Education (MoNE), there are a total of 298,523 students of formal education age enrolled at mainstream schools within the framework of inclusive education in Turkey. The number of students with ASD who are being educated with their peers in mainstream schools is 1,224 in preschool institutions, 1,379 in primary schools, 853 in secondary schools, and 175 in high schools (MoNE, 2018; Rakap, Birkan, & Kalkan, 2017, as cited in Sucuoğlu, 2019).

The data mentioned above indicates that the number of students with ASD who benefit from inclusive education is higher in primary and secondary schools. Support services regarding special needs education for individuals who are enrolled in inclusive education and require special needs education in Turkey are provided with two options: in-classroom, and non-classroom. In the in-classroom support service, an education is carried out with the help of special education teacher, consultant and teaching assistant without separating the student in the general education classroom environment. On the other hand, non-classroom support service, and education is carried out for students who need a special education outside of the classroom; in resource rooms and with special education itinerant teachers (Batu, Kırcaali-İftar, & Uzuner, 2004; Kargın, 2004). One of the prerequisite for successful inclusive education is collaboration of special education teachers who work in the inclusive class and specialist in the special education (Zigmond et al., 2009, as cited in Gürgür & Hasanoğlu-Yazçayır, 2019). However, Gün Şahin and Gürbüz (2016) state that teachers graduated without having sufficient knowledge and skills about the education of students who are in inclusive education. A study conducted by Yıkmış and Bahar (2002) state that classroom teacher working in inclusive classrooms experienced problems in determining goals for students with ASD, planning and applying educational techniques, and carrying out activities that supported and facilitated teaching. Similarly, branch teachers (e.g., science teachers, mathematics teachers) have difficulty providing systematic education to students with ASD, lack of knowledge, limited experience about preparing and implementing individual education programs and are unable to keep up with the general program most of the time (Odluyurt, 2012; Şekercioğlu, 2010). Therefore, teachers have to use methods that will increase students' learning, create a safe learning environment and inspiring classroom environment, and be well-trained and have sufficient skills in classroom environment as well as subject areas (Güner, 2010). In other words, it is important to select and implement scientific-based activities by teachers for quality teaching experience to not only students with ASD who benefits from inclusive education and have a different learning style, but also for students who need a special education.

It is observed that various institutions, such as the National Autism Center (NAC) and National Professional Development Center on Autism Spectrum Disorder (NPDC), and professional organizations, such as the Council for Exceptional Children (CEC), have been carrying out studies in the United States to determine implementations with strong evidence based for students and adults with ASD. The National Standards Project was carried out by the NAC for the first time in 2009 in order to determine evidence-based practices for individuals with ASD. In the National Standards Project carried out by the NAC in 2015, the strengths of the applications in the studies conducted between 2007 and 2012 for individuals with ASD were reported under three headings. These were (1) evidence-based practices, (2) promising practices and (3) non-evidence-based practices. Also in this report published by NAC (2015), there were 14 different practices listed under the heading of evidence-based practices, which were (1) Behavioral Treatments, (2) Cognitive Behavior Treatment Package, (3) Comprehensive Behavioral Treatment for Young Children, (4) Language Training, (5) Modeling, (6) Naturalistic Teaching Strategies, (7) Parent Training Package, (8) Peer Training Package, (9) Pivotal Response Treatment, (10) Schedules, (11) Scripting, (12) Self-Management, (13) Social Skills Package and (14) Story-Based Interventions (e.g., social stories).

In the National Standards Project carried out by NAC (2015), certain practices such as video modeling and live modeling were reviewed under the heading of "modeling" while the activity schedule was included under the heading of "schedules." Therefore, it is observed that both video modeling and activity schedules are listed among the evidence-based practices in the evaluation made by NAC (2015). Also, in the studies conducted for individuals with ASD in the literature, it was found that the practices of video modeling (Charlop-Christy & Daneshvar, 2003; Cihak, Fahrenkrog, Ayres, & Smith, 2010; Çalık, 2018; D'Ateno, Mangiapanello, & Taylor, 2003; Jowett, Moore, & Anderson, 2012; LeBlanc et al., 2003; Nikopoulos & Keenan, 2004; Shipley-Benamou, Lutzker, & Taubman, 2002; Yavuz,

2017) and activity scheduling (Cihak, 2011; Dauphin, Kinney, Stromer, & Koegel, 2004; Koyama & Wang, 2011; O'Reilly, Sigafoos, Lancioni, Edrisinha, & Andrews, 2005) were frequently used and effective in teaching certain concepts and skills to students with ASD.

When the above-mentioned evidence-based practices for individuals with ASD are considered as a whole, some researchers suggest that structured teaching applications such as video modeling or video cues should be used in educational environments for individuals with ASD, since individuals with ASD often perceive and process visual stimuli more easily than auditory and social stimuli (Bernard-Opitz, Sriram, & Sapuan, 1999; Nikopoulos & Keenan, 2006; O'Riordan, 2004, as cited in Genç-Tosun & Kurt, 2014). For example, Egel, Richman, and Koegel (1981) stated that, together with applications such as video modeling, students with ASD could learn certain concepts such as color, shape, above/below and yes/no by observing and imitating their peers with normal development (as cited in Charlop-Christy, Le, & Freeman, 2000). In the study conducted by Nikopoulos and Keenan (2006), it was found that the video modeling was also effective on students with ASD in terms of establishing social interactions. In other studies carried out on modeling with video, it was found to be effective in teaching children with ASD the ability to cross the street via the overpass (Yavuz, 2017), preparing and serving cold drinks (Gülsöz, 2014), game skills (Besler, 2015; Odluyurt, 2013; Reagon, Higbee, & Endicott, 2006; Sancho, Sidener, Reeve, & Sidener, 2010), daily life skills (Shipley-Benamou et al., 2002), social interaction skills (Acar, 2015; Pektaş Karabekir, 2016; Nikopoulos & Keenan, 2003, 2004, 2007) and speaking skills (Bahçalı, 2016; Sherer et al., 2001). In addition, it was determined to be effective in reducing the problem behaviors in students with ASD in the preschool period (Çalık, 2018).

The literature contains studies on video modeling using video technology. Video modeling is a method in which the student is presented with a video recording of a model performing a certain behavior/skill or a desired task/duty/activity. The student watches the video and imitates the model to perform the skill/target behavior. Video modeling practice is carried out by two means: presentation with video modeling and presentation with clues. In video modeling, the student watches the entire video recording from beginning to end. Then, s/he is given the opportunity to perform the skill/target behavior that is demonstrated by the model in the video recording. In video clue practice, which is a type of modeling with the video, the student is presented with a series of video clips in order. In other words, the student sees video clips where each step of the skill/target behavior is modeled. The main difference between the video modeling and video clue methods is that the entire video is shown in video modeling, while the video recording is divided into parts, or clips, which are shown separately in the video clue method (Sigafoos, O'Reilly, & De La Cruz, 2013). In studies using video modeling practice, five types of models are observed: (1) Adult model, (2) peer model, (3) video self-modeling, (4) point-of-view and (5) mixed model. In the adult model, which is the first type of video modeling, the skill or target behavior is recorded when performed by an adult, whereas in the peer model, the target behavior is recorded when performed by the student's peer of the same age and gender. Video self-modeling calls for the student to be recorded by video while performing each step of the skill or target behavior in accordance with the instructions. Then, a new video recording is obtained by combining the video recordings of each step of the skill that was recorded in parts. In the point-of-view model, the skills that reflect the point of view of the individual watching the task being performed are displayed (for instance, displaying only the hands in the hand-washing skill). The mixed model, which is the fifth modeling type, combines video modeling—in which the adult is the model—with self-modeling to provide feedback for the child or student to imitate a certain skill (McCoy & Hermansen, 2007). These types of modeling, which are used in the video modeling process, aim that the individual, who watches the behavior performed by the model on videotape, performs a similar behavior (Nikopoulos & Keenan, 2004).

Looking at the studies carried out on individuals with ASD by using only the video modeling practice in the literature, it is observed that there are studies about the effect of video modeling practice on individuals with ASD in terms of teaching them the mathematical skills (Burton, Anderson, Prater, & Dyches, 2013; Jowett et al., 2012), toilet skills (Keen, Brannigan, & Cuskelly, 2007), daily life skills such as first aid skills against home accidents, cold drink preparation and serving (Ergenekon, 2012; Gülsöz, 2014; Shipley-Benamou et al., 2002), job and professional skills such as making job interviews (Bahçalı, 2016; Rausa, Moore, & Anderson, 2016) game playing skills (Besler & Kurt, 2016; Lydon, Healy, & Leader, 2011; Reagon et al., 2006; Sancho et al., 2010), conversation skills (Sherer et al., 2001; Sng, Carter, & Stephenson, 2014), skills to start and maintain social interaction (Alzyoudi, Sartawi, & Almuhiri, 2015; Pektaş Karabekir, 2016; Nikopoulos & Keenan, 2003, 2004; Wilson, 2013), imitation skills (Kleeber & Mirenda, 2010; Rayner, 2011), crossing the road using the overpass (Yavuz, 2017) and naming the facial expressions (Akmanoglu, 2015).

In the present study, interactive video teaching—also known as video clue method, which is one of the six types of education within the video modeling process mentioned above was used together with the visual activity schedule. Visual activity schedules consist of pictures representing each step of a particular skill or behavior that is also divided into steps. Then, it is ensured that the student follows each visual activity schedule and performs each step of the skill (Spriggs, Knight, & Sherrow, 2015). In addition, activity schedules can be used with photos or in writing. Visual activitiy schedules can include informative photos, pictures, symbols, or line drawings that enable to carry out series of activities and fulfill to activities (Knight, Sartini, & Spriggs, 2015; MacDuff, Krantz, & McClannahan, 1993). Therefore, activity schedules that include visuals (photos, pictures, drawing) or word sets enable students to perform a series of activities. In addition, visuals or words help the students to participate in the activity, gain reinforcement, and engage in social interaction (McClannahan & Krantz, 2010). Activity schedules are known to have been used at the Princeton Child Development Institute (PCDI) in the United States of America for more than 20 years, and scientific studies have been carried out about activity schedules at PCDI (McClannahan & Krantz, 2010), and it is observed that the activity schedules are as frequently used in Turkey.

Looking at the studies carried out using only the activity schedule in the literature, it is observed that the activity schedule is effective in teaching children with ASD academic skills such as doing homework independently (Göç, 2016); interacting with their peers (Betz, Higbee, & Reagon, 2008); realizing free time skills such as knocking down tenpins, Mr. Potato Head and LEGO modeling (Çuhadar, 2008); communication skills (Ruhela & Parween, 2018); professional life skills (Sances, Day-Watkins, & Connell, 2019); selection skills (Watanabe & Sturmey, 2003); leisure activity skills (Carlile, Reeve, Reeve, & DeBar, 2013; Ünver, 2019); independence; social interaction and making choices (Birkan, 2013); improving game skills (Morrison, Sainato, Benchaaban, & Endo, 2002) and playing skills such as reducing resistance to perform what is required in a game (Machalicek et al., 2009); playing hide and seek (Brodhead, Higbee, Pollard, Akers, & Gerencser, 2014); social games (Akers, Higbee, Gerencser, & Pellegrino, 2018; Gadaire, Bartell, & Villacorta, 2018); independent playing skills (Akers, Higbee, Pollard, Pellegrino, & Gerencser, 2016) and socio-dramatic play skills (Pellegrino, 2018). In addition, social skills were taught to students with ASD by using social stories and activity schedules together (Daneshvar, Charlop, & Berry Malmberg, 2019).

Looking at the abovementioned studies as a whole, it is observed in the studies carried out by only using the video modeling practice or only the activity schedule that they are effective in teaching students and little children with ASD the academic, toilet, daily life, playing, business and professional life, social interaction and speaking skills. Conversely, the number of studies, which analyze the effectiveness of video modeling and activity scheduling together using video-enhanced activity scheduling in target behavior (skills or teaching concepts) to ASD students in Turkey or in other

developed or developing countries, is quite limited (Blum-Dimaya, Reeve, Reeve, & Hoch, 2010; Burckley, Tincani, & GuldFisher, 2015; Dauphin et al., 2004; Johnson, Spriggs, Shepley, Allday, & Samudre, 2019; Kimbal, Kinney, Taylor & Stromer, 2004; Ledbetter-Cho et al., 2017; Osos, Plavnick, & Avendano, 2020; Spriggs et al., 2015).

In the literature, combining activity schedules and video modeling components into a single video-enhanced activity schedule intervention package may produce more robust treatment effects than either method in isolation. Also, Mechling et al., (2009) stated that while there is a greater requirement for clues in studies where only video modeling or activity scheduling are used, there is less dependence on the clues given by the teacher in video-enhanced activity schedule with the help of clues, which enable students to see how to perform target skills step-by-step. *(For example, clues are provided with video-enhanced activity schedules, while they are provided based on the modeling of the model in videos)* (as cited in Ledbetter-Cho et al., 2017). In other words, the student would be less dependent on the teacher in the video-enhanced activity schedule by following each step of the skill, using the activity schedule to learn which skill s/he would perform and learning how to perform each step of the skill by looking at the model in the video clips. For instance, despite the fact that the requirement for the assistance of the teacher/adult is reduced in practices where only the visual activity schedule is used, students learn about the skill to follow the activity schedule and how to perform the skills in the activity schedule by presenting and withdrawing the clue. In the stage where the clue is presented, the teacher gives the clue by guiding the student manually while s/he performs the stages of gradual assistance, spatial withdrawal, shadowing and reducing closeness and withdrawing the clue to be able to take the clue back (Birkan, 2011, 2013; McClannahan & Krantz, 2010).

One of the limited numbers of studies carried out on the video-enhanced activity schedule involves the implementation of the video-enhanced activity schedule with four high school students on iPads to teach the subject of inequalities. It is observed that there are some studies on socio-dramatic game skills (Dauphin et al., 2004) and video gaming skills (Blum-Dimaya et al., 2010). Therefore, it is observed that there is a need for studies on academic skills such as science. Based on this requirement, the aim is to determine the effectiveness of using video-enhanced activity-schedule on the learning of science experiments in students with ASD who benefit from inclusive education. In light of this general purpose about the teaching of science experiments to students with ASD who benefit from inclusive education via the video-enhanced activity-schedule method, answers to the following questions are sought:

1. Is the using video-enhanced activity schedule effective on the 7th-grade students with ASD who benefit from inclusive education in terms of acquisition of science experiments?
2. Do 7th grade students with ASD who benefit from inclusive education continues to their performance and remembering the science experiments they learn two, three and four weeks after getting education with video-enhanced activity schedule?
3. Do 7th grade students with ASD who benefit from inclusive education generalize their performance in different environments and implementers after getting education with video-enhanced activity schedule?
4. What are the opinions (the social validity) of the mothers of the participants included in the study regarding the video-enhanced activity schedule and three science experiments and the video-enhanced, activity schedule related to separating the mixture, which was taught through the video-enhanced activity schedule practice?

Method

This section of the research paper includes information about the research design, the participants in the study and the prerequisite features sought in them, the environment in which the study was conducted, the data collection process and the tools used in data collection, the analysis of the obtained data, and the reliability calculations about the data.

Participants

The participants were three subjects with autism spectrum disorders studying in the seventh grade in a school affiliated with the Istanbul Provincial Directorate of National Education, adult role models to model the target behaviors (mixture separation experiments) in the video clips embedded in the activity schedule, a researcher to carry out the implementation process, and a research observer to collect the reliability data of the research participated in the study. Therefore, in this study, three seventh grade students benefiting from inclusive education in a public school affiliated to the Ministry of National Education participated in the study after obtaining the written permission of their parents who voluntarily wanted their children to participate in the study. Two of these inclusive students were female, and one of them was male. All three participants were 13 years old and had received a diagnosis of ASD from a public university hospital. In addition to inclusive education, these three participants were also receiving supportive special education services in special education and rehabilitation centers. The selection of these three students was realized by taking some prerequisite features into account. The prerequisite features sought in the participants who participated in the study were (1) to have a diagnosis of ASD, (2) to be continuing inclusive education in a public school, (3) could follow verbal instructions, (4) could direct his/her attention to visual, auditory, or tactile stimuli for five minutes, (5) could watch a five-minute video and follow the skill steps in the video, (6) not exhibit behavioral problems such as biting, yelling, etc., and (7) not to have previously participated in any study on teaching science experiments by using video-enhanced activity schedule.

Considering the prerequisite features listed above, the real names of the three participants were unmentioned in this study, and a code name was used for each. The code name 'Ece' was used for the first participant. Ece was diagnosed with ASD for the first time at three-and-a-half and started talking at eight. It is seen that Ece has been benefiting from the supportive special education service provided free of charge by MoNE in the special education and rehabilitation center both before and during the inclusive education, that is, from the first day of diagnosis. In addition, during the meeting with Ece's science teacher at the school where she is continuing her inclusive education, her teacher stated that Ece had difficulty in performing science experiments and needed supportive education about science experiments. In addition, it was determined that Ece had the abovementioned prerequisite behaviors for conducting the mixture separation experiments from science experiments that were tried to be acquired in this study.

It was detected that the second participant, for whom the code name "Ali" was used, was diagnosed with ASD at the age of four. Ali loves watching movies and playing computer games in his spare time. Ali has been continuing his inclusive education in a public school affiliated to the Ministry of National Education since the first day he was diagnosed with ASD and receives supportive special education in a special education and rehabilitation center. During the meeting with Ali's science teacher at school and his teachers at the special education and rehabilitation center where he receives the supportive special education, they stated that Ali was particularly more interested in mathematics but not interested in science. They emphasized that this kind of study could be useful for Ali.

For the last participant of the study, as with other participants, a code name was used instead of her real name. The code name "Gizem" was used for the third participant. It was found that Gizem was diagnosed with ASD at the age of three and has been receiving supportive special education in a special education and rehabilitation center from the moment she received the diagnosis of ASD. At the same time, she is continuing her education in a public school. In addition, it was stated by Gizem's teacher in the inclusive class that Gizem had difficulty in performing the experiments in science lessons.

As a result, it was determined that all three participants had difficulties in performing science experiments in their inclusive classes.

Research Design

Multiple probe design across participants, one of the single-subject research designs, was used in this study. The reason for the use of multiple probe design across participants in the implementation is that it provides the opportunity to repeat the effect of the independent variable "*video-enhanced activity schedule*" on the dependent variable "*mixture separation experiments*" on at least three participants and to evaluate the retainment (Tekin-İftar & Kırcaali-İftar, 2013).Therefore, the independent variable in this study is video-enhanced activity schedule; the dependent variables are the mixture separation experiments out of the science experiments for 7th-grade inclusive students: "*separation of the mixture with the help of a magnet*", "*separation of the mixture by filtration*" and "*separation of the mixture by density difference*".

It is known that the multiple probe design across participants is used in single-subject studies. Performing repeated measurements under standard conditions allows the determination of the effects of one or more independent variables on the dependent variable. For this purpose, in the study, the baseline data were collected from all participants simultaneously before starting the teaching. After obtaining stable, baseline-level data regarding the first participant, the practice process was started for the first participant. During teaching sessions on mixture separation experiments held with the first participant, each mixture separation experiment was performed consecutively with 15-minute intervals. No practice data were collected from the second and third participants while the practice was being carried out with the first subject. The implementation process for the first participant was completed when the criterion was met at the implementation stage, stable data were obtained, and the first full-probe session was held simultaneously with all participants. After stable data was obtained for the second participant during the first full-probe session, the implementation was started for the second participant as in the first participant, and the implementation was continued until the criterion was met. After the criterion was met by the second participant during the implementation stage, a second full-probe session was held simultaneously with all participants. In the second full-probe session, when three stable data sets were obtained regarding the third participant, the implementation with this participant was started and continued until the criterion was met. After the criterion was met in the implementation stage conducted with the third participant, the third full-probe session was held simultaneously with each participant. After that, maintenance and generalization data were collected (Fidan, 2017; Tekin-İftar & Kırcaali-İftar, 2013).

Setting and Data Collection Tools

Before starting the research process, the experiments on the "*separation of mixtures*" within the scope of science courses were selected by taking into account the seventh grade curriculum, the participants' development levels and skills, and the opinions of both the science teachers in the inclusive class that the participants attended, and five field experts (two lecturers and three teachers). For this purpose, the teaching of the mixture separation experiments to the three participants through the video-enhanced activity schedule was carried out in an 8x8m^2 laboratory allocated for the use of the science teaching department and located on the first floor of the main building of the Atatürk Faculty of Education at Marmara University. There were six long experiment tables, one whiteboard, and material cabinets in the laboratory where the practice was carried out. Distracting stimuli were removed from the environment, objects such as chairs and stools were pulled to the corners in order to give more room for movement, and the environment was adapted to the characteristics of the participants. The tools and materials used throughout the teaching session in the study were placed appropriately within the environment so that the student can see, and the researcher can easily reach.

Based on the opinions received from the experts, arrangements were made with regard to the stages of the experiments and the experimental materials in order to prevent the students from experiencing any problems related to the experiments. The first of these arrangements was that "spatula" was called "spoon," considering that students will have difficulty in spelling the word

spatula. The second arrangement was about fixing the filter paper used in the experiments of "*separation of the mixture by filtration*" and "*separation of the mixture by density difference*" into the funnel. Therefore, considering that it would be difficult and dangerous for the filter paper to be folded and cut properly by the students with ASD, the filter paper was folded, cut, and fixed into the funnel by wetting by the practitioner before the practice. Thus, the filter paper, together with the funnel, was made ready for the direct use of students with ASD. The third arrangement was that 0.5-liter transparent plastic bottles were used as water containers in the water-requiring experiments of "*separation of the mixture by filtration*" and "*separation of the mixture by density difference,*" since they did not have the risk of breakage and were practical for students with ASD. The fourth and last arrangement was that coarse iron powder was preferred to the fine iron powders due to the fact that the fine iron powder that was provided for the experiments at the beginning of the implementation process could stick to the hands and body of the participants.

Apart from the experimental materials, a television screen and a laptop were used during the teaching session of the study, and a camera was used to record the practices performed with each participant during the baseline, probe, instructional, maintenance, and generalization phases of the research process. In the study, a laptop computer and television were used to make use of video-enhanced activity schedule more effective by creating a wider field of view for the students. In addition, after the science experiments aimed to be taught in accordance with the purpose of the study were determined, the skill steps related to these experiments were determined by taking the experts' opinions. Then, videos and photos related to each science experiment (mixture separation experiments) were taken separately for each experiment in order to develop a video-enhanced activity schedule. In this study, the researcher worked as a practitioner and was used as the role model in these photos and videos. In the shooting of these videos, a person helped to record the video. However, in order to keep track of the performance of each participant, a probe and maintenance sessions skill analysis data record form and an instructional sessions skill analysis data record form was used.

General Procedure

Firstly, the necessary written permission was obtained from the Istanbul National Education Directorate. Secondly, prior to the study, the families of the subjects were interviewed and informed about the study, and families who volunteered for their children to participate in the research were determined. After the written permission that they volunteered to participate in the research was obtained from the families who wanted their children to participate in the research, the implementation process was started. The implementation process consisted of probe sessions (baseline probe session, full-probe session, and daily probe session), video-enhanced activity schedule teaching sessions, generalization sessions, and maintenance sessions.

Baseline Probe Sessions. Baseline probe sessions were held in the laboratory. The sessions were conducted until stable data were obtained in at least three consecutive sessions. In these sessions, the single-opportunity method was used to collect data on the students' existing performances in the mixture separation experiments to be taught. While the baseline data was being obtained by the researcher who worked as a practitioner in the study, the skill instructions were presented separately for each mixture separation experiment, which was the target stimulus. For example, the skill instructions, such as "do the experiment of separation of the mixture with the help of a magnet", "do the experiment of separation of the mixture by filtration", and "do the experiment of separation of the mixture by density difference", were given by the practitioner for each mixture separation experiment. In addition, no controlling prompt was used while giving the skill instruction, which was unique for each experiment and each subject: "[subject name], now with you, we will study the experiment of [name of the mixture separation experiment]". The question of "Are you ready?" was asked. Once the subjects expressed with gestures, mimics, or verbal expressions that they were ready to study, then skill instruction was given for each experiment.

Instructional Sessions. All teaching sessions were held between 17:00 and 19:00 on two days of the week and were organized as an instructional session each day. Baseline data related to the science

experiments (mix separation experiments) of the students participating in the research were collected, and use of video-enhanced activity schedule was initiated with the first student about whom stable data were obtained. In this study, video prompting practice, which is a type of video modeling practice, was used by embedding it in the video-enhanced activity schedules. Sigafoos et al. (2013), stated that video prompting practice can be used by displaying a serial video clip to the participants in turn. Therefore, a similar process was followed in this study, and the teaching was started by showing the participant a video clip where the first step of skill analysis related to the target behavior was modeled. Then the participant watching the video clip was given the opportunity to perform the first step of the target behavior. In this process, video clips related to the other skill steps of the target behavior were displayed to the participants, and this process continued until the participants had seen all of the video clips of the target behavior. In the initial sessions, the teacher helped the participants to perform the skill steps of the target behavior. Also, in teaching sessions, the participants were given an attention-grabbing verbal prompt, such as "Ali! Today, we will do the experiment of separation of a mixture by filtration. First, we will watch it in a video. Then, we will do the same. Are you ready?" The practitioner stood by the child during the teaching sessions and presented the necessary controlling prompt—full physical, partial physical, or shadowing—when the child was unresponsive or responded incorrectly. Since science experiments, which are the target behaviors, are behavior chains, an experiment was conducted for skill steps in each session. The participant's response interval between skill steps was determined to be 5 seconds. In addition, each participant was provided with the skill instructions of "*start the experiment of separation of the mixture with the help of a magnet*," "*start the experiment of separation of the mixture by filtration*," and "*start the experiment of separation of the mixture by density difference"* for the three different experiments. Immediately after the skill instruction, the researcher went near the student, presented a verbal prompt, and performed the skill steps of the relevant experiment together with the student. While the initial sessions were conducted by presenting verbal prompts, the participants' reactions were followed, and the prompt was faded when the participants started to specialize in the skill steps. In addition to these issues mentioned, the reactions of each participant were monitored during the teaching process, and instant decisions were made about the prompt. For example, depending on the student's performance during teaching, verbal prompts were used in one skill step while only shadowing was used in another skill step.

In some stages of teaching, there were times when participants responded correctly in previous teaching sessions, remained unresponsive, or tended toward the wrong response in skill steps. Re-increasing the density of prompts was preferred in these cases. The prompts presented throughout the use of video-enhanced activity schedule were recorded on the teaching sessions' data recording form. Taking into account that they were easy to present and they would not interrupt the experiment, verbal reinforces (e.g., "well done, you are doing very well") were used when the students with ASD responded correctly for the skill steps or gave the correct response with a less intense prompt.

Daily Probe Sessions. The researcher organized the daily probe sessions by using the single-opportunity method as a single session before the instructional sessions (the first instructional session excluded) that would be held with the participants who were taught every day. Daily probe sessions were held for each mixture separation experiment prior to each instructional session (the first instructional session excluded). Daily probe sessions and baseline sessions were carried out similarly. The number of correctly performed skill steps in the daily probe sessions was divided by the total number of skill steps and multiplied by 100; in this way, the percentage of steps that the participants performed correctly was found. In the drawing of the graph, the number of correctly performed steps in the daily probe sessions was used as data. Daily probe sessions were continued until the participants performed the science experiments (mixture separation experiments) consecutively with at least 80% accuracy. The teaching was terminated after stable data were obtained. No intervention was made during the probe sessions with the participant.

Full-Probe Sessions. After the target criteria were met in each mixture separation science experiment and stable data were obtained in the three consecutive probe sessions, a full-probe session

was held for all the students. The full-probe session was conducted in a manner similar to the process that was followed in the baseline probe sessions.

Maintenance and Generalization Sessions. Maintenance sessions were organized to reveal to what extent the participants included in the research retained knowledge of the science experiments they learned during instructional sessions that were conducted via the video-enhanced activity schedule method. The maintenance sessions took place in the second, third and fifth weeks following the last full-probe session. Generalization sessions involved changing the environment and the practitioner. In this session, the practitioner was replaced by another one (in other words, the person who gave the instruction changed). In addition, this session was carried out in a room (rather than a laboratory) where one-on-one teaching was conducted. No aid or prompt was provided to the participants during the maintenance and/or generalization sessions.

Data Collection and Analysis

Instructional, probe, maintenance and generalization data about the experiments of separation of the mixture with the help of a magnet, separation of the mixture by filtration, and separation of the mixture by density difference were obtained to determine the effectiveness of the video-enhanced activity schedule teaching method in teaching science experiments (mixture separation experiments) to the students with ASD. Additionally, social validity and reliability data were obtained.

Collection and Analysis of Effectiveness Data. The implementation data in this study were recorded using the data analysis form. The baseline, probe, instructional, maintenance and generalization data obtained during the research were kept through skill analysis record. The skill analysis data record table used in the research was provided by performing skill analysis on the science experiments, which is the dependent variable of the research. While recording the skill analysis data, the subject's behavior chain and responses about all skill analysis steps were recorded one by one (Tekin-İftar & Kırcaali-İftar, 2013).

Correctly performed steps were marked with + (plus), while the incorrectly performed steps and the steps where the subjects remained unresponsive were marked with - (minus) in the skill analysis data record table. In the process of collecting effectiveness data, the following steps were taken: (a) The skill analysis in the experiments (mix separation experiments) was defined as the target behavior of the study and was carried out by the researcher himself, and the steps of each experiment were written in order and assessed by him through also recording in order; (b) a gesture or mimic indicating that he/she was ready for the session was expected from the participant before starting the session; (c) the target stimulus was presented with a statement such as "Use the materials in front of you to start the mixture separation experiment with the help of magnet"; (d) the participant's waiting period between the skill steps was determined to be 5 seconds; (e) correct responses were marked with the sign (+), and false responses and non-responsiveness were marked with the sign (-); (f) when the sessions were completed, the correct responses given by the participant were divided by the total number of responses, and the resulting graphic was recorded in the form of a table; (g) the data on the video recordings taken during the sessions were assessed by the researcher by watching the video recordings.

Reliability. In the study, both **inter-observer reliability data** and **treatment integrity** data were collected.

Inter-Observer Reliability. Inter-observer reliability data and the data on the reliability of science experiments, which were dependent variables, were collected and analyzed. In order to collect inter-observer reliability data, all the practices conducted during the research process were recorded in the form of videos. Inter-observer reliability and treatment integrity data were collected in at least 30% of all sessions held throughout the study. The video recordings selected for inter-observer reliability and treatment integrity were watched by a postgraduate student who had experience in the method of graduated guidance and was also a special education teacher. Therefore, the observer who would help collect the reliability data was informed about the research variables and how the full-probe, daily probe, maintenance, and generalization sessions were organized and carried out. After informing the observer, 30% of the video recordings were selected randomly to collect data, the selected video

recordings were watched, and inter-observer reliability data were recorded. The recorded data were calculated with the formula, "*Agreement / (Agreement + Disagreement) x 100"* (Tekin-İftar & Kırcaali-İftar, 2013). The inter-observer reliability data on the instructional, full-probe, maintenance, and generalization sessions of the participants are given in Table 1 below.

Table 1. Inter-Observer Reliability Data on Daily Probe, Full-Probe, Maintenance and Generalization Sessions of the Participants

Sessions	**Inter-Observer Reliability Findings**
Daily Probe Sessions	90% (range 80-100%)
Full-Probe Sessions	90% (range 85-95%)
Maintenance Sessions	90% (range 85-95%)
Generalization Sessions	95% (range 90-100%)

Treatment Integrity. The formula of "observed practitioner behavior / planned practitioner behavior X 100" (Tekin-İftar & Kırcaali-İftar, 2013) was used for the analysis of treatment integrity data, and it was seen that the researcher carried out all the sessions (in full-probe and daily probe sessions) at a 100% reliability level.

Social Validity

Social validity is used not only to determine acceptable functional and meaningful goals but also to develop acceptable programs (Vuran & Sönmez, 2008). Social validity data of this study were obtained by conducting semi-structured interviews with the mothers of the 7th-grade students after the study ended.

Results

The research findings were discussed under two headings, considering the research objectives. While the effectiveness data were explained under the first heading, social validity data were summarized under the second heading. With regard to the effectiveness data, the data on the effectiveness and baseline levels of the participants were explained under the heading of "*Findings about effectiveness*". Maintenance and generalization data were handled under the heading of "*Findings about maintenance and generalization*". The data in Figure 1 were obtained by using the right numbers of skill steps in the participants' experiments. When the findings were analyzed as a whole, Ece's baseline session averages in relation to "*separation of the mixture with the help of a magnet*," "*separation of the mixture by filtration*," and "*separation of the mixture by density difference*" were found to be at the accuracy levels of 37.5%, 33.3%, and 35.55%, respectively. Ali's baseline session averages for all three experiments were at accuracy levels of 12.5%, 19.44%, and 22.22%, respectively. The accuracy levels of Gizem's baseline session averages for all three experiments were 33.33%, 27.7%, and 35.5%. When the daily probe sessions conducted before the teaching sessions held with each participant immediately after the end of the baseline sessions are examined, it is seen that the participants performed all the experiments with over 80% or 100% accuracy in a way to provide stable data in the last three daily probe sessions. It is seen that all of the participants performed their science experiments at 100% accuracy both in the maintenance sessions that took place two weeks after the implementation ended and in the generalization sessions.

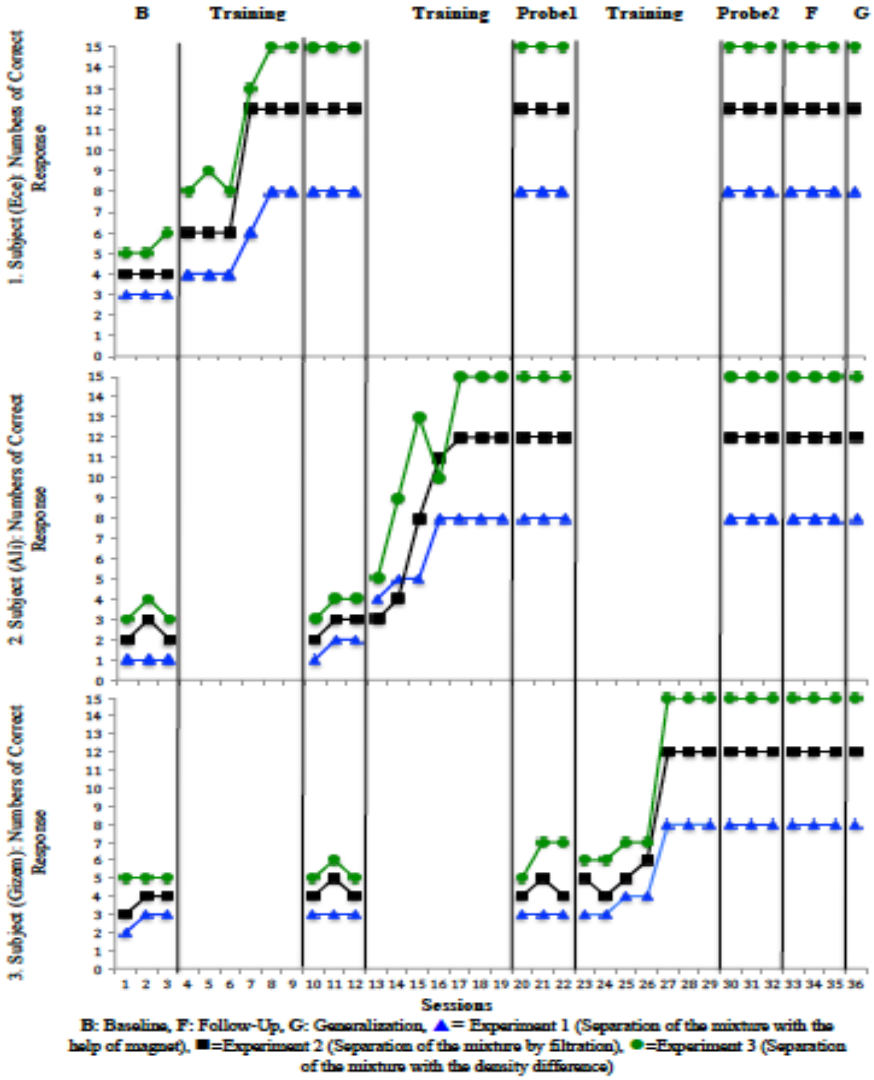

Figure 1. Findings About the Participants

Findings about the Participants

Acquisition Findings about Ece. When the baseline data in Figure 1 about Ece's experiment on "*separation of the mixture with the help of a magnet*" are analyzed, Ece appears to have failed the experiment of "*separation of the mixture with the help of a magnet*" as she performed the experiment of "*separation of the mixture with the help of a magnet*" at the average accuracy level of 37.5%. A total of 6 teaching sessions were held, with Ece's probe sessions preceding them, and Ece appears to have carried out the experiment on the *"separation of the mixture with the help of a magnet*" at the average accuracy level of 70.83% (Range: 50%-100%) in these probe sessions. In other words, while Ece conducted the experiment on the "separation of the mixture by filtration" at the average accuracy level of 100% through the using video-enhanced activity schedule in the three probe sessions held after the third probe session, practice sessions were terminated as she conducted the experiments on the "*separation of the mixture with the help of a magnet*" and the "*separation of the mixture by density difference*" in the three consecutive probe sessions held after the third probe session at an average accuracy level of over 80%. It was also observed that Ece responded with 100% accuracy in the first, second, and third full-probe sessions related to this experiment. Based on these data, it was seen that Ece completed on average 3 of the 8 skill steps of the experiment on the "*separation of the mixture with the help of a magnet*" (at the average accuracy level of 37.5%) in the baseline session and carried out the experiment on the "*separation of the mixture with the help of a magnet*" through use of video-enhanced activity schedule at 91.66% average accuracy level.

When the baseline data in Figure 1 about Ece's experiment on "*separation of the mixture by filtration*" were examined, it was revealed that Ece carried out this experiment at 33.33% average accuracy (Range: 33.33%–33.33%). In other words, Ece failed to conduct this experiment in the baseline session. After the baseline data were collected, a total of six teaching sessions were held with Ece. Probe sessions were held before each teaching session, and it was found that Ece carried out the *"separation of the mixture by filtration*" experiment at 75% average accuracy (Range: 50% –100%) in the probe sessions before the teaching sessions. The practice sessions were terminated after the third probe session since Ece conducted this experiment with 100% accuracy through the use of video-enhanced activity schedule in three consecutive probe sessions. It was also revealed that Ece responded with 100% accuracy in three consecutive full-probe sessions on this experiment. In line with these data, it was seen that Ece completed on average 4 of the 12 skill steps of the "*separation of the mixture by filtration*" experiment (at 33.33% average accuracy) in the baseline session and carried out this experiment through the use of video-enhanced activity schedule at 100% accuracy level.

Similarly, when Figure 1 was analyzed for baseline data related to Ece's experiment on "*separation of the mixture by density difference*," it was observed that Ece performed the experiment on "*separation of the mixture by density difference*" at the average accuracy level of 35.55% (Range: 33.33%–40%). In other words, Ece appears to have not fulfilled the experiment of "*separation of the mixture by density difference*" in the baseline session. After the baseline data was collected, a total of six teaching sessions were held with Ece. Probe sessions were held before each teaching session, and it was observed that Ece performed the experiment on *"separation of the mixture by density difference"* at the average accuracy of 75.55% (Range: 53.33%–100%) during the probe sessions before the teaching sessions. In other words, practice sessions were terminated after the third probe session as Ece performed the experiment on "*separation of the mixture by density difference*" at an average of 80% accuracy through the use of video-enhanced activity schedule in three consecutive probe sessions held. In addition, it was seen that Ece responded with 100% accuracy in the three consecutive sessions of this experiment. Based on the data, it seems that Ece fulfilled on average 5.33 of 15 skill steps in the experiment on "*separation of the mixture by density difference*" in the baseline session (at an average accuracy of 35.55%) and conducted the experiment on "*separation of the mixture by density difference*" with 95.55% accuracy through the use of video-enhanced activity schedule.

Acquisition Findings about Ali. When the baseline data in Figure 1 about Ali's experiment on the "*separation of the mixture with the help of a magnet*" are analyzed, Ali appears to have failed in the experiment of the "separation of the mixture with the help of a magnet" because he performed this experiment of the "*separation of the mixture with the help of a magnet*" at the average accuracy level of 12.50% (range: 12.50%–12.50%). A total of seven teaching sessions were held with Ali. Probe sessions were held before each teaching session, and Ali appears to have carried out the experiment of the "separation of the mixture with the help of a magnet" at the average accuracy level of 82.14% (range: 50%–100%) in the probe sessions held before the teaching sessions. In other words, practice sessions were terminated after the third probe session as Ali carried out the experiment of the "separation of the mixture with the help of a magnet" at 100% accuracy level through the use of video-enhanced activity schedule in four consecutive probe sessions held. In addition, it was seen that Ali responded with 100% accuracy in the last two consecutive full-probe sessions on this experiment. In line with these data, it was found that Ali fulfilled on average one of the eight skill steps of the experiment of the "*separation of the mixture with the help of a magnet*" at the average accuracy level of 12.50% in the baseline session and carried out the experiment of the "*separation of the mixture with the help of a magnet*" at 100% accuracy level through the implementation of video-enhanced activity schedule.

When the baseline data about Ali's experiment on the "separation of the mixture by filtration" in Figure 1 were examined, it was found that Ali carried out the experiment of the "separation of the mixture by filtration" at the average accuracy level of 19.44% (range: 16.66%–25%). In other words, Ali appears to have not fulfilled the experiment of the "*separation of the mixture by filtration*" in the baseline session. After the baseline data were collected, a total of seven teaching sessions were held with Ali. Probe sessions were held before each teaching session, and it was observed that Ali performed the experiment of the "*separation of the mixture by filtration*" at the average accuracy of 73.80% (range: 25%–100%) in the probe sessions before the teaching sessions. In other words, practice sessions were terminated after the fourth probe session as Ali carried out the experiment of the "*separation of the mixture by filtration*" with 100% accuracy through the use of video-enhanced activity in the three consecutive probe sessions held. It was also observed that Ali responded with 100% accuracy in the second and third full-probe sessions about this experiment. Based on these data, it seems that Ali fulfilled on average 2.33 of 12 skill steps in the experiment of the "*separation of the mixture by filtration*" at an average accuracy of 19.44% in the baseline session and carried out the experiment of the "*separation of the mixture by filtration*" at 100% accuracy level through the use of video-enhanced activity schedule.

When the baseline data about Ali's experiment on the "separation of the mixture by density difference" in Figure 1 were examined, it was evident that he carried out the experiment of the "separation of the mixture by density difference" at an average accuracy level of 22.22% (Range: 20%-26.66%). In other words, Ali appears to have failed the experiment on the "*separation of the mixture by filtration*" in the baseline session. After the baseline data were collected, a total of 7 teaching sessions were held with Ali. Probe sessions were held before each teaching session, and it was observed that Ali performed the experiment of the "*separation of the mixture by density difference*" at the average accuracy of 78.09% (Range: 33.33%-100%) in the probe sessions before the teaching sessions. In other words, practice sessions were terminated since Ali carried out the experiment of the "*separation of the mixture by density difference*" at an average of 100% accuracy through video-enhanced activity schedule in the last three probe sessions. In addition, it was determined that Ali responded with 100% accuracy in the last two full-probe sessions related to this experiment. Based on these data, Ali fulfilled on average 3.33 out of 15 skill steps in the experiment of the "*separation of the mixture by density difference*" at an average accuracy of 22.22% in the baseline session and carried out the experiment of the "*separation of the mixture by density difference*" with 100% accuracy through the using video-enhanced activity schedule.

Acquisition Findings about Gizem. When the baseline data about Gizem's experiment on "*separation of the mixture with the help of a magnet*" in Figure 1 are examined, it is seen that Gizem carried out the experiment at an average accuracy level of 33.33% (range: 25%–37.5%). A total of 7 teaching sessions were held with Gizem. Probe sessions were held before each teaching session, and Gizem appears to have carried out the experiment of "separation of the mixture with the help of a magnet" at the average accuracy level of 76.78% (range: 50%–100%) in these probe sessions held before the teaching sessions. In other words, practice sessions were terminated after the fourth probe session because Gizem carried out the experiment with 100% accuracy through the use of video-enhanced activity schedule in the three consecutive probe sessions. In addition, it was observed that Gizem responded with 100% accuracy in the third full-probe session about this experiment. It was understood that Gizem independently fulfilled, on average, 3.66 out of the 8 skill steps in the experiment at the average accuracy level of 45.83% in the baseline session and carried out the experiment at 100% accuracy level through the application of video-enhanced activity schedule.

According to the baseline data in Figure 1, Gizem appears to have failed the experiment of "separation of the mixture by filtration" in the baseline session as she performed this experiment at an average accuracy level of 27.7% (Range: 25-33.33%). After the baseline data were collected, a total of

seven teaching sessions were held with Gizem. Probe sessions were held before each teaching session and it was observed that Gizem performed the experiment of "*separation of the mixture by filtration*" at the average accuracy of 60.71% (Range: 25-100%) in these probe sessions before the teaching sessions. In other words, practice sessions were terminated after the fourth session as Gizem carried out the experiment of "separation of the mixture by filtration" with 100% accuracy through the video-enhanced activity schedule in the three consecutive probe sessions held. In addition, it was seen that Gizem responded with 100% accuracy in the last full-probe session related to this experiment. Based on this data, it is clear that Gizem independently fulfilled on average 3.33 out of the 12 skill steps in her experiment on separation of the mixture by filtration at the average accuracy level of 22.22% in the baseline session but conducted the same experiment of "separation of the mixture by filtration" at 100% accuracy level through the use of video-enhanced activity schedule.

When the baseline data about Gizem's experiment on "separation of the mixture by density difference" in Figure 1 were examined, it was seen that Gizem carried out this experiment at an average accuracy level of 35.5% (Range: 33.33%–40%). In other words, Gizem appears to have failed in the "*separation of the mixture by density difference*" experiment in the baseline session. After the baseline data were collected, a total of six teaching sessions were held with Gizem. Probe sessions were held before each teaching session, and it was observed that Gizem performed the *"separation of the mixture by density difference" experiment* at the average accuracy of 63.8% (Range: 33.33%–100%) in the probe sessions before the teaching sessions. The practice sessions were terminated after the third probe session since she carried out this experiment at 100% average accuracy through the video-enhanced activity schedule in the three consecutive probe sessions held. In addition, it was seen that Gizem responded with 100% accuracy in the last full-probe session related to this experiment. Based on these data, Gizem appears to have completed, on average, 5.33 skill steps of the experiment at 35.5% average accuracy in the baseline session and carried out the same experiment at 100% accuracy through the use of the video-enhanced activity schedule.

Maintenance and Generalization Findings about Ece, Ali, and Gizem

In this section, the maintenance and generalization findings on Ece, Ali, and Gizem are summarized. In this sense, it was seen that Ece, Ali, and Gizem each performed the experiments at 100% accuracy level in all of the maintenance sessions organized two, three, and four weeks after the completion of the implementation process. Similarly, it was determined that all participants also performed the experiments with 100% accuracy in accordance with different practitioners and environmental conditions in the generalization sessions held one week after the end of the maintenance sessions.

Social Validity Findings

The social validity findings of this study were collected by interviewing the participating students' mothers. During the interviews with the mothers, a total of three open-ended questions about social validity were asked. These open-ended questions were created by consulting three experts working in the special education department of universities in Turkey and having at least a master's degree. During the interviews, the mothers were asked whether they regarded the skills gained by their children as important, whether there were any difficulties in the implementation process, and whether the students continued to use the video-enhanced activity schedule or the knowledge acquired about the science experiments learned through the video-enhanced activity schedule after the study ended. The reason for collecting validity data from the mothers of the participants instead of their teachers was that the education period of the participants in their schools had ended when the social validity data would be collected and therefore their teachers could not be reached. The answers given to the social validity questions by the mothers of students with ASD are explained below.

While taking the mothers' opinions about social validity in the study, the opinions about whether the students had any difficulties in the implementation process were asked primarily. In this context, Ece's mother said, "*She had no difficulties. She got a little bored towards the end. Only because of this she had some difficulties*, that's all." In other words, Ece's mother stated that her child did not experience any difficulties in general but that she only got slightly bored towards the end of the implementation process. In this context, Ali's mother said, "*No, he had no difficulty. He went to the education with so much love and fun. He had no difficulty*." Accordingly, Ali's mother stated that Ali did not encounter any difficulties in the research process. "*Gizem did not have any difficulty. The study was very good. It lasted without any problem. We had no problems*." With this statement, Gizem's mother stated that Gizem had no problems during the study. Within the scope of the study, the mothers were asked about their opinions on whether the students who learned science experiments on the separation of mixtures used what they learned in their daily lives. Ece's mother said, "*Ece explained that people who are dealing with scrap business are using magnets to separate metal scraps, and that the water of boiled pasta can be filtered by a filter that we call ¨iliştir (strainer)¨ among ourselves." Ece's mother added, "She also said that when olive oil is poured onto the water, it floats over the water.*" In this explanation, Ece's mother stated that Ece learned how scraps were separated with the help of a magnet. In addition, she stated that Ece explained to her how to filter the water of boiled pasta with a strainer thanks to her experiment on separation of the mixture by filtration and how the olive oil floats over the water thanks to her experiment on separation of the mixture by density difference, and thus her daughter used the information she learned from these experiments in her daily life. Ali's mother responded, "*In his daily life, Ali used a tea strainer while filling the tea into the glass after brewing tea at breakfast. He observed that the tea leaves remained on the tea strainer. Apart from that, he said that when he filled the sand and then the water into the water bucket during the summer holiday, the sand remained at the bottom, and the water remained at the top of the bucket. He also collected the needles that fell onto the ground with a magnet. He saw such a benefit of this study in daily life*." In this explanation, Ali's mother stated that Ali easily collected needles that fell onto the ground with the help of a magnet. Ali's mother expressed that Ali used the information about the experiment of "*separation of the mixture by filtration*" by saying that the tea leaves were filtered with the help of the tea strainer while Ali was pouring tea into the glass. She reported that Ali said that the sand sank to the bottom of the bucket, and the water remained on top when he filled the bucket with sand and water at the seaside during the summer holiday. Therefore, Ali adapted the information about the experiment of "separation of the mixture by density difference" into his daily life. During the interview with Gizem's mother, she stated that Gizem used the information about the mixture separation experiments she learned within the scope of the study in her daily life. With respect to Gizem's mother's opinions on this subject, she said, "For example, Gizem *could use magnets as card magnets to attach papers in daily life. She said that some metals can be pulled and separated on ships with the help of a magnet. She showed that the tea strainer can be used to separate the tea leaves from the tea. She also said that when sand is thrown into the aquarium filled with water, the sand sinks to the bottom of the water*." In other words, she expressed that Gizem used magnets such as card magnets to attach papers and that Gizem said that the magnets were used for pulling some metals on the ships, and thus, Gizem used the information about the experiment of "separation of the mixture with the help of a magnet" in her daily life. Gizem's mother emphasized that her daughter used the information she acquired from the experiments in her daily life, saying that Gizem filtered the tea leaves by means of a strainer regarding the experiment of *separation of the mixture by filtration* and she explained that *the sand sinks to the bottom of the aquarium and the water stays over the sand when sand is thrown into the aquarium filled with water* regarding the experiment of *separation of the mixture by density difference*.

In the study, the mothers of the participants expressed their opinions about whether their children shared information about the study with their science teachers. Accordingly, Ece's mother said, "*Our teacher knew beforehand that my child would do this experiment. When it finally finished, neither did s/he ask, nor did we say anything*." With this statement, Ece's mother stated that they gave information to Ece's teacher at the beginning of the research process and that they did not reach out to Ece's teacher at the end of the study. Ali's mother said, "*I told the science teacher. His teacher expressed that such things could be useful, as Ali would encounter such things often in his daily life, but they were not able to be consolidated since*

there was no laboratory in the school. He found it very useful." In this statement, Ali's mother stated that Ali's science teacher generally found it beneficial and that it would be difficult to consolidate the information learned in this research because there was no laboratory in Ali's school. Gizem's mother talked about whether they gave information to Gizem's teacher on the study*: "We gave information about the study, but later, we did not have the opportunity to talk. We could not talk to the science teacher again*.".

Discussion, Conclusion, and Suggestions

In the current study, it was examined that whether video-enhanced activity schedule was effective in teaching of science experiments (the separation of a mixture with the help of a magnet, the separation of a mixture by filtration, and the separation of a mixture with density difference) or not for ASD students who benefits from inclusive class. The results obtained in the current study revealed that video-enhanced activity schedule was effective in teaching three children with ASD to separation of mixtures experiments, the students continued to carry out the experiments that they learned and generalization them to different environment and people. The social validity data were also collected in regard to the mothers of students with ASD. During the interviews, mothers stated that their children learned the mixture separation experiments thanks to the video-enhanced activity schedule training application and they were able to generalize the experiments they learned by giving examples (For example, a student named Gizem says that magnets are used to attach paper) from the daily life.

Upon examining similar researches made on the effectiveness of video-enhanced activity schedule training application in the literature, research on academic skills (Ledbetter-Cho et al., 2017; Spriggs et al., 2015) and on social skills (Burckley et al., 2015; Cihak, 2011; Cloke, 2012; Dalgın-Eyiip & Ülke-Kürkçüoğlu, 2014; Dauphin et al., 2004; Kimball, Kinney, Taylor, & Stromer, 2004; Osos et al., 2020) were identified to take place in the studies that were conducted using video-enhanced activity schedule teaching applications. Although these studies in the literature were carried out on different topics, the results obtained in these studies were taken as a whole and compared with the results obtained in the current research; the results obtained in both the current study and studies conducted in literature indicate that video-enhanced activity schedule is effective in acquisition of social and academic skills, retention and generalization to students with ASD. Nonetheless, these studies carried out in the literature differ from this current research, in that the subject matter and the preparation of the video-enhanced activity schedule or the format of the presentation are all different (e.g., presentation on a computer, tablet or iPad). For example, in the study carried out by Dalgın-Eyiip and Ülke-Kürkçüoğlu (2014), the effectiveness of the video-enhanced activity schedule was examined by teaching three different make-believe playing skills (teatime, hairdressing, and train) to four children with ASD. In the research, the presentation of video-enhanced activity schedules prepared for teaching playing skills to children was done via computer. The obtained results showed that children could grasp these playing skills at the level of acquisition, generalization, and maintenance with the use of video-enhanced activity schedule. It was also seen within the scope of the findings in social validity that the parents and teachers of the experiment subjects had positive opinions on the teaching process of the research. Kimball et al. (2004), who carried out a similar study, showed that the video-enhanced activity schedule that they prepared in a computer-installed PowerPoint software was effective in teaching social skills to students with ASD. Dauphin et al. (2004) investigated the effectiveness of the video-enhanced activity schedule in teaching a child with ASD socio-dramatic playing skills in their research. Although the findings revealed that the video-enhanced activity schedule is effective in teaching socio-dramatic playing skills, whether a child with ASD could put socio-dramatic playing skills into practice with different people in different environments is not yet known. This is due to the fact that the study did not include maintenance and generalization sessions. Considering the necessity that a study on generalization should be carried in repetition using research by different practitioners subject to different conditions in order to increase the external validity of the research (Öncül & Yücesoy-Özkan, 2010), it is of great importance to carry out generalization and maintenance sessions in the current study in regard to external validity.

Another research conducted on teaching social skills to students with ASD was carried out by Cihak (2011) using video-enhanced activity schedule. In Cihak's study about social skills, the effectiveness of static-picture activity schedules and video-based activity schedules were compared in teaching the transitions between activities/events (e.g., transition from reading activity to computer activity, or from vocational activity to cooking activity etc.) with special education teachers of four students with ASD attending to second grade primary education. The research which was carried out using a single-subject research model, aims to teach transitional skills between in the morning and afternoon activities. Transitional skills between activities in the morning hours included certain skills such as reading about what was told in the lesson after unpacking and checking the calendar, transitioning to reading after checking the calendar, using a computer after reading, entering the music room after using a computer, going to lunch after doing activity in the music class, whereas transition skills in the afternoon activities included skills such as going from the classroom to recess, going to a math lesson after recess, starting vocational activity after math lesson, going to cooking activity when the said vocational activity is finalized, going to the school bus after packing-up Considering the results obtained in the study, the video-enhanced activity schedule was effective in teaching students with ASD to independently perform transition skills between activities. In addition to this, static-picture activity schedule was more effective for two students with ASD to learn transition skills between activities (transition skills between morning and afternoon activities), while the video-enhanced activity schedule was more effective for the other student.

Considering the results obtained in the study conducted by Cihak (2011), they seem to differ from the current research. To elaborate, in the study of Cihak (2011), there was a comparison between how effective two different methods in teaching transitional skills between activities was (static-picture activity schedule and video-based activity schedule), while in the current study, only the effectiveness of the video-enhanced activity schedule was investigated. Another difference is that while the study of Cihak (2011) was conducted with the alternating applications model, the current research was carried out using the multiple probe design.

When the studies related to teaching of academic skills using video-enhanced activity schedules are examined, it is seen that such studies were conducted about math and writing skills, and not about science. For example, Ledbetter-Cho et al. (2017) used iPod- based visual activity schedules by embedding video-enhanced activity schedule for finding the meaning of unknown word, finding the synonym of known words and teaching mathematical skills (fraction, multiplication). Findings of study indicated that two students with ASD, aged 9 and 11 years had a decrease in their stereotypical behaviors and learned academic skills at the level of acquisition, retention, and generalization. Also, in order to determine the opinions of the parents and teachers of the students with ASD in the research about the teaching of academic skills by using the video-enhanced activity schedule, social valitidy was obtained. On the other hand, Spriggs et al. (2015) conducted a study by using video-enhanced activity schedule created in an iPad, four high school students with ASD were thought academic skills such as solving mathematical equations, writing paragraphs, spell-checking as well as everyday skills such as creating charts/tables and, regarding professional skills, entering data into an Excel document and social validity was obtained. Findings of Spriggs et al. (2015) indicated that students with ASD learned the skills such as solving mathematical equations, writing paragraphs, entering data in Excel at the level of acquisition, retention and generalization. In the studies conducted by Ledbetter-Cho et al. (2017), and Spriggs et al. (2015), with the video-enhanced activity schedule; students with ASD l did not only learned academic skills but also leaned daily life and professional life skills at the level of acquisition, retention and generalization and these results show parallelism with the current study.

When above studies about video-enhanced activity schedule considered as a whole, video-enhanced activity schedule is used teaching both academic skills and playing skills (socio-dramatic) (Dauphin et al., 2004), and ability to shop and social interaction (Burckley et al., 2015; Kimball et al., 2004; Osos et al., 2020). For example; In the study conducted by Osos et al. (2020), 3 children with ASD aged between 3 and 5 years old were taught the behavior of initiating social interaction with a video-enhanced activity schedule using a tablet. However, the study does not have a social valitidy and it indicates that findings of study of Osos et al. (2020) differ from the current study because behavior of initiating social interaction with young children in preschool age was studied. Burckley et al. (2015) found that an 18-year-old young adult with ASD (was taught the shopping skill using a video-enhanced activity schedule. A social validity study was also conducted in the study. The participant of study by conducted Burckley et al. (2015) is 18 years old and shopping skills were studied, findings of the study differs from current study too.

In the study conducted by Dalgın-Eyiip and Ülke-Kürkçüoğlu (2014) effectiveness of teaching methods were that in the form of a video-enhanced activity schedule embedded in a computer in Turkey was examined. Findings of the study indicates that video-enhanced activity schedule is effective in teaching three different role playing skills (tea time, hairdressing and training) to four students with ASD. Therefore, just like in the current research, it has been proven that the students in this study also learned the aforementioned skills and could generalize the skills they acquired onto different environments and tools. In addition, fathers and teachers of the students who participated in the study expressed a positive opinion about the teaching with the video embedded activity schedule. In the research conducted by Dauphin et al. (2004) for the development of socio-dramatic playing skills (coloring games, jigsaw puzzles, acting as a trains, and video games), video-enhanced activity schedule has contributed to a student's who are in kindergarten and with ASD socio-dramatic playing skills and the kindergarten student was also observed to adapt better to the new gaming situations with a video-enhanced activity schedule.

The literature has some studies about teaching science notions to students with ASD. For example Sazak Pınar and Merdan (2016) conducted a study with three students with ASD between ages of 10 and 15. In their study graphic organizers presented with the constant time delay procedure was effective to teaching how is digestion realized. In the study conducted by Smith, Spooner, and Wood (2013) with 3 ASD students attending 7th grade between the ages of 11 and 12, stated that using embedded computer-assisted explicit instruction that is a direct instruction method was effective to teach science notion (mitotic division, chromosome). Similarly, Knight, Smith, Spooner, and Browder (2012) used direct instructional method in their study and 15 science descriptors that related with science notion were given to 3 elementary school students with ASD to identify them. For example, when asked to show the wet one, students showed to wash cloth and it states that direct instructional method was effective. Notions about the science were studied above three studies. Also, while graphic organizers presented with the constant time delay was used in the one study, direct instructional method was used others. In the current study, video-enhanced activity schedule is used to teach some science experiments. Therefore, subjects and teaching methods when above three studies are examined in terms of subjects and teaching methods, they differ from the current study. On the other hand, studies by conducting video-enhanced activity schedule like the current study, some researchers used video-enhanced activity schedule with mobile devices such as iPad and iPod for teaching social skills (Burckley et al., 2015; Cloke, 2012; Kimball et al., 2004; Ledbetter-Cho et al., 2017; Spriggs et al., 2015). For example, Kimball et al. (2004) used the activity schedule and the visual model in computer environments in conjunction to teaching social skills to students with ASD, that is, by embedding videos in the activity chart. Furthermore, in these studies, like in this research, the PowerPoint software was

utilized in the preparation of the video-enhanced activity schedule. Therefore, these studies make a mention of the research about how the video models and the activity schedules can be combined on a computer.

In addition to the studies using the video-enhanced activity schedule method, there have also been studies in the literature using only the video model or the activity schedule method. It was observed that these studies, which were conducted, where only the video model method was effective to teach social skills (Bellini, Akullian, & Hopf, 2007; Nikopoulos & Keenan, 2004). For example, in the study conducted by Nikopoulos & Keenan in 2004, video-enhanced activity schedule was effective in teaching school-aged children between the ages of 7 and 9 about initiation of social interaction and play with toys properly with social partners. Similarly, video-enhanced activity schedule is effective on speaking skills (Charlop & Milstein, 1989; Sherer et al., 2001), gaming skills (Besler, 2015; Besler & Kurt, 2016; Blum-Dimaya et al., 2010; Charlop-Christy & Daneshvar, 2003; D'Ateno et al., 2003; MacDonald, Sacramone, Mansfield, Wiltz, & Aheam, 2009; Öncül, 2015; Sancho et al., 2010), job and professional skills (Kellems & Morningstar, 2012), daily life skills (Domire & Wolfe, 2014; Shipley-Benamou, Lutzker & Taubman, 2002), and self care ability such as toilet-training skills (Lee, Anderson, & Moore, 2014). Besides all above skills, video-enhanced activity schedule is effective for academic skills such as matheamatic skilss too (Jowett et al., 2012). Therefore, video-enhanced activity schedule is effective in teaching students with ASD many skills (academic, job and professional, social, gaming, speaking skills) and finding of above studies show similarity with the current study's findings. Also, there have been studies conducted on the activity schedule related to children with ASD. It is seen that these studies are effective in teaching skills such as independent working skills (Koyama & Wang, 2011), social interaction skills (O'Reilly et al., 2005), and motor skills (Liu & Breslin, 2013). In short, in the current study, the video-enhanced activity schedule that teaching methods for teaching self-care skills and social skills as well as academic skills in students with ASD and significantly effective to the teaching of academic skills such as science experiments to students with ASD, who attend inclusion education is used.

Furthermore, the social validity data obtained from the mothers of the experiment subjects in this study have revealed that to them, using the video-enhanced activity schedule in the teaching of mixture separation experiments is beneficial and the students, who learn science experiments related to mixture separation, share positive opinions that they use what they learned about experiments in their daily lives. To put it differently, they expressed that they use them by transferring what they learned to their daily lives. However, the limitation of this research is that the social validity data were obtained only from the opinions of the mothers, and that the opinions of teachers, who worked in inclusive environments, were not taken in regard to students, who were taught skills via scientific experiments using the video-enhanced activity schedule in this research and also, by the fact that whether the students in question could use these skills in inclusive environments.

Considering the findings obtained from the research and its limitations, some suggestions can be presented for the application and future research. Two suggestions have been given in this study for future research. These are (1) conducting research similar to this study for teaching science education to students with ASD in inclusion programs and who have multiple disabilities such hearing impairment or both hearing and mental disabilities; and (2) seeing if there is a difference in model teaching applications between peers and adults in terms of their effectiveness and efficiency (in time and cost) in future studies to be carried out by using the video-enhanced activity schedule. For the practitioners working in the field, based on the results of this research, visual and written materials showing how the science experiments of the video-enhanced activity schedules are performed can additionally be prepared and presented for the use of teachers working in inclusive environments.

Acknowledgements

There was no research funding for this study, and no restrictions have been imposed on free access to, or publication of, the research data. This study is part of Ersin Elmaci's doctoral dissertation carried out at the Institute of Educational Sciences at Marmara University, İstanbul, Turkey, under the mentorship of Assoc. Prof. Dr. Özcan Karaaslan. The authors would like to thank the mothers and their children for being part of this study.

References

Acar, Ç. (2015). *Otizmli çocuklara sosyal becerilerin öğretiminde anneler tarafından hazırlanarak sunulan sosyal öykü ve video modelle öğretim uygulamaların karşılaştırılması* (Unpublished doctoral dissertation). Abant İzzet Baysal University, Bolu.

Akers, J. S., Higbee, T. S., Gerencser, K. R., & Pellegrino, A. J. (2018). An evaluation of group activity schedules to promote social play in children with autism. *Journal of Applied Behavior Analysis*, *51*(3), 553-570.

Akers, J. S., Higbee, T. S., Pollard, J. S., Pellegrino, A. J., & Gerencser, K. R. (2016). An evaluation of photographic activity schedules to increase independent playground skills in young children with autism. *Journal of Applied Behavior Analysis*, *49*(4), 954-959.

Akmanoglu, N. (2015). Effectiveness of teaching naming facial expression to children with autism via video modeling. *Educational Sciences: Theory & Practice*, *15*(2), 519-537.

Alzyoudi, M., Sartawi, A., &Almuhiri, O. (2015). The impact of video modelling on improving social skills in children with autism. *British Journal of Special Education*, *42*(1), 53-68.

American Psychological Association. (2013). *DSM-V-TR tanı ölçütleri başvuru elkitabı* (E. Köroğlu, Trans.). Ankara: Hekimler Yayın Birliği.

Bahçalı, T. (2016). *Gelişimsel yetersizliği olan bireylere tablet bilgisayarla sunulan video modelle öğretimin iş görüşmesi becerisini öğretmedeki etkililiği* (Unpublished master's thesis). Anadolu University, Eskişehir.

Batu, S., Kırcaali-İftar, G., & Uzuner, Y. (2004). Özel gereksinimli öğrencilerin kaynaştırıldığı bir kız meslek lisesindeki öğretmenlerin kaynaştırmaya ilişkin görüş ve önerileri. *Ankara Üniversitesi Eğitim Bilimleri Fakültesi Özel Eğitim Dergisi*, *5*(2) 33-50.

Bellini, S., Akullian, J., & Hopf, A. (2007). Increasing social engagement in young children with autism spectrum disorders using video self-modeling. *School Psychology Review*, *36*(1), 80-90.

Besler, F. (2015). *Anneler tarafından sunulan video modelle öğretimin otizmli çocuklara oyun becerisi öğretmedeki etkililiği* (Unpublished master's thesis). Anadolu University, Graduate of Social Sciences, Eskişehir.

Besler, F., & Kurt, O. (2016). Effectiveness of video modeling provided by mothers in teaching play skills to children with autism. *Educational Sciences: Theory and Practice*, *16*(1), 209-230.

Betz, A., Higbee, T. S., & Reagon, K. A. (2008). Using joint activity schedules to promote peer engagement in preschoolers with autism. *Journal of Applied Behavior Analysis*, *41*(2), 237-241.

Birkan, B. (2011). Otizmli çocuklara konuşma becerilerinin öğretimi: Replikli öğretim. *Ankara Üniversitesi Eğitim Bilimleri Fakültesi Dergisi, 12*(1), 57-69.

Birkan, B. (2013). Etkinlik çizelgeleri: Otizmli çocuklara bağımsızlık, sosyal etkileşim ve seçim yapmayı kazandırma. *Ankara Üniversitesi Eğitim Bilimleri Fakültesi Dergisi, 14*(1), 61-76.

Blum-Dimaya, A., Reeve, S. A., Reeve, K. F., & Hoch, H. (2010). Teaching children with autism to play a video game using activity schedules and game-embedded simultaneous video modeling. *Education and Treatment of Children*, *33*(3), 351-370.

Brodhead, M. T., Higbee, T. S., Pollard, J. S., Akers, J. S., & Gerencser, K. R. (2014). The use of linked activity schedules to teach children with autism to play hide-and-seek. *Journal of Applied Behavior Analysis, 47*(3), 645-650.

Burckley, E., Tincani, M., & Guld Fisher, A. (2015). An iPad™-based Picture and video activity Schedule increases community shopping skills of a young adult with autism spectrum disorder and intellectual disability. *Developmental Neurorehabilitation*, *18*(2), 131-136.

Burton, C. E., Anderson, D. H., Prater, M. A., & Dyches, T. T. (2013). Video self-modeling on an iPad to teach functional math skills to adolescents with autism and intellectual disability. *Focus on Autism and Other Developmental Disabilities*, *28*(2), 67-77.

Carlile, K. A., Reeve, S. A., Reeve, K. F., & DeBar, R. M. (2013). Using activity schedules on the iPod touch to teach leisure skills to children with autism. *Education and Treatment of Children*, *36*(2), 33-57.

Charlop, M. H., & Milstein, J. P. (1989). Teaching autistic children conversational speech using video modeling. *Journal of Applied Behavior Analysis*, *22*(3), 275-285.

Charlop-Christy, M. H., & Daneshvar, S. (2003). Using video modeling to teach perspective taking to children with autism. *Journal of Positive Behavior Interventions*, *5*(1), 12-21.

Charlop-Christy, M. H., Le, L., & Freeman, K. A. (2000). A comparison of video modeling with in vivo modeling for teaching children with autism. *Journal of Autism and Developmental Disorders*, *30*(6), 537-552.

Cihak, D. F. (2011). Comparing pictorial and video modeling activity schedules during transitions for students with autism spectrum disorders. *Research in Autism Spectrum Disorders*, *5*(1), 433-441.

Cihak, D. F., Fahrenkrog, C., Ayres, K. M., & Smith, C. (2010). The use of video modeling via a video iPod and a system of least prompts to improve transitional behaviors for students with autism spectrum disorders in the general education classroom. *Journal of Positive Behavior Interventions*, *12*(2), 103-115.

Cloke, A. (2012). *Video-enhanced activity schedules: Evidence-based intervention training for early childhood teachers* (Doctoral dissertation). Retrieved from ProQuest Dissertations and Theses database.

Çalık, E. S. (2018). *Otizm spektrum bozukluğu olan okulöncesi çocuklarda ortamlar arası geçişlerdeki problem davranışların azaltılmasında videoyla model olmanın etkililiği* (Unpublished master's thesis). Anadolu University, Eskişehir.

Çolak, A. (2016). Otizm spektrum bozukluğunu anlamak. In A. Cavkaytar (Ed.), *Otizm spektrum bozukluğu* (pp. 21-56). Ankara: T. C. Aile ve Sosyal Politikalar Bakanlığı, Engelli ve Yaşlı Hizmetleri Genel Müdürlüğü.

Çuhadar, S. (2008). *Resimli etkinlik çizelgesi ile sunulan öğretim sürecinin otistik özellikler gösteren çocukların serbest zaman becerilerini öğrenmeleri üzerindeki etkisi* (Unpublished doctoral dissertation). Anadolu University, Graduate School of Educational Sciences, Eskişehir.

D'Ateno, P., Mangiapanello, K., & Taylor, B. A. (2003). Using video modeling to teach complex play sequences to a preschooler with autism. *Journal of Positive Behavior Interventions*, *5*(1), 5-11.

Dalgın-Eyiip, Ö., & Ülke-Kürkçüoğlu, B. (2014, September). *Bilgisayarda video gömülü etkinlik çizelgeleriyle sunulan öğretimin OSB olan çocukların çizelge izleme ve oyun becerileri üzerindeki etkileri*. Paper presented at the 24. Ulusal Özel Eğitim Kongresi, Trakya University, Edirne. Retrieved from http://bys.trakya.edu.tr/file/open/96414503

Daneshvar, S. D., Charlop, M. H., & Berry Malmberg, D. (2019). A treatment comparison study of a photo activity schedule and Social Stories for teaching social skills to children with Autism Spectrum Disorder: Brief report. *Developmental Neurorehabilitation*, *22*(3), 209-214.

Dauphin, M., Kinney, E. M., Stromer, R., & Koegel, R. L. (2004). Using video-enhanced activity schedules and matrix training to teach sociodramatic play to a child with autism. *Journal of Positive Behavior Interventions*, *6*(4), 238-250.

Domire, S. C., & Wolfe, P. (2014). Effects of video prompting techniques on teaching daily living skills to children with autism spectrum disorders: A review. *Research and Practice for Persons with Severe Disabilities*, *39*(3), 211-226.

Ergenekon, Y. (2012). Teaching basic first-aid skills against home accidents to children with autism through video modeling. *Educational Sciences: Theory & Practice, 12*(4), 2759-2766.

Erkaya, F., & Gürsel, F. (2011). Sınıf öğretmenleri için kaynaştırma sınıfları beden eğitim derslerinde otistik çocuklara yönelik kılavuz. *Selçuk Üniversitesi Beden Eğitimi ve Spor Bilim Dergisi, 13*(Ek Sayı), 13-17.

Fidan, A. (2017). Tek denekli araştırma modelleri. In E. Tekin-İftar (Ed.), *Uygulamalı davranış analizi* (3rd ed., pp. 147-210). Ankara: Vize Yayıncılık.

Gadaire, D. M., Bartell, K., &Villacorta, J. (2018). Evaluating group activity schedules to promote social play in children with autism. *Learning and Motivation*, *64*, 18-26.

Genç-Tosun, D., & Kurt, O. (2014). Otizm spektrum bozukluğu ve video modelle öğretim. *Ankara Üniversitesi Eğitim Bilimleri Fakültesi Özel Eğitim Dergisi*, *15*(3), 37-49.

Göç, S. (2016). *IPad yoluyla sunulan etkinlik çizelgelerinin otizm spektrum bozukluğu olan çocuklarda bağımsız ödev yapma becerileri üzerindeki etkisi* (Unpublished master's thesis). Marmara University, Graduate School of Educational Sciences, İstanbul.

Güleç-Aslan, Y., Kırcaali-İftar, G., & Uzuner, Y. (2009). Otistik çocuklar için davranışsal eğitim programı (OÇİDEP) ev uygulamasının bir çocukla incelenmesi. *Ankara Üniversitesi Eğitim Bilimleri Fakültesi Özel Eğitim Dergisi*, *10*(1), 1-25.

Gülsöz, T. (2014). *Yüksek fonksiyonlu otizm özelliği gösteren öğrencilere soğuk içecek hazırlama ve sunma becerisinin video model ile öğretiminin etkililiği* (Unpublished master's thesis). Necmettin Erbakan University, Graduate School of Educational Sciences, Konya.

Gün Şahin, Z., & Gürbüz, R. (2016). On the proficiency of secondary teachers educating inclusive students. *Adıyaman University Journal of Educational Sciences, 6*(1), 138-160.

Güner, N. (2010). *Kaynaştırma uygulamaları yapılan sınıflarda çalışan öğretmenlerin sınıf yönetimi bilgi düzeyleri ile önleyici sınıf yönetimi eğitim programı'nın öğretmenlerin sınıf yönetimlerine etkisinin incelenmesi* (Unpublished doctoral dissertation). Ankara University, Graduate School of Educational Sciences, Ankara.

Gürgür, H., & Hasanoğlu-Yazçayır, G. (2019). Kaynaştırma eğitimine yönelik öğretmenlerin görüşlerine odaklanılmış lisansüstü eğitim tezlerinin sentezlenmesi: Meta-etnografik bir çalışma. *Eğitimde Nitel Araştırmalar Dergisi*, *7*(2), 845-872.

Johnson, M., Spriggs, A. D., Shepley, S. B., Allday, R. A., & Samudre, M. (2019). Video activity schedules to increase idependence for students with disabilities. *Journal of Developmental and Physcial Disabilities*, *31*, 73-88.

Jowett, E. L., Moore, D. W., & Anderson, A. (2012). Using an iPad-based video modelling package to teach numeracy skills to a child with an autism spectrum disorder. *Developmental Neurorehabilitation*, *15*(4), 304-312.

Karaaslan, O., & Karaaslan, D. (2016). Otizmli çocukların tıbbi tanılama sürecinde yer alan uzman doktorların tanılamaya ilişkin görüşlerinin incelenmesi. *Trakya Üniversitesi Sosyal Bilimler Dergisi, 18*(2), 271-293.

Kargın, T. (2004). Baş makale: Kaynaştırma: Tanımı, gelişimi ve ilkeleri. *Ankara Üniversitesi Eğitim Bilimleri Fakültesi Özel Eğitim Dergisi, 5*(2), 1-13.

Keen, D., Brannigan, K. L., & Cuskelly, M. (2007). Toilet training for children with autism: The effects of video modeling. *Journal of DevelopmentalandPhysicalDisabilities, 19*(4), 291-303.

Kellems, R. O., & Morningstar, M. E. (2012). Using video modeling delivered through iPods to teach vocational tasks to young adults with autism spectrum disorders. *Career Development and Transition for Exceptional Individuals*, *35*(3), 155-167.

Kırcaali-İftar, G. (2015). *Eğitimdizisi: Otizm spectrum bozukluğu* (2nd ed.). İstanbul: Daktylos Yayınevi.

Kimball, J. W., Kinney, E. M., Taylor, B. A., & Stromer, R. (2004). Video enhanced activity schedules for children with autism: A promising package for teaching social skills. *Education and Treatment of Children*, *27*(3), 280-298.

Kleeber, V., & Mirenda, P. (2010). Teaching generalized imitation skills to a preschooler with autism using video modeling. *Journal of Positive Behavior Interventions, 12*(2), 116-127.

Knight, V., Sartini, E., & Spriggs, A. D. (2015). Evaluating visual activity schedules as evidence-based practice for individuals with autism spectrum disorders. *Journal of Autism and Developmental Disorders*, *45*(1), 157-178.

Knight, V. F., Smith, B. R., Spooner, F., & Browder, D. (2012). Using explicit instruction to teach science descriptors to students with autism spectrum disorder. *Journal of Autism and Developmental Disorders*, *42*(3), 378-389.

Koyama, T., & Wang, H. T. (2011). Use of activity schedule to promote independent performance of individuals with autism and other intellectual disabilities: A review. *Research in Developmental Disabilities, 32*(6), 2235-2242.

LeBlanc, L. A., Coates, A. M., Daneshvar, S., Charlop-Christy, M. H., Morris, C., & Lancaster, B. M. (2003). Using video modeling and reinforcement to teach perspective-taking skills to children with autism. *Journal of Applied Behavior Analysis*, *36*(2), 253-257.

Ledbetter-Cho, K., Lang, R., Moore, M., Davenport, K., Murphy, C., Lee, A., … Watkins, L. (2017). Effects of video-enhanced activity schedules on academic skills and collateral behaviors in children with autism. *International Journal of Developmental Disabilities*, *63*(4), 228-237.

Lee, C. Y. Q., Anderson, A., & Moore, D. W. (2014). Using video modeling to toilet train a child with autism. *Journal of Developmental and Physical Disabilities*, *26*(2), 123-134.

Liu, T., & Breslin, C. M. (2013). The effect of a picture activity schedule on performance of the MABC–2 for children with autism spectrum disorder. *Research Quarterly for Exercise and Sport*, *84*(2), 206-212.

Lydon, H., Healy, O., & Leader, G. (2011). A comparison of video modeling and pivotal response training to teach pretend play skills to children with autism spectrum disorder. *Research in Autism Spectrum Disorders*, *5*(2), 872-884.

MacDonald, R., Sacramone, S., Mansfield, R., Wiltz, K., & Ahearn, W. H. (2009). Using video modeling to teach reciprocal pretend play to children with autism. *Journal of Applied Behavior Analysis*, *42*(1), 43-55.

MacDuff, G. S., Krantz, P. J., & McClannahan, L. E. (1993). Teaching children with autism to use photographic activity schedules: Maintenance and generalization of complex response chains. *Journal of Applied Behavior Analysis*, *26*(1), 89-97.

Machalicek, W., Shogren, K., Lang, R., Rispoli, M., O'Reilly, M. F., Franco, J. H., … Sigafoos, J. (2009). Increasing play and decreasing the challenging behavior of children with autism during recess with activity schedules and task correspondence training. *Research in Autism Spectrum Disorders*, *3*(2), 547-555.

McClannahan, L. E., & Krantz, P. J. (2010). *Activity schedules for children with autism: Teaching independent behavior*. İstanbul: Sistem Yayıncılık.

McCoy, K., & Hermansen, E. (2007). Video modeling for individuals with autism: A review of models types and effects. *Education and Treatment of Children, 30*(4), 183-213.

Melekoğlu, M. A. (2013). Özel gereksinimli öğrencilerle yürütülen etkileşim projesinin genel eğitim öğretmenlerinin kaynaştırma uygulamalarına yönelik olumlu tutum ve farkındalık geliştirmeleri üzerindeki etkilerinin belirlenmesi. *Kuram ve Uygulamada Eğitim Bilimleri*, *13*(2), 1053-1077.

Morrison, R. S., Sainato, D. M., Benchaaban, D., & Endo, S. (2002). Increasing play skills of children with autism using activity schedules and correspondence training. *Journal of Early Intervention*, *25*(1), 58-72.

National Autism Center. (2015). *Findings and conclusions: National standards project, phase 2*. Randolph: Massachusetts: National Autism Center.

Nikopoulos, C. K., & Keenan, M. (2003). Promoting social initiation in children with autism using video modeling. *Behavioral Interventions: Theory & Practice in Residential & Community-Based Clinical Programs*, *18*(2), 87-108.

Nikopoulos, C. K., & Keenan, M. (2004). Effects of video modeling on social initiations by children with autism. *Journal of Applied Behavior Analysis*, *37*(1), 93-96.

Nikopoulos, C., & Keenan, M. (2006). *Video modelling and behaviour analysis: A guide for teaching social skills to children with autism*. Londra: Jessica Kingsley Publishers.

Nikopoulos, C. K., & Keenan, M. (2007). Using video modeling to teach complex social sequences to children with autism. *Journal of Autism and Developmental Disorders*, *37*(4), 678-693.

O'Reilly, M., Sigafoos, J., Lancioni, G., Edrisinha, C., & Andrews, A. (2005). An examination of the effects of a classroom activity schedule on levels of self-injury and engagement for a child with severe autism. *Journal of Autism and Developmental Disorders*, *35*(3), 305-311.

Odluyurt, S. (2012). Kaynaştırma ortamlarında etkili öğretim uygulamaları. In *Özel gereksinimli çocukların kaynaştırılması* (pp. 85-109). Ankara: Vize Yayıncılık.

Odluyurt, S. (2013). Kaynaştırmaya devam eden otistik özellikler gösteren çocuklara kurallı oyun öğretiminde akranları tarafından doğrudan model olma ve videoyla model olma öğretiminin etkilerinin karşılaştırılması. *Kuram ve Uygulamada Eğitim Bilimleri, 13*(1), 523-540.

Osos, J. A., Plavnick, J. B., & Avendano, S. M. (2020). Assessing video enhanced activity schedules to teach social skills to children with autism spectrum disorder. *Journal of Autism and Developmental Disorders,* 1-10.

Öncül, N. (2015). *Otizm spektrum bozukluğu olan çocuklara sembolik oyunların küçük grupla öğretiminde canlı modelle video modelle öğretimin karşılaştırılması* (Unpublished doctoral dissertation). Abant İzzet Baysal University, Graduate School of Educational Sciences, Bolu.

Öncül, N., & Yücesoy-Özkan, Ş. (2010). Orta ve ileri düzeyde zihin yetersizliği olan yetişkinlere videoyla model olma kullanılarak günlük yaşam becerilerinin öğretilmesi. *Anadolu Üniversitesi Sosyal Bilimler Dergisi, 10*(3), 143-156.

Pektaş Karabekir, E. (2016). *Akıllı tahta aracılığıyla sunulan video modelle öğretimin otizmli çocuklara sosyal tepki davranışlarının öğretimindeki etkililiği* (Unpublished master's thesis). Anadolu University, Eskişehir.

Pellegrino, A. J. (2018). *Promoting sociodramatic play between children with autism and their typically developing peers using activity schedules* (Doctoral dissertation). Utah State University, Logan.

Rausa, V. C., Moore, D. W., & Anderson, A. (2016). Use of video modeling to teach complex and meaningful job skills to an adult with autism spectrum disorder. *Developmental Neurorehabilitation*, *19*(4), 267-274.

Rayner, C. (2011). Sibling and adult video modeling to teach a student with autism: Imitation skills and intervention suitability. *Developmental Neurorehabilitation*, *14*(6), 331-338.

Reagon, K. A., Higbee, T. S., & Endicott, K. (2006). Teaching pretend play skills to a student with autism using video modeling with a sibling as model and play partner. *Education and Treatment of Children*, *29*(3), 517-528.

Ruhela, V. S., & Parween, S. (2018). Effect of visual communication in tracking activity schedule among children with autism spectrum disorder. *Indian Journal of Health & Wellbeing*, *9*(5), 748-751.

Sances, J., Day-Watkins, J., & Connell, J. E. (2019). Teaching an adult with autism spectrum disorder to use an activity schedule during a vocational beekeeping task. *Behavior Analysis in Practice*, *12*(2), 435-439.

Sancho, K., Sidener, T. M., Reeve, S. A., & Sidener, D. W. (2010). Two variations of video modeling interventions for teaching play skills to children with autism. *Education and Treatment of Children, 33*(3), 421-442.

Sazak Pınar, E., & Merdan, F. (2016). Grafik düzenleyicilerin otizmli öğrencilere fen bilgisi kavramlarının öğretimindeki etkililiği. *Ahi Evran Üniversitesi Kırşehir Eğitim Fakültesi Dergisi*, *17*(1), 111-131.

Sherer, M., Pierce, K. L., Paredes, S., Kisacky, K. L., Ingersoll, B., & Schreibman, L. (2001). Enhancing conversation skills in children with autism via video technology: Which is better,"self" or "other" as a model?. *Behavior Modification*, *25*(1), 140-158.

Shipley-Benamou, R., Lutzker, J. R., & Taubman, M. (2002). Teaching daily living skills to children with autism through instructional video modeling. *Journal of Positive Behavior Interventions*, *4*(3), 166-177.

Sigafoos, J., O'Reilly, M., & De La Cruz, B. (2013). *Video model ve video ipuçlu uygulamalar nasıl kullanılmalıdır?* (S. Topbaş & S. Eylikeder-Tekin, Trans.). Ankara: Detay Yayıncılık.

Smith, B. R., Spooner, F., & Wood, C. L. (2013). Using embedded computer-assisted explicit instruction to teach science to students with autism spectrum disorder. *Research in Autism Spectrum Disorders, 7*(3), 433-443.

Sng, C. Y., Carter, M., & Stephenson, J. (2014). A review of video modelling and scripts in teaching conversational skills to individuals with autism spectrum disorders. *Review Journal of Autism and Developmental Disorders*, *1*(2), 110-123.

Spriggs, A. D., Knight, V., & Sherrow, L. (2015). Talking picture schedules: Embedding video models into visual activity schedules to increase independence for students with ASD. *Journal of Autism and Developmental Disorders, 45*(12), 3846-3861. doi:10.1007/s10803-014-2315-3

Sucuoğlu, B. (2004). Türkiye'de kaynaştırma uygulamaları: Yayınlar/araştırmalar. *Ankara Üniversitesi Eğitim Bilimleri Fakültesi Özel Eğitim Dergisi*, *5*(2),15-23.

Sucuoğlu, B. (2006). *Etkili kaynaştırma uygulamaları: Yeni ilköğretim programları ve öğretmen yeterlilikleri ışığında*. Ankara: Ekinoks.

Sucuoğlu, B. (2019). Türkiye'de otizm spektrum bozukluğu olan çocuklar ve bütünleştirme. İstanbul: Tohum Otizm Vakfı Değerlendirme ve Gelişim Raporları II. Retrieved from https://tohumotizm.org.tr/wp-content/uploads/2019/09/turkiyede_otizm_spektrum_bozuklugu_olan_cocuklar_ve_butunlestirme.pdf

Şekercioğlu, B. (2010). *İlköğretim II. kademe branş öğretmenlerinin kaynaştırma uygulamalarında karşılaştıkları sorunlar ile ilgili görüşleri* (Unpublished master's thesis). Gazi University, Graduate School of Educational Sciences, Ankara.

Tekin-İftar, E., & Kırcaali-İftar, G. (2013). *Özel eğitimde yanlışsız öğretim yöntemleri*. Ankara: Vize Yayıncılık.

Ünver, M. (2019). *Ailelerin otizm spektrum bozukluğu olan çocuklarına serbest zaman etkinliklerini gerçekleştirirken tablet aracılığıyla sundukları etkinlik çizelgelerinin etkililiği* (Unpublished master's thesis). Anadolu University, Eskişehir.

Vuran, S., & Sönmez, M. (2008). Sosyal geçerlik kavramı ve Türkiye'de özel eğitim alanında yürütülen lisansüstü tezlerde sosyal geçerliğin değerlendirilmesi. *Ankara Üniversitesi Eğitim Bilimleri Fakültesi Özel Eğitim Dergisi, 9*(1), 55-65.

Watanabe, M., & Sturmey, P. (2003). The effect of choice-making opportunities during activity schedules on task engagement of adults with autism. *Journal of Autism and Developmental Disorders*, *33*(5), 535-538.

Wilson, K. P. (2013). Teaching social-communication skills to preschoolers with autism: Efficacy of video versus in vivo modeling in the classroom. *Journal of Autism and Developmental Disorders*, *43*(8), 1819-1831.

Yavuz, A. A. (2017). *Otizm spektrum bozukluğu olan çocuklara üst geçit kullanarak karşıdan karşıya geçme becerisinin öğretiminde videoyla model olmanın etkililiği* (Unpublished master's thesis). Anadolu University, Eskişehir.

Yazıcıoğlu, T. (2018). Kaynaştırma uygulamalarının tarihsel süreci ve Türkiye'de uygulanan kaynaştırma modelleri. *Nevşehir Hacı Bektaş Üniversitesi SBE Dergisi, 8*(1), 92-110.

Yıkmış, A., & Bahar, M. (2002). Kaynaştırma sınıflarında çalışan öğretmenlerin kaynaştırma becerilerini gerçekleştirme durumlarının saptanması. *Abant İzzet Baysal Üniversitesi Eğitim Fakültesi Dergisi*, *2*(1), 85-95.