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Comparison of Model-Lead-Test and Video-Modeling in Teaching Digital Citizenship Skills to Individuals with Intellectual Disability[1]

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Abstract

This study aimed to compare the effectiveness and efficiency of the model-lead-test (MLT) and video modeling (VM) methods in teaching individuals with ID how to access and use the services provided by the Turkish state in digital environments. Four individuals participated in the study, in which the adapted alternating treatments design, one of the single-subject research designs, was used. Both methods were effective in ensuring that participants acquired digital citizenship skills. The findings showed that both interventions were equally effective for three participants and VM was slightly more effective for one participant. MLT was more efficient for all participants in terms of the number of sessions and the duration of instruction. It was recorded that non-targeted information presentation regarding digital citizenship elements increased participants' knowledge levels. The participants and their parents expressed positive opinions about the study's social validity.

Keywords: Intellectual disability, mobile application, digital citizenship, video modeling, model-lead-test.

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Introduction

In the 21st century age of technology, people have started to do shopping on the internet, use communication platforms for communication, and make banking and invoice transactions via e-banking. Hence, the changing world and fast-developing technology have led people to perform social skills, consumer skills, leisure time skills, skills necessary to fulfill their civic responsibilities, and skills of accessing information and resources, which fall within the scope of independent living skills, in digital environments. Digital literacy and internet use are key elements to prevent the exclusion of groups with differences, such as individuals with ID, from this digitalized life (Salmerón et al., 2018). Every individual should be able to use technology to some extent to improve their quality of life, which is also true for individuals with ID (Wehmeyer et al., 2008).

When studies aiming to teach the use of digital devices and the internet to individuals with ID are reviewed, it is seen that VM and MLT methods are mostly used as independent variables (Almalki, 2022; Bassette et al., 2018; Dundon et al., 2013; Hommond et al., 2010; Kelley et al., 2016; Walser et al., 2012; Wennerlind et al., 2019). VM is a teaching method that requires using technology to record a demonstration of the desired behavior or skill and display the video. The video is shown to an individual, and then the individual has the opportunity to perform the target behavior either now or at a later time. There are different modeling types, such as adults or peers as a model, video self-modeling, point-of-view modeling, video prompting (VP), and video feedback (Steinbrenner et al., 2020). VP break down the target skill into steps that can be performed directly after watching each video clip (Domire & Wolfe, 2015). MLT is a three-stage teaching method in which the teacher models the correct use, then leads students to practice the correct use, and finally tests the students' independence (Itikpo et al., 2021). The relevant research shows that MLT is effective in teaching the use of digital devices and the internet to individuals with ID between the ages of 6-24.

The study by Kelley et al. (2016) investigated the effects of MLT on teaching three individuals with ID aged 19-20 how to operate Google Glass. The study results showed a functional relationship between MLT and the participants' Glass-oriented student performance. Wennerlind et al. (2019) aimed to examine the use of smart technology (Apple iPhone and Fitbit Smartwatch) in acquiring time management skills by students with ID and/or ASD aged 19-21. The study examined the effectiveness of using the MLT on the abilities of these three students to set alarms based on their daily programs and leave for class on time using the multiple probe design. The results showed that all students acquired the skills needed to set alarms independently in a short time. Almalki (2022) researched the effects of MLT paired with the "GoTalk NOW" application in teaching four children aged 6-8 years with intellectual and developmental delays to request correctly. MLT was effective in helping the participants to request correctly and independently.

Some studies have demonstrated that VM is effective in teaching individuals with ID aged 12-21 how to use digital devices and the internet. Hammond et al. (2010) used VM to teach three students with moderate ID the skills of watching movies, listening to music, and looking at photographs on the iPod within the scope of correct and independent use of the iPod. The video clips used in the study were created with the personal perspective technique. The study by Walser et al. (2012), a systematic replication of this study, was conducted with young people with ID aged 17-21 using iPhone 3GS. VM was effective in teaching the skills of taking a person's photograph, looking at photographs by starting a slide show, and accessing and watching a video. Zisimopoulos et al. (2011) evaluated the effects of VP with constant time delay in teaching three students aged 12-13 the skills of accessing the internet and downloading pictures concerning the participation in a classroom history project. In the study, video clips were used as a prompt and for error correction in the constant time delay procedure. The results demonstrated that VP could be an effective teaching strategy in teaching internet skills to students with moderate ID. In another study conducted by Bassette et al. (2018) using the multiple probe design across participants, they taught individuals with ID aged 13-15 to use mobile phones when they were lost. Two instructional videos were used in the study. In the first video, it is demonstrated to show the location of a prominent sign in the environment when lost and take its photograph. The second video consists of skill analysis steps required to take and send pictures from a mobile phone. The study results showed that VM with a system of least prompts was effective in teaching three students the skills of taking and sending photographs in community settings, including an unfamiliar setting.

Although studies demonstrate the effectiveness of VM and MLT in teaching individuals with ID some skills that require the use of digital devices and the internet, they cannot provide information on which method is more effective or efficient in teaching these skills. It is important to use methods that will enable students to reach their goals with fewer intervention sessions, in a shorter time, and with the fewest errors and that will ensure the efficiency of intervention for both the learner and the educator. Comparison studies are needed to determine and compare these methods. Furthermore, our literature review showed that the dependent variables remained limited to basic digital literacy skills in the studies teaching skills that require the use of digital devices and the internet. No study that provided education within the scope of accessing and benefiting from the services offered by the state in digital environments to support individuals with ID to be included in the digitalizing world was found. In light of all these, the general purpose of this study is to compare the effectiveness and efficiency of VM and MLT in teaching digital citizenship skills to individuals with ID. Answers to the following questions were sought to achieve this general purpose:

1. Are MLT and VM effective in teaching digital citizenship skills to individuals with ID? Does the effectiveness of MLT and VM differ in the acquisition, follow-up, and generalization stages?

2. Is there a difference between VM and MLT in acquiring digital citizenship skills until the criterion is met in terms of the following: (a) number of sessions, (b) duration of instruction, and (c) error percentage?

3. What are the acquisition levels of individuals with ID concerning the non-targeted information presented during MLT and VM interventions?

4. What are the opinions of the study participants and their parents about the target skills determined in the present study, the methods used, and the results obtained?

Method

Participants

To be suitable for the study's purpose and the target skills to be taught, the following prerequisites were sought in the participants: (a) being diagnosed with mild ID and being aged between 15-26, (b) being able to fulfill three-step instructions, (c) directing attention to visual and auditory elements for eight minutes, and (d) having reading/writing skills. Four young adults with the mentioned prerequisites are this study's participants. Information about the participants, who will be referred to by code names, is presented below:

Mert is 20 years old. He receives two hours of support education service per week from a special education and rehabilitation center. Mert has his own phone. He enjoys spending time on Instagram, Facebook, and TikTok and playing games on his phone. Ege is 23 years old. He is diagnosed with mild ID and retinopathy of prematurity and has advanced visual impairment. When he is reading, the text should have a font size twice as large as normal. He has his own phone and a computer that he shares with his sibling. Ege enjoys watching videos on YouTube on his phone. Yalın is 26 years old. He experiences difficulty speaking fluently and frequently repeats syllables and sounds in his speech flow. He has his own tablet. Yalın enjoys playing games on his tablet. Ceylin is 26 years old. She has difficulty speaking fluently. She has her own laptop and smartphone. She enjoys spending time on Twitter and listening to music.

Research Design

An adapted alternating treatments design, one of the single-subject research methods, was used in this study. The adapted alternating treatments design is a comparative design that allows comparing the effects of at least two independent variables on at least two dependent variables. Independent variables are applied to different behaviors or sets of behaviors of equal difficulty and not related to each other (Gast, 1994).

Some services provided by the Turkish state in the digital environment were used for the target skills in the study: "MHRS" (Central Physician Appointment System) which enables citizens to make

appointments at state hospitals for examinations, “e-Government” through which citizens can access insurance records, criminal records, diplomas, and central exam result documents and carry out procedures such as exam, dormitory, and job applications, and “e-pulse,” a personal health record system through which they can access their medical histories from a single place. The dependent variables of this study are the participants' correct response percentages for the behaviors making up the skills of making a doctor's appointment from the hospital using the MHRS application and viewing the criminal record document using the e-Government application. Table 1 shows the skill analyses created for both dependent variables.

Table 1. Skill analyses

Making an Appointment	Viewing the Criminal Record
1. Unlocks the keypad on the phone and touches the "MHRS" application. (a)	1. Unlocks the keypad on the phone and touches the "e-Government" application. (a)
2. Correctly writes his/her ID number on "TR ID Number" and the password on "password" and touches the "login" button. (b)	2. Correctly writes his/her ID number on "TR ID Number" and the password on "e-Government password" and touches the "login" button. (b)
3. Touches the "make an appointment from the hospital" button. (c)	3. Touches the "search" button. (c)
4. Touches on the "According to outpatient clinic" option. (d)	4. Touches the text "Search for service" and writes "criminal record." (i)
5. Touches the "Eye diseases" button. * (e)	5. Touches on the option "Inquiry for a criminal record." (d)
6. Touches on the name of the hospital wants to go to. (f)	6. Marks the box indicating that read the information text and touches the text "Continue." (k)
7. Touches the name of the physician wants to go to. (g)	7. Touches the appropriate institution type from the text "Institution type." (f)
8. Touches the button showing the date and time wants to go. (h)	8. Touches the appropriate option from the text "Why it will be given" (school registration, driver's license, job, etc.)** (g)
9. Selects the exact time of the appointment and taps on it. (i)	9. Touches the text "Where the document will be provided" and writes the place where it will be provided. (h)
10. Checks the appointment information and taps the "Confirm appointment" button. (j)	10. Touches the text "Continue." (e)
11. Reads the information text and touches the OK button. (k)	11. Taps the "Open PDF file" button and examines the document by tapping the "PDF viewer" option. (j)
* The department was changed in each intervention session. (eye diseases, general surgery, etc.).	** The option was changed in each intervention session.

The letters in Table 1 indicate the steps that are evaluated with equal difficulty according to logical analysis (such as a-a, b-b..).

The study’s independent variables are VM and MLT interventions. The MLT intervention included the following steps: (a) the implementer explained what she did for each step of the skill analysis and performed the skill analysis step (model), (b) the implementer led the participant using a

sign cue and a verbal cue together while the participant performed the same skill step, and after all skill steps were shown to the participant and the participant was provided with the opportunity to perform them, (c) the participant's level of performing the steps in the skill analysis independently was measured (test), and the stages were repeated once. The VM intervention included the following steps: (a) ensuring that the participant watched the prepared instructional video, (b) assisting with video clips prepared for VP (video clips showing each behavior constituting the target skills) while the participant performed the skill, and (c) post-instruction assessment measuring the level at which the participant performed the skill independently.

In the research design, experimental control is demonstrated by responding at different levels between conditions or by the baseline phase taken before the intervention or by including a control condition (Cariveau et al., 2021). In the present study, the research design was applied in the following way: First, baseline data were collected from all participants with at least five data points related to the target skills. After the baseline levels were determined, two independent variables were randomly matched with the target skills, and interventions were performed with four participants by considering counterbalancing. The interventions were presented as one intervention session conducted on the same day with each participant. These sessions were held in an unpredictable order, with at least one hour between the two intervention sessions. The interventions continued until the participants met the criterion for both skills and reached stable data. After the end of the interventions, the participants' generalization and follow-up data were collected. An additional control condition was included in the study to control potential threats to internal validity, clearly reveal the effect of the independent variables on the dependent variables, and strengthen the experimental control. In this respect, the percentages of the participants' correct responses to the behaviors (11 steps) constituting the skill of changing the primary care physician from the "e-pulse" application were measured without providing any intervention to the participants during the experimental process.

Setting and Tools

All sessions were conducted in a room with a table and chairs and a Wi-Fi connection. A tripod and camera were placed in the room for recording. The sessions were held as one-on-one instruction. The participants had a reminder (note paper, identity document, etc.) showing their ID number and/or password. The MHRS, "e-pulse," and "e-government" applications were used to perform the skills. In MLT interventions, two smartphones on stands were placed on the table. In VM interventions, a phone and a laptop on which videos were watched were placed. Instructional videos showing how the target skills were performed and shot using the point-of-view VM technique were used. The prepared instructional videos lasted three minutes and 57 seconds (MHRS) and four minutes and 33 seconds (e-Government). The videos also included the voice-over of the non-targeted information to be presented to the participants, supported by visuals. Furthermore, short videos showing the 11 steps of both skills

separately were used to present VP. A 10-inch screen tablet computer was used in generalization sessions.

Procedures

The implementation process consisted of baseline, intervention, control condition probe, and finally, follow-up where follow-up and generalization sessions were conducted. Adaptation was made in all sessions conducted with Ege so that his visual impairment would not prevent his learning. The largest font size was selected from the phone's settings-screen settings-font size. Then, accessibility-screen size was entered, and the image size was brought to the highest level. This adaptation ensured that Ege could see the icons and font size.

Baseline

The skill instruction was presented by drawing the participant's attention to the study ("View your criminal record document from the e-Government application" and "Make an appointment from the hospital using the MHRS application"). If the participant responded correctly within five seconds, they were encouraged by saying "continue." The session was terminated if the participant responded incorrectly.

Intervention

MLT: The participant was informed about the purpose by drawing their attention to the study ("Now I will teach you how to access your criminal record document using the e-Government application"). The implementer performed the first step of the skill analysis by explaining what she was doing ("I am touching the application "e-Government"). Non-targeted information (if any) was presented ("If we enter a government site using the web address, we can understand that this site really belongs to the government agency since the extension of the web address ends as gov.tr, e.g., www.edevletkapisi.gov.tr"). Afterward, the skill step was performed together with the participant ("Let's open the e-Government application on your phone now."). The participant's correct responses were reinforced ("You are doing very well"). If the participant remained unresponsive or responded incorrectly, the participant was led with verbal and sign cues (pointing with the finger and saying, "You are touching here"). This process was performed by repeating all skill steps. Finally, the participant's performance was tested by providing the skill instruction. The session was terminated if an incorrect response was given to the skill steps in the test.

VM: The participant was informed about the purpose by drawing their attention to the study ("Now, you will learn to make a doctor's appointment using the MHRS application on your phone. For this, we will first watch a video showing how to make an appointment via MHRS. Watch the video carefully and then you will do the same."). The participant's monitoring behavior was reinforced ("Well done, you watched the video carefully."). Afterward, the participant was given the skill instruction

("Now, make a doctor's appointment from the MHRS application using the phone as you have seen in the video."). The participant was verbally reinforced ("You are doing very well") if they responded correctly. If the participant responded incorrectly, a VP demonstrating the relevant step was shown ("Let's see how it is done in the video; watch carefully"). This process was performed by repeating all skill steps. Finally, the participant's performance was evaluated by giving the skill instruction. The session was terminated if an incorrect response was given to the skill steps in the evaluation.

Control Condition

The participants' performances were evaluated without any intervention in the "skill of changing the primary care physician from the "e-pulse" application," which was of the same difficulty as the target skills, similar but functionally different from the target skills (1. touches the "e-Pulse" application, 2. touches the "log in" button by typing the ID number and password, 3. touches the "change" button under the primary care physician's name, 4. selects the appropriate justification and touches the "OK" button, 5. selects their province and touches the "OK" button, 6. selects their district and touches the "OK" button, 7. selects the Family Health Center and touches the "OK" button, 8. selects the name of the primary care physician they want and touches the "OK" button, 9. touches the "Change" button, 10. touches the "Send verification code" button, and 11. enters the code received and touches the "Confirm" button). In the experimental process, all participants were intermittently probed regarding this skill: The participant was instructed, "Change your primary care physician by entering the "e-Pulse "application." Correct responses within five seconds were encouraged by saying, "Continue." The session was terminated in case of an incorrect response.

Follow-Up

The follow-up phase consisted of generalization and follow-up sessions. Generalization sessions were conducted to determine the level of participants' ability to perform the target skills they had learned on the phone using tablets. Follow-up sessions were organized one week, one month, and four months after the interventions to determine whether the learned skills were maintained. Three follow-up and three generalization sessions were conducted with the participants for each skill. In these sessions, instructions were presented to the participants regarding the target skills. The session was terminated if an incorrect response was given.

Data Collection and Analysis

Collection and Analysis of Effectiveness and Efficiency Data

The percentage of correct responses of each participant in the target skills during the sessions was entered into the Excel program. In this way, graphs were created for each participant. The data were analyzed using a graphical analysis. Furthermore, Tau-U and non-overlapping data analysis were conducted at the baseline and intervention stages. The Tau-U values indicating the effect size were

computed using the calculator at www.singlecaseresearch.org. The effect size values between 0-0.65 refer to a "weak" effect, values between 0.66-0.92 refer to a "medium" effect, and values between 0.93-1.00 refer to a "strong" effect (Parker & Vannest, 2009).

For efficiency data, all intervention sessions conducted until the participants gave 100% correct responses (criterion) in the target skills were examined. For the participants to meet the criterion in the skills with both interventions, how many intervention sessions were required, how long the intervention sessions lasted in total, and the percentage of errors displayed by the participants in these sessions were calculated. The calculated intervention data were compared and analyzed descriptively.

Collection and Analysis of Data on Non-Target Information

In addition to the target skills taught to the participants, six pieces of information concerning digital security, digital rights and responsibilities, and digital health elements were presented in the study. Three pieces of information were presented when teaching the skill of making a doctor's appointment from MHRS, and three when teaching the skill of viewing a criminal record document from the "e-Government" application. It was presented embedded in the instructional video in the VM intervention and verbally at the model stage in MLT. The participants' data on non-targeted information were collected in the pre-test and post-test sessions. The six questions prepared in these sessions were asked to the participants in turn. If the participants did not respond for five seconds or responded incorrectly, this was ignored, and the next question was asked. A scoring key was prepared to score the participants' answers. Table 2 presents the non-targeted information, its scoring, and the questions asked about the information.

Table 2. Non-targeted information, questions, and scoring

Viewing the Criminal Record	Making an Appointment
We should not share our private information such as address and phone number, identity information, user name, and password with anyone. We must create our password in such a way that no one can guess it. (a)	Crimes committed in digital environments include misuse of information by obtaining the information of others, committing fraud, insulting people, and sharing inappropriate articles and pictures. (a)
1. How do we ensure our security in digital environments? (18p)	2. In your opinion, what kinds of crimes can be committed in digital environments? (18p)
Using devices such as computers, tablet computers, and phones for more than two hours a day can damage our eyes and impair our mental health by making us dependent on these devices. (b)	If we share our identity information on unsafe sites, our identity information may fall into the hands of criminals, and it will appear as if we have committed the crime they have committed. (b)
3. How can using devices such as computers, tablet computers, and phones for a long time harm us? (17p)	4. What happens if you share your identity information on unsafe sites? (17 p)
If we enter a government site using the web address, we	When we come across illegal content on the internet,

can understand that this site really belongs to the government agency if the web address extension ends as gov.tr, e.g., www.turkiye.gov.tr (c)	we should notify the *Internet Information Reporting Center* by calling 166 or filling out a form at www.ihbarweb.org.tr (c)
5. How do we understand whether a site really belongs to a government agency? (15 p)	6. What should we do when we encounter illegal content on the internet? (15 p)

After the sessions were completed, the implementer watched the video recordings and calculated the participants' scores according to the prepared scoring key. Table 2 shows the maximum score that can be obtained from the questions according to the prepared scoring key.

Collection and Analysis of Reliability Data

An independent observer watched 30% of the baseline, control, intervention, generalization, and follow-up sessions (random assignment). Inter-observer agreement (IOA) was 100% for each stage. The observer recalculated the participants' non-targeted information scores using the scoring key. IOA was 98.75% in the pre-test and 98% in the post-test. Procedural fidelity was calculated by dividing the sum of the behaviors marked as + by the observer by the planned implementer behavior (see Procedures Section) and multiplying by 100. Procedural fidelity was 100% for each stage.

Collection and Analysis of Social Validity Data

After the experimental process was completed, a subjective evaluation was performed to examine the study's social validity. The opinions of the participants and their parents were obtained about the skills taught in the study, the interventions used, and the study results. Semi-structured interviews were conducted to this end. The interviews were conducted with the participants in the intervention setting and one-on-one with the participants' mothers or fathers in their homes. During the interviews, the parents were asked how the acquired skills contributed to the individuals, the status of using the skills after they were learned, and what aspects of the study they liked and disliked. In addition to the above-mentioned questions, the participants were asked, "During the studies, you learned one skill by watching me and another by watching a video. Which one was better, in your opinion? Why?" The audio-recorded interviews were transcribed into a Word file, and the data were analyzed descriptively.

Results

Effectiveness Results

In the Tau-U calculation performed to determine the effect size of independent variables on dependent variables, the participants' data average was calculated as follows: Tau-U=0.95 (Range: 0.8-1) for MLT, Tau-U=1 for VM. Both independent variables had a "strong" effect on the dependent variables. The effectiveness of the interventions did not differ in maintaining the skills and generalizing them to different devices. The graphs display the percentages of correct responses the participants gave

concerning digital citizenship skills in the control, VM, and MLT interventions. Figure 1 shows Mert's performance.

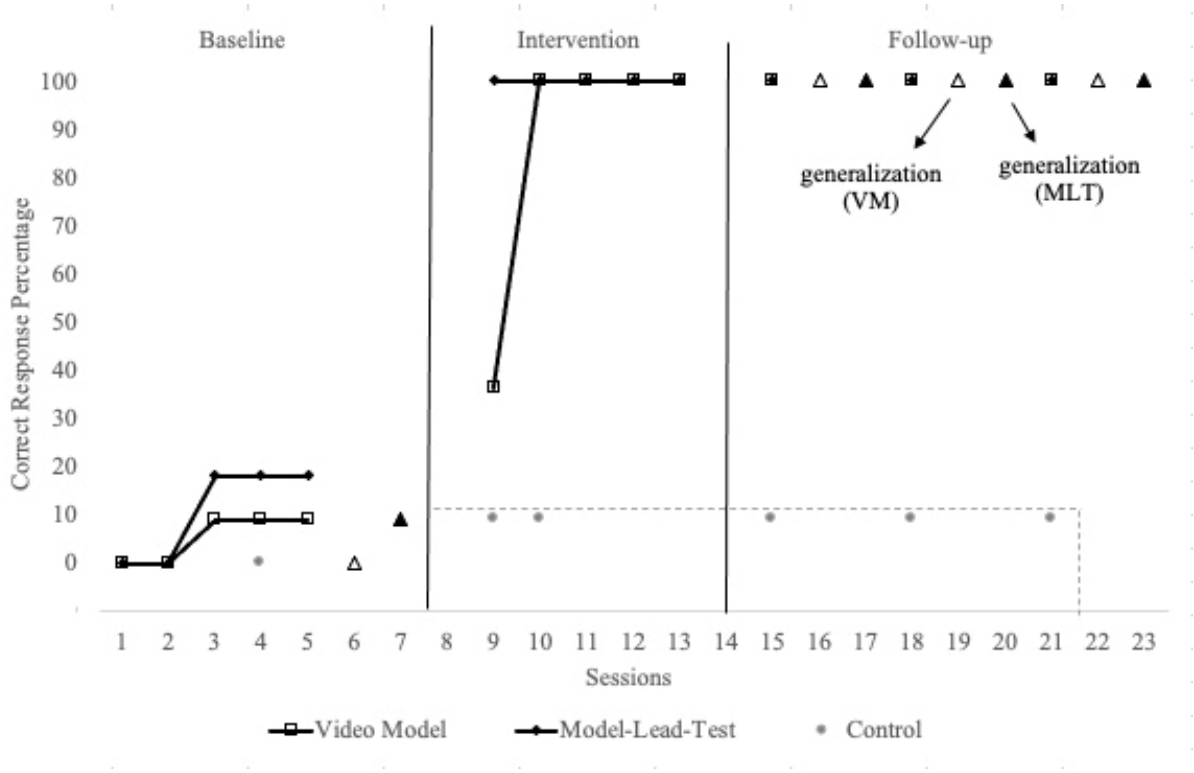

Figure 1. Mert's percentages of correct responses in the experimental stages concerning digital citizenship skills

As seen in Figure 1, Mert gave an average of 5.45% (Range: 9.09-0%) and 10.9% (Range: 18.18-0%) correct responses in the target skills in the five baseline sessions. When the MLT and VM interventions were started, Mert's percentages of correct responses for the target skills increased immediately. On the contrary, Mert's correct responses remained at an average of 7.56% in the six sessions in the control condition. Mert met the criterion for the target skills in the first session in the MLT intervention and the second session in the VM intervention. He consecutively gave 100% correct responses in the following sessions and reached stable data in four sessions with the VM intervention and three sessions with the MLT intervention. The baseline and intervention data of both interventions did not overlap 100%. Whereas Mert gave 0% and 9.09% correct responses at the baseline level in performing the target skills using a tablet, the percentage of correct responses was 100% in each of the three generalization probes taken after the interventions. In the follow-up sessions conducted one week, one month, and four months after the intervention sessions, he gave 100% correct responses in both digital citizenship skills.

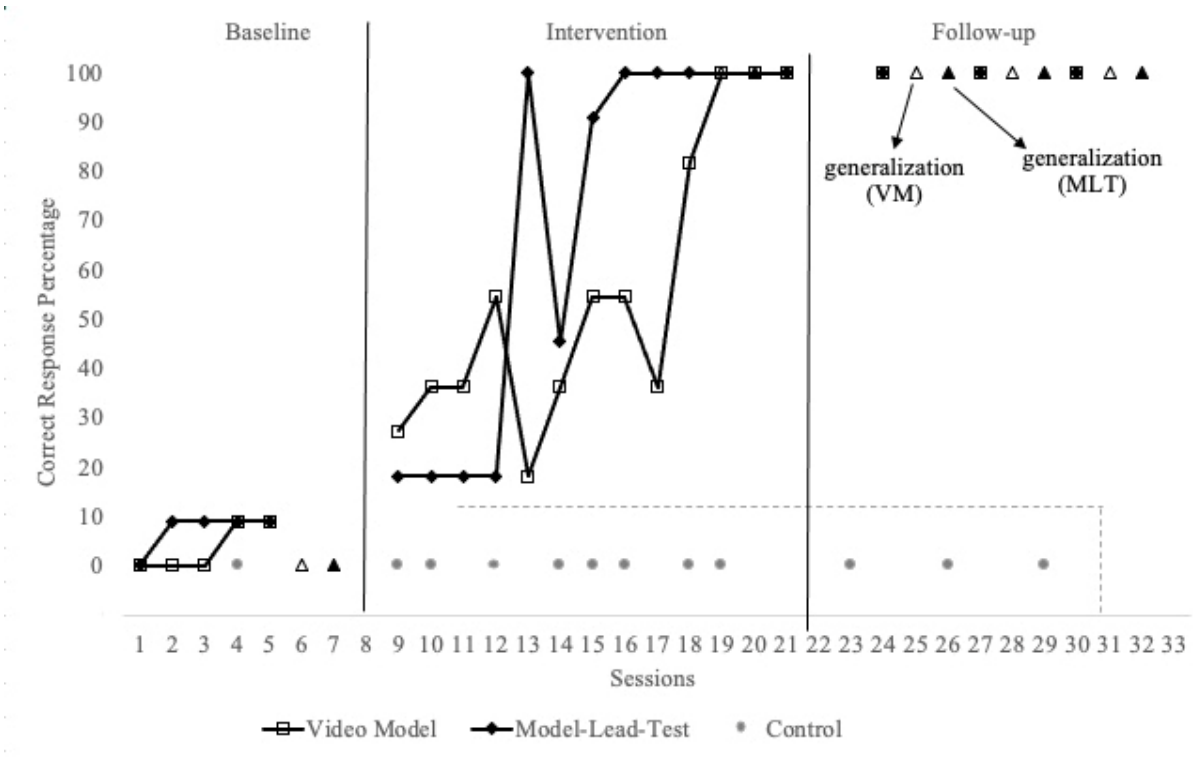

Figure 2. Ege's percentages of correct responses in the experimental stages concerning digital citizenship skills

Ege gave an average of 3.63% (Range: 9.09-0%) and 7.27% (Range: 9.09-0%) correct responses in the target skills in the five baseline sessions. The visual analysis of the line chart in Figure 2 shows that when the interventions started, the variability and trend of the data in VM increased. In the MLT intervention, there was a transition from stability to variability in the trend and level of the data and then an increase in the trend. On the contrary, Ege's correct responses remained at 0% in the 12 probes in the control condition. Although Ege reached the 100% criterion for the skill in the fifth session of the MLT intervention, his correct responses decreased in the following sessions, and he could not reach stable data. Therefore, it was decided to make the calculation by considering the session in which Ege met the 100% criterion and then reached stable data. Accordingly, Ege met the criterion in the eighth session of MLT and the 11th session of VM. Baseline and intervention data did not overlap (100%). Ege could not respond correctly in performing the target skills with a tablet at baseline (0%). After the interventions, his performance was 100% in three generalization sessions using the tablet. In all follow-up sessions, he gave 100% correct responses in the target skills.

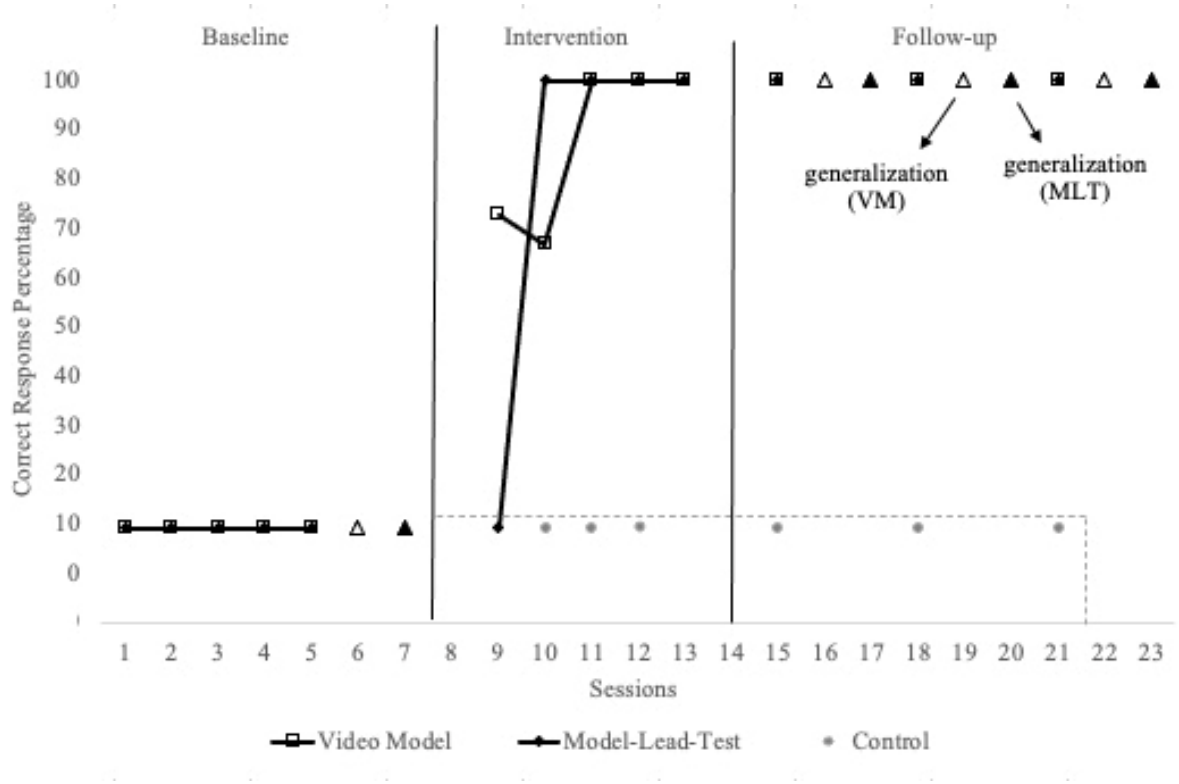

Figure 3. Yalın's percentages of correct responses in the experimental stages concerning digital citizenship skills

As seen in Figure 3, Yalın gave 9.09% (Range: 0%) correct responses in five consecutive baseline sessions in both skills. After the start of the interventions, Yalın's percentages of correct responses for the target skills increased and reached the level meeting the criterion in a short time. However, while an immediate effect was observed on the dependent variable in VM, there was no immediate effect in MLT. Consecutive phase data did not overlap at 80% in MLT and at 100% in VM. Hence it was concluded that VM was more effective for Yalın. Whereas Yalın gave 9.9% and 9.09% correct responses at the baseline level in performing the target skills using a tablet, his percentage of correct responses was 100% in the generalization sessions after the interventions. In the follow-up sessions, he maintained the skills he learned by giving 100% correct responses in both digital citizenship skills.

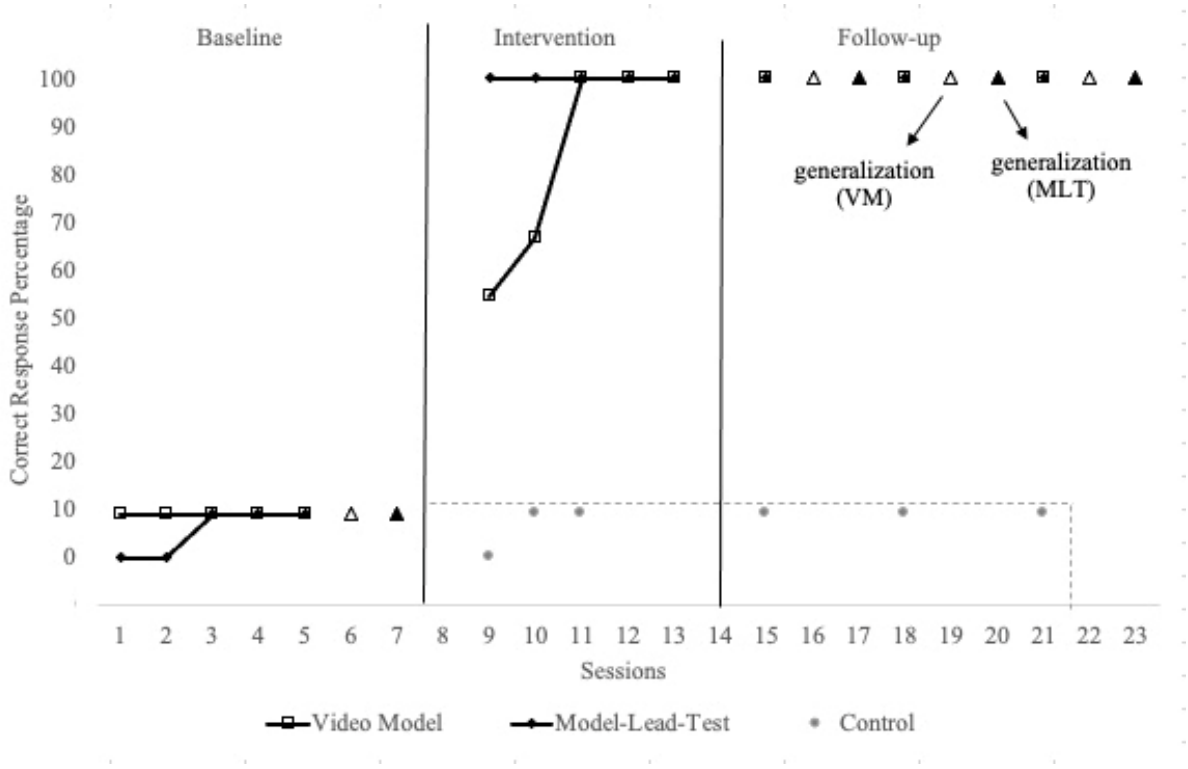

Figure 4. Ceylin's percentages of correct responses in the experimental stages concerning digital citizenship skills

As seen in Figure 4, Ceylin gave an average of 9.09% (Range: 0%) and 5.45% (Range: 9.09-0%) correct responses in the target skills in the five baseline sessions. When the MLT and VM interventions were started, Ceylin's percentages of correct responses for the target skills increased immediately. On the contrary, Ceylin's average of correct responses remained at 7.57% (Range: 0-9.09%) in the six sessions in the control condition. Ceylin met the criterion by giving 100% correct responses in the first session of the MLT intervention and the third session of the VM intervention. Ceylin gave 100% correct responses in the following sessions and reached stable data in four sessions with the VM intervention and three sessions with the MLT intervention. The baseline and intervention data of both interventions did not overlap 100%. Ceylin gave 9.09% correct responses in both skills performed using a tablet at baseline. She gave 100% correct responses in the three generalization sessions after the interventions. In the follow-up sessions conducted one week, one month, and four months after the intervention sessions, Ceylin gave 100% correct responses in both target skills.

Efficiency Results

Table 3 contains data on the intervention processes in which VM and MLT methods were applied until participants met the criteria in the skills.

Table 3. Efficiency data on VM and MLT

Efficiency Measures	Mert	Ege	Yalın	Ceylin
Number of Sessions				
MLT	1	8	2	1
VM	2	11	3	3
Error Percentage				
MLT	0%	48,87%	45,46%	0%
VM	31,82%	51,25%	21,22%	27,28%
Intervention Time				
MLT	00:07:26	01:44:45	00:24:35	00:07:58
VM	00:21:33	03:02:25	00:35:52	00:34:49

According to the data in Table 3, considering the number of sessions and the duration of instruction spent in these sessions, MLT was more advantageous for all participants. All participants learned the targeted digital citizenship skills in fewer sessions and a shorter time with the MLT intervention. There was a difference between the participants in terms of error percentages. While Mert, Ege, and Ceylin displayed a lower error percentage in the MLT intervention, Yalın showed a lower error percentage in the VM intervention.

Results for Non-Targeted Information Acquisition

Figure 5 shows the participants' scores in the pre-test and post-test in line with their correct answers.

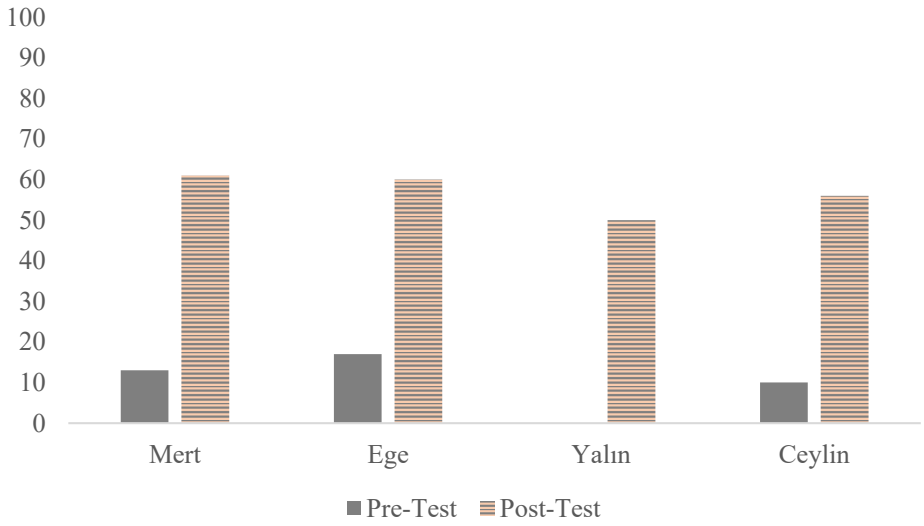

Figure 5. Participants' pre-test and post-test scores regarding non-targeted ınformation

As seen in Figure 5, all participants' post-test scores were higher than their pre-test scores. The non-targeted information provided during skill teaching increased the participants' acquisitions

regarding this information and increased their post-test scores. Mert scored 13 points in the pre-test and 61 points in the post-test. Ege scored 17 points in the pre-test and 60 points in the post-test. Yalın could not give correct responses to the non-targeted information questions in the pre-test (0 points) and scored 50 points in the post-test in line with the correct responses he gave. Ceylin scored 10 points in the pre-test and 56 points in the post-test. While the participants gave an average of 10% correct responses to the non-targeted information questions in the pre-test, their percentage of correct responses increased to an average of 56.75% in the post-test.

Social Validity Results

All participants and their parents expressed positive opinions about the study. They stated that there was nothing they did not like or that bothered them during the study and they were satisfied with the study: "Everything was very enjoyable for me. I didn't get bored in any part; it was entertaining. I loved all of it. (Ege)," "She came with pleasure and even looked forward to that day. She was sad when the time was postponed and was excited to go. She was definitely very happy. In fact, when you didn't perform the intervention for a month, we all waited together to see when it would happen. (Ceylin's mother.)"

The participants think that the target skills they learned will reduce their need for others, will be used in daily life, and will benefit themselves and their families: "I can now make an appointment at the hospital on my own. Now I can do it on my own, without needing anyone; there were useful things in all of them (Ege)," "If I apply for a job in the future, I have learned what to do from "e-Government" (Mert)," "I can use it in case of any illness. Now, I can help my family and make appointments for them. (Yalın)." Parents also think that their children will use the target skills functionally in daily life and will be able to do their work independently, and the target skills will provide advantages to both their children and their families when learned: "If I go somewhere for two or three days, when he is at home, he at least can manage his work from "e-Government." He can also make an appointment from the hospital (Ege's mother)," "If you tell me to enter "e-Government" and take a queue number, I can't manage this. When he knows how to do this, it is more advantageous for us; at least, all you have to do is take him there. It is also advantageous when he says, "Mom, give me your ID number, I'll get a queue number from the hospital for you. (Yalın's father)".

The participants and their parents stated that they used the learned skills when needed in daily life and could generalize them to different settings and people: "For example, I made a doctor's appointment from MHRS. I made an appointment from the department of eye diseases. (Mert)," "I used the skills and made an appointment at the hospital from the department of general surgery (Ceylin)." "He also got an appointment for himself from the department of eye diseases. He even makes an appointment for me at the hospital. He got me an appointment from the department of internal medicine, I didn't know (Mert's mother)," "She made an appointment at the hospital, then she postponed it and

got it again. She did some really great things, and her skills made me very happy. Even I couldn't do them myself; the fact that she did them really made me very happy (Ceylin's mother)".

Three participants stated that they liked the MLT intervention more and they would prefer MLT for the skills they would learn in the future: "It was better to learn by watching you. I can ask you when I get stuck, teacher. I don't remember the whole video. But since you explained it, it was more permanent. In other words, the one you explained is more permanent (Ege).", "Yours, by watching you. (Ceylin)", "Both were good, but the one you taught was better. I prefer the one you teach to learn different skills (Yalın)." One participant stated that he liked the VM intervention more and would prefer VM for the skills he would learn later, "The video was better. I remember better with the video, and I don't forget things right away. It's faster, and I don't forget things right away. I prefer watching videos to learn different skills (Mert)."

Discussion, Conclusion and Recommendations

The effectiveness results show that all participants acquired the targeted digital citizenship skills with both interventions. The effectiveness of VM and MLT in acquiring digital citizenship skills is similar to the findings of other research using the VM and MLT methods to teach individuals with ID how to use digital tools. The dependent variables addressed in similar studies are the skills of taking a photograph of a specific sign indicating your location from a mobile phone and sending it within the scope of security skills (Bassette et al., 2018), setting an alarm according to a daily schedule (Wennerlind et al., 2019), operating Google Glass (Kelley et al., 2016), taking photographs, looking at photographs by starting a slide show, accessing and watching videos (Walser et al., 2012), watching movies, listening to music, and looking at photographs (Hammond et al., 2010), and accessing the internet and downloading images (Zisimopoulos et al., 2011). The current study's dependent variables were the skills of making a doctor's appointment by phone and accessing a criminal record document, which require the use of "MHRS" and "e-Government" mobile applications that will enable individuals with ID to benefit from the services provided by the state in digital environments. The mentioned target skills are higher-level skills that require the use of applications that can be downloaded to devices such as smartphones, tablets, and computers. Nowadays, it is seen that individuals with ID widely use and are willing to use digital devices such as phones and tablets, the internet, and social media platforms. Some studies (Asgarzade, 2022; Chiner et al., 2017) support our observations with findings revealing that there is an increase in the use of the internet and smartphones by individuals with ID, that individuals prefer smartphones more, listen to music, watch videos, use social media, and chat with their friends online. These observations and research findings suggest that individuals with ID have the prerequisite skills to learn higher-level skills requiring the use of the internet and digital devices and they need to be taught different mobile applications and different digital skills that will enable them to participate in society and support them in living as independent citizens to prevent digital exclusion.

Upon examining the data obtained from the participants on an individual basis, the results of the non-overlapping data analysis show that both methods were equally effective for three participants, whereas VM was slightly more effective for one participant. For the participant for whom VM was more effective, the first intervention session was conducted with MLT. Therefore, the participant may have displayed low performance in the skill since he could not fully get used to the implementation process and intervention setting in the first session.

One of this study's important findings is that all participants maintained the skills they acquired four months after the intervention and could generalize them to another digital device (tablet). The maintenance and generalization results of all participants showed that they exhibited 100% performance. In the study in which Zisimopoulos et al. (2011) taught the skills of accessing the internet and downloading images with VM, the participants generalized the skills to a different desktop computer of the same type as the device used in the intervention process (desktop computer). The researchers stated that the participants' performance decreased to 82.7-89.6% in the follow-up data they collected 18 weeks after the intervention. This demonstrates a significant difference in terms of maintenance and generalization in their study, unlike our study. The fact that three intermittent follow-up data were collected after the intervention in our study (one week, one month, and four months) may have created suitable conditions for permanent teaching or may have originated from the fact that the participants used the skills in daily life after the interventions. The effectiveness results of this study differ from related studies in the literature in terms of demonstrating a strong functional relationship with five data points at the baseline level and control condition data obtained during the intervention and follow-up phases.

Since the participants reached independence in the instruction with MLT with fewer sessions and in a shorter time, it was more efficient for all participants in terms of the number of sessions and duration. Whereas MLT was more efficient for three participants in terms of error percentage, VM was more efficient for one participant. This may arise from the participants' individual learning differences and differences in the learning styles they prefer. Conditions requiring fewer sessions to independently perform a skill and reach stable data can be considered more efficient than conditions requiring more sessions (Kodak & Halbur, 2021). Hence it can be said that MLT is more efficient for teaching digital citizenship skills. Since no study comparing VM and MLT could be found in the literature, the efficiency results obtained cannot be compared with the findings of other studies. This research finding will contribute to selecting effective and efficient methods for implementers and researchers who want to teach digital citizenship skills to individuals with ID. Furthermore, the efficiency results obtained in this study can be used to compare with the efficiency results of future research.

It was recorded that non-targeted information presentation increased the participants' knowledge levels. No planning was made concerning non-targeted information acquisition in the relevant studies

supporting the effectiveness results. However, the study conducted by Albarran & Sandbank (2019), in which a systematic review of studies with data on non-targeted information acquisition in special education was performed, found that the participants' non-targeted information acquisition presented with instructive feedback was at an average level of 64%, and the acquisition of extra information provided to their peers in group studies was at an average level of 55%. The study's social validity results supported the fact that the participants used the skills taught in the study functionally in daily life and could generalize them to different devices and settings. The fact that these findings supported the generalization and follow-up results reached during the experimental process suggests that this is the study's strength. The participants and their parents stated that the skills could be performed with the knowledge of different people, in different settings, and on different devices, which enriched the generalization results during the experimental process.

Although the literature frequently mentions the numerous advantages of using VM in skill teaching (Bidwell & Rehfeldt, 2004; Mechling, 2005; Nikopoulos & Keenan, 2003), the present study showed that there might be some disadvantages for teaching mobile applications that also require the use of the internet. First, it is thought that VI causes a waste of time for these skills. Opening and showing VI from the computer for skills that take very little time, such as touching a button, will not be useful for implementers. In future studies, using an interactive application design where participants are automatically shown the correct VI when they respond incorrectly may increase the efficiency of the teaching process. Second, changes can be made frequently in mobile applications. Therefore, the skill steps performed will also change. This requires re-shooting and renewing the instructional video to show the current video model.

The present study used MLT as a very practical method in these skills that include teaching technology and the internet. The participants performed the skill they learned with this method more confidently and with awareness of their movements. Bulkey et al. (2012) indicated that MLT allowed students to answer without fear of making mistakes for the lead phase. The researchers experienced this in the current study as well. The advantage of VM in this study is that it provided the implementer with great comfort during instruction in presenting non-targeted information. In this intervention, the information embedded in the video was presented to the participants without requiring any additional effort during instruction. In the MLT intervention, pre-instructional preparations for non-targeted information presentations took longer and required additional effort. Future studies can be designed to examine the effectiveness and efficiency of MRT and VM in small group teaching.

Policy Implications

In order to support individuals with special needs to adapt to the digitalizing world and participate in society, they need to be taught the safe use of digital devices and the internet. This study has addressed digital citizenship under the name of "digital citizenship skills" and has shown a way of

how these skills can be provided to students with special needs in the field of special education. In this respect, it will contribute to the dissemination of such studies by providing ideas for the development of such studies to experts, researchers, teachers, educational programmers and education politicians working in the field.

The results of this study have provided evidence that individuals with mild ID can access the services provided by the state in digital environments and use these services independently. Teaching digital citizenship skills to individuals with ID can play a major role in providing them with independent living opportunities, helping them to perform their daily life skills and adapt to the age we live in. Thus, these individuals can achieve a higher quality of life. By providing individuals with ID with digital citizenship skills, we can support them to become "digital citizens" who can respond to the changing needs of society and live independently. In this context, teachers need to have knowledge on how to teach these skills to help students realize their potential. At the same time, it is important for teachers to use methods that have been proven to be effective in teaching these skills. The study findings provide evidence that the use of VM and MRT methods is effective in teaching digital citizenship skills to individuals with mild intellectual disability. Research is still needed to determine more effective and efficient methods for teaching individuals with ID. Based on the findings of this study, some suggestions that can contribute to instructional efficiency have been put forward regarding which teaching practice teachers working with students with ID can prefer in teaching digital citizenship skills, technology, and the use of the internet.

Conflict of Interest

The authors have no relevant financial or non-financial interests to disclose.

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Ethical Statement

Ethics committee approval numbered 58676 was obtained from Anadolu University Ethics Committee on 27.04.2021. Informed consent was obtained from all participants.

Credit Author Statement

Author 1: Conceptualization and Methodology, Writing- Original draft preparation. Author 2: Conceptualization and Methodology, Data Curation, Project Administration, Supervision.

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