

## Evaluation of Preservice Teachers' Computer-based Instructional Materials by Special Education Teachers

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Article Info	ABSTRACT
<p><b>Article History</b> Received: 24.06.2022 Accepted: 15.08.2022 Published: 30.08.2022</p> <p><b>Keywords:</b> Special Education Technology, Computer-based Instructional Materials, Preservice Special Education Teacher Education, Students with Disabilities, Web 2.0 Tools.</p>	<p>This study aims to investigate the successes and challenges of implementing instructional materials that preservice special education teachers developed for students with disabilities in a rehabilitation center using Web 2.0 tools through an instructional design project as part of a technology integration course. For this project, preservice teachers collaboratively developed instructional materials to meet the needs of the student assigned to their group and implemented them with the student. After the implementation, the success and challenges of the materials were evaluated by 12 special education teachers of the students through structured interviews. The interviews were analyzed using inductive analysis. Analysis results indicated that the vast majority of the materials were found to be successful in terms of the teaching strategies applied within the materials, the appropriateness of the instructional materials, and the opportunities that the materials provided in practice. Most of the teachers claimed that the instructional materials contributed to the students' learning and skill development even after the one-shot implementation. According to the special education teachers, eight groups experienced no difficulties during the implementation, whilst eight groups faced several challenges due to student-related issues and the infrastructure. They also proposed suggestions to improve the instructional materials and their implementations. The results of this study is valuable as the current literature lacks studies reporting materials' success from the teachers' perspective.</p>

## Öğretmen Adaylarının Geliştirdikleri Bilgisayar Destekli Öğretim Materyallerinin Özel Eğitim Öğretmenleri Tarafından Değerlendirilmesi

Makale Bilgileri	ÖZ
<p><b>Makale Geçmişi</b> Geliş: 24.06.2022 Kabul: 15.08.2022 Yayın: 30.08.2022</p> <p><b>Anahtar Kelimeler:</b> Özel Eğitim Teknolojisi, Bilgisayar Destekli Öğretim Materyali, Özel Eğitim Öğretmen Adayları, Özel Eğitim Öğrencileri, Web 2.0 Araçları.</p>	<p>Bu çalışma, özel eğitim öğretmen adaylarının bir rehabilitasyon merkezinde kayıtlı özel gereksinimi olan öğrenciler için geliştirdikleri öğretim materyallerini uygulamaları sırasında deneyimledikleri başarı ve zorlukları araştırmayı amaçlamaktadır. Adaylar, öğretim materyallerini bir teknoloji entegrasyonu dersinde yürütülen öğretim tasarımı projesi kapsamında Web 2.0 araçlarını kullanarak hazırlamışlardır. Bu proje için öğretmen adayları grup oluşturarak gruplarına atanan öğrencilerin öncelikli gereksinimlerine yönelik öğretim materyalleri geliştirmiş ve öğrencilere uygulamışlardır. Uygulama sonrasında, materyallerin başarıları ve deneyimlenen zorluklar, özel gereksinimli öğrencilerin özel eğitim öğretmenleri tarafından yapılandırılmış görüşme yolu ile değerlendirilmiştir. Çalışmaya 12 özel eğitim öğretmeni katılmıştır. Görüşmeler tümevarımsal analiz kullanılarak analiz edilmiştir. Analiz sonuçları, materyallerin büyük çoğunluğunun materyaller içerisinde uygulanan öğretim stratejileri, öğretim materyallerinin uygunluğu ve materyallerin uygulamada sağladığı olanaklar açısından başarılı olduğunu göstermiştir. Öğretmenlerin çoğu, tek seferlik uygulamadan sonra bile öğretim materyallerinin öğrencilerin öğrenmesine ve beceri gelişimine katkıda bulunduğunu iddia etmiştir. Özel eğitim öğretmenlerine göre, sekiz grup uygulama sırasında herhangi bir zorluk yaşamamışken, sekiz grup öğrenci ile ilgili sorunlar ve altyapı nedeniyle çeşitli zorluklarla karşılaşmıştır. Ayrıca, özel eğitim öğretmenleri öğretmen adaylarının öğretim materyallerini ve uygulamalarını iyileştirebilmeleri için önerilerde bulunmuşlardır. Bu çalışmanın sonuçları, mevcut literatürde öğretmenlerin bakış açısıyla materyallerin başarısını değerlendiren çalışma bulunmadığı için önemlidir.</p> <p><b>Atıf/Citation:</b> Arslan-Arı, İ. &amp; Başer, D. (2022). Evaluation of Preservice Teachers' Computer-based Instructional Materials by Special Education Teachers, <i>Ahmet Keleşoğlu Eğitim Fakültesi Dergisi</i> 4(2), 248-266.</p>



## INTRODUCTION

Disability is an umbrella term used to describe any condition of the body or mind which causes “difficulties in executing activities” and/or “problems with involvement in any area of life” (World Health Organization, 2011, p. 5). According to the Turkish 2005 Disability Act (Engelliler Hakkında Kanun, 2005), a person with a disability is defined as someone who has difficulties in adapting to a normal social life and meeting their daily needs, and who needs prevention, care, rehabilitation, counseling, and support services due to varying degrees of congenital or acquired physical, mental, intellectual, emotional, or social function loss. According to the World Report on Disability, global disability prevalence of those with at least one form of disability is about 15% (World Health Organization, 2011), which is higher than the estimated 10% figure from the 1970s, indicating an increase in the number of people with some form of disability. Of this 15% of the global population, 5.8% are children aged 14 years old or younger. According to the 2011 Turkish Population and Housing data, 6.9% of the population have some form of disability that hinders their daily activities (Turkish Statistics Institute, 2015), and that 27% of them are aged 21 years or less. However, increases in the number of students with disabilities either receiving special education or within inclusive classrooms is evident from data sourced from the Turkish Ministry of National Education. While the number of registered K-12 special education students was 141,248 in the 2010-2011 academic year, this increased fourfold within 10 years to reach 425,816 for the 2020-2021 academic year (Turkish Ministry of National Education, 2021). These numbers indicate that appropriate strategies and policies are required to be implemented in order to meet their individual learners' needs.

When we look at the history of special education in Turkey, there have been numerous attempts to provide equality in education to students with disabilities (Öztürk, 2019). The establishment of the Izmir Deaf-Blind School in 1921, the development of the first special education program in 1952, and the establishment of Guidance and Research Centers in 1955 are several early examples of such initiatives. Also, the right of students with disabilities has been supported through legislation, the most recent being the Turkish Disability Act (Engelliler Hakkında Kanun, 2005) in relation to special education. The Act declares that people with disabilities cannot be prevented from receiving education for any reason (Article 15), and that individuals with disabilities should equally benefit from the opportunities of lifelong education by considering their individual differences. With the widespread usage of technology in today's education, a statement related to technology in special education was added to the Act. According to the expanded Article 15, to meet learners' individual needs, appropriate technology (e.g., braille, e-books, captioned video, etc.) must be provided or produced.

With the advancements in technology, its usage in special education has been widely investigated by researchers (e.g., Cagiltay et al., 2019; Cranmer, 2020; Polat & Çağiltay, 2018; Ronimus et al., 2019). The findings of these studies have underlined the importance and benefits of using technology for students with disabilities. For example, technology in special education has been shown to support students' skill development in areas such as mathematics (Ok, et al., 2020; Xin et al., 2017), reading (Ronimus et al., 2019), writing (Dawson et al., 2019), communication (Hill & Flores, 2014), and language (Kamalı Arslantaş et al., 2019; Rodríguez & Cumming, 2017); as well as to improve students' learning and academic performance (Perelmutter et al., 2017; Badilla-Quintana et al., 2020). Other benefits of technology application within the special education context include providing ease of access to the curricula (Floyd et al., 2020), engaging academic activities independently (Nordström et al., 2019; Pilgrim et al., 2012), allowing students to learn at their own pace (Atanga et al., 2020), increasing their motivation and interest in learning (Nordström et al., 2019), and easing their inclusion in general

education classrooms (Chambers, 2020). Most importantly, technology in special education can “enhance the quality of education for these students in both curricular and non-curricular activities in inclusive settings” (Park et al., 2021, p. 1).

Special education teachers have a crucial role in bringing benefit from special education technologies into the classroom. Teachers' competencies in using these technologies is an important factor in realizing the actual potential of their benefit (Park et al., 2021). Although teachers in general have positive attitudes toward technology use, they may believe that they lack the capability to efficiently use special education technologies (Onivehu et al., 2017). They affirmed that special education technologies highly contribute to the teaching of students with disabilities, but that they require further development in their usage (Chukwuemeka & Samaila, 2020). Teachers do not always use technological devices even when they are available in schools, and one reason put forward for this is a lack of experience in using such devices or understanding how they can be beneficial (Connor & Beard, 2015). In a study by Kutlu et al. (2018), they reported one of the major challenges of using special education technology being teachers' lack of relevant knowledge and skills.

In addition to the necessity of inservice training of teachers, special education technology training should begin right from undergraduate programs, since teachers who complete special education technology courses are found to be more proficient in the use of technology in their classrooms (Atanga et al., 2020). Aslan (2018) found that special education teachers who had completed technology courses demonstrate significantly more positive attitudes towards special education technologies than do teachers who have not taken such courses. However, studies (Atanga et al., 2020; Kimm et al., 2020) have indicated that the technology training of preservice special education teachers is lacking in undergraduate programs. Therefore, special education teacher curricula should be revised in order to develop the technology-based competencies of preservice special education teachers.

Practice-oriented technology integration courses that are operated in an organized manner could help develop preservice teachers' knowledge and skills related to special education technology (Benedict et al., 2016). Lohnes Watulak (2018) suggested that technology courses integrating connected learning, whereby preservice teachers create instructional materials that integrate technology into their content within a collaborative learning environment, as being a successful form of technology education in preference to technology-based courses that purely focus on the development of technological skills. If authentic learning context is integrated into content-related practices, preservice teachers can better develop an understanding of user-centered design (Best et al., 2017) and such context may contribute to their decision-making skills, as suggested by Wu (2019). Peterson-Ahmad et al. (2018) stated that Web 2.0 tools should be integrated into special education technology training as they add significant benefit to supporting students with disabilities.

The purpose of the current study was to investigate the successes of and challenges to the implementation of instructional materials developed by preservice special education teachers specifically for students with disabilities at a rehabilitation center according to an instructional design project within a technology integration course. The success and challenges of the developed materials were evaluated from the perspectives of special education teachers who worked with students with disabilities as the current literature lacks studies reporting from the teachers' perspective (Serttas et al., 2020).

## **METHOD**

### Research Design and Context

This qualitative case study aims at reporting a deep understanding (Yin, 2014) of the challenges and successes of implementing computer-based instructional materials developed by preservice teachers for students with disabilities according to an Instructional Design (ID) project from the perspective of special education teachers. The ID project took place within a technology integration special education course provided for preservice special education teachers by one of the authors of the current study at a public university in Turkey.

In the ID project, the preservice special education teachers were asked to develop instructional materials using Web 2.0 tools that were aimed specifically at students with disabilities that have an effect on their intellectual capability. As the students' needs varied considerably, the preservice teachers developed the materials in groups that were specifically aimed at the students assigned to their group.

The course instructor first sought and received ethical approval to implement the materials to students attending a rehabilitation center. The center's manager and the course instructor selected 16 students with the permission of their parents. Each student had some form of disability that affected their intellectual capability, namely learning disability, or mild/moderate intellectual disability. Table 1 demonstrates the types of disability of each assigned student for each group of participant preservice teachers.

The ID phases were utilized for the development of the materials so as to enable the preservice teachers to manage the complexity of the materials development process according to the unique needs of their group's assigned student. Analysis formed the first phase of the ID project. Each group of preservice teachers booked a day to visit the rehabilitation center in order to observe the student assigned to their group, and also to examine the students' individualized education progress reports. In the second phase, each group designed their instructional materials based on the analysis of the students that took place in the first phase. Prior to designing their materials, the groups undertook extensive research of a variety of Web 2.0 tools in accordance with the needs of their assigned student. Then, they provided written information about each of the materials they planned to develop. After receiving feedback from the course instructor and having revised their written designs, the groups proceeded to develop the materials during the third phase of the ID project. The instructor examined the materials and asked the groups to revise or redevelop the materials as necessary. During the implementation phase, the groups revisited the rehabilitation center in order to implement the materials they developed to the student assigned to their group. Table 1 also shows the learning outcomes that each group was focused upon, and which Web 2.0 tools they used in the development of the materials.

**Table 1.** *ID Projects' Focus: Type of Disability, Learning Outcomes, Web 2.0 Tools*

GROUP #	TEACHER PSEUDONYM	TYPE OF DISABILITY	LEARNING OUTCOMES	WEB 2.0 TOOLS
1	Madison	Mild intellectual disability	<ul style="list-style-type: none"> <li>• Sight word recognition.</li> <li>• Addition &amp; subtraction.</li> </ul>	LearningApps Emaze
2	Ella	Learning disability	<ul style="list-style-type: none"> <li>• Skip counting.</li> <li>• Addition.</li> </ul>	Prezi LearningApps

3	Oliver	Learning disability	<ul style="list-style-type: none"> <li>● Skip counting &amp; multiplication.</li> <li>● Multiplication, fractional numbers, &amp; skip counting.</li> </ul>	Powtoon LearningApps
4	Yousef	Learning disability	<ul style="list-style-type: none"> <li>● Reading comprehension.</li> <li>● Multiplication.</li> </ul>	Prezi Kahoot
5	Isabella	Mild intellectual disability	<ul style="list-style-type: none"> <li>● Reading comprehension.</li> <li>● Geometrical shapes.</li> <li>● Skip counting.</li> </ul>	Prezi Powtoon
6	Ryan	Learning disability	<ul style="list-style-type: none"> <li>● Number reversals.</li> <li>● Skip counting.</li> </ul>	Google Form LearningApps
7	Celine	Learning disability	<ul style="list-style-type: none"> <li>● Using/understanding Turkish idioms.</li> <li>● Reading comprehension.</li> </ul>	LearningApps Google Slides
8	Ella	Learning disability	<ul style="list-style-type: none"> <li>● Sight word recognition.</li> </ul>	Worditout Emaze
9	Gloria	Learning disability	<ul style="list-style-type: none"> <li>● Rhythmic counting.</li> <li>● Multiplication.</li> <li>● Addition &amp; subtraction.</li> </ul>	Emaze LearningApps
10	Paige	Learning disability	<ul style="list-style-type: none"> <li>● Whole, half, quarter concepts.</li> <li>● Reading comprehension.</li> </ul>	Emaze Google forms
11	Grace	Learning disability	<ul style="list-style-type: none"> <li>● Sight word recognition.</li> <li>● Specific speech sounds.</li> </ul>	LearningApps Powtoon
12	Nova	Learning disability	<ul style="list-style-type: none"> <li>● Opposite concepts.</li> <li>● Punctuation.</li> </ul>	Cacoo Voki
13	Olivia	Learning disability	<ul style="list-style-type: none"> <li>● Multiplication.</li> <li>● Reading comprehension.</li> </ul>	Google Forms Prezi
14	Ryan	Learning disability	<ul style="list-style-type: none"> <li>● Counting.</li> <li>● Addition and subtraction.</li> <li>● Reading comprehension.</li> </ul>	Emaze Prezi
15	Ryan	Learning disability	<ul style="list-style-type: none"> <li>● Fluent reading.</li> <li>● Reading including “y” sound.</li> <li>● Specific speech sounds.</li> </ul>	Google Slides Toondoo & Mic. Word
16	Olivia	Moderate Intellectual Disability	<ul style="list-style-type: none"> <li>● Conversational skills.</li> <li>● Geometrical shapes.</li> </ul>	Google Slides Powtoon

### Participants

Data were collected from 12 special education teachers (nine female, three male) working

at a public rehabilitation center in Turkey. The participants' teaching experience ranged from 1 year to 11 years. Their average age was 34.64 years old, with a standard deviation of 13.74. Pseudonyms were used for each of the participants within the reporting of the study's results. Table 2 presents the demographic information of the study's 12 participants. One participant declined permission to share information about her age or teaching experience.

**Table 2.** *Participants' Demographics*

PSEUDONYM	GENDER	AGE (YEARS)	TEACHING EXPERIENCE (YEARS)
Celine	Female	24	1
Ella	Female	30	2
Gloria	Female	44	3
Grace	Female	67	11
Isabella	Female	35	7
Madison	Female	29	2
Nova	Female	-	-
Oliver	Male	24	2
Olivia	Female	50	1
Paige	Female	28	5
Ryan	Male	27	2
Yousef	Male	23	2

### Data Collection Instruments

Data were collected through structured interviews held with the participant special education teachers. Following the implementation of the developed instructional materials, the preservice teacher groups conducted structured interviews with teachers who taught students with disabilities. The preservice teachers applied an interview protocol developed by the researchers. The interview protocol included five questions related to the teachers' opinions about the implemented instructional materials, the material's contribution to the students' education, problems encountered related to the implementation, aspects of the material that needed to be developed, and the use of technologies to support students with disabilities.

### Data Analysis

The collected data were analyzed using inductive analysis to identify themes that emerged within the analysis process (Cresswell, 2014). The researchers analyzed the data together by discussing any disagreements and refined the coding scheme through multiple cycles of coding. As a first step, the researchers read through the teachers' interviews to familiarize themselves with the data. Then, the researchers coded the interview transcripts using NVivo (version 12). After the codes had been created, the researchers looked for patterns so as to create the categories subsumed from these codes, and then themes emerged from similar categories. The researchers used open coding, descriptive coding, and pattern coding in order to make meaning of the collected data, as well as to identify patterns and overlapping themes (Saldaña, 2015).



## **Ethic**

The committee involved in ethics evaluation: [name deleted to maintain the integrity of the review process] Social and Human Sciences Ethics Committee.

Date of ethics evaluation: 20/02/2018.

Serial number of ethics evaluation document: 2018/44.

## **FINDINGS**

Following the implementation of the developed materials, the special education teachers shared their opinions about the successes and challenges of implementing instructional materials that the preservice teachers developed, along with suggestions on how to improve their implementations. In addition to their thoughts about the materials, most of the teachers (n = 11) pointed out their eagerness to using similar instructional materials in the future. From inductive analysis of the interview transcripts, five themes emerged: (1) Success vs. failure of the instructional materials, (2) Positive aspects of instructional materials, (3) Contribution of the instructional materials to students' knowledge and skills, (4) Challenges, and (5) Suggestions.

### **Success vs. Failure of the Instructional Materials**

The special education teachers observed the implementation of the instructional materials that had been developed by the preservice teachers specifically for their students with disabilities. The special education teachers considered the vast majority of the groups' (n = 14) instructional materials to be successful, although they suggested that three groups needed to apply revisions in order to align the materials better with their students' needs. On this, one of the teachers, Grace, said,

*Your computer-based instructional material was nice, but it might be more effective for students who are just learning to read and write. However, since your student can already read and write, the material was perhaps a little simplistic for their level. Nevertheless, the application was still useful as the student has difficulty in making certain sounds. (Grace)*

On the other hand, the teachers suggested major revisions for two groups' materials since they found them to be inappropriate for the target students' level of knowledge and skill. However, the teachers stressed that if the required revisions were applied, the materials could still be considered beneficial for the students. On this, Isabella commented,

*I think that the fable application created with the story map technique, which aimed to improve the student's reading comprehension skills, was perhaps too hard for them, and was therefore not best suited to the level of your student. The student did not really understand the concepts of fable, character, and main idea, and therefore could not answer the questions due to his lack of knowledge. In addition, the text was too long for the student and he could not remember what he had read because of their limited reading fluency. The student was unable to maintain their focus during the practice and became visibly bored. When you [preservice teacher] summarized the story in the last section, the student showed a little more interest at that point, so was able to grasp the story a little bit by the end.*

### **Positive Aspects of Instructional Materials**

The special education teachers remarked on the positive aspects of the implemented instructional materials based on their observations. These positive aspects included the (a) teaching strategies applied in the materials, (b) appropriateness of the instructional materials, and (c) opportunities the materials

provided in practice.

The positive aspect stated most by the teachers ( $n = 7$ ) was that teaching strategies were applied successfully. Several of the special education teachers claimed that the instructional materials supported the students' learning through visualization of the topics in addition to the added audio. For instance, Grace said,

*You used words, sounds, and pictures. What more could you have added? It was very well done. The child sees the picture and pronounces the word. Also, you narrate the word yourself. Well done.*

The teachers also acknowledged other teaching strategies through which the materials supported the students' knowledge and skills by providing a variety of examples, recurring practice, immediate feedback, modeling examples, the use of abstract concepts with concrete objects, and word-drill techniques. The following excerpts exemplify their thoughts about the teaching strategies as a positive aspect of the developed materials:

*It reinforced [learning] faster as there were many examples in the reading comprehension material. (Paige)*

*The repetitive reading and modeling technique used [in the material] accelerated his fluency in reading, even in just a short time. (Ryan)*

The special education teachers ( $n = 5$ ) stressed the appropriateness of the instructional materials for the students with disabilities as another positive aspect. Most of the special education teachers ( $n = 8$ ) expressed that the instructional materials were successfully developed as they were aligned with the students' individual developmental levels and needs, knowledge, and skills. Some teachers specified this alignment by explaining how the materials were considered appropriate for their students' levels of knowledge and skill. For example, Yousef said, "*The instructional material was prepared and applied in accordance with the developmental characteristics of the child.*" In addition, Celine pointed out the contribution of the students' analysis on the effectiveness of instructional material, saying,

*The material used in the teaching of students with special needs is very important. Therefore, first of all, the individual characteristics of the child should be properly considered. It is very important to get to know the student and to determine material that is appropriate for the student's characteristics and needs through observation [of the student] prior to the instructional material's implementation. I think in this way, the teaching could be more effective.*

The teachers also stated that they found the materials to be successful as they were aligned with the learning objectives and also that they met the students' special needs. Madison commented, "*It met the needs of the student and was very suitable for his level.*"

Finally, the special education teachers ( $n = 6$ ) mentioned the opportunities that the materials would provide in practice. The most frequently expressed opportunity was the enjoyment which the materials offered to students with disabilities. Yousef stated that, "*The implementation achieved the desired goal without letting the student get bored.*"

The teachers found the materials to be useful in practice as they were easy to use, supported multiple skills at the same time, and were easily adaptable to the relevant topics. Some of the teachers' statements relating to the use of the materials in practice were as follows:

*Since the material was designed to be flexible and updateable, it can be applied to the entire multiplication table. (Yousef)*



*While the student was learning about numbers, it [the instructional material] provided information about colors, cultures, and animals. (Ryan)*

### **Contribution of the Instructional Materials to Students' Knowledge and Skills**

The special education teachers scrutinized the implementations to understand whether or not the materials contributed to the students' knowledge and skills. Following the implementation, most of the special education teachers (n = 10) claimed that the instructional materials contributed to (a) the students' learning, and/or (b) the students' skill development.

The special education teachers (n = 6) stated that the instructional materials supported the students' learning by pointing out different opportunities that the materials provided. The majority of those teachers (n = 5) thought that the materials guided the students' attention towards the content. For example, Madison mentioned this contribution as follows:

*The material application can be highly beneficial for students with learning difficulties. Thanks to these applications, students can pay more attention to the lesson, their perceptions can be clearer, and thus it makes it easier for them to learn.*

The teachers claimed that the materials also contributed to the students' learning by promoting learning, facilitating permanent learning, constructing relations among concepts, increasing the students' motivation, enhancing their self-confidence, stimulating active learning, and supporting the students' cognitive development. Ryan mentioned observing changes in the students' reading fluency and knowledge development, even after just the single implementation of the material. Some of the teachers' statements about the contribution of the material to the students' learning were as follows:

*Since there were many examples of whole, half, and quarter concepts [within the instructional material], the students were able to establish relationships among them more easily. (Paige)*

*In general, I liked the materials. They were prepared in a way that presented the content from easy to difficult, which is a strategy that increases the child's motivation and self-confidence. (Ella)*

The special education teachers (n = 8) also asserted that the materials improved the students' skill development. Most of the teachers mentioned that the students' mathematical skills (n = 6) and reading skills (n = 6) developed with the help of the materials. Comprehension skills, eye-hand coordination skills, writing skills, language skills, and learning skills were other skills that the teachers mentioned as having been supported by the use of the materials. The following excerpts are examples of their claims:

*The instructional material contributed to the development of the student's numerical counting by three skills included in the mathematics standards. This has been an extremely successful piece of work. (Yousef)*

*I think that the material contributed to the reading skills of the student, who was prior observed to have inadequacy in the meaning of idioms, reading accuracy, and reading comprehension skills before the application. (Celine)*

*The material was successful in supporting the student's hand-eye coordination. (Ryan)*

### **Challenges**

During the implementation of the instructional material, the special education teachers had the opportunity to realize some of the challenges that confronted both the preservice teachers and students with disabilities. According to the special education teachers, eight groups did not experience any difficulties during the implementation, whilst eight groups faced several challenges, which were: (a)

student-related, (b) infrastructure-related, and (c) the use of foreign-sounding names within the instructional material.

The special education teachers reported that the groups ( $n = 6$ ) mostly encountered student-related challenges. They stated that the students with disabilities hesitated to participate in the technology-integrated activity. On this, Ryan commented on Group 15's implementation that due to the students' hesitation, "*they frequently had to pause the activity.*"

The teachers acknowledged that the students with disabilities were stubborn, easily became bored, had limited technological knowledge and skills, and did not want to remain seated whilst studying. Moreover, establishing communication was listed as a challenge due to the students' characteristics. Some of the teachers quotes regarding this were as follows:

*Since the student had previously worn braces on his teeth, he still felt conscious of it even though the braces had been removed, and would constantly cover his mouth with his hand throughout the activity. In addition, due to the fact that the student was going through adolescence, he did not like to be in a crowded environment, and therefore establishing a healthy level of communication with the student could not be achieved.* (Isabella)

*It was somewhat challenging because the material required the child to remain seated at the table.* (Ryan)

Another challenge reported by the teachers ( $n = 2$ ) during the implementation was related to the infrastructure. They pointed out that the small classrooms and a lack of window curtains to block out the sun had caused some difficulties. For example, while evaluating Group 6's implementation, Ryan mentioned that, "*Our classroom was small and there was no window curtain in the classroom whilst it was sunny.*"

Although the teachers reported that the challenges seen were mostly related to the implementation, one teacher mentioned observing a difficulty due to the content of the developed instructional material. Group 7 used a reading text in which the character in the story had an English-sounding name, whereas the target student was Turkish-speaking. On this, Celine said, "*I think the fact that the names of the heroes in the text were English sounding made it difficult for the student to remember.*"

Besides the challenges observed, the teachers also mentioned other possible challenges that may occur in the integration of the developed instructional materials. They stressed that the students' lack of computer skills, their parents' negative perceptions toward technology use, and the students' unwillingness to talk could be considered as potential challenging issues to an implementation, as demonstrated by the following statements:

*I use supportive methods in accordance with the topics. However, when you do something with the computer, there is often a perception in society, especially with the students' parents, that we just chose the easy option. Since the students often use computers to play games, I think that the parents perceive these types of applications [use of computer-based instructional materials] have no benefits. But of course, I evaluate its usage according to the content, and like to use it where I can.* (Nova)

*If the students do not know how to use a computer, they may experience some difficulties in using the material. Therefore, if the students' computer use can be improved, their usage of the materials will also become less challenging.* (Ella)

### **Suggestions**

Based on the reported challenges, their expertise in the special education field, and their

experiences with teaching students with disabilities, the special education teachers proposed suggestions to improve both the developed instructional materials and their implementation. Those suggestions included; (a) improving the multimedia features of the instructional materials, (b) adding new features to the instructional material to enhance active participation, (c) modifying the instructional materials so as to eliminate any inappropriateness for the students, and (d) teaching the students basic computer skills prior to the implementation.

The majority of the suggestions ( $n = 6$ ) are related to enriching the multimedia features of the material by adding audio, providing text through digital storytelling, including more visuals, using simple visuals, and improving the audio and visual quality. The following quotes were among the many which exemplify the preservice teachers' suggestions on this:

*It would be nice to have audio support. Especially in the activity part, I thought that it would be better if there was a sound used that would reinforce when a correct answer was given by the student and a warning sound for an incorrect answer. The reading passage could have been presented with narration in the form of a digital story. (Celine: Group 7)*

*It would be more useful if simple and plain visuals could be used. (Olivia: Group 13)*

*The figures in the examples could have been made clearer. (Olivia: Group 16)*

Besides multimedia features, the teachers ( $n = 3$ ) also recommended adding games, more interactive activities, and modifying the instructional material for the students' independent use in order to enhance their active participation in the lesson. On this, Olivia commented, "*The materials should be supported with fun games in which the child can participate actively.*"

As previously mentioned, a few of the teachers found the instructional materials to be inappropriate based on the target students' knowledge and skill levels. Two of the teachers suggested modifying the instructional materials by considering the students' interests more while developing the materials, and using character names that are in the native language of the target students. For example, Isabella said, "*A simpler reading passage and a familiar topic that may be of interest to the students could be chosen instead.*"

Lastly, the teachers recommended equipping the students with disabilities with basic computer-based skills prior to attempting to integrate technology-enhanced activities into their teaching since one student experienced difficulties in using the computer during the implementation due to having limited computer-based skills. On this, Oliver said, "*First of all, it is necessary to develop their technology skills. I don't think there will be any problems after they acquire these skills.*"

## **DISCUSSION AND CONCLUSION**

The special education teachers found most of the computer-based instructional materials implemented to be successful. The success of the materials may well be due to the development of the materials having been undertaken through a systematic approach (Benedict et al., 2016) based on the individual needs of students with disabilities (Adebisi et al., 2015). The participating special education teachers valued the way that the instructional materials were developed, in that the preservice teachers analyzed the students' needs first and then developed the materials based on their specific needs. Sola Özgüç and Cavkaytar (2016) also emphasized the importance of only developing activities after having first determined the students' needs. Schmidt et al. (2017) asserted that analysis of the students' needs is critical in that it provides teachers with the ability to select the right technology to suit the identified needs.

The special education teachers asserted that the instructional materials developed by the preservice special education teachers helped contribute to the students' learning and skills

development, even though it was just a single implementation. This result supports the findings of other published studies (e.g., Çay et al., 2020; Eldeniz Çetin & Geçal, 2017; Sola Özgüç & Cavkaytar, 2016) having described the views of special education teachers regarding the effect of technology use in the special education context in terms of students' learning. According to the teachers in the current study, the materials supported the students' learning by providing them with various opportunities (Eldeniz Çetin & Geçal, 2017; Sola Özgüç, 2015; Sola Özgüç & Cavkaytar, 2016), guiding the students' attention towards the content (Çay et al., 2020; Eldeniz Çetin & Geçal, 2017), promoting learning (Çay et al., 2020; Eldeniz Çetin & Geçal, 2017), facilitating permanent learning (Çay et al., 2020; Eldeniz Çetin & Geçal, 2017; Sola Özgüç & Cavkaytar, 2016), constructing relations among concepts, increasing the students' motivation (Çay et al., 2020; Eldeniz Çetin & Geçal, 2017; Hasselbring & Williams-Glaser, 2000; Sola Özgüç, 2015) by providing enjoyment whilst learning (Çay et al., 2020; Sola Özgüç, 2015), enhancing the learners' self-confidence (Sola Özgüç, 2015), stimulating active learning (Çay et al., 2020; Sola Özgüç & Cavkaytar, 2016), and supporting the students' cognitive development.

The special education teachers stated that they observed progress having been made in the students' academic skills (Badilla-Quintana et al., 2020; Eldeniz Çetin & Geçal, 2017; Sola Özgüç & Cavkaytar, 2016) such as in their mathematical skills (Xin et al., 2017), reading skills (Cheek et al., 2022; Ronimus et al., 2019), writing skills (Ok et al., 2022), and comprehension skills, hand-eye coordination skills (Eldeniz Çetin & Geçal, 2017), language skills (Eldeniz Çetin & Geçal, 2017; Gerakis & Volioti, 2022), and learning skills (Hasselbring & Williams-Glaser, 2000) with the help of the instructional materials developed by the preservice teachers.

Besides the advantages of the special education technologies, many research studies (e.g., Ahmed, 2018; Atanga et al., 2020; Cagiltay et al., 2019; Coleman et al., 2015; Kutlu et al., 2018; Thomas et al., 2019) stressed the challenges of using technology in the special education context. These challenges include teachers' lack of special education technology knowledge and skills, teachers' attitudes toward technology usage, limited access to the required technological applications, lack of educational resources, and the associated high cost of implementing such technologies. In the current study, special education teachers reported on the challenges they observed during the implementation of instructional materials developed by preservice special education teachers. Student characteristics (e.g., boredom, stubbornness, reluctance) were the most mentioned challenges to the special education technology integration, which corroborated the findings reported by Atanga et al. (2020). Possible reasons for these challenges being observed in the current study might be due to the students' unfamiliarity with the preservice teachers who implemented the instructional materials, as well as the students' lack of or limited exposure to the use of such technological applications in their education. The preservice teachers did not have the opportunity to interact with the students prior to the implementation, therefore the students might have been more comfortable if they had worked with their usual class teachers. Although the literature (e.g., Atanga et al., 2020; Kutlu et al., 2018; Taylor et al., 2020; Thomas et al., 2019) has stressed teachers' lack of technology knowledge and the implementation of such technologies in the special education context as being sources of the challenges observed, the current study found that students' lack of technological knowledge and skills were also reported by the special education teachers who observed the implementations. This finding supports the study of Taylor et al. (2020) who noted that successful instruction using technologies could only be achieved if both the teachers and their students have sufficient prior knowledge of relevant technology use. Congruent to the current literature, the special education teachers in the current study asserted that the infrastructure of the classroom was also seen as a barrier to the integration of technology in special education (Arslan-Ari, & Inan, 2010; Çay et al., 2020; Eldeniz Çetin & Geçal, 2017; Kutlu et al., 2018).

Based on the special education teachers' observations of the application of the instructional materials developed by the preservice special education teachers, they proposed a number of suggestions. Even though the special education teachers found the multimedia features of the instructional materials to be supportive to the students' learning, they suggested the addition of audio to written text where not already provided, the addition of more visuals, and improvements to the visual and audio quality. The use of multimedia elements in special education has been supported by just a few research studies to date (e.g., Ahmad et al., 2013; Wang et al., 2018); however, the effectiveness of using audio and visuals has depended on the type and level of disability of the students. For example, Harrar et al. (2014) found that people with dyslexia can struggle with transitions among media types while studying in multimedia learning environments.

The special education teachers also recommended increasing the interactivity of the instructional materials by adding games and activities which might promote the students' active participation. The impact of interactive learning environments in special education was supported by the current literature. For example, according to a recent systematic review by Lämsä et al. (2018), the current literature related to the use of games for people with disabilities supports the benefits of gaming to improve their learning, particularly in reading and math skills.

Another suggestion was to revise the materials to make them more appropriate to the students' knowledge levels and needs. This finding aligns with research studies conducted by Eldeniz Çetin and Geçal (2017) as well as by Sola Özgüç and Cavkaytar (2016), in which special education teachers expressed that technology-based materials and programs best suited to the individual needs of students with disabilities should be developed. Also, Adebisi et al. (2015) stressed that the right choice of special education technology depends on the individual needs of the target students, their knowledge and skills, the setting, and the objectives that the students are targeted to achieve. Lastly, the special education teachers recommended providing basic computer literacy skills to students with disabilities prior to attempting to integrate technology into their education. This suggestion notably aligns to the conclusion of a research study conducted by Taylor et al. (2020).

### **Limitations and Future Studies**

There are several limitations to the current study. First, this qualitative case study explored the challenges and successes of computer-based instructional materials from the perspectives of just 12 special education teachers working at a rehabilitation center. This limits the generalizability of the findings when it comes to considering different settings or larger populations. Therefore, the results should be interpreted judiciously, and further studies could be conducted within inclusive classrooms or with larger populations. Second, the current study may be considered limited through its single implementation of computer-based instructional materials. Future studies could implement the same project in the same technology integration course, but in a way that includes multiple implementations. Lastly, data was collected through structured interviews conducted by the preservice teachers. In order to elicit more in-depth information, further studies could conduct semi-structured interviews as a data collection strategy, and also include observed implementations.

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## UZUN ÖZ

**Giriş:** Özel eğitim teknolojilerinin yaygın ve etkili kullanımında özel eğitim öğretmenlerinin rolü büyüktür. Ancak, öğretmenlerin teknolojik bilgi ve beceri eksikliği bu teknolojilerin entegrasyonundaki en büyük zorluklardan biridir (Kutlu vd., 2018). Lisans programlarında özel eğitim teknolojisi derslerini tamamlayan öğretmenlerin sınıflarında teknoloji kullanımında daha yeterli oldukları tespit edildiğinden, bu eğitim lisans programlarından itibaren başlamalıdır (Atanga vd., 2020). Aslan (2018) da teknoloji derslerini tamamlayan özel eğitim öğretmenlerinin, bu tür dersleri almayan öğretmenlere göre özel eğitim teknolojilerine yönelik anlamlı düzeyde daha olumlu tutum sergilediklerini bulmuştur. Ancak yapılan araştırmalar (Atanga vd., 2020; Kimm vd., 2020), lisans programlarında özel eğitim öğretmen adaylarının teknoloji eğitiminin eksik olduğunu göstermiştir. Bu nedenle, özel eğitim öğretmeni adaylarının teknoloji temelli yeterliklerinin geliştirilmesi için öğretmen müfredatlarının revize edilmesi gerekmektedir.

Yapılandırılmış bir şekilde yürütülen uygulamaya yönelik teknoloji entegrasyon dersleri, öğretmen adaylarının özel eğitim teknolojisi ile ilgili bilgi ve becerilerini geliştirmelerine yardımcı olabilmektedir (Benedict vd., 2016). Ancak, Lohnes Watulak (2018) öğretmen adaylarının işbirlikçi bir öğrenme ortamında teknolojiyi içeriklerine entegre eden öğretim materyalleri oluşturdukları teknoloji entegrasyonu derslerinin, yalnızca teknoloji temelli derslerden daha başarılı bir teknoloji eğitimi biçimi olduğunu öne sürmüştür. Bu çalışmanın amacı, özel eğitim öğretmen adaylarının teknoloji entegrasyonu dersinde yürütülen öğretim tasarımı projesi kapsamında özel gereksinimli öğrenciler için geliştirdikleri öğretim materyallerinin uygulama yapılan rehabilitasyon merkezindeki özel eğitim öğretmenler açısından başarı ve zorluklarını araştırmaktır.

**Yöntem:** Bu çalışma, öğretim tasarımı projesine özel eğitim öğretmenleri penceresinden bakan bir durum çalışmasıdır. Çalışmada, özel eğitim öğretmen adaylarının özel eğitim kurumunda kayıtlı öğrencilerin ihtiyaçlarına yönelik geliştirdiği ve uyguladığı teknoloji entegre edilmiş öğretim materyalleri, o öğrencileri en iyi tanıyan özel eğitim öğretmenleri tarafından değerlendirilmiştir.

Çalışmaya, uygulamanın yapıldığı rehberlik ve araştırma merkezinde görev yapan 12 (9 kadın, 3 erkek) özel eğitim öğretmeni katılmıştır. Bu öğretmenler, aday öğretmenlerin ihtiyaçlarını analiz ettikleri öğrencilerin öğretmenleri olup materyal uygulamasını gözlemlemişlerdir. Öğretmen adaylarının materyallerini uygulamasının ardından özel eğitim öğretmenleri ile görüşme yapılarak veri toplanmıştır. Verinin analizi sürecinde, ortaya çıkan temaları belirlemek için tümevarımsal analiz yöntemi kullanılmıştır (Cresswell, 2014).

**Bulgular:** Özel eğitim öğretmen adayları öğretim materyallerini uyguladıktan sonra, katılımcı özel eğitim öğretmenleri, uygulamaların başarılı ve zayıf yönleri ile ilgili görüşlerini paylaşmışlardır. Yapılan görüşmelerin nitel veri analizine göre sonuçlar, beş temel tema ortaya çıkarmıştır: (1) Öğretim materyallerinin başarısı ve başarısızlığı; (2) Öğretim materyallerinin başarılı yönleri; (3) Öğretim materyallerinin öğrencilerin bilgi ve becerilerine katkısı; (4) Zorluklar ve (5) Öneriler.

Özel eğitim öğretmenleri, öğretim materyallerinin büyük çoğunluğunun (n = 14) başarılı olduğunu düşündüklerini belirtmişlerdir. Ancak, üç materyalin öğrencilerin ihtiyaçlarına daha iyi hizmet edebilmesi için revize edilmesi gerektiğini öne sürmüşlerdir. Bu materyallerden ikisinde öğrencilerin bilgi ve beceri seviyesine uymadığı için önemli değişiklikler yapılmasını tavsiye etmişlerdir. Gerekli revizyonların yapılması halinde materyallerin öğrenciler için faydalı olabileceğini vurgulamışlardır.

Özel eğitim öğretmenleri, materyallerde kullanılan öğretim stratejileri, materyallerin uygun bir şekilde hazırlanmış olması ve öğrencilere sunduğu olanaklar sayesinde materyallerin öğrencilere olumlu yönde katkı sağladığını ifade etmişlerdir. Materyallerin özel gereksinimli öğrencilerin hem öğrenmelerine hem de beceri (matematik, okuma, okuduğunu anlama, yazma, dil ve öğrenme) gelişimine katkı sağladığını savunmuşlardır. Ayrıca, özel eğitim öğretmenleri adayların materyalleri sınıfta uygularken karşılaştıkları zorluklara da değinmişlerdir. Bu zorluklar öğrenciler, altyapı ve

öğretim materyali içinde kulağa yabancı gelen isimlerin kullanılması ile ilgili olmuştur. Bildirilen zorluklara, özel eğitim alanındaki uzmanlıklarına ve engelli öğrencilere eğitim verme konusundaki deneyimlerine dayanarak hem geliştirilen öğretim materyallerini hem de uygulamalarını iyileştirmek için önerilerde bulunmuşlardır. Bu öneriler: (a) Öğretim materyallerinin çoklu ortam özelliklerini geliştirmek; (b) Aktif katılımı artırmak için öğretim materyaline yeni özellikler eklemek; (c) Öğretim materyallerini öğrencilere uygun olacak şekilde revize etmek ve (d) Öğretim materyallerini uygulamadan önce öğrencilere gerekli olan temel bilgisayar becerilerini öğretmektir.

**Tartışma ve Sonuç:** Özel eğitim öğretmenleri uygulanan öğretim materyallerinin çoğunu başarılı bulmuşlardır. Materyallerin başarısı, özel gereksinimli öğrencilerin bireysel ihtiyaçlarına göre sistematik bir yaklaşımla (Benedict vd., 2016) geliştirilmesine bağlı olabilir (Adebisi vd., 2015). Katılımcı özel eğitim öğretmenleri, öğretmen adaylarının önce öğrencilerin ihtiyaçlarını analiz etmeleri ve daha sonra materyalleri öğrencilerin ihtiyaçlarına göre geliştirmeleri nedeniyle öğretim materyallerinin geliştirilme biçimini takdir etmişlerdir.

Özel eğitim öğretmenleri, öğretmen adayları tarafından geliştirilen öğretim materyallerinin tek bir uygulama olmasına rağmen öğrencilerin öğrenmelerine ve beceri gelişimine katkı sağladığını belirtmişlerdir. Bu sonuç, özel eğitim öğretmenlerinin özel eğitimde teknoloji kullanımının öğrencilerin öğrenmesine etkisine ilişkin görüşlerini tanımlayan diğer yayınlanmış çalışmaların (Çay vd., 2020; Eldeniz Çetin & Geçal, 2017; Sola Özgüç & Cavkaytar, 2016) bulgularını desteklemektedir. Bu çalışmadaki öğretmenlere göre materyaller, öğrencilere çeşitli fırsatlar sunarak öğrenmelerini desteklemiş (Eldeniz Çetin & Geçal, 2017; Sola Özgüç, 2015; Sola Özgüç & Cavkaytar, 2016), öğrencilerin dikkatini derse yönlendirmiş (Çay vd., 2020; Eldeniz Çetin & Geçal, 2017), öğrenmeyi teşvik etmiş (Çay vd., 2020; Eldeniz Çetin & Geçal, 2017), kalıcı öğrenmeyi kolaylaştırmış (Çay vd., 2020; Eldeniz Çetin & Geçal, 2017; Sola Özgüç & Cavkaytar, 2016), kavramlar arası ilişkiler kurmuş ve öğrencilerin motivasyonunu artırmıştır (Çay vd., 2020; Eldeniz Çetin & Geçal, 2017; Hasselbring & Williams-Glaser, 2000; Sola Özgüç, 2015). Bunları eğlenmeyi sağlayarak (Çay vd., 2020; Sola Özgüç, 2015), özgüvenlerini artırarak (Sola Özgüç, 2015), aktif öğrenmeyi teşvik ederek (Çay vd., 2020; Sola Özgüç & Cavkaytar, 2016) ve öğrencilerin bilişsel gelişimini destekleyerek sağlamıştır.

Özel eğitim öğretmenleri, öğretmen adayları tarafından geliştirilen öğretim materyalleri yardımıyla öğrencilerin akademik becerilerinde ilerleme kaydedildiğini gözlemlediklerini belirtmişlerdir. Bu araştırmanın sonuçları daha önceden yapılan çalışmalarla (Eldeniz Çetin & Geçal, 2017; Hasselbring & Williams-Glaser, 2000) örtüşmektedir.

Bu çalışmada, özel eğitim öğretmenleri, öğretmen adayları tarafından geliştirilen öğretim materyallerinin uygulanması sırasında gözlemledikleri zorlukları da belirtmişlerdir. Öğrenci özellikleri (can sıkıntısı, inatçılık, isteksizlik) özel eğitim teknolojisi entegrasyonunda en çok bahsedilen zorluklardır (Atanga vd., 2020). Mevcut çalışmada gözlenen bu zorlukların olası nedenleri, öğrencilerin öğretim materyallerini uygulayan öğretmen adaylarına aşına olmamalarının yanı sıra, öğrencilerin bu tür teknolojik uygulamaları eğitimlerinde kullanmamaları veya sınırlı kullanmaları olabilir. Öğretmen adayları uygulama öncesinde öğrencilerle yeterince etkileşime girme fırsatı bulamamış olabilirler. Ayrıca, mevcut alan yazınla uyumlu olarak, mevcut çalışmadaki özel eğitim öğretmenleri, sınıf altyapısının da teknolojinin özel eğitime entegrasyonunun önünde bir engel olarak görüldüğünü ileri sürmüşlerdir (Arslan-Ari & İnan, 2010; Çay vd., 2020). Son olarak, özel eğitim öğretmenleri, öğretmen adayları tarafından geliştirilen öğretim materyallerinin geliştirilmesine ve uygulanmasına ilişkin önerilerde bulunmuşlardır.