



EXPLORING THE SATISFACTION LEVEL WITH THE COMPLETE ANATOMY-LIKE THREE-DIMENSIONAL ANATOMY APPLICATIONS: A CASE STUDY FROM KOCAELI UNIVERSITY FACULTY OF MEDICINE

Tuncay Çolak¹, Pınar Daylan Koçkaya², İsmail Sivri¹, Emre Kaygın^{*1}, Furkan Mehmet Özden^{*1}

Kocaeli University, Faculty of Medicine, ¹Department of Anatomy; ²Department of Anaesthesiology and Reanimation, Kocaeli, Türkiye

ORCID iD: Tuncay Çolak: 0000-0002-9483-3243; Pınar Daylan Koçkaya: 0000-0002-0116-8986; İsmail Sivri: 0000-0002-5809-5693; Emre Kaygın: 0000-0003-3704-0033; Furkan Mehmet Özden: 0009-0006-2415-3943

***Sorumlu Yazar / Corresponding Author:** Furkan Mehmet Özden **e-posta / e-mail:** furkanmehmetozden@gmail.com

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Abstract

Objective: This study was conducted to evaluate the impact of the three-dimensional anatomy learning application, called “Complete Anatomy” on students and to assess user satisfaction.

Methods: A survey was conducted among volunteers who had used the application among the first and second-year students at Kocaeli University Faculty of Medicine. Participants were asked to complete a ten-question survey measuring age, gender, and application satisfaction. Responses were evaluated on a five-point Likert-type scale (strongly agree, agree, undecided, disagree, strongly disagree). Statistical analysis was performed using SPSS, version 22.0.

Results: A total of 148 participants took part in the study. Of the participants; 69.6% found the application easy to use, 81.8% found the application enjoyable, 78.4% liked the application, 81.8% stated that they learned new things about anatomy through the application, 83.8% preferred such applications over traditional teaching methods, 62.2% felt more prepared for exams after using the application, 80.4% would recommend the application to their friends, 70.9% learned topics they couldn't learn through traditional education, 76.4% stated that the application is easy to understand, and 90.5% believe that the application would be beneficial when used alongside traditional education.

Conclusion: The results of the study demonstrated that three-dimensional anatomy applications, such as Complete Anatomy, positively impact student satisfaction and learning experiences. These applications can add variety to education content by being added to traditional learning methods and offer an opportunity to enrich the anatomy learning process for students. However, further research is necessary to better understand the effectiveness of such applications in the future.

Keywords: *Complete anatomy, three-dimensional anatomy, anatomy education, anatomy learning applications.*

Introduction

"Complete Anatomy" is a three-dimensional anatomy learning application.¹ The content of the application was prepared by medical professionals providing anatomy education in academic institutions worldwide.¹ It includes three-dimensional interactive anatomy models, animated videos, and virtual dissections. In 2019, Complete Anatomy evolved into an online publishing platform for interactive anatomy content.¹ These materials can be used as part of the curriculum in academic faculties and are also accessible for individual users.¹⁻³

Three-dimensional anatomy applications offer several significant advantages compared to traditional anatomical learning methods, helping students visualize the structures of the body more thoroughly and clearly.¹⁻⁴ These applications allow users to examine and explore anatomical structures at their own pace, providing students with a vivid learning experience.^{1,2} While working with realistic images, students gain a better understanding of the location and relationships of structures. Users can rotate, zoom in, and interactively learn about structures.^{1,2} Visual and interactive learning can help motivate students further.^{5,6} Such applications capture students' interest and make the learning process more enjoyable, enabling students to focus on a specific subject and have personalized learning experiences based on their needs.⁵ Students can focus on a specific structure or explore different systems individually.^{1,2,5}

These advantages can be evaluated in terms of user satisfaction.⁷⁻⁹ User satisfaction survey studies are helpful for assessing and improving the impact of three-dimensional anatomy applications.^{10,11} Surveys can be used to evaluate how effectively the application meets its learning objectives while being user-friendly and how users perceive it.^{3,10-12}

In this context, three-dimensional anatomy applications like Complete Anatomy can enrich the anatomical learning process and contribute to students having a better understanding and learning experience.^{1,2,4} However, it is important to conduct regular survey studies to assess the impact and user satisfaction of these applications because such studies can aid in the continuous improvement of applications and better responsiveness to the needs of anatomists and students.^{3,7,8,10-12}

In this study, satisfaction levels of medical school students regarding the Complete Anatomy application were examined. Data were collected through surveys from students who agreed to participate in the study. The collected data were analyzed using the SPSS program. The analyses revealed the satisfaction levels of medical school students with three-dimensional anatomy learning applications.

Methods

In the present study, volunteers who were enrolled in the first and second semesters of Kocaeli University Medical Faculty and have used Complete Anatomy were included. Volunteers were recruited by posting announcement posters on the Anatomy Department Laboratory bulletin board. Informed consent was obtained from voluntary participants at the beginning of the survey, and demographic information such as age and gender was collected in the following section. Survey questions include queries measuring satisfaction levels with three-dimensional anatomy applications.

The questions were:

1. Using the mentioned applications was easy.
2. Using the mentioned applications was enjoyable.

3. I enjoy using the mentioned applications.
4. The mentioned applications helped me learn new things about anatomy.
5. I prefer learning anatomy with applications like the ones mentioned rather than traditional methods.
6. After using the mentioned applications, I feel more prepared for exams.
7. I would recommend applications like the mentioned ones to my friends.
8. I learned things with the mentioned applications that I couldn't learn in traditional learning.
9. The use of the mentioned applications is easy and understandable.
10. I believe these types of applications would be more beneficial when used alongside traditional anatomy education.

The possible responses were:

1. Strongly agree,
2. Agree,
3. Neutral,
4. Disagree,
5. Strongly disagree.

Statistical Analysis

Statistical analysis was conducted using SPSS, version 22.0 (IBM, Inc., Armonk, NY, USA). The responses given by students in the survey were evaluated using the Chi-square test. Descriptive statistics were performed for age, gender, and responses to the survey questions.

Results

A total of 148 participants voluntarily provided consent and completed the survey for the study. Of the participants, 53 were male, and 95 were female. (Table 1) The ages of the participants range from 18 to 23. (Table 2) Due to the insufficient sample size, the responses to the survey were categorized into positive (strongly agree, agree) and negative (neutral, disagree, strongly disagree).

Table 1. Genders of participants in the survey

Gender	Count	%
Male	53	35.8
Female	95	64.2
Total	148	100.0

Table-2: Ages of Participants in the Survey

Age	Count	%
18	5	3.4
19	56	37.8
20	63	42.6
21	20	13.5
22	3	2.0
23	1	0.7
Total	148	100.0

Among the students; 69.6% found the the application easy to use and 76.4% stated that the application was easy to understand. Participants who found the application enjoyable was 81.8% whilst 78.4% of them liked the application overall and 80.4% would recommend the application to their friends. The application made 81.8% of students state that they learned new things about anatomy and 62.2% of the participants felt more prepared for exams after using the application. Over traditional teaching methods 83.8% of students preferred the application instead, whilst 70.9% of

them stated that they learned topics they could not learn before in traditional education. In addition, 90.5% of students said the application would be beneficial when used alongside

traditional education.

There is no significant difference between genders in the responses to the survey questions (Table 3).

Table-3: Responses to Survey Questions

Questions		Gender				Total		p value
		Male		Female		Count	%	
		Count	%	Count	%			
1. Question	Positive	16	30.2	29	30.5	45	30.4	1.000
	Negative	37	69.8	66	69.5	103	69.6	
	Total	53	100.0	95	100.0	148	100.0	
2. Question	Positive	12	22.6	15	15.8	27	18.2	0.416
	Negative	41	77.4	80	84.2	121	81.8	
	Total	53	100.0	95	100.0	148	100.0	
3. Question	Positive	12	22.6	20	21.1	32	21.6	0.987
	Negative	41	77.4	75	78.9	116	78.4	
	Total	53	100.0	95	100.0	148	100.0	
4. Question	Positive	5	9.4	22	23.2	27	18.2	0.064
	Negative	48	90.6	73	76.8	121	81.8	
	Total	53	100.0	95	100.0	148	100.0	
5. Question	Positive	12	22.6	12	12.6	24	16.2	0.177
	Negative	41	77.4	83	87.4	124	83.8	
	Total	53	100.0	95	100.0	148	100.0	
6. Question	Positive	21	39.6	35	36.8	56	37.8	0.875
	Negative	32	60.4	60	63.2	92	62.2	
	Total	53	100.0	95	100.0	148	100.0	
7. Question	Positive	11	20.8	18	18.9	29	19.6	0.960
	Negative	42	79.2	77	81.1	119	80.4	
	Total	53	100.0	95	100.0	148	100.0	
8. Question	Positive	18	34.0	25	26.3	43	29.1	0.427
	Negative	35	66.0	70	73.7	105	70.9	
	Total	53	100.0	95	100.0	148	100.0	
9. Question	Positive	14	26.4	21	22.1	35	23.6	0.697
	Negative	39	73.6	74	77.9	113	76.4	
	Total	53	100.0	95	100.0	148	100.0	
10. Question	Positive	5	9.4	9	9.5	14	9.5	1.000
	Negative	48	90.6	86	90.5	134	90.5	
	Total	53	100.0	95	100.0	148	100.0	

Discussion

Anatomy education is a fundamental step in medical training.^{13,14} Having knowledge of anatomy in both clinical and preclinical fields is essential for performing medical skills and conducting medical research.² For a considerable period in anatomy education, cadaver dissection has been the preferred traditional method. However, studies indicate that it has only a slight advantage as a learning method and there is a need for more extensive research.¹⁵

Diverse results have emerged from studies in history on the impact of digital resources on learning. Khalil *et al.* compared computer-based interactive materials with paper-based static materials and found no significant difference in terms of learning.⁸ In contrast, Nicholson *et al.* reported that three-dimensional computer-based anatomy shapes improved the learning processes for medical students.³ More recently, Hoyek *et al.* demonstrated that three-dimensional digital animations are more effective than two-dimensional drawings.⁴ Regarding side effects, Moro *et al.* reported that augmented and virtual reality in education did not make a difference in learning and that subjects showed symptoms such as headaches, dizziness, and blurred vision.¹⁶ With the recent rapid advance in computer technologies, interactive applications featuring three-dimensional anatomy models have been added as alternatives to traditional anatomy learning methods.^{3,17} Complete Anatomy is one of these three-dimensional anatomy learning applications.¹

The results of the satisfaction survey study showed that three-dimensional anatomy learning applications, such as Complete Anatomy, may provide a new alternative to traditional educational materials, like cadaver dissection and atlases that have been in use for years.^{1,3,8,15} These applications received positive feedback from students and made their learning easier.^{8,9} The majority of students said that using such applications alongside traditional education would be beneficial. Future studies can provide further insights into the tangible benefits of these applications. In the future, hybrid education models by integrating three-dimensional anatomy applications into the curriculum may be preferred for the education of students in fields such as medicine, dentistry, physiotherapy, nursing, midwifery, and sports sciences.

Limitations

This study has some limitations that need to be considered. Firstly, there is an insufficient sample size (148 individuals). The sample size of the study did not reach the desired level compared to the total number of students, as it only includes a specific group of Kocaeli University Medical Faculty students from Semesters 1 and 2 and relies on voluntary participation. The available data consist of subjective responses to a survey created subjectively by the researcher. Although the survey questions were scored on a Likert scale, they do not provide concrete numerical data since the measured feature is the users' satisfaction levels. To obtain more tangible data about the effectiveness of Complete

Anatomy or similar three-dimensional anatomy learning applications, ongoing studies could divide students into two different groups in their education programs, conduct pre-tests and post-tests, and compare the results.

Conflict of interest

The authors declare no conflicts of interest.

Compliance with Ethical Statement

Our study was conducted in accordance with ethical standards, collecting participants on a voluntary basis and obtaining informed consent at the beginning of the survey. Ethical committee approval was granted by the Kocaeli University Faculty of Medicine Non-Interventional Clinical Research Ethics Committee with the reference number GOKAEK-2023/15.16. This approval was officially communicated to us in the letter with the reference number E-80418770-020-472632.

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Author's Contributions

T.Ç., P.D.K.: Study design; İ.S., E.K.: Data collection; İ.S., F.M.Ö.: Data analysis; E.K., F.M.Ö.: Literature review and article writing.

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