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The Effectiveness of an Interactive Digital Animation-Enriched Application for Teaching Concepts to Students with Intellectual Disabilities.

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SUMMARY

The prerequisite for teaching many skills and behaviors to children with intellectual disabilities is that the child has acquired the basic concepts. Teaching concepts plays a very active role in the independence of the child with intellectual disabilities and in the acquisition of higher level skills that they will learn in the future. The studies conducted in recent years show that technology-based applications are effective in teaching concepts to children with intellectual disabilities. The purpose of this study is to investigate the effectiveness of a technology-enhanced concept teaching application enriched with digital animations in teaching basic concepts to children with intellectual disabilities. Two male students diagnosed with intellectual disabilities participated in the study. In determining the ethics of technology-enhanced concept teaching practice, the multiple probe between skills model, which is one of the methods of single-subject research, was used. As a result of the study, it was found that the use of technology-assisted concept teaching was effective in teaching basic concepts to children with intellectual disabilities, that the children continued the concepts learned after the end of the instruction, and that they generalized them to different situations.

Keywords: Intelelctual disability, teaching concept, technology assisted intervention

INTRODUCTION

Although the search for effective teaching continues in the education of children with intellectual disabilities, it is generally thought that the behavioral approach or applied behavior analysis methods yield successful results. With an instructive approach, the setting is primarily responsible for learning. Hence, elements such as the design of the setting, i.e., the curriculum, the selection and ordering of the examples to be presented for teaching, the observation of progress in students, and the systematic correction of student mistakes are very important in teaching and learning activities. The purpose of teaching adaptations is to ensure that students acquire and use concepts and skills permanently (Tuncer and Altunay, 2010). Teaching individuals with different learning characteristics using effective methods that can result in fewer mistakes in a shorter time may increase the quality of teaching (Tekin-İftar and Kırcaali-İftar, 2001).

Functional teaching domains for children with intellectual disabilities can be listed in the following way: a) self-care skills, b) daily living skills (home skills), c) social life skills, d) leisure time skills, e) communication skills, f) psychomotor skills, g) functional academic skills, and g) professional skills (Sucuoğlu, 2010). Two main domains, functional academic skills and independent living skills, come to the fore in the education of individuals with intellectual disabilities. In this context, it becomes important to teach concepts that are prerequisites for individuals with intellectual disabilities to acquire functional academic skills. Students with intellectual disabilities must acquire concepts and skills that are prerequisites for them to acquire basic academic skills.

The fact that examples to be presented in intervention studies carried out especially with students with intellectual disabilities are concretized, diversified, and interesting facilitates the learning of concepts and skills by such students (Tuncer and Altunay, 2010; Vuran and Çelik, 2010). The use of computer-assisted teaching prepared using multimedia components containing visual and auditory information in the education of students with intellectual disabilities is an important tool to overcome the difficulties these children encounter in learning. Especially for students with attention problems, computer-assisted teaching content is regarded as an important teaching tool since it can be presented in a systematic, gradual, and repeatable format beyond being presented through visual and auditory channels (Ortega-Tudela and Gómez-Ariza, 2006). Continuity in the education of children with intellectual disabilities is very important in terms of the permanence of what is learned. The family also has great responsibilities in this process (Cavkaytar and Diken, 2005; Eripek, 2005). Owing to technology, parents who want to contribute to the education of their children can acquire new ideas and catch the opportunity to apply them with their children without time and space restriction. The use of computers that will support and facilitate students' learning is an important element for individuals working in special education (Agarwal and Singh, 2012). As a practical tool, technology is used to provide individuals with special educational needs with practice, repetition, simulation, exploration, or communication activities through new ways of teaching and learning (Fernández-López, Rodríguez-Fórtiz, Rodríguez-Almendros, and Martínez- Segura, 2013).

Many individuals with special educational needs have difficulties reaching scientifically based applications used in teaching concepts to individuals with intellectual disabilities, and there are problems in disseminating these applications (Ünlü, Vuran and Diken, 2018). Computer-assisted education can make very significant contributions in terms of providing continuity, parallelism, permanence, and generalization by ensuring the active participation of the family in the process, especially in the education of children with intellectual disabilities. It is stated that educational applications made using technology reduce the burden of parents in family education. In general, parents who want to contribute to the education of their children can acquire new ideas owing to technology and will have the opportunity to apply this with their children without time and place restriction. Computer-assisted teaching is an important tool to make learning more effective and permanent and has significant potential in the learning process. Although many researchers have indicated that some technology applications have paved the way for the transition to the general education classroom and helped to increase student achievement for several years, technology is not used to its full potential in the field of special education. It is thought that teachers' inadequacies in instructional and support technologies, incomplete knowledge of the mainstream and general education curriculum, limited perspectives, and in-service personnel training affect this (Judge and Simms, 2009). The relevant literature shows (Morash-Macneil, Johnson and Ryan, 2017; Owuor et al., 2018) hat there are few computer and technology-assisted education programs prepared to teach concepts to individuals with intellectual disabilities. This study aims to determine the effect of an interactive digital animation-enriched application for teaching concepts that was developed by Diken, Ünlü, and Birinci (2017) on teaching concepts to children with intellectual disabilities.

METHOD

The present research was designed as a quantitative study, and a multiple probe across participants design with probe phase, one of the single-subject research designs, was used. A multiple probe across behaviors design with probe phase is a research design in which the effectiveness of an independent variable on a dependent variable is examined on at least three behaviors (Ledford and Gast, 2018). Experimental control in single-subject studies is ensured by the increase observed in the performance of the subject who receive training after the instruction compared to his/her baseline performance; near baseline performance of the subjects who do not receive training, and similarly, increase in the performance of the subjects along with implementation and similar change in all subjects in a diachronic manner (Tekin-İftar, 2012). Experimental control in this study was established by observed increases of subject' performance in providing "showing the target concepts pictures" compared to his/her baseline performance after the subject was provided with training, no change between baseline performance and later performance for subjects who were not taught the concepts and the fact that this could be observed in all subjects based on the principle of diachrony.

Dependent Variable

The independent variable in the study was determined as "students showing correctly the concept whose name was said within five seconds among three options." The dependent variable registration form was used for each concept category to measure the dependent variable. In the study, the response interval was determined as 5 seconds for the student to respond correctly to the dependent variable.

Independent Variable

The independent variable of the study is the interactive digital animation-enriched application for teaching concepts developed by Diken, Ünlü, and Birinci (2017). This application consists of three components. The first component is the teaching and transfer of the target concept in the digital story. The second stage includes the repetition of the story in a way that will enable the student to respond correctly by providing him/her with a time delay with the time delay procedure. The student's performance regarding the targeted concept is evaluated at the third stage. There are three concept categories in the application: farm animals, vehicles, and household appliances. The three steps mentioned above are applied to each of these categories.

Figure 1. samples from scenes

Participants

The independent variable of the study is the interactive digital-animation enriched application for teaching concepts developed by Diken, Ünlü, and Birinci (2017). Two male subjects who were diagnosed with intellectual disability and were 4 and 7 years old participated in the study. Berke is a 4-year-old boy diagnosed with intellectual disability. Berke was attending a private rehabilitation center during the study. Berke exhibits a performance close to the skills of his peers in gross and fine motor skills. However, he shows significant retardation in social, academic, and communication skills compared to his peers. Berke can imitate words, follow 2-3-word instructions describing two actions, initiate communication with a single word when needed, and direct his attention to the activity studied for 5 minutes. Hasan is a 7-year-old boy with an intellectual disability. Hasan was attending a private rehabilitation center during the study. Hasan exhibits a performance close to the skills of his peers in gross and fine motor skills. However, he shows significant retardation in social, academic, and communication skills compared to his peers. Berke can imitate words, follow instructions describing two actions, and direct his attention to the activity studied for at least 5 minutes.

Setting

The study was conducted in an individual training room 4 m by 4 m in size. There was a table to work with the student, chairs, and toys and materials that the student could play with during a break in the room. Various tools and materials were used during the study. Registration forms, paper, pens, picture cards, and tablet computers were used while working with the student during the study. Moreover, reinforcers determined in line with the student's interest were used to reinforce student participation.

Experimental Process

The experimental process of the study consists of multiple probe, teaching, generalization, and follow-up sessions. All sessions were held in the school setting between 9:00-15.00 on weekdays. All of the sessions were conducted as one-on-one teaching. The response interval was 5 seconds. Verbal reinforcers were used to reinforce the subject's correct responses in the multiple probe, teaching, generalization, and follow-up sessions. In all sessions, the subjects' participation in the study and their correct responses were reinforced verbally (e.g., "Well done, you are amazing," etc.) with a fixed-ratio schedule of reinforcement. Teaching sessions were continued until stable data were obtained in the subject's teaching sessions. The generalization study was performed in the form of generalization across settings. The generalization study was conducted in the form of pretest-posttest. The pretest session was held right after the first multiple probe phase, and the posttest session was held after teaching and the final probes were completed. Generalization sessions were conducted in another classroom with tablets of different sizes and with different features. Follow-up sessions were held at the 1st, 2nd, and 4th weeks after the last probe session to see whether each subject could perform the acquired behavior.

Reliability

The experimental process comprises multiple probe, teaching, generalization, and follow-up sessions. The interobserver agreement and procedural adherence coefficients were calculated in the study to be performed. While estimating interobserver agreement, video recordings of the baseline and probe sessions, during which the children's concept performances were taken, were used. Of the total records for each student, 20% were selected using a random assignment table and examined by a second observer and re-evaluated through the measurement tool prepared to measure the dependent variable. Then the scores were calculated using the "agreement/disagreement x 100" formula by the implementer and the second observer, and the interobserver agreement coefficient was calculated as 93%.

In the study to be carried out, the procedural adherence coefficient was calculated to assess whether the implementer applied the independent variable correctly. The procedural adherence evaluation form created for the "interactive digital animation-enriched application for teaching concepts" sessions, the independent variable of the study, was used. This form includes the behaviors expected from the implementer who will work with the student in that session. The video recordings of 20% of the teaching sessions to be held were determined by random assignment, and the procedural adherence of the selected session was evaluated by an independent observer using the evaluation form and estimated as 97%.

Social Validity

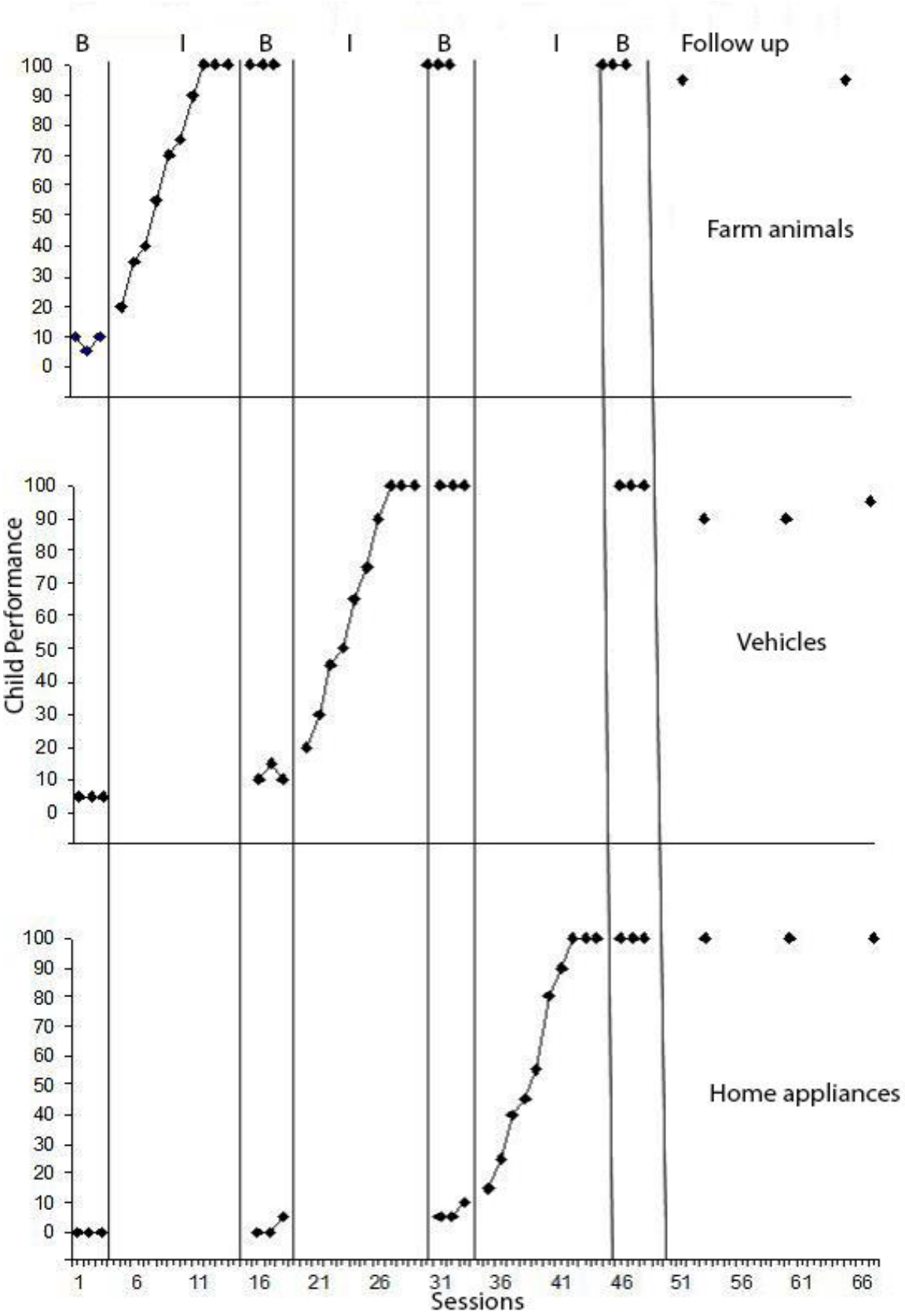
Social validity data were collected using the "social validity evaluation form," (This forms consist question like " Do you think it is an important skill for your child?, Did you enjoy using tablets and computers on teaching this concepts to your child?, What are the good side of the application?) prepared to evaluate the social validity of the study with the parents and teachers of the students who would participate in the experiment. The parents and teachers of the subjects participating in the study had positive opinions about the activity. The families thought (… when we back home he wanted to play it again) that their children enjoyed this application and that the teaching process was entertaining. The participants' teachers stated "…. using it is really easy for me, …. he really know the animals now and enjoy to use it". phrases and this shows they think the application was quite efficient and could be used easily. Furthermore, the students' teachers said (… if you will conduct some other studies please call me) that they would like to take part in similar studies. Both the teachers and parents indicated that the study also contributed positively to the students' interest and attention.

FINDINGS

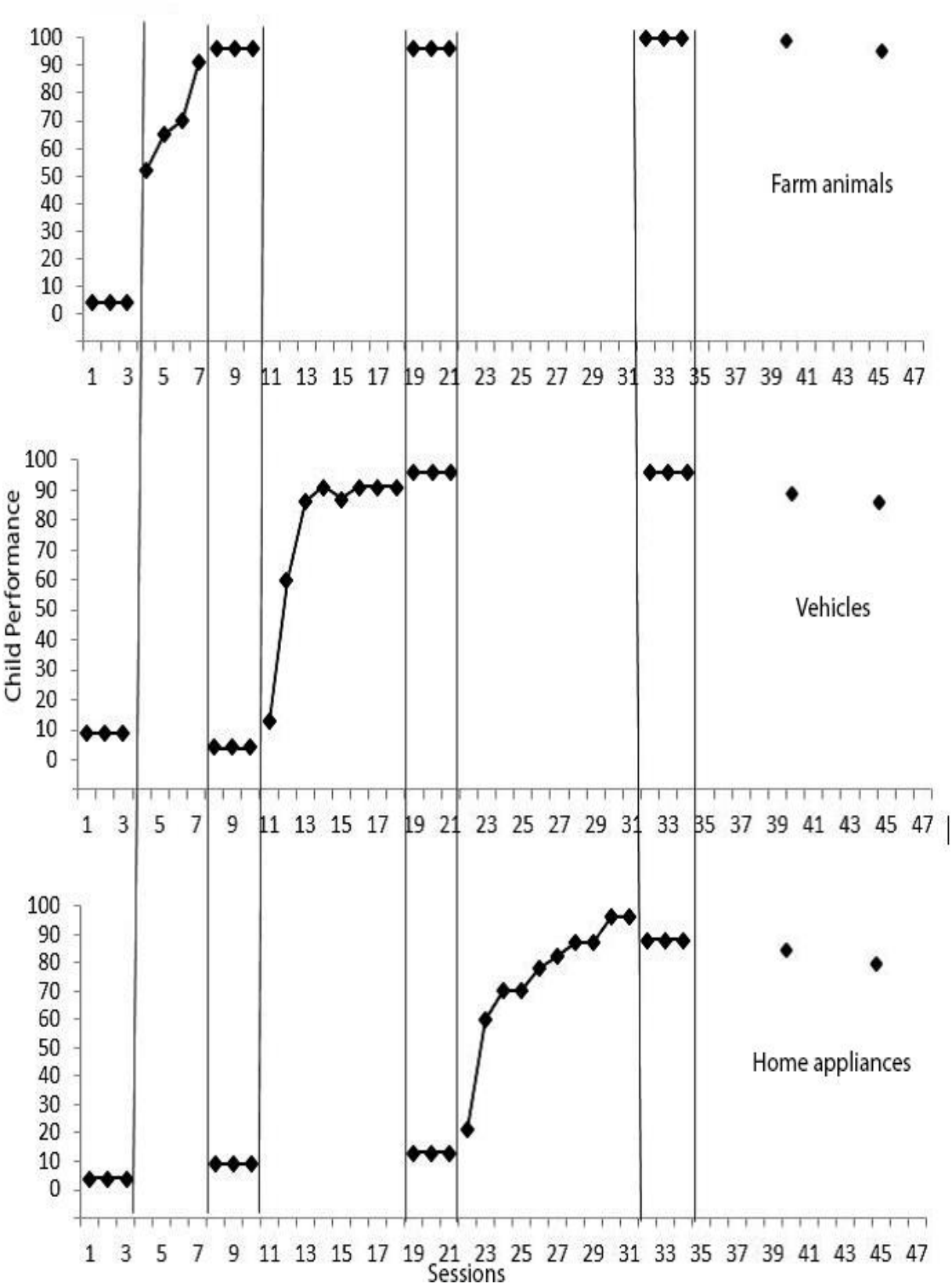
Upon examining Berke's data, it is observed that Berke acquired the concepts of farm animals, vehicles, and household appliances he studied. While Berke's baseline performance was below 10% for all skills, this percentage started to increase rapidly with the beginning of teaching. Berke exhibited the desired performance for all skills after about 8-9 teaching sessions. It is seen from the graph that the interactive digital animation-enriched application for teaching concepts was effective in teaching the concepts selected for Berke. Furthermore, it is understood from the follow-up data that Berke continued to exhibit the concepts he acquired after the end of teaching (Graph 1).

Upon examining Ahmet's data, it is observed that Ahmet acquired the concepts of farm animals, vehicles, and household appliances he studied at the criterion level. While Ahmet's baseline performance for all skills was below 10%, this percentage started to increase rapidly with the beginning of teaching. Ahmet showed the desired performance for all skills after about 9-10 teaching sessions. It is seen from the graph that the interactive digital animation-enriched application for teaching concepts was effective in teaching the concepts selected for Ahmet. Moreover, it is understood from follow-up data that Ahmet continued to exhibit the concepts he acquired after the end of teaching (Graph 2).

Graph 1: Berke's performance for the targeted concepts



Graph 2: *Ahmet's performance for the targeted concepts*


Child Performance
Farm animals
Vehicles
Home appliances
Sessions
100
90
80
70
60
50
40
30
20
10
0
1 3 5 7 9 11 13 15 17 19 21 23 25 27 29 31 33 35 37 39 41 43 45 47

CONCLUSION AND DISCUSSION

This study was conducted to determine the effect of a concept teaching application, prepared using technology support, on the teaching of basic concepts to students with intellectual disabilities. The findings obtained from the study show that the technology-assisted concept teaching application was effective in teaching basic concepts to students with intellectual disabilities. Moreover, it is revealed that the students could generalize the concepts they had acquired to different situations and maintained them after the end of the teaching.

As stated in similar studies in the literature, the teaching application carried out with technology support supports the learning of students with intellectual disabilities, provides opportunities for practice, and ensures an innovative learning experience (Agarwal and Singh, 2012; Fernández-López, Rodríguez-Fórtiz, Rodríguez-Almendros, and Martínez-Segura, 2013). The studies conducted indicate that the level of using technology-assisted applications in special education schools is moderate (Sharma and Madhumita, 2012). The results obtained from this study show that the use of similar applications will be effective and should be widespread, and it is thought that this will contribute to the more widespread use of technology-assisted applications in special education classes.

Individuals with intellectual disabilities differ in terms of their mental, personal, and social characteristics. It is stated that the most prominent of these differences in all individuals with intellectual disabilities is short attention and memory. Agarwal and Singh (2012) revealed that computer games caused an increase in the attention and memory of children with intellectual disabilities. It has been indicated that computers can be used to draw the attention of individuals with a need for special education. In this study, it is also observed that the students increased their performance quickly and actively participated in the process. The fact that the students gave very few wrong responses suggests that the technology-assisted application affects their attention positively.

Yılmaz (2008) mentioned the importance of paying attention to the concept teaching systematics in the contents to be prepared for students with intellectual disabilities and stated that special education specialists should definitely be included in the contents to be prepared. The technology-assisted application used in the current study was prepared in line with the opinions and suggestions of special education experts, and attention was paid to the concept teaching systematics. It can be said that paying attention to these situations contributes to the application's effectiveness.

The teachers of the children who participated in the study stated that they had a positive attitude toward the study and the application was easy to use. Likewise, in another study carried out by Judge (2001), preschool special education teachers said that they felt comfortable using technology-assisted applications and they wanted such applications to become widespread. The results of the current study are consistent with this study and also contribute to the elimination of the deficiency stated in the study.

The examples chosen in concept teaching, the order of their presentation, and the consistency of the feedback are critical for the permanence of knowledge in individuals with intellectual disabilities. The educational content to be prepared using multimedia components will enable individuals with intellectual disabilities to convey concepts with a rich variety of examples, sequence of examples, and feedback in a consistent way. However, it is observed that the educational content in Turkish, which has these features and is accessible to teachers, is not very common nowadays. Although various applications were added to the special education system within the scope of the Education Information Network, especially during the pandemic, there are still not enough applications with tested effectiveness and validity. Furthermore, considering that children with intellectual disabilities have to receive distance education for a long time and have to receive education individually at home during the pandemic, it can be said that a technology-assisted application for teaching concepts and similar applications will provide very important learning characteristics and may reduce the impact of the pandemic.

Three different concept groups were selected, and the concepts under these three groups were examined in this study. Different concepts can be studied in other research to be carried out, and studies that will test the effect of technology support in teaching higher-level concepts can also be conducted. Moreover, this study was carried out in the one-on-one teaching format. The effect of the application in group education can be assessed by repeating the study in the form of small-group teaching. Furthermore, the teaching provided by the expert in the study can be presented by families or teachers in other studies, and the effectiveness of using the application by different participants can be investigated.

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