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SPECIAL EDUCATION TEACHERS' VIEWS ON USING TECHNOLOGY IN TEACHING MATHEMATICS

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Abstract:
Individuals with special needs require support in acquiring various academic and social skills and mathematical skills are one of the most important skills in which individuals with special needs need to acquire in order to maintain their daily lives. Current approaches in education emphasize the importance of integrating technology into special education classrooms in order to increase achievement and facilitate learning and various technological tools are used in teaching mathematics to individuals with special needs. Therefore, special education teachers need to be competent in using technology in teaching mathematics and aim of this study is to determine the views and recommendations of special education teachers on technology use in teaching mathematics to students with special needs. Qualitative research method was used in the study. A total number of 15 special education teachers working at special education institutions in North Cyprus participated in the study. A semi-structured interview form developed by the researchers was used to collect the data. Data of the study were analyzed using content analysis method through constituting themes based on the answers of special education teachers. According to the results, special education teachers think that they are competent in using technology in teaching mathematics. Results are provided and discussed with reference to relevant literature. Finally,

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implications for special education practices and recommendations for further research are also presented.

Keywords: mathematics, technology, special education teachers, views, recommendations

1. Introduction

Current scientific and technological developments in the world have led educational practices to change and education system needs to renew itself in the process of these rapid innovations. Important changes in the understanding of what is mathematics and how to teach mathematics have also occurred recently. Mathematics as a discipline in school curriculum include skills and concepts such as numbers, fractions, four operations, geometrical shapes, problem solving and measurement for students to function in the society as an independent individual (Ciftci & Tatar, 2015; Polat, Yavuz & Tunc, 2017). Students are able to acquire these skills when they are presented in appropriate educational environments based on students' characteristics and needs.

It is considered that when teaching practices are presented with appropriate methods and strategies in appropriate education environments, it would also help both students and teachers to achieve the goals and objectives of mathematics course. In addition to the academic and social skills including daily life skills, shopping, travelling, reading-writing; basic mathematical skills are necessary to use in daily life for individuals with special needs. In order to acquire these skills, it is important to provide instruction with organizing components, goals, content of education programs with appropriate method or approach (Krawec, Huang, Montague, Kressler & Melia de Alba, 2013).

Individuals with special needs require support in acquiring various academic and social skills in order to maintain their lives. Academic skills may include reading-writing and basic mathematical skills and social skills comprise helping others, seeking help from others and self-promotion which help them to establish relationships and increase their social acceptance and adaptation in the society. Mathematics has a facilitative role in both individuals with special needs and individuals with typical development. In this regard, it is necessary for individuals with special needs to acquire mathematical skills. Teachers generally tend to use traditional teaching approaches and methods in teaching academic skills such as mathematics and reading-writing. In recent years, problems experienced in teaching mathematical skills have led teachers and professionals to seek new methods (Goldsmith, Doerr & Lewis, 2014; Kan, 2015).

Mathematics is a tool for solving problems encountered in daily life. In addition, it is beneficial for many activities which require specific talents and skills. It is also prerequisite for individuals to achieve some work (Boobekova, 2013; Atasoy, Uzun & Aygun, 2016). Counting, reading time, making payments, measuring and weighing, understanding simple graphics and schemes and making arithmetic operations are some examples for basic concepts of mathematical subjects in which individuals experience in daily life.

For many individuals with typical development, mathematics arises as a difficult field. Therefore, it is considered that individuals with special needs experience more difficulties in learning mathematics compared to their peers with typical development. For individuals with special needs, it is necessary to learn mathematics as their peers in order to be able to cope with problems encountered during daily life and acquire independent living skills (Yikmis, 2016). If children with special needs are given the opportunities to learn mathematics, their conceptual understanding and ability to transfer knowledge is increased (Carpenter, Franke, Jacobs, Fennema, & Empson, 1998). Currently, direct instruction, interaction unit and TouchMath are the most frequently used effective approaches in teaching mathematics to individuals with special needs (Gursel, 2017).

Teachers are responsible for integrating educational technologies into instructional practices. Special education teachers now have the opportunity to individualize and differentiate instructions with many technological devices never before available for children with special needs (Akpan & Beard, 2014). They can promote greater independence for students by enabling them to perform tasks which students with special needs are unable to achieve or have difficulties to achieve.

Technological tools include a variety of advantages to help students in a mathematics classroom. By incorporating a variety of readily and user friendly available technologies into math instruction for students, educators can enhance the success of all students with various types of disabilities in the math classroom (Cviko, McKenney & Voogt, 2014). Therefore, it is important to integrate technology into mathematics instruction for individuals with special needs and it is expected that this study would provide an overview on the views and recommendations of special education teachers on using technology in mathematics instruction for individuals with special needs.

Aim of this study is to determine the views and recommendations of special education teachers on the use of technology in teaching mathematics to individuals with special needs. According to literature, it is seen that number of studies examining the views and recommendations of special education teachers on the use of technology in teaching mathematics to individuals with special needs is limited. Therefore, it is

expected that this study would contribute significantly to the field from both theoretical and practical perspectives.

2. Method

2.1. Research Model

In this study, a qualitative research approach was used to determine the views of special education teachers on the use of technology in special education. Semi-structured interview technique was used as a qualitative research method. Qualitative research is the type of research in which qualitative data gathering methods such as observation, interview and document analysis are used in a realistic and holistic way in order to reveal the perceptions and events in a natural environment (Yildirim & Simsek, 2005).

2.2. Study Group

A total number of 15 special education teachers working at special education institutions in North Cyprus participated in this study. A semi-structured interview form developed by the researchers was used to collect the data. Demographic characteristics of the participants are shown in detail in Table 1.

Table 1: Demographic Characteristics of the Participants

Participants	Age	Gender	Years of teaching experience
P1	27	Female	2 years
P2	29	Female	7 years
P3	36	Male	11 years
P4	24	Female	2 years
P5	26	Male	4 years
P6	22	Female	1 year
P7	27	Female	3 years
P8	23	Male	2 years
P9	25	Female	4 years
P10	40	Male	12 years
P11	36	Female	8 years
P12	33	Male	9 years
P13	25	Female	3 years
P14	31	Female	6 years
P15	34	Male	7 years

2.3. Data Collection Tool and Procedure

A semi-structured interview form developed by the researchers was used to collect the data. The data were collected through an interview form with 8 open-ended questions prepared by the researchers in this study. The interview form consisted of demographic questions including the years of professional experience and the undergraduate education of the teachers. In the semi-structured interviews, the questions prepared by the researcher are directed by interviewing the interviewees individually. The questions in the interview form included the following questions:

1. What do you think about your competency in using technology in mathematics?
2. Which technological tools do you use in teaching mathematics?
3. What concepts and skills taught mathematics do you think it is more effective to use technological tools?
4. What are the software for educational purposes do you use in mathematics?
5. What are the problems you encounter when using technological tools in teaching mathematics?
6. What are your recommendations for using technological tools more effectively in teaching mathematics?

The opinions of 5 experts from the field of special education were received in terms of the suitability, intelligibility and conformity of statements of the questions in the interview form. Opinions were received from a group of specialists, consisting of 2 people from the field of special education, 2 people from the field of Turkish, and 1 person from the field of assessment and evaluation, on the appropriateness (content), understandability and conformity of statements for the purposes of the research.The data of the research were collected by interviewing the special education teachers. The interviews were conducted in March. The interviews were conducted on an individual basis at times when both the researcher and the teachers were available.

2.4. Data Analysis

Data of the study were analyzed with content analysis method through constituting themes based on the answers of the participants. After the interviews were completed, the transcription of the voice recordings began. The responses obtained from the research were collected under themes by analyzing the content. The analysis of the data was performed by expressing the answers of the teachers to the questions under the themes and sub-themes and expressing the numbers of the teachers giving the answers for each theme.

3. Results

Results obtained from the study in line with the general aim and sub-aims are provided in this section.

3.1. Views of special education teachers on their competency in using technology in mathematics

Table 2: Special education teachers' views on their competency in using technology in teaching mathematics

Views	n
I think I'm competent in using technology in teaching mathematics.	12
I do not think I'm competent in using technology in teaching mathematics.	3

Views of special education teachers on their competency in using technology in mathematics are shown in Table 2. As it can be seen, most of the teachers (n=12) think that they are competent in using technology in teaching mathematics and only 3 teachers reported that they do not think they are competent in using technology in teaching mathematics.

3.2. Views of special education teachers on technological tools used in teaching mathematics

Table 3: Technological tools used in teaching mathematics

Technological tools	n
Computer	8
Tablet	5
Smart phone	4
Calculator	3
Projection	3
Smart board	2

Table 3 shows the views of special education teachers on technological tools used in teaching mathematics. As it can be seen from Table 3, special education teachers reported six different technological tools which can be used in teaching mathematics. Results showed that most of the teachers stated that computer as a technological tool is used in teaching mathematics (n=8). Special education teachers also indicated that tablet (n=5), smart phone (n=4), calculator (n=3), projection (n=3) and smart board (n=2) are

other technological tools to teach mathematics. One special education teacher stated that "*I frequently benefit from computer and tablet in mathematics lecture*" (P11).

3.3. Views of special education teachers on the educational software they use in mathematics

Table 4: Educational software used in teaching mathematics

Software	f
Mathematical games from the internet	11
Microsoft Word	9
Microsoft Excel	5
Morpa kampus	3
Egitimhane	2
I do not use educational software for teaching mathematics.	2

Table 4 shows the views of special education teachers on the educational software they use in mathematics. Most of special education teachers indicated that they benefit from mathematical games from the internet (n=11), Microsoft Word (n=9) and Microsoft Excel (n=5) as educational software for teaching mathematics. In addition, morpa kampus (n=3) and egitimhane (n=2) are two Turkish educational software in which special education reported that they use for educational software in teaching mathematics. Only 2 special education teachers stated that they do not use educational software for teaching mathematics.

3.4. Views of special education teachers on the concepts and skills in which using technology is more effective in teaching mathematics

Table 5: Concepts and skills in which using technology is more effective in teaching mathematics

Concepts and skills	n
Numbers	11
Geometric shapes	9
Opposite concepts	9
Four operation skills	8
Matching skills	6
Counting skills	5
Mathematical problem solving	5

Views of special education teachers on the concepts and skills in which using technology is more effective in teaching mathematics are shown in Table 5. When the table is examined, it can be seen special education teachers provided seven different

views on what concepts and skills are taught more effectively through using technology. Most of the teachers responded as numbers (n=11), geometric shapes (n=9) and opposite concepts (n=9). In addition, four operation skills (n=8), matching skills (n=6), counting skills (n=5) and mathematical problem solving skills (n=5) are other skills which can be taught more effectively by using technology.

One special education teacher said that "*Technology really facilitates to teach mathematical concepts and skills. When we visualize complex things, they become clearer. For example, steps for making four operations and problem solving can be very easily visualized and simplified with technology*" (P7).

3.5 Views of special education teachers on the problems they encounter when using technological tools in teaching mathematics

Table 6: Problems teachers experience when using technological tools in teaching mathematics

Views	**n**
Obtaining results with fractions	9
Possibilities of deteriorations in technological tools	8
Disconnections in the internet	6
Having no Internet	4
Excessive use of technology might lead to addiction	4
Not obtaining any feedback from programs	3

Table 4 shows the views of special education teachers on the problems they encounter when using technological tools in teaching mathematics. As it can be seen from the table, teachers reported five different views on the problems they experience when using technological tools in teaching mathematics. Most of the teachers reported that obtaining results with fractions (n=9) and possibilities of deteriorations in technological tools (n=8) are the problems they experience when using technological tools in teaching mathematics. Furthermore, disconnections in the internet (n=6), having no Internet (n=4) not obtaining any feedback from programs (n=3) are other problems they experience. 4 special education teachers also indicated that excessive use of technology might lead to addiction.

One teacher stated that "*Technological tools can go out of order and this might affect learning and teaching process negatively*" (P2). Other teachers reported that "*Especially when using applications from smart phones, having no internet or disconnections in the internet is a big problem*" (P1) and "*Since I use software through the Internet, I encounter with difficulties. I tried to solve the Internet connection problem, but if I cannot solve, I give up using the technological tool*" (P15). Besides, one teacher indicated that "*Some educational*

programs do not give feedback at the end of the activity so this creates a space and I have to follow and provide feedback at the end of every activity" (P12).

3.6 Views of special education teachers on the recommendations for using technological tools more effectively in teaching mathematics

Table 7: Recommendations for using technological tools more effectively in teaching mathematics

Recommendations	f
Teachers can be supported with in-service trainings on using technology in teaching mathematics.	10
Visual and auditory dimensions can be supported together.	3
I cannot provide any recommendation since I do not use technology frequently.	2

Views of special education teachers on the recommendations for using technological tools more effectively in teaching mathematics are shown in Table 7. Special education teachers provided three different recommendations for using technology in teaching mathematics. Most of special education teachers recommended that teachers can be supported with in-service trainings on using technology in teaching mathematics (n=10). In addition, 3 special education teachers reported that visual and auditory dimensions can be supported together and only 2 special education teachers did not provide any recommendations.

One special education teacher reported that "*I think schools have to give education to teachers to learn more about how to integrate technology in teaching mathematics. Because I graduated from the university 13 years ago and I need assistance on using new technologies in teaching*" (P10). Another teacher indicated that "*I think technology is more effective when both visual and auditory materials are used together*" (P13) and one special education teacher stated that "*I use technology only as reinforcement so I cannot provide recommendations*" (P14).

4. Discussion

As every individual in the society, individuals with special needs also need to have adequate level of knowledge in mathematics to maintain their daily lives. At this point, the role of special education teachers becomes more crucial in teaching mathematics to individuals with special needs since they provide support in terms of both academic and social skills. In addition to the crucial role of special education teachers, effectiveness of using technology in teaching mathematics to individuals with special needs is also evidenced in literature. Therefore, this study aimed to determine the views

of special education teachers on the use of technology in teaching mathematics. In order to achieve this aim, a total number of 15 special education teachers were asked 7 questions and their answers to each question are presented in detail in the present study.

According to the results of the study, special education teachers mentioned about computers, tablets, smart phones, calculators, projection and smart board when they are asked about technological tools which can be used in teaching mathematics. Effective uses of most of these technological tools are supported with evidence from the literature. For instance, Wiest (2001) emphasized the role of computers in learning and teaching mathematics; Jeffries, Crosland and Miltenberger (2016) mentioned about tablet computers as effective instructional tools for students with autism, Kiger, Herro and Prunty (2014) indicated that mobile learning applications increase achievement in mathematics and Tunaboylu and Demir (2017) showed that interactive whiteboard enhances teaching mathematics.

Furthermore, Demir and Bozkurt (2011) investigated primary teachers' views on their competencies on the integration of technology and showed that primary teachers need training on using technology in education to increase their competencies. This result is similar with the findings of the present study. In addition, Pierce and Ball (2009) emphasized that although teachers have positive attitudes towards using technology in mathematical classes, they also think that there are some barriers to need to be addressed and improved as well. This is also similar with the findings of the present study in which special education teachers reported that although using technology in teaching mathematics facilitate teaching of various mathematical concepts and skills, disconnections in the internet, having no internet and no feedback from technological devices are some problems addressed by special education teachers.

Tournaki and Lyublinskaya (2014) showed that it is important to prepare and train special education teachers to integrate technology in teaching mathematics. Therefore, it can be said that this study provides a comprehensive perspective on the views of special education teachers working in North Cyprus on the use of technology in teaching mathematics. It is important to increase the use of technology in teaching mathematics to individuals with special needs and teachers have the key role in achieving this through integrating technology into mathematics lessons in an effective way.

5. Conclusion and Recommendations

It is important to understand and reveal the views of special education teachers on using technology in teaching mathematics to individuals with special needs since they

determine the prospective attitude and behaviors of special education teachers in their professional lives and the results of the study provided sufficient information about views of special education teachers.

Overall, the study showed that special education teachers think that they are competent in using technology in mathematics. This study also provides educational implications about the importance of using technology in teaching mathematics and special education teachers' key role in teaching mathematical skills to individuals with special needs.

Special education teachers need to follow new trends and practices in technology in order to integrate technology into education and therefore meet the educational needs of their students. In this way, they would be more beneficial for their students with special needs when they have professional competency in using technology in teaching mathematics to individuals with special needs in an effective way.

In the light of the results obtained from the study, the following recommendations for further research and practices are provided:

- In-service trainings, courses, seminars and conferences should be organized for special education teachers to increase their competency to use technology in teaching mathematics.
- Views of special education teachers on the use of technology in acquiring other academic skills such as reading-writing might be examined.
- Educational policies and programs should be improved in order to develop knowledge, understanding and awareness of the importance of using technology in teaching mathematics.
- Number of courses on using technology in teaching mathematics in teacher training programs at universities should be increased.
- Similar studies with quantitative or experimental research design might be carried out.
- This study might be also carried out with preservice special education teachers in order to obtain their views on using technology in teaching mathematics.

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