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Augmented Reality Practice Book For The Hearing Handicapped

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Abstract

The main purpose of our study is to create a cost-effective educational tool that can be integrated into existing books and used in the education of the hearing-impaired. In order to achieve this, it is aimed to combine augmented reality with textbooks. In this way, savings will be made in the education of the hearing-impaired with the system to be used in existing textbooks.

Textbooks distributed by the Ministry of National Education and the Digital Game Design program Unity and Vuforia plug-in were used to carry out this study . It is seen that the product that emerges during the evaluation process is important both in facilitating the work of the teacher and in increasing the academic success of the hearing-impaired student.

Another important point is that instead of preparing separate books and curricula for all students with special needs, savings are achieved by using existing textbooks for the hearing impaired. Such training materials are important even when the use of virtual and augmented reality applications increases in the future.

Key words: *Hearing Impaired, Textbook, Turkish Sign Language, Augmented Reality*

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Introduction

The biggest factor in individual learning is that people reach certain judgments by reading on heir own and make it permanent. In this sense, reading skill can be considered as a prerequisite for learning. However, it has been observed from some studies that individuals with hearing impairment develop these abilities both more slowly and at a lower level in proportion to the level of these disabilities (Eg. Güldenoğlu, 014). In addition, deficiencies in interactive thinking, social learning and communication further slowdown learning. For this reason, hearing-impaired individuals learn much slower and harder than their peers.

In fact, it is known that the interest, motivation and potential of hearing impaired students towards learning are the same as non-disabled students (Passing & Eden, 2000). However, it is known that these students lag behind their peers in education. While normal students learn reading in the 1st grade, the hearing impaired students switch to reading in the 4th grade (Center for assessment and demographic Studies, 1993). This situation prevents hearing impaired individuals from reaching equal opportunities in education and always leaves them one step behind. In addition, it was observed that when students' hearing problems were reduced with better devices, their reading and comprehension skills increased (Karasu et al., 2012). This clearly undermines the principle of equal opportunity in education for students and necessitates work in this area.

A plenty of seminal studies are carried out in this field with new generation technologies (Eg. Yılmaz, 2021). In this sense, new technologies should be used as a tool to provide equal opportunities in education for students with hearing impairment. Especially virtual reality applications and augmented reality applications can provide a certain solution to this problem of education. In this sense, these two technologies are very close to each other and their effectiveness varies according to their application areas.

The aim of our study is to create an educational tool that can be used in existing textbooks, to be used in the education of the hearing-impaired and/or to increase their academic success.

1.1 Virtual Applications in Education

In order to make learning processes more effective, many opportunities offered by the computer and the internet are actively used today. In particular, animations, simulations, virtual reality applications and augmented reality applications are rapidly developing and changing in this field. Among these, virtual reality and augmented reality applications provide users with realistic experiences, both by increasing the motivation for learning and providing deeper learning. In addition, these applications are used in astronomy, in the micro-realm , in experimental environments where it is not possible to perform very costly and time-consuming physics experiments, to perform potentially dangerous studies in a safe environment, to implement very complex applications, to perform the same application over and over, and to improve the educational opportunities of individuals with disabilities (Ayyildiz, Yilmaz & Baltaci, 2021; Shelton & Hedley, 2002).

Virtual reality is a three-dimensional simulation model that interacts between the user and the program and creates a sense of reality with physical effects (Bayraktar, 2007). Virtual reality, where important applications are made especially in the field of medicine and gaming, provides opportunities for learning with simulation in education (Lange et al., 2010). With wearable technologies such as glasses and gloves that are specially designed in 3D, the user tries to create a sense of reality (Sui et al., 2001). In addition, there are augmented reality applications that combine the real environment with the virtual.

1.2 Augmented Reality

Unlike virtual reality, augmented reality is a technology that provides a mixture of real and virtual by transferring real images, models, data to the virtual world (Çetinkaya & Akçay, 2013). These applications was, were first produced for military purposes and then used in the entertainment industry. With this technology, which has also been used in education in recent years, users have the chance to undergo experiences that are normally very difficult to do by using real and virtual in the same environment. It is tried to create more effective systems by presenting AR (Augmented reality) and other virtual applications for disabled individuals . With visual applications, virtual books, visual materials and speech interfaces are tried to be created especially for students with hearing impairment. AR applications also offer

opportunities with smart keyboards and smart applications for other individuals with other disabilities (Mirzae et al., 2012).

1.3 Augmented Reality Books

AR books are known to have a motivation-enhancing effect on hearing-impaired students (Parton, 2010). However, such applications show that hearing impaired students develop their inference skills, perception skills, imagination and 3D thinking skills (Passing & Eden, 2000). Enriching the learning environment with AR not only increases the desire to learn and teach, but also makes it more meaningful. It enables students to understand faster and deeper (Zauniddin , 2010). In this sense, it can be claimed that AR applications enriched with sign language are extremely effective. For this reason, AR applications are extremely important as they have positive effects on hearing-impaired students.

AR books are extremely important for hearing impaired students. In this type of books, especially 3D images are used. There are various studies in this area. In English books, there are studies in which visuals are shown in 3D, texts are enriched with animations, hybrid textbooks, books enriched with digital pictures, videos and slides (Çınar & Akgün, 2015). But these books have to be created in certain ways. Among these applications, it has been seen that sign language is more effective for hearing impaired students than other 3D and 2D models and books enriched with virtual applications (Zainuddin , 2010). For this reason, sign language should be used even more for AR books. The most important method that will ensure this effectiveness is that sign language should be included in the books with the video method, data matrix or other methods. Therefore, within the scope of this study, we aimed to make an AR application in which visuals are expressed in sign language. We think that with the increase in such studies, equality of opportunity for students with hearing impairment will increase in education.

Methods

This study aimed to develop a sustainable model that can be used in existing textbooks for the hearing impaired by developing existing interactive books. We tried to set an example that would help hearing-impaired students better understand the

subjects by translating the subjects in the textbooks, into sign language, which we thought to be theoretically very easy and equally applicable.

Although the applications of using 3D models and pictures in the interactive books are currently used to make learning more permanent, we think that there is a need to adapt these technologies to the textbooks for hearing impaired students, which enhances their comprehension of the subject.

In today's education system, we frequently encounter that students with special needs are educated by taking the decision of Full-time Inclusion in Normal Schools. In an average classroom, there should be a student with hearing impairment, all teachers who will attend the class should know Sign language and explain the subject to the students in this way .

2.2 Construction of the Study

To determine the prototype of the study, Unity 2018, Vuforia programs from Game Engines used today (Augmented Reality applications can also be made), and the Solar System and Eclipses Unit, the 1st Unit of the "Secondary School and Imam Hatip Secondary School Science 6" Book distributed by the Ministry of National Education, were used.

The most original point of the interactive book we have created is to increase the academic success of hearing impaired students.

For this, it will be the simplest and most applicable solution to translate the subjects in the books into sign language by expert teachers and integrate them into existing books.

Teacher (Hearing Impaired) working at Kastamonu Guidance and Research Center, simplified the subjects and translated them into sign language.

2.2.1 The Program and Images Used in the Study

In order to create our Interactive Book , the 2018 version of the Unity Program , one of the most used game engines in the world, was used.

The installation of the program and the implementation of the Augmented Reality Application are as follows.

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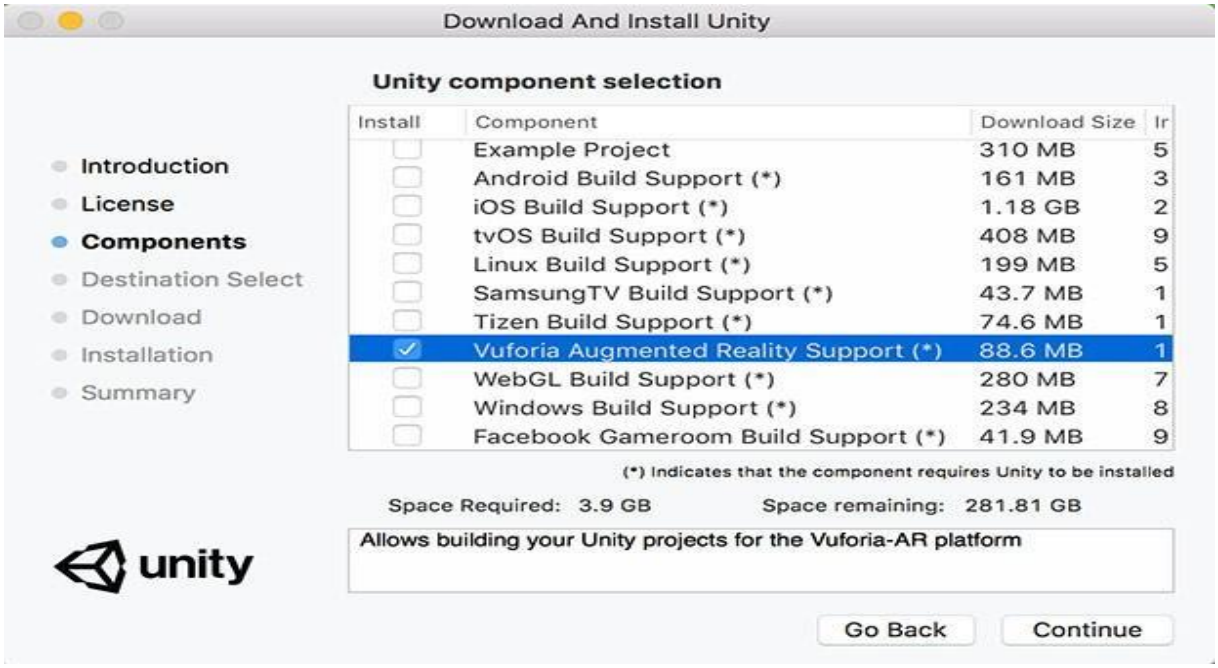
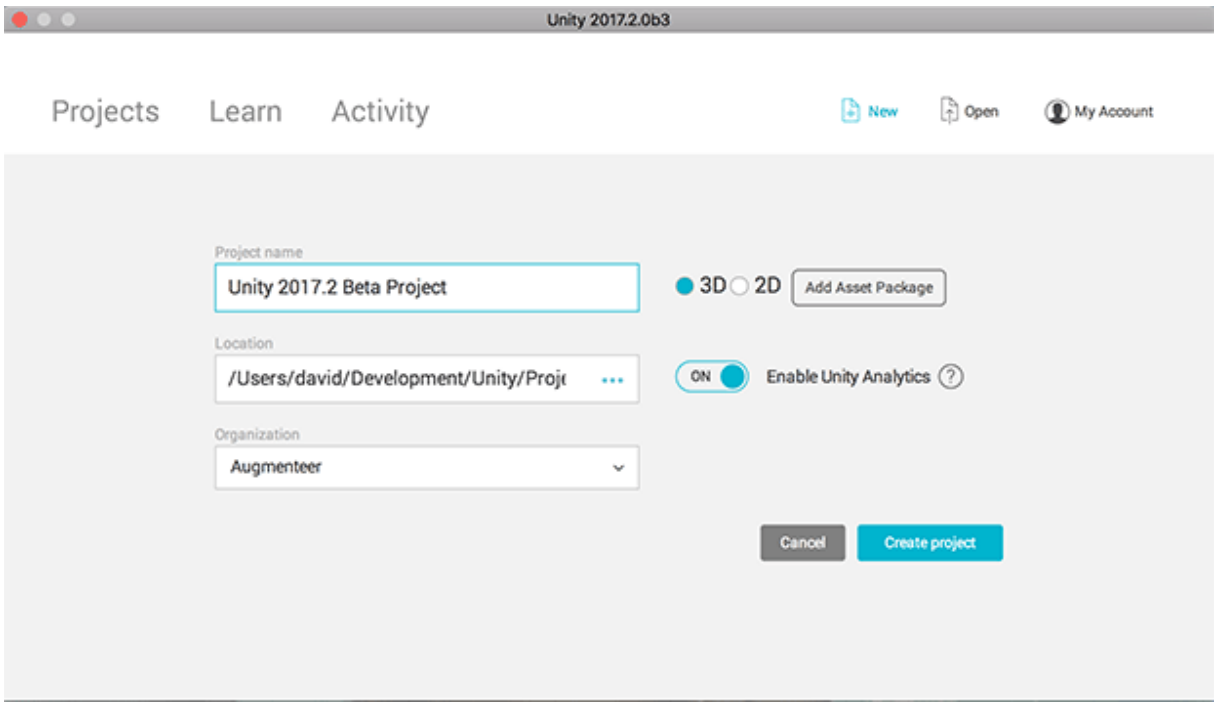
Unity Installation

Unity Download Download and run Assistant 2018.4 from the Unity website: https://unity3d.com/ . Accept Unity's license agreements.

Unity before 2019 versions of **Vuforia Augmented Reality Support** in addition to your platform support (iOS, Android, UWP) in the Components selection dialog. select . Then continue with your installation.

Unity 2019.2 this is not needed as Vuforia can be added to any project using Unity's package manager.

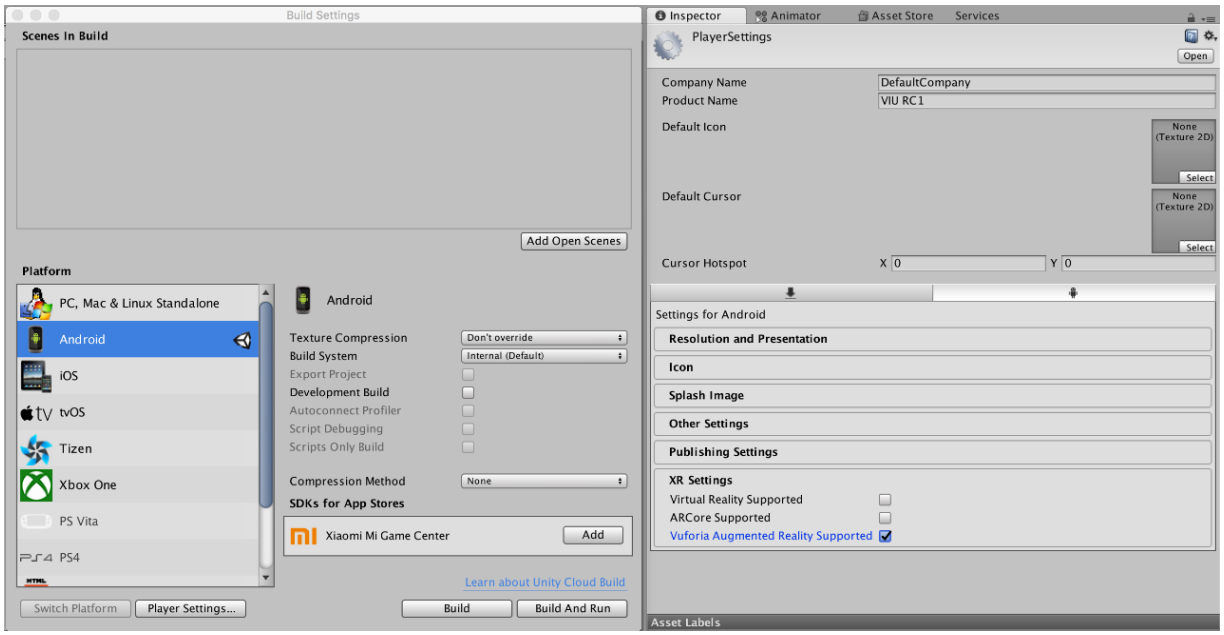




It is recommended to use a 3D project setup.

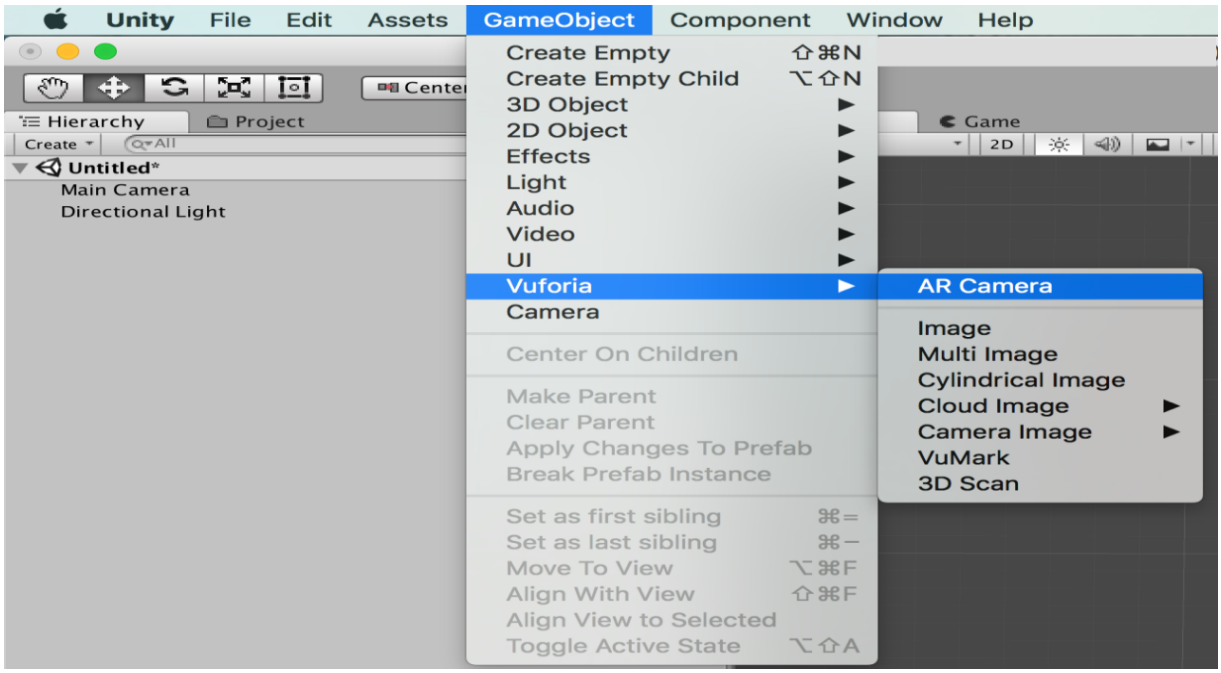
Vuforia Activation

Vuforia before creating a Vuforia Engine application You need to enable Engine in your project or Vuforia in Play Mode. You must use Engine . For Unity 2018.4 and earlier versions ; **To enable Vuforia Engine under section " XR Settings" go to Player Settings and check " Vuforia Augmented Reality".**



Vuforia Engine Game Objects

Vuforia Engine is in Unity Game Object menu and also Build It will appear in Settings and Player Settings .



If this menu is not shown, this will launch Vuforia . It means you haven't installed with Unity (versions before Unity 2019.2) or added the Vuforia Engine package to your project (Unity 2019.2 and above).

in Unity Accessing Vuforia Engine features

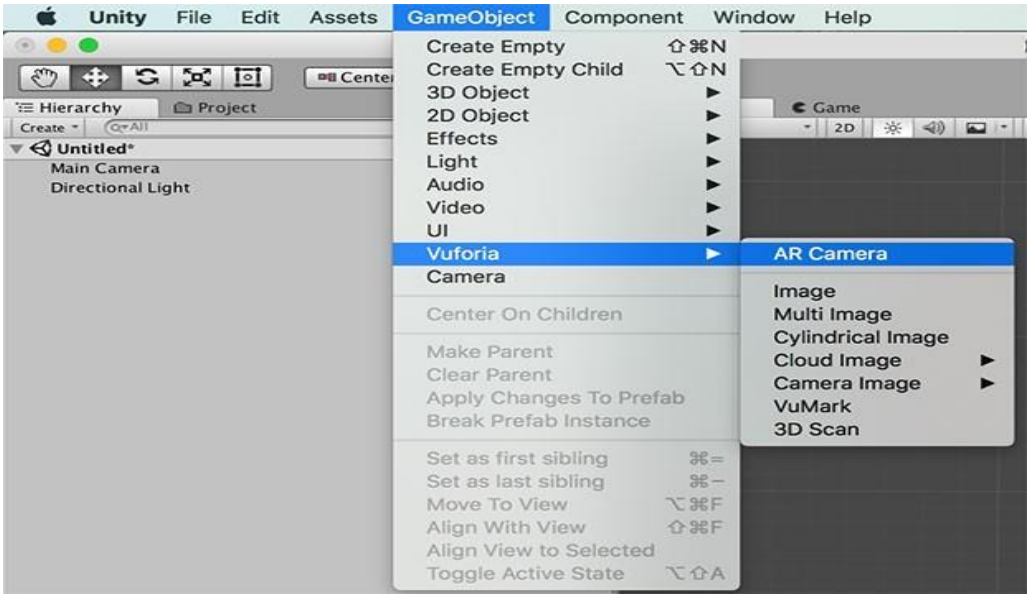
vuforia Engine After enabling it in Unity , Unity Vuforia to your project from the GameObject Menu You can add features of Engine . For more information on all the features offered by Vuforia Engine, please see the Features Overview .

an ARCamera . This is a special type of camera that supports augmented reality applications for both handheld devices and digital glasses.

Steps:

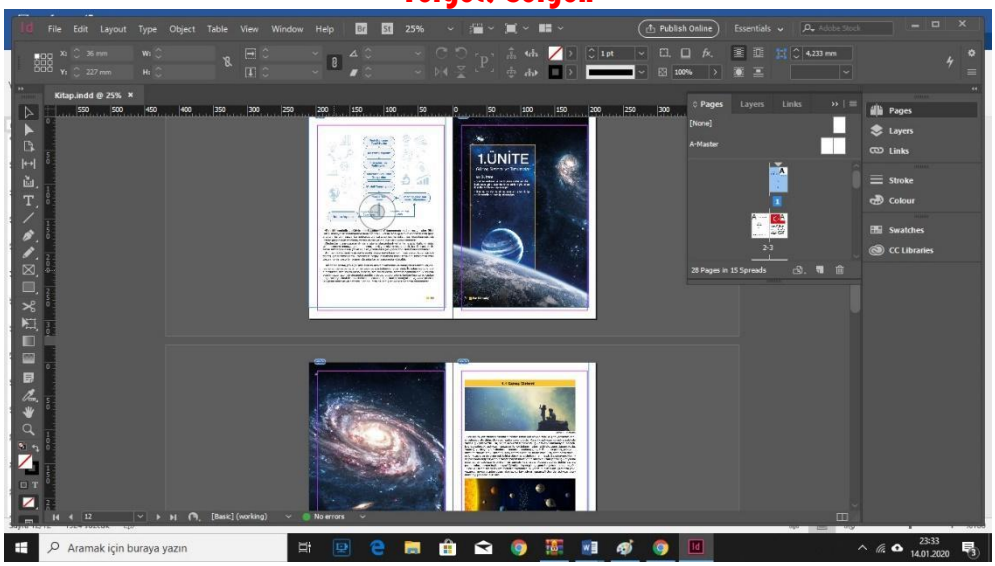
1. Add ARCamera
2. Open the Global Vuforia Configuration Menu
3. Enable target databases
4. Add targets to your scene

1. Add an ARCamera . Delete Main Camera.



Printing the Book

For our sample book, which is one of the books distributed by the Ministry of National Education, the .pdf format of my book was downloaded from http://www.eba.gov.tr/ , and our sample book was printed by typing and editing in Adobe Indesign program.



Add Goals to your Scene

Vuforia Engine targets to your scene by selecting the associated Game Objects in **the GameObject > Vuforia menu** . A target Game Object will be added to your scene hierarchy that will appear in your scene.

Each target object can be configured in Inspector . Select the database and target name of the target you want to use .

Add a digital asset or Video

Now you are ready to add digital content to increase your target. You can do this by adding your assets as children of the target in the scene hierarchy. Combining content with a target object automatically sets the required rendering and physics behaviors

Include the content as a child of the target.

Tip: After adding an ARCamera , delete the default Main Camera. ARCamera includes its own stage Camera. You don't need the Main Camera unless you use it to create a specific camera view.

Playing the Scene
Vuforia Engine provides a simulator that you can activate by pressing the Play button in the Game view. You can use this feature to evaluate and quickly prototype your scenes without having to deploy to a device .

Playback Mode is configured in the Webcam section of Vuforia Configuration.

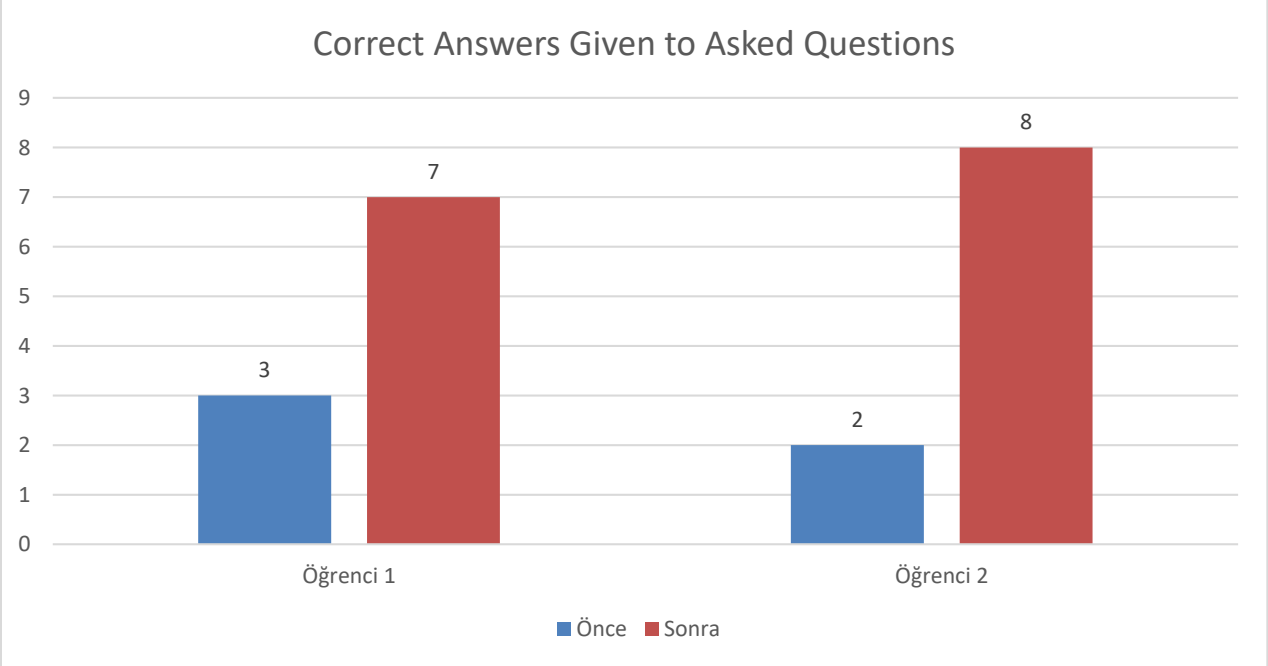
Build and run your app
Unity apps powered by the Vuforia Engine are built and run in the same way as other Unity apps for Android, iOS, and UWP .

Results

In this study , a book design was created which is thought to increase the academic success of the Hearing Impaired. During the interviews with 2 Hearing Impaired students, who are educated as Full-Time Inclusion in the Secondary Schools of our province, through an interpreter, we had our friends examine the textbook and asked the questions (first 10 questions) at the end of the unit, and then we noted down the correct answers. Without giving the correct answers, we ran our application and noted the correct answers. The questions we asked and the answers given are indicated in the chart.

Questions

- (….) Mercury is the smallest planet in the Solar system.
- (….) Uranus is the farthest planet from the Sun in the solar system.
- (….) In a solar eclipse, the Moon is between the Sun and the Earth.
- (….) Planets with solid surfaces and metals in their structure are in the group of inner planets.
- (….) Celestial bodies that circulate freely in space and contain various metals in their structure are called meteorites.
- …… ……. . It is the closest and smallest planet to the Sun.
- …… ……. . is the planet known as Earth's twin.
- …… ……. . It is the only planet with life in the solar system.
- The celestial bodies orbiting the planets in certain orbits …… . . called .
- Solar eclipse of the Moon …… . . occurs in phase .



According to findings and and face-to-face interviews, it has been seen that our book is effective in understanding the subject. Our hearing-impaired participants, who stated that they had difficulty in understanding the subject before, stated that they liked the sample book we created very much.

Project Images

Discussions

In our country, various studies are carried out on the academic success of students with special needs. We think that we have taken a step towards increasing the academic success of the Hearing Impaired with this sample book we have created. This application we have made can be applied to all courses and can be used by lecturers by experts in the field. Such innovative systems can be especially supported by methods such as flipped learning (Aydınlı & Avan, 2017). Thus, it is possible for the individual to learn in a system, not alone (İzmirli & Akyüz, 2017).

Conclusions and Recommendations

Our Sample Book was designed as 1 (One) Unit. Our study revealed that the size of the application to be installed on the mobile phone or tablet will reach high dimensions when the whole book is made interactive. It a higher level of software knowledge was needed to ensure the continuity of the book. In addition, it would be more appropriate to use a non-glare paper for the application to work smoothly.

It is recommended that those who want to work in this field should work more systematically. It is very important for people who are experts in their branches to make lectures about the education of the Hearing Impaired.

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URL2: https://www.eba.gov.tr/ders/proxy/VCollabPlayer_v0.0.530/index.html#/main/vcEbaSearch/2/fen%2520bilimleri%25206%2520ders%2520kitab%25C4%25B1/1?pageSize =24 AccessDate : 27.12.2019