

Intelligent Interaction for Special Education Students

Özel Eğitim Öğrencileri İçin Akıllı Etkileşim

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Abstract

Foreign language education is important for everyone at every stage of life, and it is a resource for people with disabilities to find the opportunity to realize themselves in the international arena. With our material named Intelligent Interaction for Special Education Students, it is aimed to facilitate the foreign language learning of special education students and to make learning fun. Therefore, our material is designed to support foreign language learning of all our special education students. In addition, it offers all students the opportunity to learn and repeat on their own. If we consider the gap in the area targeted by the material, we can see that it sheds light on both individual and versatile teaching by using the indispensable digital learning method of age. When our material could be developed, it is at a stage where it can be easily applied in other fields of education.

Keywords: Intelligent Interaction, Special Education, Foreign Language

Öz

Yabancı dil eğitimi, herkes için hayatın her aşamasında önemli olduğu gibi engelli bireyler için de kendilerini uluslararası alanlarda gerçekleştirme fırsatı buldukları bir kaynaktır. Intelligent Interaction for Special Education Students (Özel Eğitim Öğrencileri için Akıllı Etkileşim) isimli materyalimizle özel eğitim gören öğrencilerimizin yabancı dil öğrenimini kolaylaştırmak ve öğrenmeyi eğlenceli bir hale getirmek hedeflenmiştir. Dolayısıyla materyalimiz tüm özel eğitim öğrencilerimizin yabancı dil öğrenimine destek olmak amacıyla tasarlanmıştır. Ayrıca materyalimiz, öğrencilerimize kendi kendine öğrenebilme ve tekrar edebilme fırsatı sunmaktadır. Materyalin hedeflediği alandaki açığı göz önüne alırsak, çağımızın vaz geçilmezi dijital öğrenme yöntemini kullanarak hem bireysel hem de çok yönlü öğretime ışık tuttuğunu görebiliriz. Materyalimiz geliştirildiğinde diğer eğitim alanlarında da rahatlıkla uygulanabilir bir aşamadır.

Keywords: Akıllı Etkileşim, Özel Eğitim, Yabancı Dil

Introduction

Special education aims to enable the individuals with special needs to be self-sufficient. In addition, it enables individuals with special needs, who cannot learn at the same time with their peers, to complete their deficiencies with education programs according to their learning status. Many of us do not know exactly what special education means. You can see that special education is actually at the center of life. It ranges from crawling to shopping skills, from eating and drinking habits to personal care skills. In fact, what is meant to be conveyed is a structured transfer of skills that the individual cannot acquire naturally or with their peers. In today's Turkey and in the world, serious studies are now being carried out in this field. In this study, a literature review was conducted in order to see what technologies are used in the development and education of individuals with special educational needs and to understand what studies are carried out in this field. The search was carried out using Web of Science, Science Direct, Springer Link databases, Google Scholar and Google search engine. Only academically determined journal articles were included in the search. In the research process, it has been tried to reach the relevant resources by using keywords such as "technology in special education", "special education and assistive technologies", "special education", "individuals with special educational needs", "disabled individuals education". During the screening, firstly, the abstracts of the publications were examined and filtered according to relevance. As a result of the keywords, new keywords were obtained from the sources reached, and the research continued by reducing it to a more specific one. Many difficulties encountered in the realization of the education of children with disabilities who require special education, and many solutions are available in the literature (Achmadi et al., 2012; Campigotto, McEwen, & Epp, 2013; Derya & Onur, 2017; Fernández-López, Rodríguez-Fórtiz, Rodríguez-Almendros, & Martínez-Segura, 2013; Hammond, Whatley, Ayres, & Gast, 2010; Kagohara, Sigafos, Achmadi, O'Reilly, & Lancioni, 2012; Mednick, Jaidka, Nesdole, & Bona, 2017; Roche et al., 2014; Sigafos et al., 2013; Strasberger & Ferreri, 2014; van der Meer et al., 2011; Van Laarhoven, Johnson, Laarhoven-Myers, Grider, & Grider, 2009; Waddington et al., 2014). On the other hand, another issue that needs to be addressed is the importance of knowing a foreign language. Today, the importance of knowing a foreign language is increasing, and even a foreign language is not considered sufficient.

Apart from the problems experienced by individuals who do not have any disabilities, the foreign language learning problem of individuals who need special education is an incurable wound. Foreign language education is insufficient for disabled individuals who cannot benefit from education services like other services due to all physical and social barriers. Because for them, an environment suitable for foreign language education and an infrastructure that can meet their needs are not enough. The lack of necessary Braille alphabet and audio materials in foreign language education and the inadequacy of teachers who know special teaching methods still continue as a problem (Glisan, 2012; Pearson, Fonseca-Greber, & Foell, 2006). This constitutes the whole motivation of our work. Now, let's look briefly at the methods and studies developed in the first part of the literature according to some barrier situations.

Foreign Language Teaching for the Physically Disabled; The importance of learning a foreign language is inevitable, as among all the disabled, especially the physically handicapped, they hold on to life by finding the opportunity to realize themselves in international fields such as the Paralympic Olympics. When we look at the literature, many samples selected both in our country and in the world, and when compared with other types of obstacles, solvable methods stand out (Emery, 2008; Yurttabir, 2019). In other words, English education given to disabled candidates with communicative language, theater and toys brings disabled individuals to a level where they can tell their problems.

Foreign Language Teaching for the Visually Impaired; despite the various possibilities offered by technology in language learning today, visually impaired or low vision individuals face difficulties in foreign language education compared to sighted individuals (Aikin Araluce, 2005; Guinan, 1997; Stein, Neßelrath, & Alexandersson, 2010). One of the most important factors in overcoming these difficulties is the creation of individualized teaching/learning environments adapted to the needs of visually impaired or low vision individuals learning a new foreign language (Guinan, 1997; PRESENTERS'INTRODUCTIONS). In a master's thesis on teaching English as a foreign language to the visually impaired in Turkey, Açıkgöz et al. (Açıkgöz, 2006) stated that visually impaired students have special educational needs, such as focusing on touch and hearing, and working one-on-one for some skills when compared to their sighted peers. One of the important projects in foreign language teaching for the visually impaired in our country is a project of the Visually Impaired Secondary School in Izmir, which was awarded the European Language Award. The Orff schulverk approach was used for the first time as a language teaching technique (Açıkgöz, 2006; Colibaba, Vlad, & Dinu, 2013). Apart from this study, there are many qualitative studies that also use the case and solution-oriented Braille alphabet presented by many researchers (Kocyigit & Artar, 2015; López & Iribarren, 2014; Susanto & Nanda, 2018).

Foreign Language Teaching for the Hearing Impaired; human beings begin life with hearing and gain their first knowledge through hearing. Even though a baby can't see everything clearly at birth, they can hear and react to sounds. People acquire their mother tongue through hearing. If hearing impaired individuals are congenitally deaf, they cannot learn their mother tongue like hearing individuals without special education. Hearing-impaired individuals usually use signs because they cannot hear or speak. Due to the lack of auditory stimuli, their vocabulary remains very narrow. Therefore, there is a need for studies on different and applicable methods in a different language, such as English, while there are problems in his native language (Domagała-Zyśk & Kontra, 2016).

Foreign Language Teaching to People with Down Syndrome; the process of teaching a foreign language to people with Down syndrome who have language development difficulties in their mother tongue will be at least as difficult. Those with Down Syndrome receive education in private education centers in the world and in our country, and those with mild Down syndrome receive education in mainstreaming classes. Individual teaching plans and different methods are applied to these students both in their own language and in a different foreign language, and these approaches have been extensively discussed in the literature for different case reports (Acarlar, 2006; Chapman, 1997; Chapman, Bird, & Schwartz, 1990; Sicilia Polo, 2017).

Foreign Language Teaching for Dyslexics; dyslexia, which is seen in the form of mixing letters and words and perceiving them backwards, appears as a disorder in the areas of word reading accuracy, reading speed and fluency, and reading comprehension. In our country, students with dyslexia are exempt from foreign language classes if they wish, when they are diagnosed with a special learning disability. However, it is a fact that individuals with dyslexia can learn more than one foreign language when special studies are conducted. The methods developed for individuals with this disability have been considered as case studies and have taken their place in the literature extensively (Armstrong, 2017; Dal, 2008; Griffiths, 2020; Schneider & Crombie, 2012; Simon, 2000). We can support the second stage of literature with the following studies on digital designs. In their study, Tozcu and Coady (2004) tried to find out the effect of computer-assisted technologies on vocabulary learning, reading comprehension and word recognition speed using an experimental method. The result of the study showed that the students in the experimental group, that is, the group using computer-assisted technologies, learned more words than the control group (Tozcu & Coady, 2004). Likewise, Lin et al. conducted a study measuring the effect of collaborative computer-assisted learning environment on foreign language learners' perceptions of vocabulary learning (Lin, Chan, & Hsiao, 2011). COVAC (Computer Assisted Word Acquisition Programme) (Groot, 2000), developed by Groot (2000), is a computer-assisted vocabulary learning program designed for both mother tongue and second language learning. An indirect learning approach is used in this program. The system has features such as showing the use of the word in a sentence or passage, finding its synonym by using the word in a sentence, correcting it with true-false feedback, leaving a space in the sentence and writing the appropriate word. Groot tried to measure the effectiveness of this tool using an experimental method and carried out the experiment in 4 stages. Each phase of the study showed different results, however, overall it was concluded that COVAC is an effective tool for vocabulary learning (Groot, 2000). In another study, Olmanson was designed as an online language learning program (Olmanson, 2007). Includes spelling exercises and systematic vocabulary support for native-second language learners of English. It can be used for groups aged 7 and above. In this program, a direct vocabulary learning approach was used. It offers features such as word memorization, definitions, sparse contextual examples, mini-tests, and a feedback system is also available (Olmanson, 2007).

In the third part of the literature review, we can summarize the contribution of games to learning with the following studies. Another important point in language learning is games. Studies have shown that people learn more effectively when they are entertained than when they are stressed (PRESENTERS'INTRODUCTIONS). In addition, game-based learning has been shown to have a positive effect on motivation, critical thinking, and participation in learning (Yılmaz, 2014). For this reason, it was reported by Shears and Bower in 1974 that educators use games as a powerful learning tool for learning vocabulary in many fields, including science, mathematics, language, and especially foreign language (Shears & Bower, 1974). Likewise, according to Blachowicz and Fisher (Blachowicz & Fisher, 2004), they argued that teachers and parents should play games with their children in order to develop vocabulary.

Considering the literature that we have examined in three parts, such as descriptive-case report, computer-assisted education and game-based education, the efforts to create an environment suitable for foreign language education for people with disabilities and an infrastructure that can meet the needs are still continuing all over the world, and deficiencies are clearly waiting. Therefore these shortcomings constitute our motivation in our design and in the article. Thanks to the material we developed, we wanted to facilitate foreign language learning in special education, to eliminate the deficiency in the field, and to enable individuals to reach results without the need for anyone. In other words, our goal is to directly reduce the problem with material design rather than case detection and analysis.

Technical Details and Results

Today, the place and importance of foreign language education is increasing and new teaching methods are being developed by using different technologies. A feasibility study was conducted for the product that needs to be developed in the field of special education, and although other examples were searched in the field on what materials to be used, no product examples could be found. Thereupon, it was decided to develop the product ourselves. In the team meetings we held to develop the product, it was concluded that using 3D printers, electronic materials and computer software would reduce the cost, and the electronic and software technical details of the design are as follows:

- Arduino UNO R3 – SMD Clone (CH340 Chip) – USB Cable
- 12x12x7mm Push Button – Tact Button x22
- 10K Resistor Package – 1/4 W – 22 Pieces
- Electronic Breadboard - Large - 830 Pin
- Cable, jumper cable

The dimensions of electronic materials are very important in the three-dimensional design we will do. We need to adjust the places we will use in the material we will measure by measuring the dimensions. When electronic materials were procured, the electronic circuit we planned to do with the computer and Mblock software had to be tested. Accordingly, the designed circuit is shown in Fig. 1.

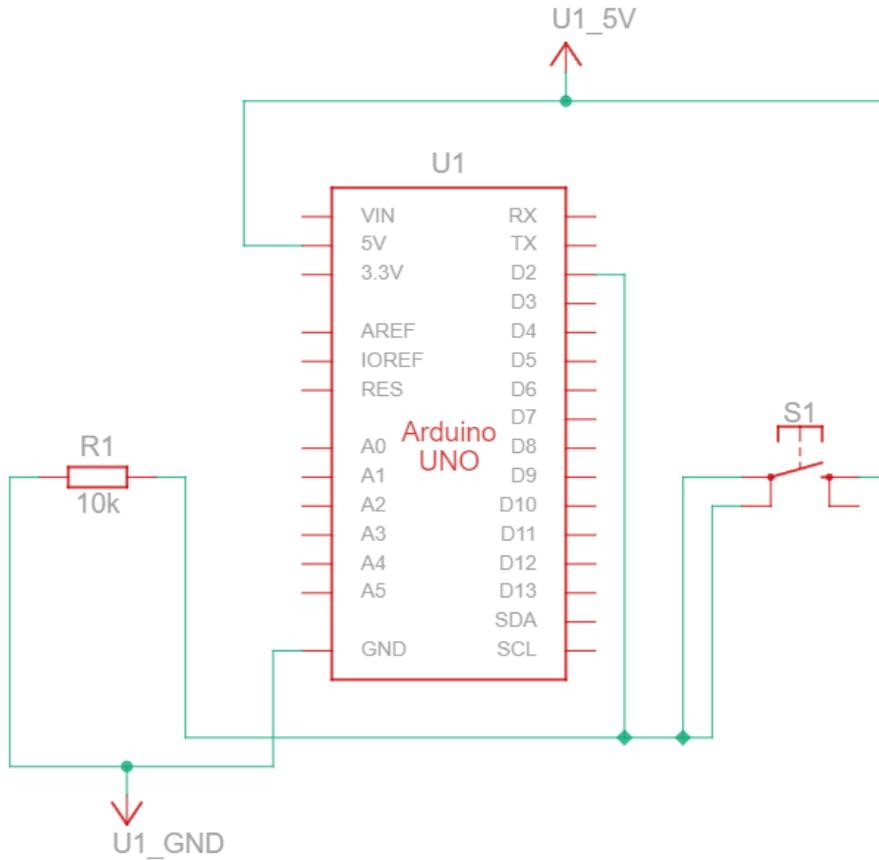


Figure 1. Tested circuit design

In the Fig. 1, there is the schematic that we planned on Thinkercad Circuits (Mohapatra et al., 2020) about reading the value of a button. In the diagram, 5 volts is given to a 10kΩ resistor on the Arduino and when the button is pressed, the value from the digital gate number 2 on the Arduino is read. The Mblock program is used for reading (mBlock (2016). mBlock. *Çevrim-ıçı: <http://www.mblock.cc/>). While the value read in 10kΩ resistor appears to be 1023, this value changes as the number of resistors and buttons increases.

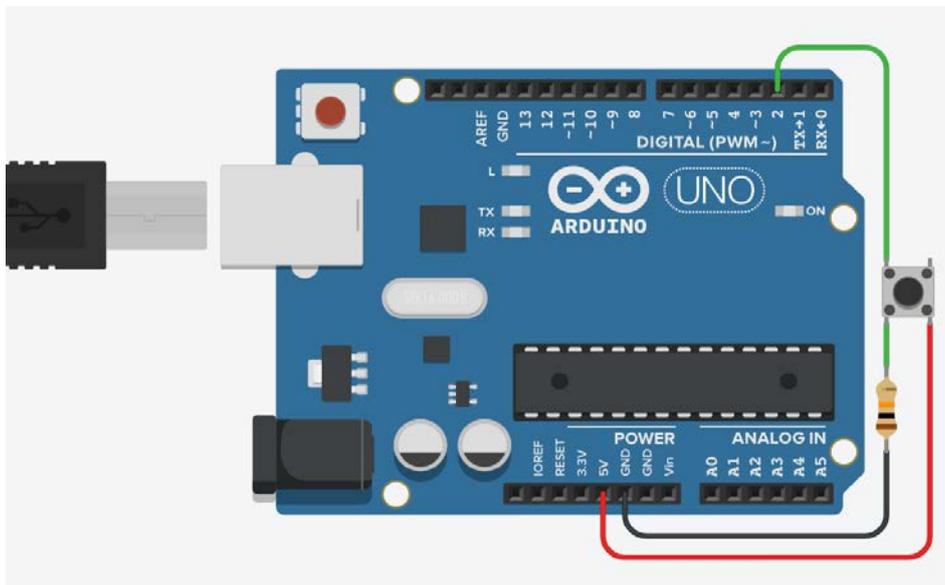


Figure 2. Arduino set for our design

We can use the result we get from here in our project, using the value we get when we press the button, and use it as we want on Mblock. This is the electronic part of the business. With this information, we need to combine software and three dimensions. As a second step, we decided to use the Thinkercad web2.0 (<https://web2araclari.com/2020/03/31/tinkercad/>) tool in our search for the simplest program that we can design in three-dimensional design. Thinkercad is a program developed by Autodesk, where we can make three-dimensional designs free of charge, and we provide three-dimensional design training to our students. Our material was considered by our team members through the Thinkercad program, its size and features were decided and its design was made. While designing, the places where the electronic circuits are thought to come in the design are also shaped according to the dimensions. In the Fig. 3, the bottom plate of our material is seen during the design phase.

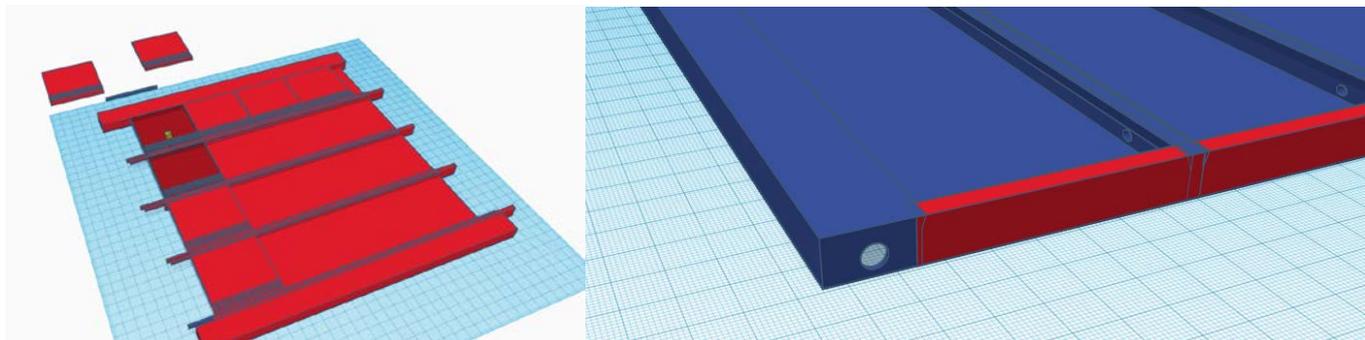


Figure 3. Baseline process of the material

Another situation in the design was to add the design of the Braille alphabet for the visually impaired. For this purpose, Braille alphabet rules were researched and added to our design as seen in the Fig. 4.

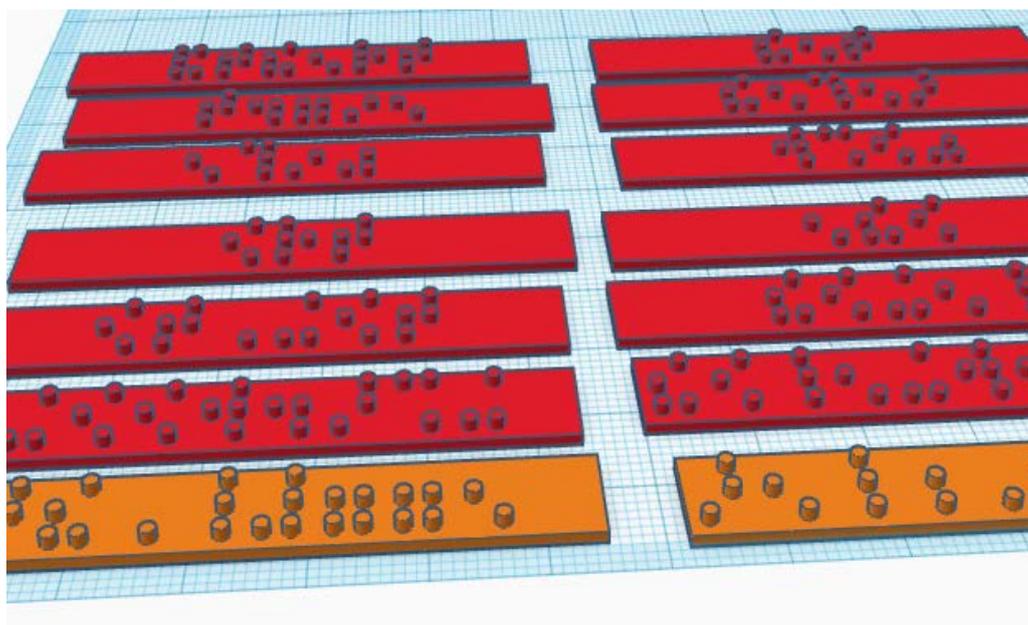


Figure 4. The design of the Braille alphabet

After the design phase, the design must be extracted from the 3D printer. A large 3D printer is required to print your design. There are some negativities in a print that takes 20 hours to print. A hot environment, being connected to the power supply of the 3D printer, and if possible closed, will minimize the negative effects. Two of these prototypes were built. It took 7 days to take into account the negativities experienced during the printing process. Our next step is to solder electronic buttons, resistors and cables in a certain order. Here, one of our cables is connected to a single leg of the button in all of the buttons, while the other leg of the button is soldered using a resistor. Our purpose in this scheme is to ensure that the more 5 volts electric current passes through 10k resistors, the more it reduces the voltage, and as a result, a different data is read in each button. For example, while a single resistor takes a reading of 1023, it gives a value of 800 after passing through 5 resistors. This allows us to get different values for each of the 13 buttons that we will use in a material. This information will be read with Arduino and each value will be used with a different coding on the software side. Our goal in choosing a resistor is to do a more accessible job by minimizing the cost.

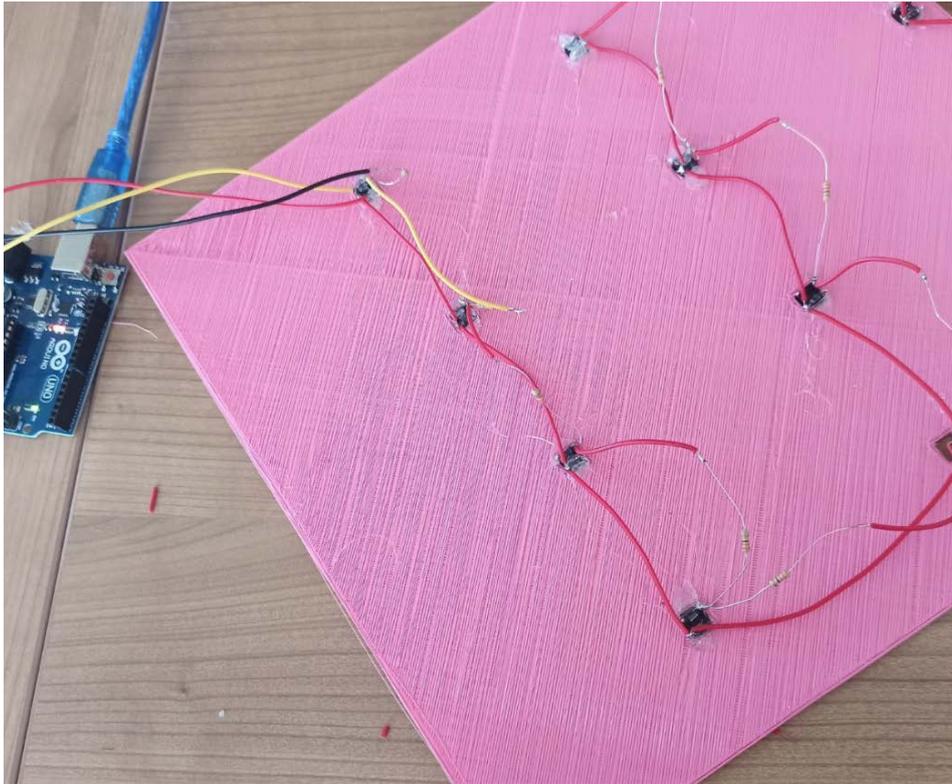


Figure 5. The occurring of bottom table of circuit

In the next stage, we wanted to read the data from the arduino using the Mblock program on the computer and use it as we wanted on Mblock. We made the same design in our material on the Mblock program. In this way, our visually impaired individual will hear and learn the English pronunciation of what he touches as a result of touching the Braille alphabet and shaping the shape in his own mind and pressing the button. Our mentally handicapped individual, on the other hand, will hear the pronunciation of a material he/she touches and will see its English spelling.



Figure 6. Vegetable set group image of the circuit

Our hearing-impaired individual, on the other hand, will visually read the deaf English equivalent of a material he sees and touches. Considering the English curriculum, we decided to work on two examples, which can be reproduced if desired. Here, when the 5 button is pressed from the numbers, or if only software is used, when the mouse is hovered over the number 5, the picture that appears on the screen is displayed. A multidimensional study has been tried to be done (Fig. 7).



Figure 7. The number set group image of the circuit

In Mblock software, when the button in the material is pressed, the data coming from the arduino is read and the incoming data is interpreted and accordingly the output is thought to be as we want. For this, a background area and 10 puppets were created and different codes were made for each puppet.

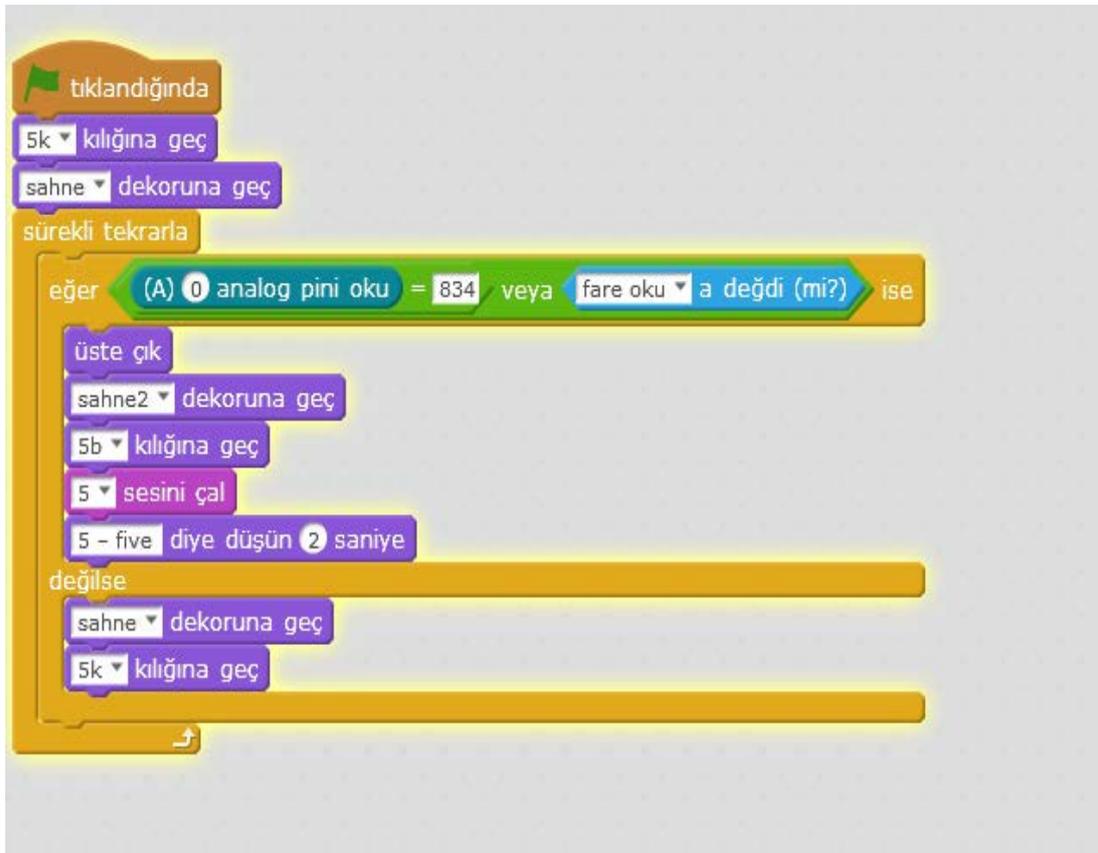


Figure 8. Mblock image of the circuit

The example here should be used by changing the data according to the resistors coming from the arduino for all the puppets. The interpretation of the coding on the side can be briefly summarized as follows. If the value 834 comes from the Arduino or when the computer mouse touches the puppet, it is said to show a different picture, disguise and play the previously prepared sound file. Since this code is in the repeat code, in fact, all the puppets in the software are constantly trying to read data and show the desired behavior when the button is pressed or the mouse arrow is on the puppet. The system repeats this continuously until any key is pressed. In this study, problem-based scenario and project study method was used. A scenario was created for an educational problem, a project was created and a solution was reached by determining the steps. The prototype material obtained at the last stage of our study is shown in the figure, and it can be used on a national basis in our

country on a national basis, as well as in digital platforms such as EBA, and has a wide usage efficiency. In addition, some of the digital photos taken during the project phase are available to Supp. Inf. It is located inside (Fig. 9).



Figure 9. The obtained prototype material.

Conclusion

Computer-assisted language learning gives students the opportunity to work for their own purposes, to effectively use materials tailored to their needs, and to evaluate results and give feedback. The findings obtained from this study, in which the design-based research method was used, support that technology is very important in language learning of individuals with disabilities. For this reason, educators should know that online resources are available, select resources according to the content they will teach, develop appropriate activities, and all this will create an opportunity for both language and digital skills to increase and will make a great contribution to the development of skills related to the needs of the digital age. Social work policies would also benefit from the use of universal design principles in the physical and educational spheres in order to view people with disabilities as a valuable member of society rather than as a separate group and to improve their social effectiveness. Since this study progressed within a limited budget, open source was used in the vocalization of the words and caused delays in the system from time to time due to the density. From this point of view, taking the work one step further with a more comprehensive budget and expanding its use will provide an important opportunity in language education for people with disabilities.

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