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Research Paper

Students' Opinions on the Usage of Mobile Augmented Reality Application in Health Education

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ABSTRACT

The use of mobile augmented reality technology has recently improved in education and training methods. Studies have shown that this new technology has a positive effect on education and students. This study aims to present a synthesis of the studies on mobile augmented reality in health education with a critical approach and to develop suggestions for future researchers. In addition, by presenting an application on the effect of the use of augmented reality in health education on the performance of students, it is aimed to investigate the students' perspectives on the use of this technology and its use as an educational tool in teaching-learning through students' perspectives. For this purpose, an anatomy application for anatomy lesson was designed with Unity 3B platform, Blender and After Effect, and 150 students studying at Vocational Department of Health Services were asked to experience the augmented reality application developed. Mobile augmented reality application was made available to students during the application process. as a result, "Student Views Questionnaire on the Use of Augmented Reality Application in Health Education" was applied. Frequency and percentage distributions were used to determine student views. The results obtained in the research show that students respond positively to the use of technology and they believe that the use of technology in the learning-teaching process will increase their performance.

INTRODUCTION

The rapid inclusion of technology in education started to play the main role in the success of the learning process, there was a presentation of different technologies, and one of them is augmented reality. This technology has been used to offer solutions to the problems faced by education and to create an interactive learning environment that can be an advantage to improve students' learning and increase their knowledge and skills. Augmented reality is a technology used to demonstrate the interaction between the real world and the virtual world, where users can place models and objects in the real world and then interact with it.

Applications designed with the use of hardware and software in Augmented reality technology together provided a new opportunity for more interaction with learners, showed more interest in education, provided educational gains, and increased the effectiveness of the learning process. After the introduction and use of this technology in computers, developers thought of ways to make this technology available to every user, anytime and anywhere. Developers have started designing apps that can be used on mobile phones and tablets, helping the technology spread and become famous, and mostly used in apps drifting from Snapchat and Facebook to E-commerce, being a part of learning and education methods. Augmented reality applications have made it easier for mobile users to experience the real world and engage more with the real world, and devices that support AR are becoming more common, with affordable costs and different features.

This study tries to find out how the new augmented reality technology affects students' performance while studying and how you can strike the right balance without missing any of the available methods. These methods differ from traditional methods, (Textbooks). Health education is becoming a complex issue today and teachers face difficulties in providing solutions because of the wide variety of information that needs to be presented in different ways. The health education sector has begun to depend on software and hardware developers to provide technological solutions to improve health education and has begun to undergo changes involving the complete digitalization of medical records, and there have been changes in social-ethical issues related to health education. A study by (Güze, 2015) noted that there is a gap between developers and clinicians, as well as universities and educational facilities, with the result being ineffective technology that frustrates and overwhelms health education professionals and clinicians. This has resulted in the technology being offered by developers being ignored as a solution to education and learning problems. Some difficulties also arose as time constraints within the training program, lack of cadavers, it was also stated that the training process was handled by non-medical teachers and trainers due to the lack of institutions with professional clinical care. Recommendations included developing relationships with both clinicians and researchers for anatomy education programs, thereby advancing teaching and research. One of the solutions offered is computer-assisted teaching, the development in computer technology has undergone a rapid change since the last few years, many computer-assisted teaching applications have been created,

and various techniques and tools have been provided for the development of intelligent systems. Developers started to produce and develop an effective technology, researchers started to focus primarily on computer assistant training to train teachers, and teachers were not satisfied with the workshops and training that is given by the education authorities at their professional beginnings. Then, labs and computers also need a technical assistant if an error occurs in the application being used, as they require more training to understand how applications work.

This study highlights a technology delivered on a handheld device (mobile/tablet filled with camera) application designed to be involved in higher education as a learning tool for students that allows users to interact with it. With its (MAGAU) technology features, it supports students to learn anatomy lesson, the lessons include many hands-on sessions in the learning curriculum, after the end of the practical sessions in laboratories and universities, most of the students have trouble remembering details after they finish the lessons (Weking & Santoso, 2020). These problems can be solved by using mobile learning as a tool in learning methods, and in order to achieve this goal, it is important to understand these problems and make sure that the application is the perfect solution. The application re-examines or changes the subject more regularly using Mobile Augmented Reality (MAGAU) innovation, also our aim is to guide students and universities to fast learning practice using this application and the biggest finding of this study is to help students, self-study and self-study due to lecture-based education programs Avoid minimizing editing time for the resulting congestion learning.

Purpose of the Research

The general aim of the research is to determine the effect of the augmented reality system on student performance from the student's opinions. There are various studies on the use of mobile technology in undergraduate and graduate education in various countries, but without measuring the students' perspective on this technology. In this sense, the goal is to clarify students' use cases for augmented reality systems in learning process. It aims to provide students with perspectives on the use of mobile augmented reality application as an educational technology tool clarify the factors limiting the adoption of augmented reality applications in health education activities. Research questions are:

- What is the use of Augmented Reality in the field of education?
- What are the materials used in the health education process?
- What are the students' views on the effects of augmented reality applications in health education on the learning process?
- What are the evaluations of the mobile augmented reality application (MAGAU) on the subject content?
- What are the design considerations of the mobile augmented reality Application (MAGAU)?
- What are your suggestions for using the (MAGAU) app for classroom teaching and learning needs?

METHOD

In this section, the research model, study group, data collection and application, data analysis and interpretation are given, and studies on each sub-title are explained in detail.

Research Model

In terms of the purpose and method of this research, the scanning model for due diligence is used. It is a descriptive research based on Gazi University Health Services Profession Students in the School of Health; Mobile device augmented reality application It includes an evaluation of its use in education. “Survey research has brought the social sciences the opportunity to work numerically. Statistics concept, techniques and processes are widely used. In other words, survey studies are based on statistical measurements. Usually this type question paper (questionnaire) or interview technique is used in researches” (Gökçe, 2004, p, 60).

The (MAGAU) application is designed using the Vuforia SDK and Unity and Blender and Adobe after effect for animation and color, the system is used to store 3D objects and store multiple image targets, there are two parts of the application, (See Figure 1, Figure 3), Marker and Unmarked. In the first part, the user This is the part where he clicks the button in the main menu where the 3D objects appear and controls the 3D objects and rotates the 3D objects. The second part of the application is the marker part where the camera will open. The pictures in the book can be traced after scanning, successfully detecting the models, and can be examined clearly.

In order to achieve the designed system in this study a various tools used in this project were Vuforia and Unity, and the ready 3D models design face took five stages to complete the application.

Phase 1: Designing and creating the UI hierarchy that connects all implementation phases and represents the startup scene

Phase 2: Downloading and uploading the 3D models and adjusting the sizes and colors of the models with the blender program and adding them to the scenes with the description of each model and information that will help to understand the model description.

Phase 3: In the use of the application in the fifth scene, the image target from the anatomy book is prepared and edited using the camera, making it visible and clear.

Phase 4: Framework programming of augmented reality based on Vuforia SDK and Unity Diversion Engine as framework development environment.

Phase 5: Unity is used as a framework build phase and coordinated with the Android SDK, the final item implementation is accessible for installation and use.

Phase 6: Finally, the app is released on Game jolt free platform.

System Description

According to the (MAGAU) system figures, (See Figure 2) is the part where the 3D capture module appears, clicks the button in the main menu, controls the 3D objects and rotates the 3D objects. The second part of the application (Figure 1) is the marker part where the camera will open, and after the pictures in the book are scanned, the followed picture is targeted and the displayed models are successfully detected and can be examined clearly.

System Design

(MAGAU) application is designed using Vuforia SDK and Unity and Blender, system Used to store 3D objects in unity database and store multiple image targets, it has two parts, (Figure 1,2, and 3), Marker and Unmarked. In the first part, the user Click the button in the main menu where 3D objects appear and check the 3D objects and it is the part where it rotates 3D objects. The second part of the application is, where the camera will open, the marker part. After the pictures in the book are scanned, they can follow, the models are successful. clearly identified and can be examined clearly.

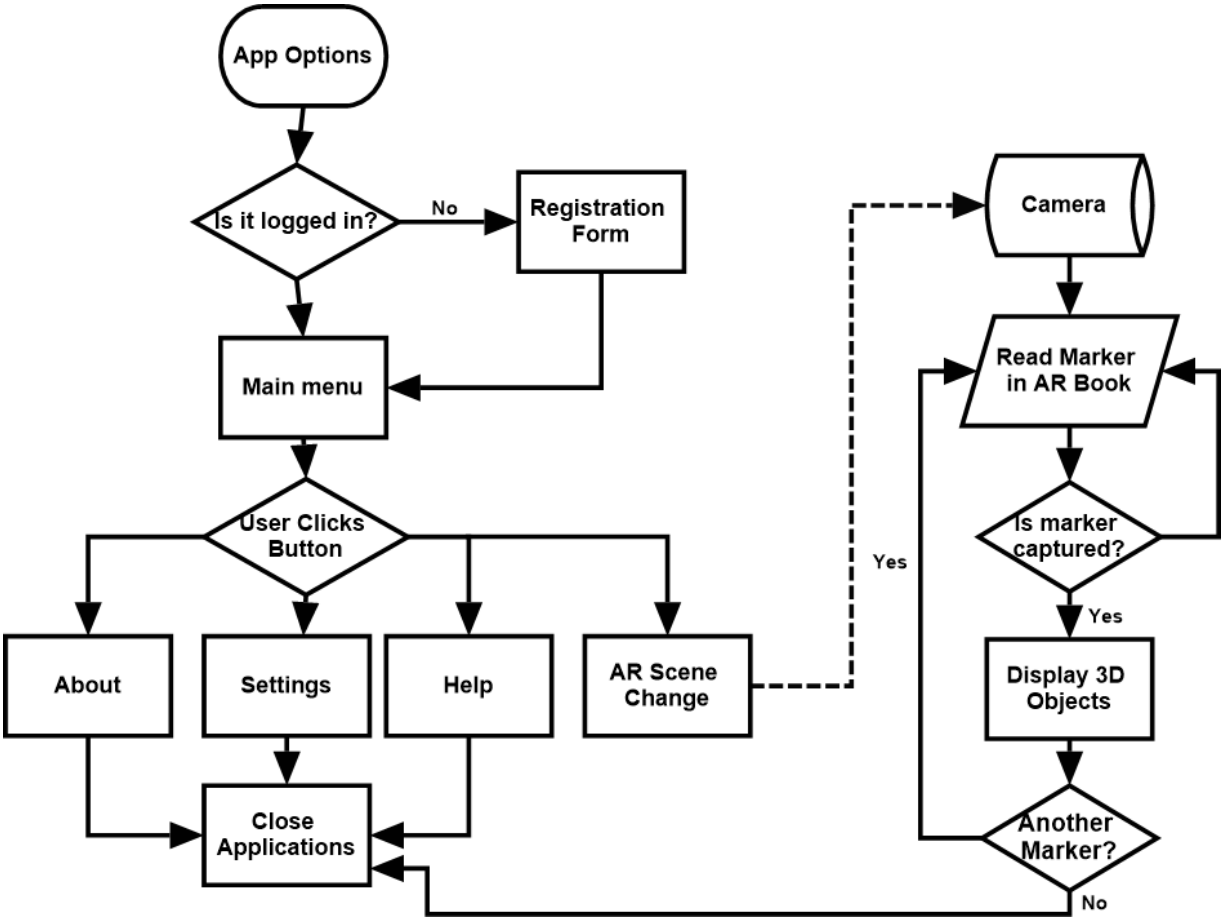

Figure 1. Flow chart of the AR Anatomy Marker tracking

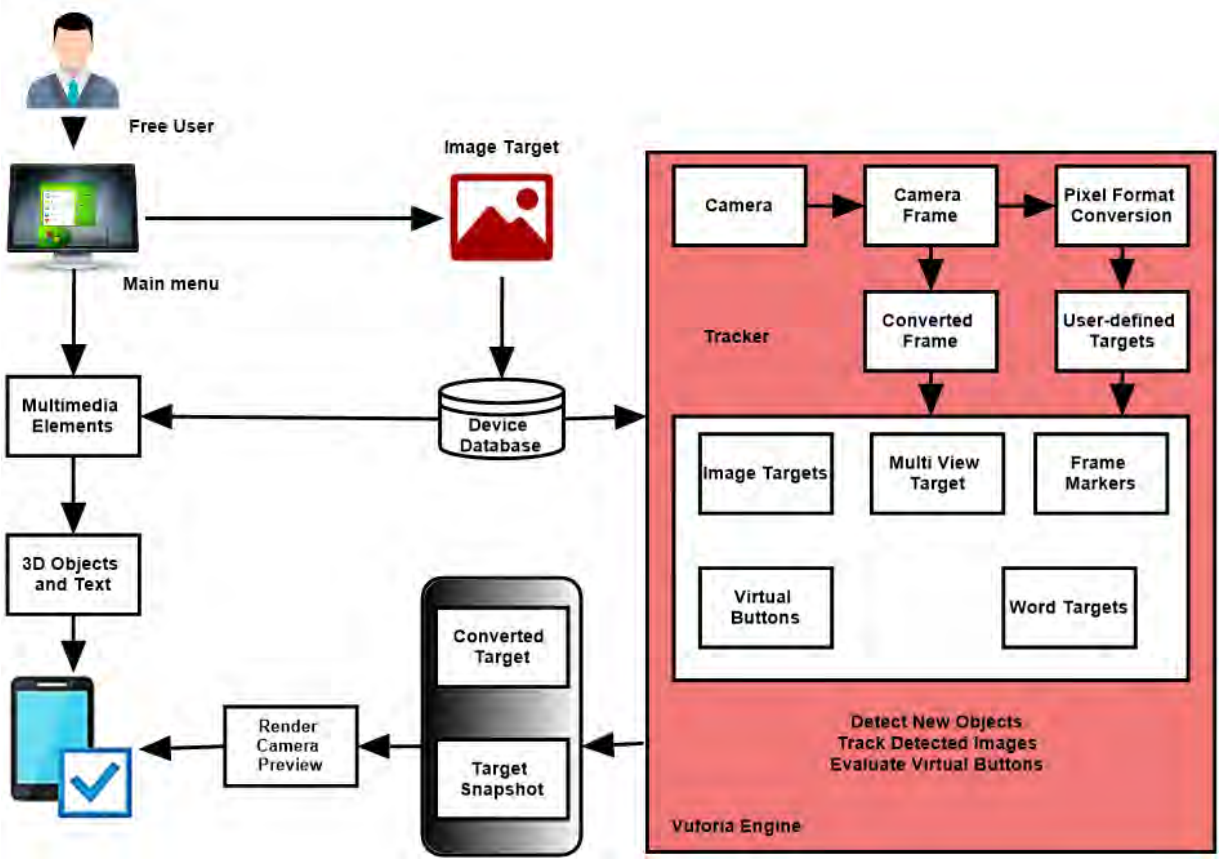

Figure 2. Architectural System Design

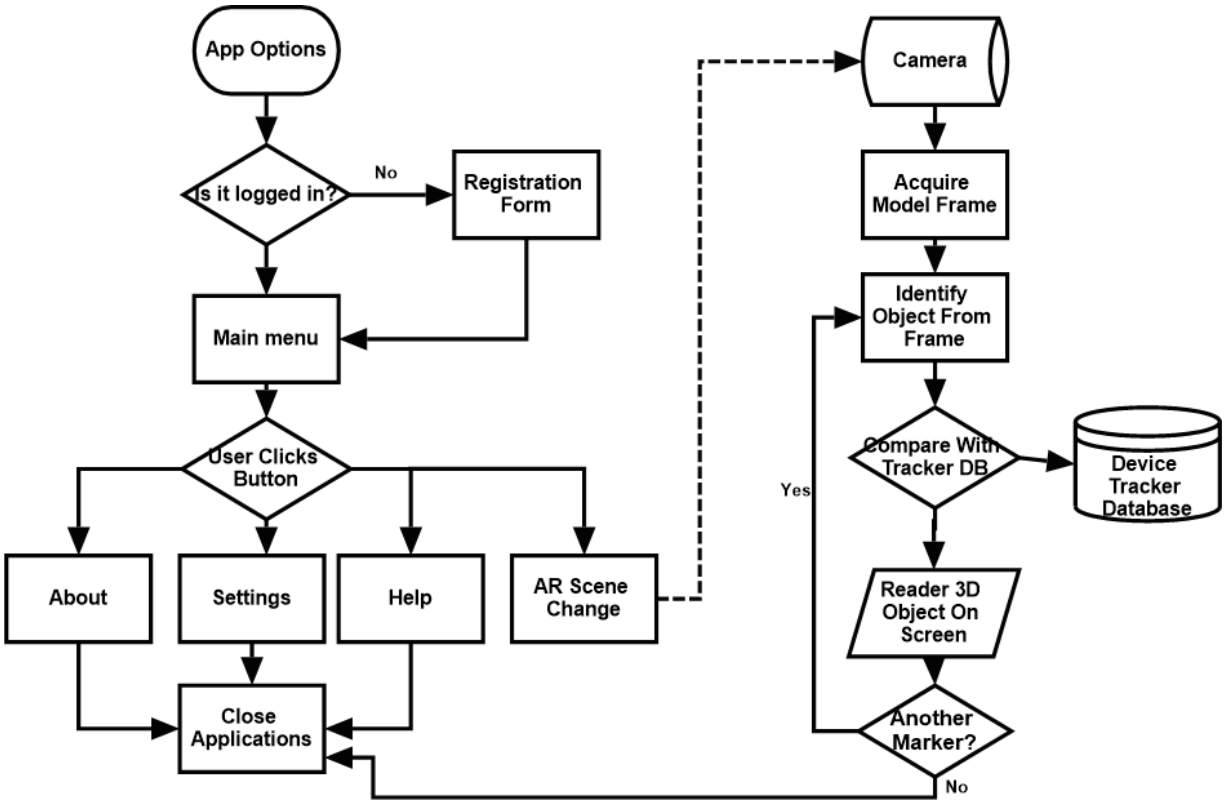

Figure 3. Flow chart of the AR Anatomy Marker-less tracking

Participants

Gazi University Health Services Vocational School has a total of 1405 students studying in their 1st and 2nd grades in all departments. Considering the departments with anatomy lessons; A total of 1213 students studying in their 1st and 2nd year, including 193 students in the First and Emergency Aid Department, 191 students in the Pathology Laboratory Techniques

Department, 195 students in the Medical Documentation and Secretarial Department, 193 students in the Medical Imaging Techniques Department, 200 students in the Medical Laboratory Techniques Department, and 241 students in the Elderly Care Department. There are approximately 600 students in the departments that have anatomy lessons in the 1st year. It is planned to get the opinions of around 200 students for the questionnaire developed for the Mobile Augmented Reality Anatomy Application (MAGAU) developed for the use of augmented reality and Anatomy courses.

It is planned to get the opinions of around 200 students for the questionnaire developed for the Mobile Augmented Reality Anatomy Application (MAGAU) developed for the use of augmented reality and anatomy course. The study group selected in this study were Gazi University Health Services Vocational Department students for the survey, but the application was tested by Gazi University computer engineering department. 13 students tested the application and added their comments and changes, and also by healthcare professionals and intern health education students in Turkey. Tested online by 42 healthcare professionals from different departments who participated in the survey. And lastly, it was conducted with 150 students by face-to-face interviews, participated in the survey while they were studying at the Health Services Vocational department, necessary permission was obtained from the department manager and department chair in order to apply the survey in the 2020-2021 academic year, brief information was given to the students and an introductory video was used for the anatomy application (Table 1). An online link was provided to them with a questionnaire about their employment, 22 of these questions were accepted as valid.

Table 1. The student and gender distributions

Demographic information	**Categories**	**F**	**%**
Gender	Male	29	19.3
	Woman	121	80.7
Age	16 – 20 age difference	109	72.7
	21 – 25 age difference	41	27.3
Department	Department of Medical Documentation and Secretarial	126	84.0
	Department of Medical Imaging Techniques	6	4.0
	Medical Laboratory Techniques Department	18	12
	Total	150	100

Mobile AR (MAGAU) in Use

Clicking the first button change as AR in the main menu (MAGAU) will switch to the marker less part of the application where the camera is turned on and the 3D models are transferred to the scene, and the models shown in the figure are on different pages and are shown below. The list and numbers can be changed by pressing, so the next 3D model will also contain text container when models change, each with information about the 3D model. The (MAGAU) AR mobile app has been designed using new packages introduced that help to combine the marker and unmarked design of the AR app, but the modern design of this app, (Figure 4), will help future researchers do more work using the new features in Unity and this application is specially designed for health education students and their reviews will help to give the use of this application and more applications in the future.

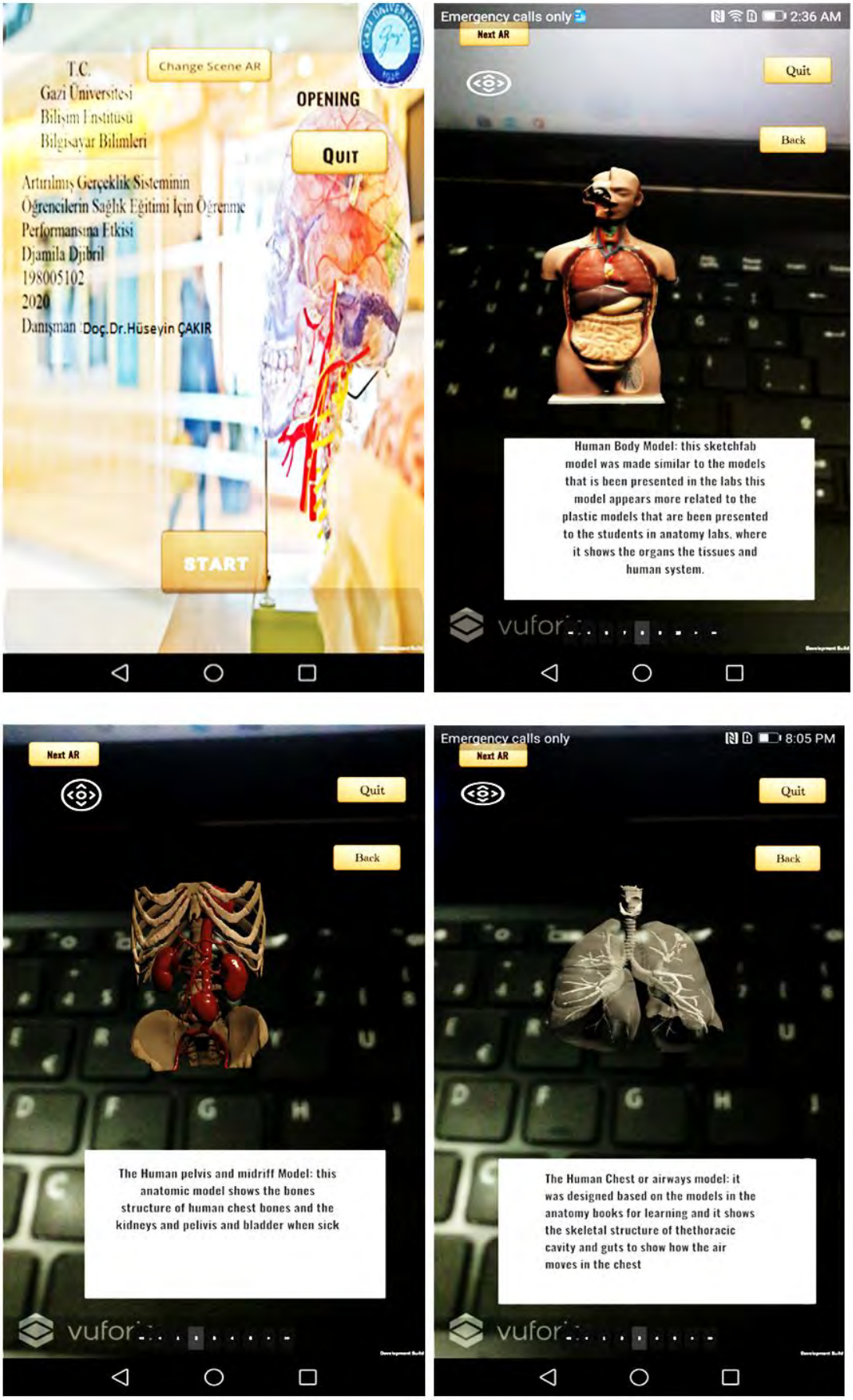

Figure 4. MAGAU Application.

Analysis and Interpretation of Data

The data obtained from the document and literature review were used in the introduction and findings and comments section of the research. The data collected as a result of the surveys were converted into numerical data in the form of frequency (f) and % distribution table. Obtained results charts and then necessary explanations and comments were made for each chart. While evaluating the findings obtained from the study, IBM SPSS Statistics v22.0 program was used for statistical analysis.

Data Collection

Research data were collected through a questionnaire developed by the researchers. The measurement tool, which is prepared to get the opinions of individuals and groups in various fields and includes the demographic information of the group to be reached, is called a questionnaire (Sönmez & Alacapınar, 2019). While preparing the survey questions, related studies in the literature were used. In order to ensure the content validity of the questionnaire, a total of three experts, one in the field of health and two experts in the field of information technologies, were consulted. Prepared survey First of all, it was applied to 12 students and the missing and wrong places were corrected.

Data Analysis

In this study, the first factor refers to what is called quantitative methods as it refers to two separate experimental processes. A survey was conducted on the students with an open-ended interview questionnaire. As a result of the literature review, an appropriate questionnaire was created and as a result, the data option in this questionnaire was used. With the literature review prepared using the data scale (Serin, 2020), 22 questions were divided into two parts, and the first questions were demographic questions about the participant's age, gender, and whether or not they were students of which department. There were 2 categorical questions about their views, the second part of the questions was 11 questions were used to measure the Anatomy mobile augmented reality use in scale questions. The scale showing the purpose of the research, the application was shared with the students and sent via WhatsApp, and after testing, they were asked to fill out the questionnaire, how the users could interact with the application, and how and with the future intention of the design. Technology use and acceptance based on work done by (Weking and Santoso, 2020) 8 questions about user experience, suggestions for future intentions and these statements were evaluated with 3 points Yes– No-Maybe/somewhat.

Fundamental frequency analysis: it is a statistical method often used to trust how much value we have or how many times an event has occurred, a vital area of insight that negotiates the number of events (repeats) and analyzes measures of central tendency. In our study, where we measured the number of occurrences of each participant, the frequency value of each question was the appropriate method since there were not many values in our study.

The data options were analyzed using IBM SPSS version 20.0, the first part was evaluated with frequency analysis and the scale questions were analyzed in the statistical structure. To determine the characteristics of the participants, first frequency analysis was applied, then scale measurement was applied and the proposed research was tested with structural research. The result will determine whether the students' perspective on the use of this technology is positive or not, and they agree that the use of this technology in the teaching and learning process in health education will increase the performance of the students.

RESULTS

A survey was conducted to measure the students' perspectives on how the application design can be successful and can be used as an educational tool, the interview-survey gave positive results and the aim of the study is to learn whether the application design is successful or not. The designed application can meet the expectations of the students and can help increase their academic achievement performance and motivate them to use AR technology, the students' great support for the use of the technology in which the application is presented has affected the attitudes of the students towards the use of the application in learning the anatomy lesson according to the survey about the designed application, the student showed a positive response, it was quite informative and easy to use and fun so students suggested creating more apps and it needed to stand out from other AR apps to get different results.

As mentioned earlier, due to the rapid change in teaching and learning methods, attitudes and future use intentions implying that universities and education must keep up with this change have been found to be effective.

The good part of technology is that the application can be used without internet access, it does not require a technical audience or supervisor, and it will use social media, which eliminates the excuses of teachers like students and will waste time, because education systems are falling behind in rapidly increasing technology competitions. will lag behind international methods that use more advanced technology in teaching-learning methods used in education systems. In the survey results, it was also stated that it is very difficult for universities to adopt this type of technology in their teaching methods, but the state and related institutions are willing to apply it through training to teachers who can apply it as a teaching method. It is necessary for education systems to be successful in global competition. In addition, more research is needed to measure the use of augmented reality technology in the education system in Turkey, especially in areas such as health education.

Qualitative research has been conducted on a limited number of students to understand their perspectives and also to measure the factors that make AR technology effective and the technology that may limit its use and applications in universities, and how this

technology may have future effects on students' performance The purpose of the current study is to be used as a learning tool. The distribution of the resulting questionnaire on the use of technology was presented, which was to examine the students' perspective on the use of Mobile AR technology through students' opinions:

1.1. Use of Augmented Reality in Education: As mentioned, AR technology had a positive effect on the students in our study. In order to measure this effect, we needed to know the student's state of knowledge, use this technology in their studies and outside the classroom, and find out whether there is any background knowledge about AR. This goal was based on three survey questions, we would analyze the results as it shown below:

1.Do you know about augmented reality?

Table 2 shows the students' prior knowledge of AR applications.

Table 1. Students' prior knowledge of AR applications

Answer	F	%
Yes	46	30.7
No	48	32.0
Maybe	56	37.3
Total	150	100.0

2. Have you used augmented reality applications before?

Table 3 shows the utilization of AR applications. Accordingly, **s**ome students (17.3%) said they had experienced and used these AR games for a while, but most of the students (68.7%) said they did not use these applications or tried any AR applications. 14% of the students stated that they used game applications, not educational applications.

Table 3. Utilization of AR applications

Answer	F	%
Yes	26	17.3
No	103	68.7
Maybe	21	14.0
Total	150	100.0

1.2. Materials used in the health education learning process: In general, students in education tend to use different educational tools to learn and facilitate the learning process. Students tend to use mobile phones in their classes as shown in Table 4. The students were asked whether they used any material in their education and while they stated that they used it, the most used material is mobile phones, web pages and e-books, computers, and they prefer watching videos from the internet.

1.Which materials do you use for educational purposes in the training process?

Table 4 shows the results of the students' usage on educational materials.

Table 4. Students' usage of educational materials

Materials used in health education learning	F	%
Computer	36	24.0
Telephone	34	22.7
Telephone; Computer	3	2.0
Book	28	18.7
Book; Telephone	1	.7
Book; Web Page	4	2.7
No	2	1.3
Video	15	10.0
Video; Telephone	1	.7
Video; Book	4	2.7
Video; Web Page	3	2.0
Web Page	18	12.0
Web Page; Telephone	1	.7
Total	150	100.0

1.3. Student views on the effects of augmented reality applications in health education on the learning process: Students' views on the general effects of augmented reality applications on the health education learning process were measured to know the students' perspective on the general use of AR application in the learning process in the past and up to now. More explicit about this technology usage via questions are as follows:

1.Is it useful for you to use the augmented reality application in the classroom?

Table 5 shows the results on the whether it is useful to use AR in the classroom. The results clearly indicated that students mostly found the application useful (73.3%). 6% of the students stated that they did not have any prior knowledge about AR use. Moreover, some students (20.7%) also indicated that they are not certain about usefulness of the MAGAU since they had no prior knowledge about it before (6%).

Table 2. Usefulness of augmented reality

Answer	F	%
Yes	110	73.3
No	9	6.0
Maybe	31	20.7
Total	150	100.0

The results of the questionnaire asked the students (See Table 5) were generally related to the background information about augmented reality and they stated that they had knowledge (30.7%) and that they saw (MAGAU) AR applications and games but did not use them. (37.3%) stated that they had knowledge about AR technology through social media and the internet, while

2.Does the augmented reality application provide a better understanding of the subject content of the course?

Table 6 shows the results on the whether the augmented reality application provide a better understanding of the subject content of the course. Students (74.7%) stated that applications designed in AR for health education and teaching health courses were very useful, but 21.3% of the students are not certain about a better understanding of the subject, because they think they need also traditional materials when testing applications in the classroom. On the other hand, 4.0% of the students think that AR does not provide a better understanding.

Table 3. Students' views on the effects of augmented reality

Answer	F	%
Yes	112	74.7
No	6	4.0
Maybe	32	21.3
Total	**150**	**100.0**

3.Do you think that the use of augmented reality applications will make the information more permanent?

Table 7 shows the results on the whether the use of augmented reality applications will make the information more permanent. Students (73.3%) said that AR apps helped students remember information and maintain attention during the lesson. However, 23.3% of the students still thought that students should use the apps with their traditional materials. On the other hand, 3.3% of the students think that information is not more permanent and cannot be helpful when using it.

Table 4. Permanence of information in augmented reality

Answer	F	%
Yes	110	73.3
No	5	3.3
Maybe	35	23.3
Total	**150**	**100.0**

4.Does using a reality application increase students' interest in the teaching process?

Table 8 shows the results on whether AR application increases students' interest in the teaching process. Students stated that they agreed that the application designed with AR technology had a really great effect on students' interest in the teaching process (76%). AR applications support teachers who tend to use this technology in their classrooms to make their students more engaged in the learning process. 19.3% of the students think that it is a tool that can be used, but still need training from the instructors to use it more easily in the lesson. On the other hand, 4.7% of the students think that it does not affect the students.

Table 5. Students' interest on the effects of augmented reality

Answer	F	%
Yes	114	76.0
No	7	4.7
Maybe	29	19.3
Total	**150**	**100.0**

5.Does using an AR application increase students' performance in the learning process?

Table 9 shows the results on whether using an AR application increase students' performance in the learning process. Students expressed their views and (76%) supported and agreed that this technology can make a positive difference in students' performance in and out of the classroom and have a positive impact on their learning processes. 21.3% of the students think that it can be used, but more instruction should be applied by teachers to guide students. On the other hand, 2.7% of the students think that using an AR application does not increase the performance of students in the learning process.

Table 6. Students' views on the effects of augmented reality

Answer	F	%
Yes	114	76.0
No	4	2.7
Maybe	32	21.3
Total	**150.0**	**100.0**

1.4. Evaluations of the mobile augmented reality application (MAGAU) on the subject content: For this study, we created a mobile AR that can be used in the classroom and outside and can also be used as a teaching tool in the teaching-learning process. The application was evaluated in two parts, the first part was about the subject. The second part was about the design of the application and the evaluation of mobile AR design:

1.Does the Mobile Augmented Reality Anatomy App (MAGAU) help students learn more about anatomy?

Table 10 shows the results on whether the students think that MAGAU help students learn more about anatomy. The students (71.3%) liked the application and saw that the app met the content of the subject. However, some students thought the app would help students partially, but not like traditional books (26%). On the other hand, 2.7% of the students think that it does not help students learn more about anatomy.

Table 7. MAGAU' potential to help students learn more about anatomy

Answer	F	%
Yes	107	71.3
No	4	2.7
Maybe	39	26.0
Total	**150**	**100.0**

2.Does the Mobile Augmented Reality Anatomy Application (MAGAU) provide easy and comfortable use?

Table 11 shows the results on whether the students think that MAGAU also provide easy and comfortable use. Results show that after the students tested the application and used in their phones to learn, they indicated that the app could be used easily (66%). On the other hand, some students thought it would take time to determine its effect (30%). 4% of the students think that the app is not easy to use and comfortable.

Table 11. Easy and comfortable use MAGAU

Answer	F	%
Yes	99	66.0
No	6	4.0
Maybe	45	30.0
Total	**150**	**100.0**

3.Does the Mobile Augmented Reality Anatomy Application (MAGAU) allow students to use anatomy outside the classroom?

Table 12 shows the results on whether the students think that MAGAU allow students to use anatomy outside the classroom. The students (74%) approved that the designed application could be used after the lessons and could be a part of books and traditional materials, and some students (22%) stated that it could be used but still need more development and pedagogical approach. Other students stated that it would not be used after the classroom (4%).

Table 8. The use of MAGAU outside the classroom

Answer	F	%
Yes	111	74.0
No	6	4.0
Maybe	33	22.0
Total	150	100.0

4.Does the Mobile Augmented Reality Anatomy Application (MAGAU) design meet the needs of the students?

Table 13 shows the results on whether student think that MAGAU design meet the needs of the students. The students clearly indicated that MAGAU is helpful for the first year of the anatomy course, and the application help students better understand the learning issues regarding anatomy (60.7%). Most students think MAGAU is very helpful and facilitate the learning process and make students focus and interest very high. 2.7% of the students clearly thought that the app does not meet their needs. 36.7% of the students think that MAGAU can help partly in the learning process, and still need some technical and pedagogical guidance.

Table 9. Meeting the needs of the students in MAGAU

Answer	F	%
Yes	91	60.7
No	4	2.7
Maybe	55	36.7
Total	150	100.0

5.Is the Mobile Augmented Reality Anatomy Application (MAGAU) suitable for delivering educational content?

Table 14 shows the results on whether student think that MAGAU is suitable for delivering educational content. The majority of the students (75.3%) stated that they would definitely show more interest in testing and using the application, and they agreed that it could be an educational tool, while 22% of the students thought it was very useful as an educational tool, but under certain conditions, and 2.7% of the students thought that the students would not use it.

Table 10. Suitability of the MAGAU in terms of delivering educational content

Answer	F	%
Yes	113	75.3
No	4	2.7
Maybe	33	22.0
Total	150	100.0

6.Do you think the use of Mobile Augmented Reality Anatomy Application (MAGAU) will need teacher guidance?

Table 15 shows the results on whether student think that the use of MAGAU need any teacher guidance. The students stated that since the application is a mobile application (50.7%) and do not need any teacher guidance, while 8.7% of the students thought that there must be definitely teacher guidance in the app. Some students are not certain about teacher guidance in the app (40.7%) since they believe some kind of technical assistance would be helpful in the app.

Table 11. Teacher guidance of MAGAU

Answer	F	%
Yes	76	50.7
No	13	8.7
Maybe	61	40.7
Total	150	100.0

1.5. Design considerations of mobile augmented reality Application (MAGAU): In these seven objectives, we tried to evaluate the application design from the perspective of students who can easily use the application, and the design meets the pedagogical learning and teaching structure with 6 questions in the questionnaire:

1.Are you generally satisfied with using the Mobile Augmented Reality Anatomy Application (MAGAU)?

Table 16 shows the results on whether the students are satisfied with using MAGAU. Students expressed their opinions about the feature that allows the user in the application to rotate the model and add movement (62.7%) and hence they are very satisfied, while some students are not satisfied since they think some features are not working as they think (3.3%). Moreover, some student also think that the users must be allowed to change the rotation features in the app (34%).

Table 12. Students' satisfaction in using the MAGAU

Answer	F	%
Yes	94	62.7
No	5	3.3
Maybe	51	34.0
Total	150	100.0

2.Do you find the Mobile Augmented Reality Anatomy Application (MAGAU) unnecessary and complex?

Table 17 shows the results whether students think that MAGAU is complex to use and includes unnecessary information. The students expressed their opinions possitively (60.7%) about the ability to use MAGAU and said that the app is easy to use in terms of selecting 3D models in the application. 16.7% of the studens indicated that the app is very confusing to use, while 22.7% of the students thought that they need guidance and instructions for using the MAGAU.

Table 17. The complexity of MAGAU

Anser	F	%
Yes	25	16.7
No	91	60.7
Maybe	34	22.7
Total	150	100.0

3.Is it possible to quickly access the Mobile Augmented Reality Anatomy Application (MAGAU)?

Table 18 shows the results whether students think that they have easily access to MAGAU application. In this sense, students expressed their opinions positively(58.7%), indicatig that they easily installed the app into their phones. However, 10.0% of the students indicated that quick access is not available and hard to find the app on the phone. Moreover, some students are not certain about accessing the app, since they thought that app is new; hence it takes time to find the app on the phone.

Table 13. Students' opinions about quick access to MAGAU

Answer	F	%
Yes	88	58.7
No	15	10.0
Maybe	47	31.3
Total	150	100

4.Does Mobile Augmented Reality Anatomy App (MAGAU) 3D models load fast?

Table 19 shows the results on whether the students think that MAGAU is fast or not. In this regard, the students expressed their opinioans positively about the speed in the application (60%), while 4% of the students thought that MAGAU is not fast and not loading quickly. Also, some students alos indicated that they encountered minor problems regarding loading and uploading and they said that it depends on memory and brand of the phone (36%).

Table 19. Evaluation of MAGAU in terms of speed

Answer	F	%
Yes	90	60.0
No	6	4.0
Maybe	54	36.0
Total	150	100.0

5.Does the Mobile Augmented Reality Anatomy Application (MAGAU) have a user-friendly interface design?

Table 20 shows the results on whether students think that interface design of MAGAU is user-friendly or not**.** 60.7% of the students stated that they thought the interface design was friendly and easy to use, while 8% of the students thought it was difficult to use MAGAU. Also, 31.3% of the students are not certaion about whether interface design of MAGAU is user friendly or not.

Table 14. Evaluation of MAGAU in terms of interface design

Answer	F	%
Yes	91	60.7
No	12	8.0
Maybe	47	31.3
Total	150	100.0

6.Is the information about the 3D models of the Mobile Augmented Reality Anatomy Application (MAGAU) effective and understandable?

Table 21 shows the results on whether MAGAU is effective and understandable. Students stated that the application was effective and they liked the MAGAU as 3D models in English, while 2.7% of the students thought they did not like the MAGAU. Some students also are not certain about the effectiveness of the application. They indicated that it would be difficult to learn with MAGAU (23.3%).

Table 15: Effectiveness of MAGAU application

Answer	**F**	**%**
Yes	111	74.0
No	4	2.7
Maybe	35	23.3
Total	150	100.0

1.6. Suggestions for using the (MAGAU) app for classroom teaching and learning needs: These sub-goals focus on student suggestions and current and future perspectives on this technology in the two questions included in the questionnaire:

1.Would you recommend using the Mobile Augmented Reality Anatomy Application (MAGAU) as teaching material?

Table 22 shows the results on whether students recommend MAGAU as a teaching material. Students stated that they mostly recommend using mobile application (MAGAU) (78%). On the other hand, 2% of the students do not suggest using MAGAU as educational tools and as a part of the learning-teaching process. 20% of the students consider using MAGAU if there were necessary materials and fitted learning-teaching environment.

Table 16. Recommendation of MAGAU as a teaching material

Answer	**F**	**%**
Yes	117	78.0
No	3	2.0
Maybe	30	20.0
Total	150	100.0

2.Would you like the Mobile Augmented Reality application to be developed for other courses (MAGAU)?

Table 23 shows the results on whether MAGAU might be used for other courses. Table 23 shows that students approved (79.3%) their views on suggesting that the application be used as an educational tool and improved accordingly. 18.7% of the students are not sure about whether MAGAU might be used as an educational tool by developing it, while (2%) disagred that the application can help in other courses.

Table 17. MAGAU' potential use for other courses

Answer	**F**	**%**
Yes	119	79.3
No	3	2.0
Maybe	28	18.7
Toplam	**150**	**100.0**

CONCLUSION AND RECOMMENDATIONS

As we have seen the effects of AR technology in different areas, as stated in the literature review section, education experts have also started to focus on the effects of technology in education, and the reason for the spread of these studies is that the students experience educational materials and the images and models in health education are augmented reality that provides both fun and permanence in learning. This study is based on a mobile augmented reality application (MAGAU) to determine the power of technology to be used as part of the learning and teaching process. their use of this technology and their perspectives were tried to be determined. According to the results of the analysis, the overall outlook showed a positive outlook, but we will try to evaluate it according to the aims of the study:

• *What is the use of Augmented Reality in the field of education?*

The overall result was that the students were not that familiar with augmented reality, we measured the result with two questions and because of the use of social media and video, the students were aware of it, but they did not use it in their studies.

• *What are the materials used in the health education process?*

Students stated that they use different materials with traditional materials such as books and notebooks, video and mobile phones, and most of the students use mobile phones. reading or memorizing in schools, which makes it easy to apply mobile learning to the curriculum of students' work.

• *What are the students' views on the effects of augmented reality applications in health education on the learning process?*

The students stated that they experienced their views positively and that they thought that using this technology would have a positive effect on their learning processes, and that they wanted to use it in different fields and courses, especially in higher education.

• *What are the evaluations of the mobile augmented reality application (MAGAU) regarding the subject content?*

The application designed for this study was designed to meet all the pedagogical needs of the students and their perspectives were positive, the students stated how easy it was to use and set up the program, and they accepted the designed application, but some students expressed their opinions on this subject. Since the app (MAGAU) is designed for anatomy class, it should be with more models and information in the future.

• *What are the evaluations of mobile augmented reality Applications (MAGAU) in design?*

Application designed for an anatomy course (MAGAU) students stated that they have a positive attitude towards the application design, the application interface is for educational purposes and the design meets all the requirements and can be used easily, positively affecting their studies and education. The design is easy and simple to use.

• *What are your suggestions for using the (MAGAU) application for classroom teaching and learning needs?*

The students made many suggestions, suggested that the application be used in learning materials as an educational tool, suggested that more applications should be developed for other lessons, and that the application designed in this study should be used in classrooms to increase the interaction of students. As a result, as seen in the survey results, the students expressed their opinions as follows:

Making Lessons More Responsive: The main purpose of using technology in education is to make lessons more interesting and increase students' interest and interest, AR technology helps teachers achieve more than that, lecturers quickly attract students' attention. (Serin, 2020). It also increases levels of interaction Brings unique topics like anatomy to life, builds hypotheses and coherent thinking, and makes learning more engaging than ever before. In this way, students can learn through experiential learning by trying several cycles to discover the most perfect and foremost suitable combinations.

Collaboration with students: When using AR technology, the classroom is filled with fun and lessons become more challenging and students are locked into learning through this technology. Augmented reality in teaching has been shown to advance teacher-student collaboration in classrooms (Weking & Santoso, 2020).

Making the Leading Innovation: Currently teachers can use AR technology and create lessons in a more engaging way, being unfamiliar with new developments and advancements is not regulation, or perhaps educators and teachers need to learn how to work and use it. AR technology applications to follow the trail of the modern student, it takes a few seconds to scan the images in the books and display them in 3D or 2D format, use this content to grab the attention of the students with the help of simulations keep them locked up and let them know until they are fully mastered (Taçgin & Tacgin, 2020).

Using Innovation for Assessment: Assessment can be fun, teachers can use augmented reality in teaching and do that too, students can use these apps to bolt on their answers Another interesting way to create an energizing assessment method is to use puzzles and quizzes this may not work for every point, history, biology or ponder on topics such as learning mathematical equations (Serin, 2020).

It is estimated that there will be 2.4 billion users for mobile augmented reality by 2023, as augmented reality benefits the in-game world and its use in education areas increases. As a result of developments, augmented reality can replace reading materials, white papers and printed brochures. With this mobile learning model, it makes it easy for everyone to access learning materials. The gamification of augmented reality can make students' mental states more positive with the educational environment. It makes learning curious, fun, easy, develops collaboration and skills.

Scope for Further Research: The scope of the study is limited to the number of participants and demographic characteristics. In further studies, research can be conducted with more participants.

Ethics and Consent: Ethics committee approval for this study was received from the Ethics Committee of Gazi University (Date: January 20, 2022; Approval Number: 2022/018).

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