

Comparison of the Effectiveness of Teaching with Simultaneous Prompting Procedure of Spatial Concepts to Students with Intellectual Disabilities with and without Tablet

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Abstract

The purpose of this study is to compare the effectiveness and efficiency of simultaneous prompting procedure offered with or without tablet in the teaching of spatial concepts to students with mild intellectual disability. Parallel to this objective, a mobile learning software was prepared in mobile devices using simultaneous prompting procedure method in the teaching of spatial concepts. In the study, adapted transform applications model, one of the single-subject research methods, was used. The dependent variables of the research were the concepts of on-out, in-behind, in front of-under, and the independent variables were the simultaneous prompting procedure offered using a tablet and a simultaneous prompting procedure offered without tablet. All sessions were held in a special education center with one-to-one teaching arrangement. According to the results of the research, it was determined that the simultaneous prompting procedure offered via tablet was more effective in two of the three participants, and both teaching practices were equally effective in one of the participants. It has been found that teaching using tablet is more efficient in terms of number than the simultaneous prompting procedure. It was determined that two of the participants maintained the concepts in the first, third and fifth weeks following the application. Social validity data were found to support the results of the study.

Keywords: Concept teaching, tablet, simultaneous prompting procedure, adapted alternating treatments model

Introduction

Intellectual disability is the state of having delays in social skills, responsibility, communication, daily skills and self-efficacy compared to the age group of the individual, as well as the general intelligence function being significantly below the average. Individuals with intellectual disability suffer from limitations in personal, social and academic skills due to some neurological reasons. The majority of these limitations emerge before school age (AAIDD, 2019).

In the Special Education Services Regulation published in 2018, the following definition is provided: "Individual with mild intellectual disability: individual who needs special education

and support education services at a limited level due to his mild inadequacy in intellectual functions and conceptual, social and practical adaptation skills" (MEB, 2018). These individuals are usually noticed as a result of the problems they experience in academic success when they start school (Eripek, 2012). Individuals with mild intellectual disability are expected to meet their needs independently and participate in social life. In this context, individuals with intellectual disability should have pre-requisite concepts and skills. If an individual does not have or cannot learn these concepts, their learning in several areas such as academic and daily life may be incomplete (Acungil, 2014). These individuals should be taught functional concepts and skills that they can use in their daily lives which contribute to their independent living (Özak & Avcioğlu, 2008). Individuals' acquisition of basic concepts and skills as prerequisites contributes to their achievement of goals targeting self-care, daily life, business and occupation, social skills and basic

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academic skills (Özak & Avcioglu, 2007; Toper Korkmaz & Vuran, 2007).

Concepts expressing color, shape, size, place-direction, qualification and action required by elementary school curriculum are introduced to students through systematic experiences via pre-school education curriculum (Angin, 2013; Metin & Sari, 2015). Concepts are groups of stimuli that create a common response in individuals and are ranked in stages from the lowest level to the upper level. Concepts are taught at four different levels, namely concrete level, recognition level, classification level and abstract level (Vuran & Çelik, 2013). While individuals with normal development learn these basic concepts, which are the prerequisites of academic and daily life skills, by observing their environment and imitating the individuals around them, individuals with intellectual disability need to plan and make different arrangements in their education in order to learn these concepts (Birkan, 2002; Nelson, Cumming & Boltman, 1991).

In order to increase the quality of teaching offered to individuals with mild intellectual disability, effective methods should be chosen that can result in teaching in a short time with fewer errors. One of the most effective methods used for these individuals is errorless teaching methods (Tekin-İftar, 2012). "Simultaneous prompting procedure", one of the errorless teaching methods, is one of the methods used in teaching concepts and skills to individuals with mild intellectual disability and shown to be effective in studies (Morse & Schuster, 2004). In the simultaneous prompting procedure method, a controlling prompt is presented immediately after the target stimulus (instruction / question) is presented and the individual takes this prompt as a model. Since a controlling prompt is offered per trial, the possibility of an independent reaction to the individual is not offered (Tekin-İftar and Kırcaali-İftar, 2013). Wolery, Bailey & Sugai (1988) argue that the simultaneous prompt procedure method can be chosen when students cannot learn with traditional methods and emphasize that it is effective in teaching concepts to individuals with mild intellectual disability (Morse & Schuster, 2004).

It has been observed that studies conducted in Turkey tested the effectiveness of different methods in teaching the concepts of young, fresh and stale (Öz Alkoyak, 2017), piece concept (Varol, 2009; Sazak Pınar, 2013), contrast (long-short, big-small) concepts (Ekergil, 2000), color and geometric shape concepts (Güzel Özmen & Ünal, 2008;

Kırcaali-İftar, Birkan & Uysal, 1998). In international studies, on the other hand, it is seen that studies which test the effectiveness of different methods in teaching scientific concepts (Knight, Spooner, Browder, Smith & Wood, 2013) and basic concepts (Nelson, Cummings & Boltman, 1991) are conducted.

Studies examining the effectiveness of the simultaneous prompting procedure method regarding concept teaching are limited in the Turkish and international literature. Considering the studies in which the effectiveness of the simultaneous prompt method in Turkey is examined, studies on the concepts of qualification (long-few-old-thick) (Çelik & Vuran, 2014; Çelik, 2007), the concept of time (Karabulut & Yıkılmış, 2010) and the concept of color (Dere Çiftçi, 2013; Dere Çiftçi & Temel, 2010; Toper Korkmaz & Vuran 2007; Birkan, 2002) can be found. In Çelik & Vuran's (2014) study, the effectiveness of simultaneous prompting procedure and direct teaching methods for teaching qualification concepts (long, old, low and thick) was compared, it was found that both teaching methods are effective but simultaneous prompting teaching method is compared to direct teaching method in terms of efficiency. As a result, it has been found to be more effective. Considering the international literature, it is seen that the studies examining the effectiveness of the simultaneous prompting procedure method in concept teaching are studies on the teaching of science concepts (Parker & Schuster, 2002) and location (in and out) concepts (Fickel, Schuster, & Collins, 1998).

In addition to scientifically based methods, the use of technology has also increased in individuals with mild intellectual disability (Metin & Sari, 2015). With the use of technology, attention span and interest of individuals in learning gradually increase. In addition, meaningful learning experiences such as developing academic skills, problem solving and cause-effect relationships can be provided (Martin, 2006). The use of technology-based applications in the teaching of individuals with intellectual disability contributes to the emergence of their real performance and to reaching the opportunities that these individuals have (Jeffs, Morrison, Messenheimer, Rizza & Banister 2003; Stodden, Conway & Chang, 2003; Hasselbring & Laser, 2000). Studies have revealed that the most frequently used technological tools in the education of these individuals are laptops, mobile phones and tablets (Genty, 2012; Hetzroni & Tannous, 2004). Studies on this subject show that computer-based training is effective on individuals

with intellectual disability (Jeffer, Morrison, Messenheimer, Rizza & Banister 2003; Stodden, Conway & Chang, 2003; Hasselbring & Laser, 2000). Computer use increases the attention and learning speed of individuals with intellectual disability compared to traditional education (Hetzroni & Tannous, 2004). The use of tablets in teaching concepts and skills can provide easier acquisition of targeted goals (Mechling, Gast & Cronin, 2006).

It is known that several studies have been conducted in the Turkish and international literature to test the effectiveness of tablet-assisted technology in teaching concepts and skills to individuals with intellectual disability (Baran, 2019; Sani Bozkurt, 2016; Çengel, 2015; Eliçin, 2015; Sola Özgüç, 2015; Acungil, 2014; Alexander, Ayres, Smith, Shepley & Mataras, 2013; Ganz, Boles, Goodwyn & Flores, 2013; Burke, Allen, Howard, Downey, Matz & Bowen, 2013; Hourcade, Bullock-Rest & Hansen, 2012).

Although there are studies on the usage of technology in special education, limited number of studies can be found which are developed using special teaching techniques and which evaluate effectiveness (Karanfiller, Göksu & Yurtkan 2017; Soykan & Özdamlı, 2017; Öztürk, 2016; Doenyas, Şimdi, Özcan, Çataltepe & Birkan, 2014; Cullen, 2013; Kagohara, Sigafos, Achmadi, Meer, O'Reilly & Lancioni, 2011). In a study conducted by Karanfiller, Göksu & Yurtkan (2017), a mobile learning design was developed in line with the open expression method in teaching the concepts of big-small, many-few, and long-short to students with special needs, and it was concluded that this program was effective on learning the concepts. Soykan and Özdamlı (2017), on the other hand, developed a software using the simultaneous prompting method in the teaching of big-small concepts and determined that the applied program improved the concept-learning of students with special needs.

Individuals with mild intellectual disability need to learn concepts that are prerequisites for academic, self-care and daily life skills; however, as the level of disability increases, it becomes difficult for them to learn these concepts. Therefore, this study aimed to teach spatial concepts that are prerequisites for most academic, self-care and daily life skills that can make their lives easier. In addition, the limited number of studies on individuals with mild intellectual disability with portable devices necessitates further research with scientific-based applications (Doenyas, 2014). In the literature, no research has been identified which presents a mobile learning software

prepared on portable devices using the simultaneous prompting procedure method in teaching spatial concepts via tablet. In this context, it was considered necessary to prepare a program for teaching spatial concepts and to test the effectiveness of this program.

This research is important in terms of being the first study in both international and national literature in which the tablet-based software program was designed using the simultaneous prompting procedure method to introduce spatial concepts to students with mild intellectual disability and the effectiveness of the presentation of this method via tablet was evaluated. In addition, it is believed that presenting the simultaneous prompting procedure via tablets in the acquisition of spatial concepts in the research will contribute to the students gaining independent working skills and, as it is a prerequisite for various skills, to perform their academic, self-care and daily life skills independently.

The general purpose of this research is to determine whether the simultaneous prompting procedure offered using tablets and the simultaneous prompting procedure offered without using tablets differs in terms of effectiveness and efficiency in introducing spatial concepts to individuals with mild intellectual disability. In line with this general purpose, answers were sought to the following questions:

1. Is there any difference in the effectiveness of simultaneous prompting procedure offered using tablet in teaching the concept "on" and the effectiveness of simultaneous prompting procedure offered without using tablet in teaching the concept "out" to students with mild intellectual disability at acquisition, follow-up and generalization stages?
2. Is there any difference in the effectiveness of simultaneous prompting procedure offered using tablet in teaching the concept "in" and the effectiveness of simultaneous prompting procedure offered without using tablet in teaching the concept "behind" to students with mild intellectual disability at acquisition, follow-up and generalization stages?
3. Is there any difference in the effectiveness of simultaneous prompting procedure offered using tablet in teaching the concept "in front of" and the effectiveness of simultaneous prompting procedure offered without using tablet in teaching the concept "under" to students with mild intellectual disability at acquisition, follow-up and generalization stages?

4. Is there any difference between (a) number of sessions, (b) number of trials, (c) number of errors, and (d) total teaching period of simultaneous prompting procedure offered using tablet and simultaneous prompting procedure offered without using tablet in teaching spatial concepts to students with mild intellectual disability realized until the criterion was met?
5. What are the opinions of the teachers of the students with mild intellectual disability who participated in the study about the research process?

Method

Participants

Three students (two boys and one girl) with a diagnosis of mild intellectual disability and aged 4-6 participated in the study. All students attend a private education institution.

The students participating in the study were

required to fulfill the following prerequisite skills: (a) following instructions, (b) paying attention to audio-visual stimuli for at least five minutes, (d) accepting manual prompts, (e) choosing among images, and (f) ability to match / distinguish. In addition, the precondition of not having received a systematic education was sought regarding the concepts of on-out, in-behind, in front of-below, which were the dependent variables of the research. In order to determine whether the students have prerequisite skills or not, semi-structured questions were first formed and their teachers were interviewed. As a result of the interview, students who had the above-mentioned prerequisite skills and attended the institution regularly participated in the study. Before the study, the families of the students were informed about the application and the necessary permissions were obtained from the families. Code names were given to the students who participated in the study. Information about the students is shown in Table 1.

Table 1. Demographic Characteristics of Participants

Participant	Sex	Age	Schooling History	Type of Disability
Ali	Male	4	1 year	Mild intellectual disability
Elif	Female	6	6 months	Mild intellectual disability
Can	Male	5	2 years	Mild intellectual disability

Ali (aged 4), one of the students participating in the study, is a male student diagnosed with mild intellectual disability. Ali attends the private education institution five days a week. Ali can show and state the primary colors and basic geometric shapes independently. He can independently perform his gross motor and fine motor skills. He needs help in performing cognitive skills and communication skills such as contrasting concepts, position concepts, and number concepts.

Elif (aged 6) is a female student diagnosed with mild intellectual disability. She attends general education class on a full-time basis and private education institution on a part-time basis, three days a week. Elif independently performs self-care skills, gross motor and fine motor skills. She is having difficulties in performing spatial concepts, cognitive skills such as reading and writing, basic mathematical skills, and communication skills.

Can (5) is a male student diagnosed with mild intellectual disability. Mehmet attends general education class on a full-time basis and private education institution on a part-time basis. Mehmet independently performs self-care skills, gross motor and fine motor skills. He is having difficulties in performing basic mathematical and communication skills such as position concepts,

number concepts, and number-object matching.

Practitioner and Observer

The research was carried out by the researcher who is studying in the Special Education Teaching doctorate program and also works as a lecturer. Before starting the study, the researcher conducted a pilot study on a tablet application designed using the simultaneous prompting procedure method with a five-year-old student diagnosed with intellectual disability. As a result of the pilot study, it was found appropriate to teach the concepts in the form of steps and to move on to the next after the teaching of one step is completed.

A special education teacher participated as an observer to collect data on the application reliability and inter-observer reliability of the study. The observer was informed about the dependent and independent variable of the research, daily checkup, and organization of teaching, follow-up and generalization sessions as well as data-recording. Reliability data between the application and the observers were collected in 30% of the sessions held during the research process.

Setting and Time

Except for the generalization sessions of the

study, all sessions (starting level, teaching, checkup and follow-up sessions) were held in the classroom (4mx4m) where the students attended the institution. In the left corner of this classroom, a peanut table and two chairs were placed where the student and practitioner sat during the study, as well as a tool-equipment cabinet and a library. During the sessions, a practitioner, the student and an observer teacher were present in the classroom. Generalization sessions were held in the institution where the students were educated, but in a different classroom (3mx3m) and with different materials. All sessions were held by the researcher as two sessions per day between 13:30 and 16:30 on weekdays.

Tools-Instruments

For the teaching, checkup and follow-up sessions of the research, a Samsung Galaxy Tab 4 model tablet, video camera, and visual materials prepared by the researcher regarding the concept of "out" were used. Chairs, boxes and pillows were used in the generalization sessions. In addition, rattles, rings, balls and Legos were used to achieve the purpose of placing on or out of the specified items.

In addition, a video camera, data collection forms, a pen and various reinforcements to be given to the students were used to collect the research data.

Research Model

Adapted alternating treatments model, one of the single-subject research models, was used in the study. Adapted alternating treatments model is a research model used to compare the effects of two or more independent variables on two or more irreversible dependent variables (Holcombe, Wolery & Gast, 1994; Tekin-İftar, 2012; Kurt, 2018).

In the application stage of the study, rapid

alternating (sequential teaching) of simultaneous prompting procedure using tablet and simultaneous prompting procedure without using tablet were applied in the acquisition of spatial concepts. This alternation was implemented in the form of teaching sessions held on the same day and with an interval of minimum one hour. An equal number of sessions and tests were included in both teaching practices.

Independent Variable

The independent variables of the study were the simultaneous prompting teaching application offered via the tablet and the simultaneous prompting teaching application offered without using the tablet.

In the process of preparing the simultaneous prompting teaching application (I Learn Concepts software) offered via tablet, which is one of the independent variables, the criterion-dependent measurement tool regarding spatial concepts (on-in-in front of) was first developed by the researcher. Later, a software developer from the field of Computer and Instructional Technologies designed the software with the simultaneous prompting method of visuals related to spatial concepts. The prepared software consisted of three teaching steps corresponding to the three steps of concepts and evaluations of each step, making a total of six steps.

In the process of applying the simultaneous prompting procedure without using a tablet which is another independent variable, criterion dependent measurement tools for the spatial concepts (out-behind-under) were developed and visuals suitable for the measurement tools were prepared.

Teaching sessions were ended after the students met the criteria (100%) in teaching spatial concepts in both teaching practices.

Table 2. Independent and Dependent Variables Determined for Participants

Participants	Simultaneous Teaching Delivered with Tablet	Simultaneous Teaching Delivered without Tablet
Ali	On	Out
Elif	In	Behind
Can	In front of	Under

Dependent Variables

The dependent variables of the study are above-out, in-behind and in front of-below concept sets among spatial concepts. In the teaching of the spatial concepts that are planned to be taught, it is necessary to provide 100% acquisition level for students.

Spatial concepts are analyzed and divided into

steps according to related and unrelated qualities. Criterion dependent measurement tools and materials were prepared by taking into account the analyzes prepared. The analyzes made regarding the concepts of "on" and "out" are shown in Table 3 and Table 4. Other concepts are analyzed similarly.

Table 3. Analysis of the Concept "on"

Related qualities	Unrelated qualities
An object located on the boundaries of another object or area.	What is the object forming the boundary or space and the object on top of it Color of the object Dimensions of the object Material which the object is made of
Steps	
To show the sample which is "on" among the visuals of same type and kind	
To show the sample which is "on" among the visuals of different type and same kind	
To show the sample which is "on" among the visuals of different type and kind	

Table 4. Analysis of the concept "out"

Related qualities	Unrelated qualities
An object located out the boundaries of another object or area.	What is the object forming the boundary or space and the object out of it Color of the object Dimensions of the object Material which the object is made of
Steps	
To show the sample which is "out" among the visuals of same type and kind	
To show the sample which is "out" among the visuals of different type and same kind	
To show the sample which is "out" among the visuals of different type and kind	

Development of Tablet-Based Software

In the study, a software (mobile application) was developed for teaching on-in-in front of concepts by using the simultaneous prompting procedure method offered via tablet to students with mild intellectual disability. This software was prepared by a software developer who was studying at a PhD program in Computer Engineering. The software was developed using the java programming language on the Android Studio operating system. Attention was paid to ensure that the screenshots of the developed software were plain and simple and contained few buttons. The background color on which the images would be placed was chosen as white, and thus a simple design was aimed. The visuals of the concepts to be taught were prepared by the graphic designer and vocalized by a special education teacher.

Taking into consideration the steps included in analysis for teaching of concepts, a six-step program was prepared, three of which were to be used in teaching session and the other three of which were to be used in checkup sessions. Instructions were given by the program to be used in teaching sessions, followed by a controlling prompt and reinforced when the student responded correctly. When the student responded incorrectly, the program gave a new instruction and a controlling prompt. In the checkup sessions, only instructions were offered by the program, and the

student was able to react independently without giving a controlling prompt. The teaching and checkup sessions of each step in the program were prepared consecutively. When the 100% criteria were met in the checkup session for the relevant step, the next step was initiated, and when the criterion was not met, the instruction of the step was repeated by the program.



Visual 1. Main user screen view of "I am learning concepts" mobile application



Visual 2. Screen view of "on" concept application

Application Process

In this study, the teaching of the concepts of “on, in and in front of” via simultaneous prompting procedure using tablet and the teaching of the concepts of “out, behind and under” via simultaneous prompting procedure using materials to the students with mild intellectual disability were compared. The implementation process consisted of pilot application, starting level, teaching, daily checkup, follow-up and generalization sessions.

Pilot Study

Before starting the study, a pilot application was carried out for the presentation of the simultaneous prompting procedure via tablet with a student who had the same qualifications and prerequisites as the students. A 5-year-old female student participated in the pilot study. The student was attending a private education institution on a part-time basis. The software developed on the tablet in line with the simultaneous prompting procedure method to introduce the concept “on” was tested by making a one-on-one application with the student. As a result of this pilot application, it was deemed appropriate to teach and evaluate each step in the criterion-dependent measure tool for acquiring the concept of “on”.

Checkup Sessions

Within the scope of the research, before the teaching of spatial concepts, starting level data were collected in order to determine the pre-teaching functioning level of the students regarding the concepts. Collective checkup sessions were held with all students and at least three consecutive sessions were held for each student until stable data were obtained. These sessions were organized according to the teaching application (with or without a tablet) selected through unbiased assignment.

In order to obtain the application stage data of the study, daily checkups were organized for each student prior to all teaching sessions with the exception of the first teaching session. One trial was applied per session.

Remarkable prompts were presented in order to attract the attention of students in checkup sessions (“Hello...! Today we will conduct a study related to with you. Are you ready to work?) The study was launched when a verbal or non-verbal reaction was received from the student as to his/her readiness. (“Great, you are ready to work. Let’s begin.”) After the materials were introduced, the students were given instructions. (Look at the screen/what is in front of you, show what is

on/out.) The student was instructed once in line with the single opportunity method and the researcher waited 5 seconds for his/her reaction. The true responses of the student to the toolkits in accordance with the instructions were marked as “+” on the data collection form, and their false responses or non-responses were marked as “-”. After giving instructions for four tool sets for the teaching stage of the concept, the trial was ended and the checkup session was ended. During the checkup sessions, no feedback or correction was given to the student participants, and their positive study behaviors were reinforced with primary reinforcers. Checkup sessions for other concepts were conducted following the same process.

Teaching Sessions

In the research, the teaching of spatial concepts was carried out using the simultaneous prompt method offered using a tablet and simultaneous prompt teaching method offered without using a tablet. Before the teaching started, the teaching sets for both applications were selected through unbiased assignment. Teaching sessions were conducted in the students' classroom environment by sitting face to face with the researcher. Two teaching sessions were held with each student during the day. The materials were introduced at the beginning of each teaching session. Teaching sessions continued for three consecutive sessions until stable data was obtained.

The teaching session for the presentation of the simultaneous prompting procedure method via tablet for the acquisition of spatial concepts and the teaching session for the presentation of the simultaneous prompting procedure method without using a tablet was held with one-hour interval. Accordingly, the teaching of the application presentation assigned to the students was made, and then the teaching set of the presentation was made without using the tablet.

The order in each session of the teaching application used to control the sequencing effect was chosen through unbiased assignment. If the same ranking was determined for three consecutive sessions, the other option was applied.

One trial was made for each of the four tool sets in the teaching set determined for the three steps prepared per concept. Teaching sessions and materials used were differentiated according to these steps. After meeting the criteria for each step, the next step was launched.

The findings regarding whether the presentation of simultaneous prompt instruction using tablet and the simultaneous prompting

procedure method without using tablet are effective on the participants' acquisition of the concepts in introducing spatial concepts to individuals with mild intellectual disability was graphically analyzed. In the graphs, data regarding the starting level, application, checkup and follow-up sessions are included. At the same time, the correct responses exhibited by the students in the generalization sessions were shown with a column chart in the form of pre-test and post-test.

Simultaneous Prompting Teaching Application Presented Using Tablet

In the tablet application designed by using the simultaneous prompting procedure method, the target stimulus "Look at the screen, show what is on" was presented. A verbal prompt was used as the controlling prompt after the target stimulus. One trial was conducted in each session.

In the teaching sessions held for teaching the concept, the researcher and the student sat opposite each other, the study was called to the student, and his/her attention was drawn. (Today we will learn the concept of "on" with you). The student was explained the rules to be followed and the reinforcer he/she would gain. After the verbal or non-verbal confirmation of the student's readiness, the teaching was launched (Great, you're ready. Let's get to work.). After the tablet was introduced, it was placed in front of the student and the program was launched. Visuals regarding the concepts of "on" and "under" appeared on the screen and instructions were provided by the program (Look at the screen, show which one is "on"). The visual right after the instruction was highlighted and the prompt was presented (this is "on"). The student was given a five-second waiting time, and he/she was expected to select by touching the visual which was "on". The student's correct response was reinforced by the program (Well done, you showed what is "on" very nicely.) If the student responded incorrectly or did not respond at all, the instruction was repeated by the program and a prompt was presented. After the education was completed with four tool sets, the student was evaluated. Four different tool sets were presented for the step taught by the program (Look at the screen, show which one is "on".) The responses of the student were recorded on the data collection form. When the student met the 100% criterion for the teaching level of the concept (in 4 out of 4 trials), the next step was assumed. This process continued until the other two steps of the concept were completed.

The same process was followed for the teaching

of concepts "in" and "in front of".

Simultaneous Prompt Teaching Application Presented Without Using Tablet

In the teaching sessions performed with simultaneous prompting procedure presented without using tablet, the target stimulus "Look at what is in front of you, and show which one is out" was used. One trial was conducted per session.

In the teaching sessions held for teaching the concept, the researcher and the student sat opposite each other, the study was called to the student, and his/her attention was drawn. (Today we will learn the concept of "out" with you). The student was explained the rules to be followed and the reinforcer he/she would gain. After the verbal or non-verbal confirmation of the student's readiness, the teaching was launched (Great, you're ready. Let's get to work.). After the tablet was introduced, it was placed in front of the student and the program was launched. Visuals regarding the concepts of "out" and "in" appeared on the screen and instructions were provided by the program (Look at the screen, show which one is "out"). The visual right after the instruction was highlighted and the prompt was presented (this is "out"). The student was given a five-second waiting time, and he/she was expected to select by touching the visual which was "out". The student's correct response was reinforced by the program (Well done, you showed the "out" very nicely.) If the student responded incorrectly or did not respond at all, the instruction was repeated by the program and a prompt was presented. After the education was completed with four tool sets, the student was evaluated. Four different tool sets were presented for the step taught by the program (Look at the screen, show which one is "out".) The responses of the student were recorded on the data collection form. When the student met the 100% criterion for the teaching level of the concept (in 4 out of 4 trials), the next step was assumed. This process continued until the other two steps of the concept were completed.

The same process was followed for the teaching of concepts "behind" and "under".

Follow-up and Generalization Sessions

In the research, after the simultaneous prompting procedure presentation using tablet and the simultaneous prompting procedure presentation without using tablet, follow-up sessions were held in order to determine to what extent students preserved the learned concepts. The follow-up sessions were held with each student

1, 3 and 5 weeks after the completion of the instruction as checkup sessions. The reactions of the students were recorded on the Follow-up Session Data Collection Form.

In the research, generalization sessions were held to determine whether the concepts learned as a result of simultaneous prompting procedure presentation using tablet and simultaneous prompting procedure presentation without using tablet regarding the acquisition of spatial concepts were used in different conditions. Generalization sessions were conducted by different items and different people one week after the instruction was completed. In these sessions, items different from the materials and visuals used in the teaching sessions were employed. A chair, a stool and a box were placed in a different classroom, and the students were asked to put items such as rattles, rings and Legos on and out, in-behind and in front

of-behind these objects. The reactions of the students were recorded on the Generalization Session Data Collection Form.

Reliability

During the research, two types of reliability data, namely, inter-observer reliability and application reliability, were collected separately in the starting level, teaching, generalization and follow-up sessions. Reliability data were collected by monitoring 30% of the sessions determined as a result of unbiased assignment.

Application reliability data

In order to collect the data related to the teaching sessions of the research, an application reliability data collection form was prepared and the data were collected using this form.

Table 5. Application Reliability Findings Regarding Spatial Concepts of Students

Student	Independent variable	Dependent variable	Starting level sessions	Teaching sessions	Daily checkup sessions	Generalization sessions	Follow-up sessions
Ali	Simultaneous prompting procedure offered through tablet	On	100%	91.13%	100%	100%	100%
	Simultaneous prompting procedure offered without tablet	Out	100%	95%	100%	100%	100%
Elif	Simultaneous prompting procedure offered through tablet	in	100%	92.85%	100%	100%	100%
	Simultaneous prompting procedure offered without tablet	Behind	100%	93.33%	100%	100%	100%
Can	Simultaneous prompting procedure offered through tablet	In front of	100%	96.42%	100%	100%	100%
	Simultaneous prompting procedure offered without tablet	Under	100%	95%	100%	100%	100%

In the study, the data collected with the application reliability forms of the starting level, teaching, daily checkup, follow-up and generalization sessions were analyzed separately. In the analysis of the obtained data, the formula of "Observed Implementer Behavior / Planned Implementer Behavior x 100" was used. The application reliability findings obtained for starting level, teaching, daily checkup, generalization and follow-up sessions are shown in Table 5.

Inter-observer reliability data

To collect inter-observer reliability data, a checkup, follow-up and generalization data collection form was prepared and the data were recorded in this data collection form. The data recorded by the experts who collected the reliability data during the research process were analyzed using the formula "Agreement / Agreement + Disagreement x 100" (Alberto & Troutman, 2009; Tekin-iftari 2012). The agreements and disagreements were determined

by comparing the data collection forms filled in by the observer and the data collection forms filled in by the researcher. Inter-observer reliability findings

obtained for starting level, daily checkup, generalization and follow-up sessions are shown in Table 6.

Table 6. Inter-Observer Reliability Findings Regarding Spatial Concepts

Student	Independent variable	Dependent variable	Starting level sessions	Teaching sessions	Daily checkup sessions	Generalization sessions
Ali	Simultaneous prompting procedure offered through tablet	On	100%	100%	100%	100%
	Simultaneous prompting procedure offered without tablet	Out	100%	100%	100%	100%
Elif	Simultaneous prompting procedure offered through tablet	in	100%	100%	100%	100%
	Simultaneous prompting procedure offered without tablet	Behind	100%	100%	100%	100%
Can	Simultaneous prompting procedure offered through tablet	In front of	100%	100%	100%	100%
	Simultaneous prompting procedure offered without tablet	Under	100%	100%	100%	100%

Social Reliability

The social validity data regarding the importance of the aims of the two teaching practices used in the acquisition of spatial concepts, the convenience of the methods used and the results obtained were collected from the teachers of the students. A "Social Validity Form for Teachers" was prepared to determine social validity. The form prepared by the researcher consists of 6 open-ended questions. Social validity data were analyzed with content analysis used in qualitative research (Yıldırım & Şimşek, 2018). Themes and codes were extracted from the opinions of teachers within the scope of content analysis. The codes obtained were

examined and the opinions of the teachers regarding the results of both teaching practices were interpreted and described.

Findings

Findings Regarding the Effectiveness of Simultaneous Prompting Procedure Offered Using Tablet and Without Using Tablet

The findings regarding the effectiveness of the simultaneous prompting procedure method, which is offered using tablet and without using tablets, in teaching concepts to children with mild intellectual disability participating in the study are shown in Figure 1, Figure 2 and Figure 3.

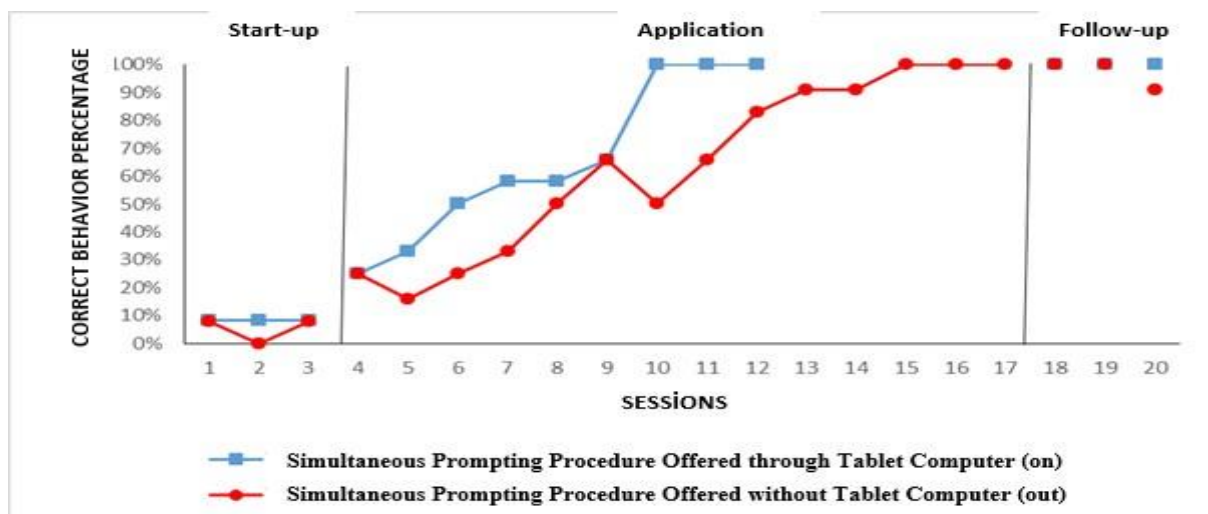


Figure 1. Ali's starting level and true response percentages regarding the concepts of "on" and "out" in follow-up sessions and applications performed with the simultaneous prompting procedure method offered using tablet and simultaneous prompting procedure method offered without using tablets.

In these graphs the data obtained were examined in three phases: starting level checkup sessions, application sessions, and follow-up sessions. Starting level data were obtained from the responses of the students in the starting level checkup sessions. The application data were obtained from the reactions they exhibited in the daily checkup sessions, and the follow-up sessions data were obtained from the reactions they displayed in the monitoring sessions held 1, 3 and 5 weeks after the teaching ended.

When the starting level findings in Figure 1 are examined, it can be seen that Ali did not show a performance which met the criterion as regards the concepts of "on" and "out". In the application phase, Ali was subjected to 9 checkup sessions with simultaneous prompting procedure using tablet for teaching of the concept "on" and 14 checkup sessions with simultaneous prompting procedure without using tablet for teaching of the concept "out". When the teaching sessions of Ali are

examined, it can be seen that he showed satisfactory performance to meet the criterion after 7th teaching session with simultaneous prompting procedure using tablet and after 12th session with simultaneous prompting procedure without using tablet. Ali performed at the level of 100% (the number of correct responses divided by the total number of responses multiplied by 100) in the last three of the checkup sessions held after the teaching sessions on the concept of "on" and "out", meeting the 12/12 criterion. According to the follow-up data collected after the end of teaching on both concepts, it is seen that the concept of "on" is preserved at 100% level and the concept of "out" is preserved at 96%.

According to the findings obtained, it was concluded that the simultaneous prompting procedure offered using tablet in teaching Ali the concepts of "on" and "out" is more effective than the teaching presented without using the tablet.

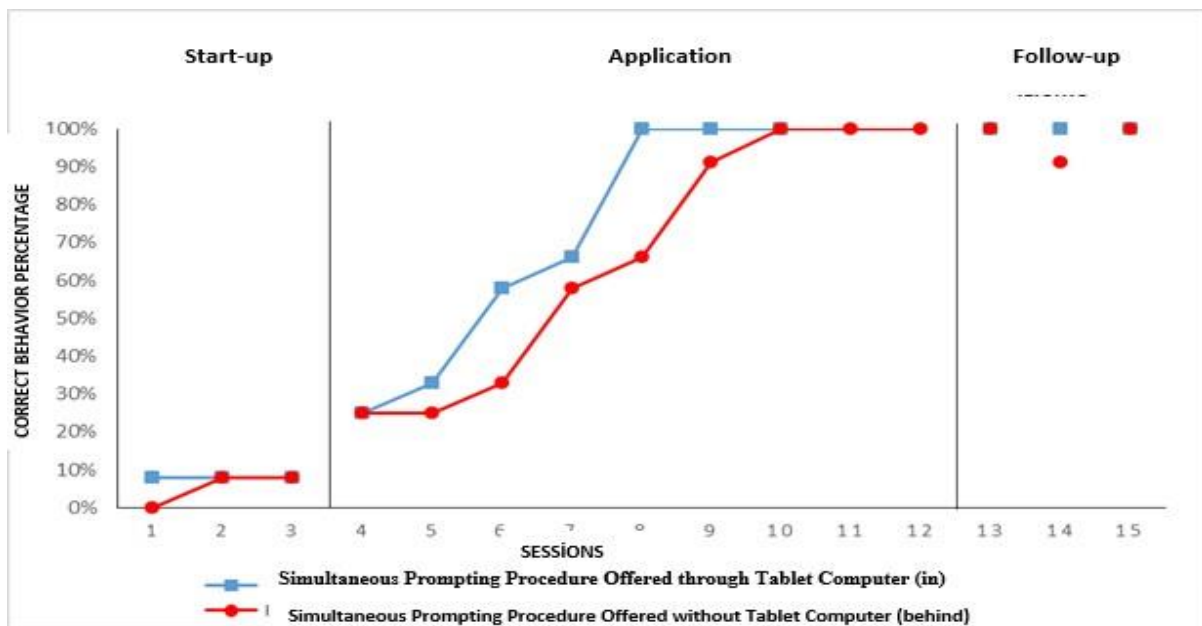


Figure 2. Elif's starting level and true response percentages regarding the concepts of "in" and "behind" in follow-up sessions and applications performed with the simultaneous prompting procedure method offered using tablet and simultaneous prompting procedure method offered without using tablets.

When the starting level findings in Figure 2 are examined, it can be seen that Elif did not show a performance which met the criterion as regards the concepts of "in" and "behind". In the application phase, Elif was subjected to 7 checkup sessions with simultaneous prompting procedure using tablet for teaching of the concept "in" and 9 checkup sessions with simultaneous prompting procedure without using tablet for teaching of the concept "behind". When the teaching sessions of Elif are examined, it

can be seen that she showed satisfactory performance to meet the criterion after 5th teaching session with simultaneous prompting procedure using tablet and after 7th session with simultaneous prompting procedure without using tablet. Elif performed at the level of 100% (the number of correct responses divided by the total number of responses multiplied by 100) in the last three of the checkup sessions held after the teaching sessions on the concept of "in" and

"behind", meeting the 12/12 criterion. According to the follow-up data collected after the end of teaching on both concepts, it is seen that the concept of "in" is preserved at 100% level and the concept of "behind" is preserved at 96%.

According to the findings obtained, it was concluded that the simultaneous prompting procedure offered using tablet in teaching Elif the concepts "in" and "behind" is more effective than the teaching presented without using the tablet.

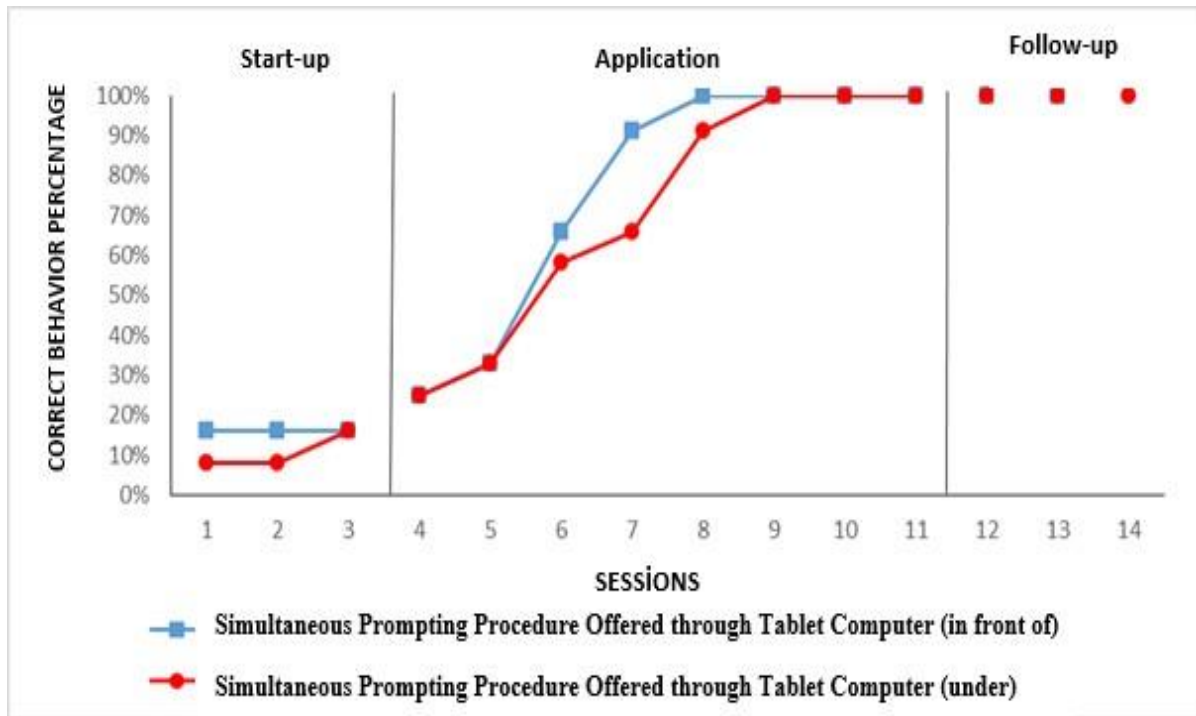


Figure 3. Can's starting level and true response percentages regarding the concepts of "in front of" and "under" in follow-up sessions and applications performed with the simultaneous prompting procedure method offered using tablet and simultaneous prompting procedure method offered without using tablets.

When the starting level findings in Figure 3 are examined, it can be seen that Can did not show a performance which met the criterion as regards the concepts of "in front of" and "under". In the application phase, Can was subjected to 7 checkup sessions with simultaneous prompting procedure using tablet for teaching of the concept "in front of" and 7 checkup sessions with simultaneous prompting procedure without using tablet for teaching of the concept "under". When the teaching sessions of Can are examined, it can be seen that he showed satisfactory performance to meet the criterion after 5th teaching session with simultaneous prompting procedure using tablet and after 5th session with simultaneous prompting procedure without using tablet. Can performed at the level of 100% (the number of correct responses divided by the total number of responses multiplied by 100) in the last three of the checkup sessions held after the teaching sessions on the concept of "in front of" and "under", meeting the 12/12 criterion. According to the follow-up data collected after the end of teaching on both concepts, it is

seen that the concept of "in front of" is preserved at 100% level and the concept of "under" is preserved at 100%.

According to the findings obtained, it was concluded that the simultaneous prompting procedure offered using tablet in teaching Can the concepts "in front of" and "under" is more effective than the teaching presented without using the tablet.

Findings Regarding the Efficiency of Simultaneous Prompting Procedure Offered Using Tablets and Without Using Tablets

In the teaching of spatial concepts, the simultaneous prompting procedure offered using tablet and the simultaneous prompting procedure offered without using tablet have been compared in terms of efficiency. Table 7 contains data on the number of sessions, the number of trials, the number of errors and the total teaching time for all students until the criteria for each set of concepts were met.

Table 7. Efficiency Findings Regarding Simultaneous Prompting Procedure Offered Using Tablets and Simultaneous Prompting Procedure Offered Without Using Tablets

Student	Independent Variable	Dependent Variable	Number of Sessions	Number of Trials	Number of Errors	Total time
Ali	Simultaneous prompting procedure offered using tablet	On	9	36	5	1 hr. 10 min. 20 sec.
	Simultaneous prompting procedure offered without tablet	Out	14	68	12	1 hr. 45 min. 30 sec.
Elif	Simultaneous prompting procedure offered using tablet	in	7	28	2	45 min. 33 sec.
	Simultaneous prompting procedure offered without tablet	Behind	9	36	4	1 hr. 5 min. 7 sec
Can	Simultaneous prompting procedure offered using tablet	In front of	7	28	2	40 min. 12 sec.
	Simultaneous prompting procedure offered without tablet	Under	7	28	2	47 min. 26 sec.

As can be seen in Table 7, it was observed that the simultaneous prompting procedure presented using tablet was more efficient for two of the students (Ali, Elif). It was determined that the instruction provided by tablet was more efficient in terms of session, trial and error number. For one of the students (Can), there was no significant difference in the number of sessions, trials and errors carried out until the criteria for the targeted concepts were met. In terms of teaching time, it was observed that the simultaneous prompting procedure offered using tablet was realized in a shorter time for all three students.

Findings Regarding the Generalization of Simultaneous Prompting Procedure Offered Using Tablets and Without Using Tablets in Teaching Spatial Concepts

During the generalization sessions, data was collected for the generalization of the simultaneous prompting procedure offered using tablet and without using tablets to different people and equipment. The correct behavior percentages of Ali, Elif and Can regarding the generalization sessions are shown in Figure 4.

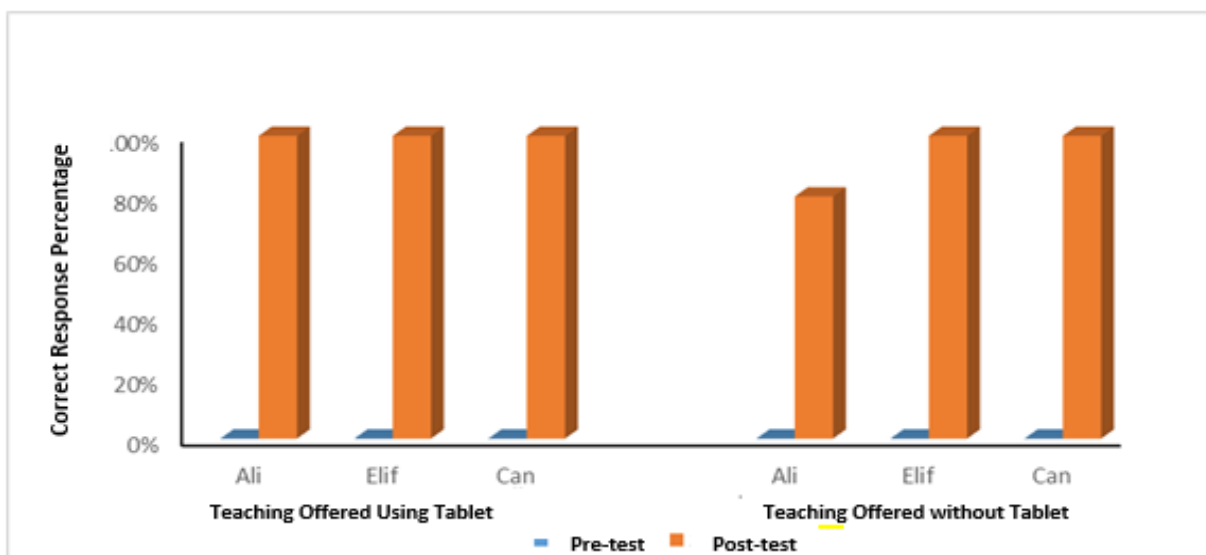


Figure 4. The true response percentages of the simultaneous prompting procedure offered using tablet and without using tablet for Ali, Elif and Can's generalization of spatial concepts to different people and materials

Three students participating in the study responded 100% in generalizing the concepts they

acquired through the simultaneous prompting procedure offered using tablet to different people

and tools. Two of the three students responded 100% in generalizing the concepts acquired through a simultaneous prompting procedure presented without using a tablet to different people and tools, while one student responded 80%. The data obtained from the generalization sessions show that all participants generalize the spatial concepts to different people and materials.

Social Validity Findings Collected from the Teachers of Participants

In this study, in which the effectiveness and efficiency of the simultaneous prompting procedure, which is offered using tablets and without using tablets, in teaching spatial concepts to students with intellectual disability was examined, opinions of students' teachers were received and social validity was studied. Three teachers, two females and one male, participated in the study. One of the women had an experience of 5 years in the profession, the other had an experience of 10 years, and the male teacher had an experience of 7 years.

Three teachers participating in the study expressed a positive opinion about the usage of the tablet in teaching spatial concepts. All of the teachers stated that the tablet application developed using the simultaneous prompting procedure method was remarkable for the students and the learning was more permanent through audio-visual stimuli. They also reported that it enabled students to attend classes willingly.

All of the teachers reported that the simultaneous prompting procedure method is effective in teaching and that they would use it more often. They also stated that the method increased the ability of students to react accurately. They explained that they wanted to use different tablet applications designed for teaching concepts more frequently. They stated that these practices were effective on the sense of curiosity of students.

At the end of the study, they stated that the students used the concepts learned through this application during their daily life activities at the institution. They observed that they were willing to work again and actively attend classes.

Teachers stated that the tablet application is a popular application because it increases the interest and willingness of students.

Conclusion and Discussion

In this study, the effectiveness of the simultaneous prompting procedure, which is presented using tablet and presented without using tablets, in teaching spatial concepts to students

with intellectual disability, whether the information on these concepts are preserved one, three and five weeks after the end of the teaching, and generalization to different conditions were examined.

Spatial concepts are a prerequisite for students to independently fulfill their academic, self-care and daily life skills. Therefore, they are considered within the scope of cognitive / academic skills.

In the research, when the findings regarding the effectiveness of the simultaneous prompting procedure offered using tablet in teaching spatial concepts are examined, it is seen that it is more effective and efficient in two out of three students. This finding is in parallel with studies examining the effectiveness of a method offered using tablet or computer in teaching concepts. The presentation of a method used in special education via tablet increases the attention of the students, shortens the learning time and enables them to learn by having fun (Karanfiller, Göksu & Yurtkan 2017; Soykan & Özdamlı, 2017; Öztürk, 2016; Doenyas, Şimdi, Özcan, Çataltepe & Birkan, 2014; Cullen, 2013; Kagohara, Sigafos, Achmadi, Meer, O'Reilly & Lancioni, 2011).

Considering the findings related to the first (Ali) and second (Elif) students participating in the study, it is seen that the simultaneous prompting procedure offered using tablet is more effective and efficient in gaining the concepts of "on" and "in" compared to the teaching offered without using tablets. Simultaneous prompting procedure has been less effective and efficient in acquiring the concepts of "out" and "behind". In the study conducted by Karanfiller, Göksu & Yurtkan (2017), it was determined that the qualification concepts were learned better with the explicit method of expression. Soykan & Özdamlı (2017), on the other hand, found that the attention of students was increased and that they were effective in their teaching with the simultaneous prompting procedure when they used tablets. These results support the findings described above. Ali and Elif's developmental characteristics such as attention spans and learning speeds are lower than Can. For this reason, it is believed that the presentation made via the tablet increases the attention of these students and accelerates their learning, since tablet is more remarkable and fun. In this context, it can be said that these two students liked the simultaneous prompting procedure offered via tablet more and their learning was more permanent than the simultaneous prompting procedure offered without using a tablet.

When the findings of the study on the

effectiveness of simultaneous prompting procedure on the teaching of spatial concepts are examined, it can be seen that simultaneous prompting procedure with tablet and simultaneous prompting procedure without tablet are equally effective for Can compared to other students. This finding is consistent with the results of studies examining the effectiveness of simultaneous prompting procedure on the teaching of qualification concepts (Çelik, 2007; Çelik & Vuran, 2014), the concept of time (Karabulut & Yıkılmış, 2010), concept of color (Dere Çiftçi & Temel, 2010; Dere Çiftçi, 2007; Toper Korkmaz & Vuran 2007; Birkan, 2002), scientific concepts (Parker & Schuster, 2002) and location concepts (in-out) (Fickel, Schuster & Collins, 1998).

Research findings concluded that for the third student participating in the study (Can), the simultaneous prompting procedure, offered both using tablet and without using a tablet, was equally effective. It is known that Can's learning characteristics and performance are higher than other students. Therefore, it can be thought that the fewer and shorter instructions provided in both teaching practices are equally understandable for the student and do not make a difference on his learning pace.

Considering the findings of the research, it is seen that the number and duration of sessions in the simultaneous prompting procedure offered without using a tablet in teaching the concepts of "out" and "behind" in two of three subjects was longer than teaching using a tablet. It can be said that this is due to the fact that the students have not encountered a systematic instruction before.

In this study, the simultaneous prompting procedure, which is offered both using tablet and without using tablet, was found to be effective in all of the three students. It was determined that the teaching provided by using tablet was more efficient in terms of session durations, number of trials, number of sessions and false responses in students for whom both applications were effective. It can be believed that the efficiency is due to the fact that the skill directives presented before the presentation on the tablet, the appropriate visuals being brought to the fore, and presenting the prompt increases the attention of the students. It can be stated that this situation decreases the session durations, trial numbers and false reactions regarding the teaching.

According to the findings of the research, it was concluded that all three students were able to generalize the spatial concepts they acquired in the teaching conducted with simultaneous prompting,

offered using tablet, to different people and different tools. However, it was concluded that a student (Ali) could not generalize the concept (out) that he acquired in the teaching with simultaneous prompting offered without using a tablet. Accordingly, it can be thought that the permanence of the concept acquired with the simultaneous prompting procedure offered without using tablets is leaner. In addition, it can be said that the concept acquired was limited to the visuals used in teaching due to the short attention span of the student.

The limitation of this study can be that students are limited to the behavior of showing spatial concepts, and the behavior of expressing the concept taught is not targeted.

As a result of the research, the following can be recommended for implementation: (1) It can be recommended that the visuals regarding the related and unrelated nature of the concepts be prepared by making the distinctive points more pronounced. This may increase the generalization and permanence of the concepts taught. (2) The teaching provided by tablet can be applied in the form of group teaching, increasing the attention of students to the course and improving their social skills such as taking turns. The following recommendations can be made for further research: (1) Both teaching practices can be carried out with different disability groups and their effectiveness can be examined on these groups. (2) An application can be prepared to gain different academic skills by using the simultaneous prompting procedure on the tablet. (3) A software for spatial concept teaching can be developed by using other errorless teaching methods on the tablet. (4) In a different study, an application can be developed and its effectiveness can be studied by examining the concept-naming behavior along with the indicating behavior of students on the tablet.

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