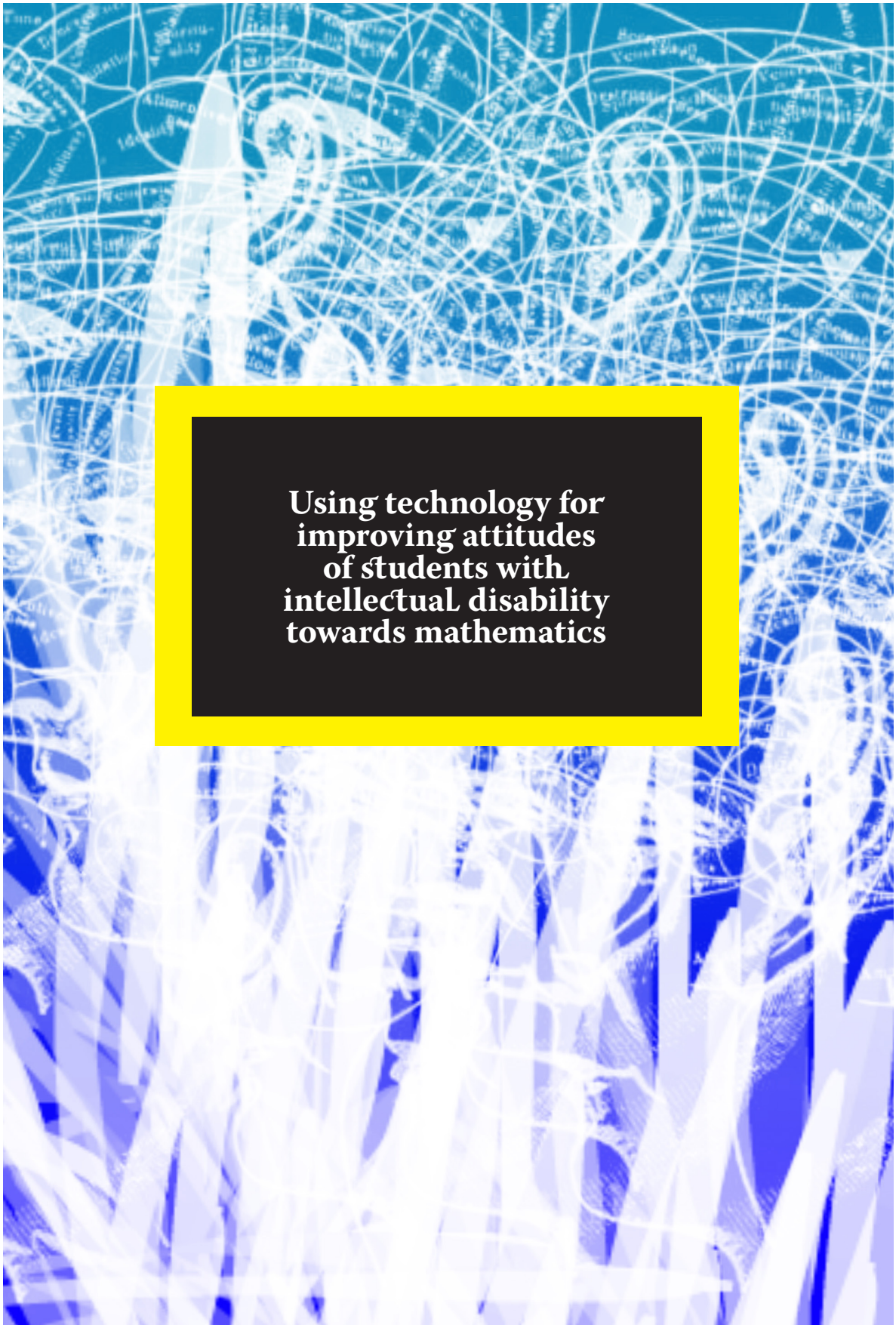

Using technology for improving attitudes of students with intellectual disability towards mathematics

USING TECHNOLOGY FOR IMPROVING ATTITUDES OF STUDENTS WITH INTELLECTUAL DISABILITY TOWARDS MATHEMATICS

USO DE TECNOLOGÍA PARA MEJORAR LAS ACTITUDES DE LOS ESTUDIANTES CON DISCAPACIDAD INTELECTUAL HACIA LAS MATEMÁTICAS.

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Abstract

Advancements and innovations in technology enhanced learning various skills of individuals with intellectual disability. These skills primarily include reading, writing and mathematical skills and attitudes of students on learning these skills are really important. Therefore, it is important to reveal whether technology really helps students with intellectual disability to improve their attitudes towards learning mathematics through technology. This study aims to determine the effectiveness of using technology to improve attitudes of students with intellectual disability towards mathematics. Pre-test and post-test single group design as an experimental research method was used in the study. A total number of 6 students with intellectual disability participated in the study. Students were subjected to teaching sessions of mathematical problem solving presented with computer aided videos consituted with direct instruction. Data were collected before and after teaching sessions in order to reveal the differences between pre and post teaching sessions through a survey. Results showed that students' attitudes towards mathematics improved after teaching sessions presented with computer aided videos. Results are discussed with relevant literature and recommendations for future research and practices are provided.

Keywords: Mathematics, intellectual disability, technology, attitude.

Resumen

Los avances e innovaciones en tecnología mejoraron el aprendizaje de diversas habilidades de las personas con discapacidad intelectual. Estas habilidades incluyen principalmente habilidades de lectura, escritura y matemáticas, y las actitudes de los estudiantes sobre el aprendizaje de estas habilidades son realmente importantes. Por lo tanto, es importante revelar si la tecnología realmente ayuda a los estudiantes con discapacidad intelectual a mejorar sus actitudes hacia el aprendizaje de las matemáticas a través de la tecnología. Este

estudio tiene como objetivo determinar la efectividad del uso de la tecnología para mejorar las actitudes de los estudiantes con discapacidad intelectual hacia las matemáticas. En el estudio se utilizó el diseño de un solo grupo antes y después de la prueba como método de investigación experimental. Un total de 6 estudiantes con discapacidad intelectual participaron en el estudio. Los estudiantes fueron sometidos a sesiones de enseñanza de resolución de problemas matemáticos presentados con videos asistidos por computadora constituidos con instrucción directa. Los datos se recopilaron antes y después de las sesiones de enseñanza para revelar las diferencias entre las sesiones de enseñanza previa y posterior a través de una encuesta. Los resultados mostraron que las actitudes de los estudiantes hacia las matemáticas mejoraron después de las sesiones de enseñanza presentadas con videos asistidos por computadora. Los resultados se discuten con literatura relevante y se proporcionan recomendaciones para futuras investigaciones y prácticas.

Palabras clave: Matemáticas, discapacidad intelectual, tecnología, actitud.

Introduction

It is known that individuals with special needs have difficulties in working, learning and developing social relations with the people around them and this situation prevents individuals with special needs to have a sense of existence in society (Vuran, 2013). Participation in society includes not only existence in the society, but also the dimensions of participating in social activities and establishing significant social ties. Thus, individuals with special needs can be physically and psychologically healthy individuals by not feeling lonely. Participation in the social process is related to social belonging, commitment, and well-being of individuals with special needs. In addition, the possibility of prejudice, exclusion and negative attitudes towards individuals with special needs in social life are considerably reduced (Wilson, Jaques, Johnson & Brotherton, 2017).

Every individual in the society shows different characteristics. Physical or behavioral differences of individuals are called "individual differences". Some individual differences might arise as disabilities in some areas and one of the types of disability is intellectual disability. Intellectual disability is defined as an insufficiency characterized by significant limitations in both adaptive behaviors that manifest in conceptual, social and practical adaptive skills (Eripek, 2009). Students with intellectual disabilities need academic skills as well as self-care skills, communication skills, business skills and social skills in order to maintain their current and future lives (Crnic et al., 2017).

Individuals with special needs should live in a functional integrity with the society in which they live. In this context, it is of great importance that individuals with special needs are given the skills to participate in the social process in order to enable them to live independently. As a result of the implementation of the No Child Left Behind Act of 2001 and the revision of the IDEA law, it was emphasized that each child can learn and the students having disabilities can benefit more by communicating with friends within the general education curriculum. (Huefner, 2000; Kauffman, Hallahan & Pullen, 2017; Williams, 2019). Participation skills in the social process consist of communication, social and functional academic skills and these skills enable individuals with special needs to participate in social life. In addition, functional academic skills mainly cover reading,

writing and mathematics skills. Although mathematics includes skills that require complex cognitive processes involving abstract concepts, it has an important role to lead and participate in social life. Supporting individuals with special needs in terms of academic and social skills contributes to their independence and involvement in social life by increasing the likelihood of their employment. (McClelland, Morrison & Holmes, 2000).

The general aim of education of individuals with intellectual disability is to perform their roles in society and to reduce problematic behaviors. The purpose of providing mathematics education is to enable individuals with intellectual disabilities to perform the basic mathematical skills they will encounter in their lives and to prepare them for life by supporting their mathematical thinking skills (Kaplan et al., 2016).

Today, technology makes life easier for people and is progressing rapidly. In the process of integration of developing technologies into the field of education, important studies are carried out on an international platform (Lai & Hong, 2015). In the last few years, there have been case studies about assistive technologies such as tablet computers, smart board applications, cloud technology applications and educational robots that can guide the use of assistive technology in special education (Nordstrom et al., 2018). Technology-supported practices in teaching various skills and behaviors (social, cognitive, motor skills, self-care, etc.) to individuals with special needs give positive and effective results. As a result of these positive outcomes, applications and tools in which technology is used in applications offered to individuals with special needs are increasing. What kind of assistive technologies will be selected for the learner among the technologies that continue to develop and make our lives easier every day is important (Artoni et al., 2018).

In addition to saving time in producing, sharing and rearranging information, new learning environments are also offered to learners through technology. For this reason, it is important that teachers who want to use technologies in learning environments determine the technologies appropriate to the needs of learners. In this context, an important planning process for assistive technologies is required in order to identify functional assistive technology tools, with the participation of the learner and teacher as well as the family and other relevant experts (Ghavifekr & Rosdy, 2015; McKnight et al., 2016; Sahin & Arslan, 2019).

In order to provide effective teaching, the individual, the family, and other experts who will use the assistive technology should decide together what type of assistive technology should be selected in the planning process of assistive technologies. For assistive technologies, a planning should be made for goals, technological tools, programs, methods, techniques and activities. If such a planning is made, a very effective and entertaining technology supported learning environment will be provided for both the learner and the teacher (Connor & Beard, 2015; Bozkurt, 2017; King & Allen, 2018; Aslan, 2018).

Spooner, Root and Saunders (2019) stated that individuals with intellectual disabilities need mathematics in daily life and it is known that these individuals learn some skills more slowly than their normal peers. Abstract concepts are difficult to learn and take a long time. They need more stimulants because their attention span is short. Different personal needs for individuals with special needs require the use of different teaching methods, the use of teaching methods and the diversification of teaching methods. The more important it is for children with normal development in mathematics teaching, the more important it is for individuals (Baglama, Yikmis & Demirok, 2017; Tan et al., 2019).

Technological tools are one of the basic tools that can be used for mathematics teaching. According to Mahmoudi et al. (2015), the use of computers in mathematics teaching will contribute to the development of students' affective and cognitive skills. The ability of individuals with intellectual disabilities to use and adopt computers is closely related to their teachers' interest in computers and their level of use (Avcioglu, 2012). In this context, it is important that teachers with mental disabilities are individuals who can use computers and use computers in their courses.

Advancements and innovations in technology enhanced learning various skills of individuals with intellectual disability. These skills primarily include reading, writing and mathematical skills and attitudes of students on learning these skills are really important. Therefore, it is important to reveal whether technology really helps students with intellectual disability to improve their attitudes towards learning mathematics through technology. This study aims to determine the effectiveness of using technology to improve attitudes of students with intellectual disability towards mathematics.

Method

Research Model

Experimental method was used in the research. Pre-test and post-test single group design of this method constitute the model of the research. In the single-group pre-test and post-test model, an independent variable is applied to a group and measurement is performed before and after the application. In the model, if there is a significant difference between the arithmetic mean of the pre-test and post-test scores obtained from the measurement tools of the group, it is accepted that the application is effective (Karasar, 2002; Balci, 2004).

Subjects

The research was conducted in a special education and rehabilitation center in North Cyprus where the subjects receive education. 6 students, one female and five male, with intellectual disability participated in the research. Code names were used instead of the real names of the subjects.

Instrument and Data Collection

In order to determine students' perceptions towards mathematics, a survey form consisting of 5 questions was formed. In the directive part of the survey, there is a directive "Circle the face that best describes how you feel!" . The possible answers to the survey are colorful emojis representing "Yes", "No" and "I do not know". The survey sample is shown in Table 1. All the questions in the survey contain expressions that will arouse positive feelings about mathematics. Therefore, the data were evaluated that the higher the number of students' "Yes" responses, the more positive their attitudes towards mathematics would be.

Table 1. Survey form used to determine students' perceptions towards mathematics

	Yes	No	I don't

			know
1. I like maths.			
2. I think I'm good at maths.			
3. I want to be good at maths.			
4. I think I'm better at maths than I used to be.			
5. I think it is very important to learn maths.			

Data Analysis

Subjects scored the questions in the survey form before and after application of teaching sessions and subjects' total scores on the survey. Subjects' pre-test and post-test scores on the survey were compared and evaluated.

Results

In this research, the survey form which was used to examine the effect of computer assisted video teaching application on students' attitudes towards mathematics was analyzed with pre-test-post test model and shown on the column graph. When the responses of the students before and after attending any of the teaching sessions were compared with the computer assisted video, it was found that the students' positive response to the questions in the survey before teaching sessions was low. It can be said that the number of positive answers to the questions in the questionnaire increased after computer assisted video teaching sessions were conducted. At this point, it can be concluded that computer-aided video instruction provided by direct teaching method positively affects the attitudes of students with mild intellectual disabilities to mathematics.

Data were collected by using a questionnaire form on the effect of computer assisted video teaching which was provided by direct teaching method on the attitudes of students with mild intellectual disabilities to mathematics. The data were collected by filling the students in the form of pre-test and post-test twice before the start of the sessions and after the end of all sessions. The relevant data are presented in Figure 12. While showing the data, the results of the pre-test and post-test results were included in the six subjects who participated in the study.

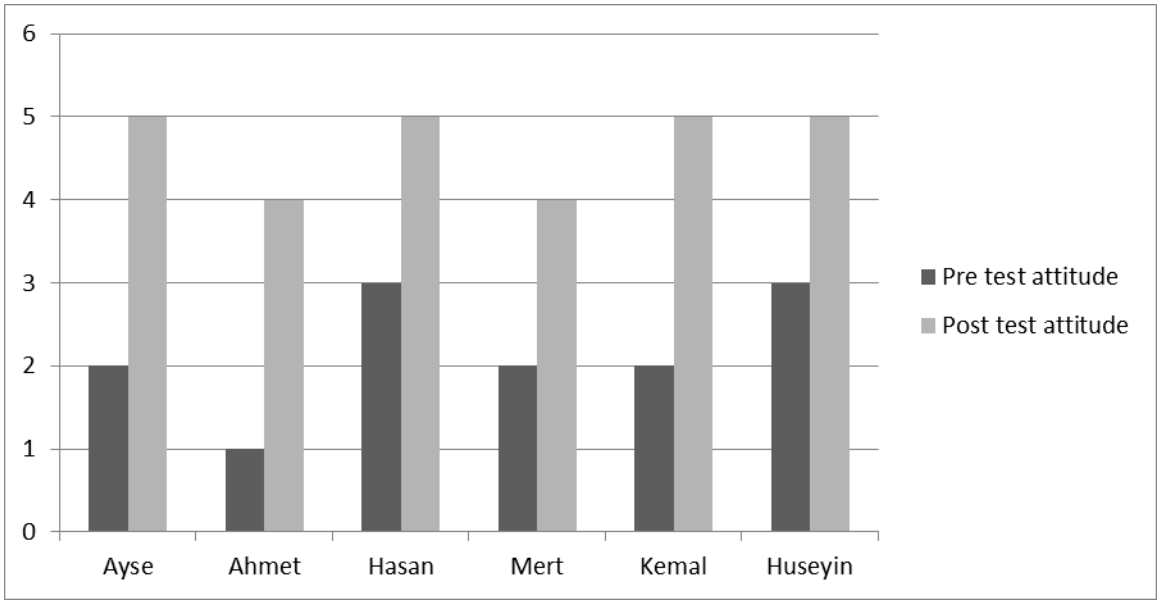

Figure 1. Results on the Effect of Computer Assisted Video Teaching Presented with Direct Instruction on Attitudes Towards Mathematics of Students with Mild Disability

When Figure 1 is examined, Ayse, from one of the group in which mathematics problems that require addition, is given two positive answers to the questions in the survey before the computer assisted video session, and five positive answers after the computer assisted video session. Ahmet gave 1 positive answer to the questions in the survey before the computer assisted video teaching session and 4 positive answers after the computer assisted video teaching session. In addition, Hasan gave 3 positive answers to the questions in the survey before the computer assisted video teaching session and 5 positive answers after the computer assisted video teaching session.

Mert, from the group where mathematics problems which necessitates subtraction were taught, had two positive answers to the questions in the survey before the computer assisted video session, and four positive answers after the computer assisted video session. Kemal gave 2 positive answers to the questions in the survey before the computer assisted video teaching session and 5 positive answers after the computer assisted video teaching session. Finally, Hüseyin gave 3 positive answers to the questions in the survey before the computer assisted video teaching session and 5 positive answers after the computer assisted video teaching session.

Discussion and Conclusion

A variety of research have shown that learning mathematics is influenced by many different factors such as motivation, perception, attitude, curriculum, teaching method used by the teacher. Perceptions and attitudes towards mathematics can be measured on the basis of three structures. These structures include: (1) self-confidence in learning mathematics; (2) positive perception and attitudes towards mathematics and (3) appraisal of mathematics (Di Martino & Zan, 2015). In some cases, the complexity of measuring attitude makes it

difficult to determine the effects of technology on mathematics attitude. It is believed that the use of technology in today's classrooms has a positive effect on student achievement and perception.

Some researchers have reported results supporting the positive effects of technology on mathematics attitudes (Li & Ma, 2010; Eyyam & Yaratan, 2014; Anil, Batdi & Kucukozer, 2018). In addition, Ellington (2003) examined the effect of calculators on students' mathematics achievement and attitudes and reported that they had positive effects. Yorgancı and Terzioğlu (2013) investigated the effect of using smart board in mathematics teaching on mathematics achievement and attitude towards mathematics. In the research which used the pre-test and post-test experimental design, the researchers concluded that the use of smart board increased the success and attitude towards mathematics lesson.

As it is known, technologies such as computer software programs, videos, calculators, graphics can be used to improve students' problem solving skills, to learn mathematical concepts and to develop general metacognitive skills such as planning and reasoning. By bringing these tools to the classroom environment, it is possible to make abstract mathematics concrete. Vale and Leder (2004) found that computer-aided mathematics had a positive effect on students' mathematics achievement and attitude. In addition, Pilli and Aksu (2013) investigated the effect of a computer software called Frizbi Mathematics 4 on the mathematics achievement, motivation, and attitude of primary school 4th grade students and revealed that the mathematics achievement, motivation and attitude of the students in the experimental group were positively influenced by this software.

In this study, facial expressions (emojis) containing emotions were used to determine students' attitudes towards mathematics. Similarly, Tezer and Özcan (2015) developed an attitude scale towards mathematics course and used facial expressions expressing emotion as a response. As a result of the study, it was found out that the students' responses to their attitudes towards mathematics course were “happy”.

In this study, it was determined that computer aided video teaching had a positive effect on students' attitudes towards mathematics. In this context, computer aided video teaching can also be used in teaching different mathematical skills and the effects of students on their attitudes towards mathematics can be examined. Other mathematical skills or concepts might be taught with technology. Further research might examine other technological tools such as smart boards for improving students with intellectual disability towards mathematics.

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