AN INTERDISCIPLINARY STUDY: DETERMINING THE NEEDS FOR MEDICAL ANIMATION COURSE DESIGN

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ABSTRACT

Objective: This study aims to identify the need for designing an interdisciplinary undergraduate course in the field of medical animation. As a rapidly emerging field with increasing global relevance, medical animation presents a significant opportunity for collaboration between students in Animation and Pharmacy faculties.
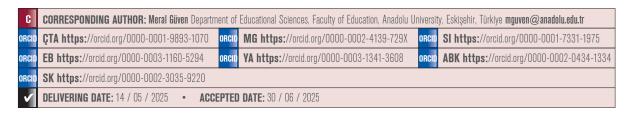
Material and Method: A mixed-methods research design was adopted, involving semi-structured interviews with subject matter experts and faculty members from both disciplines, as well as surveys administered to students.

Results: The findings indicate a strong consensus among experts and faculty regarding the content and structure of a proposed medical animation course. In contrast, student responses revealed limited knowledge concerning the scope and production processes of medical animation. This knowledge gap underscores the growing educational and professional significance of the field and highlights the urgent need for an interdisciplinary course that bridges the domains of visual communication and medical sciences.

Conclusion: In conclusion, both empirical data and existing literature point to a clear and concrete need for the development of an interdisciplinary medical animation course at the undergraduate level.

Keywords: Animation, medical animation, program design, need analysis in education, course design.

DİSİPLİNLERARASI BİR ÇALIŞMA: MEDİKAL ANİMASYON DERS TASARIMINA YÖNELİK GEREKSİNİM BELİRLEME

ÖZET

Amaç: Bu çalışma, medikal animasyon alanında disiplinlerarası bir lisans dersi tasarımına yönelik gereksinimi belirlemeyi amaçlamaktadır. Türkiye'de ve dünyada giderek artan bir kullanım potansiyeline sahip olan bu alan, özellikle Çizgi Film ve Animasyon Bölümü ve Eczacılık Fakültesi öğrencileri için önemli bir iş birliği zeminidir.

Materyal ve Metot: Araştırmada karma yöntem benimsenmiş; alan uzmanları ve ilgili fakültelerin öğretim elemanlarıyla yarı yapılandırılmış görüşmeler gerçekleştirilmiş, öğrenci görüşleri ise anket yoluyla toplanmıştır.

Bulgular: Elde edilen bulgular, alan uzmanları, çizgi film ve eczacılık öğretim elemanlarının medikal animasyon ders programının içeriği ve yapısına dair görüşlerinin büyük ölçüde örtüştüğünü ortaya koymaktadır. Öte yandan, öğrenci yanıtları medikal animasyonun kapsamı ve üretim süreçlerine ilişkin bilgi düzeylerinin oldukça sınırlı olduğunu göstermektedir. Bu durum, medikal animasyonun hem eğitimsel hem de sektörel açıdan önemini artırmakta; bu alanda disiplinlerarası bir dersin gerekliliğini açık biçimde ortaya koymaktadır.

Sonuç: Sonuç olarak hem elde edilen veriler hem de alanyazın doğrultusunda, lisans düzeyinde disiplinlerarası bir medikal animasyon dersi tasarımına duyulan ihtiyaç somut biçimde ortaya konmuştur.

Anahtar kelimeler: Animasyon, medikal animasyon, program tasarımı, eğitimde gereksinim belirleme, ders tasarımı.

INTRODUCTION

Although the first illustrations of human anatomy date back to Ancient Times, the history of medical illustration or animation today is based on the anatomist and physician Andreas Vesalius (1541) in the 16th century. Vesalius prepared his book "De Humani Corporis Fabrica", which has a 700-page series of detailed drawings published in 1543, together with a group of artists headed by Jan Stefan van Calcar. This book has been used by medical students for many years. It can be said that Vesalius's work with Calcar laid the foundation for artist-physician collaboration.[1] In the 19th century, the anatomical illustration studies of the artist Max Brödel with physicians brought about a significant development. Brödel, a graduate of the Faculty of Fine Arts, worked with doctors such as Carl Ludwing and Howard Atwood Kelly, and made many illustrations by undergoing surgeries and examining cadavers. With the "Department of Arts as Applied to Medicine" opened at John Hopkins University in 1911, a first in the world was experienced, and for the first time, art students began to receive training to become medical artists. Brödel's students, who continued their careers in this field, supported the establishment of new departments in other institutes, thus contributing to the birth of a new profession and its place in the education system.[2] After medical illustration was first introduced as a science by Max Brödel in the world, academic studies in this field gained momentum, and then the academic training opportunity was provided with the studies of the "Department of Arts as Applied to Medicine" opened at John Hopkins University in 1911. The first studies in the field of medical animation emerged with the developments in computer animation in the 1970s and became widespread in parallel with the rapidly developing computer technology after the 2000s.

The studies carried out in Türkiye have generally been carried out by experts who have a personal interest in the subject and have developed themselves in this field or by realizing the demands of the sector, and do not have a widespread impact and recognition in general. However, when the current policies in Türkiye are examined, it is noteworthy that design technologies, and within this scope, the development of the animation industry, are becoming increasingly important. As a matter of fact, strategic technology areas have been determined under 8 main headings in the National Science and Technology Policies 2003-2023 Strategy Document, and one of them is the "design technologies" heading. It was emphasized that this topic is directly related to the field of animation; it touches on issues such as design, virtual reality, and simulation; In addition, the need to integrate the animation industry with other sectors and fields (e.g., medicine, automotive, aviation, defense industry, etc.) has been emphasized.[3]

The medical animation sector, which has a wide range of uses and is developing rapidly today, is undergoing a rapid development process in Türkiye, as it is in the world. In this rapid development process of the medical animation sector, training competent scientists and artists who will work in the field of medical animation in Türkiye, increasing the quality of the workforce, informing and training students at the undergraduate level emerges as a problem.

The aim of this study is to reveal the need for designing an interdisciplinary curriculum for the students of the Department of Cartoon and Animation of the Faculty of Fine Arts and the Faculty of Pharmacy, who receive formal education at undergraduate level in the field of medical animation, which has the potential for widespread use in Türkiye and the world. In line with this purpose, the questions sought to be answered in the research are as follows:

1. What is the level of need for Cartoon (Animation) and Faculty of Pharmacy students for a medical animation course?

2. Medical animation course curriculum design;

    a. Subject area experts'

    b. Faculty members of Cartoon and Pharmacy departments

    According to their views, how should it be?

MATERIAL AND METHOD

A mixed research method was used in this study, which aimed to determine the need for designing an interdisciplinary curriculum for students receiving formal education at undergraduate level in cartoon departments, in the field of medical animation, which has a potential for widespread use in Türkiye and in the world. Mixed methods research is a type of research in which components of qualitative and quantitative research approaches (e.g., use of qualitative and quantitative perspectives, data collection, analysis, and inference techniques) are combined by the researcher or research team for the purpose of breadth and depth of understanding and validation.[4] While mixed methods research is characterized as empirical research that involves the collection and analysis of both qualitative and quantitative data, it is considered to be more than just a combination of qualitative and quantitative research as it also involves a mix of paradigms, philosophical assumptions and theoretical perspectives.[5,6]

The study utilized an explanatory sequential mixed design. It was assessed that this approach would provide a more comprehensive perspective on the problem compared to using solely qualitative or quantitative research methods, contribute more effectively to the research objectives by incorporating multiple methods and data collection techniques, and ultimately strengthen the study.

Participants of the Study

In accordance with the research objectives, data was collected from field experts, faculty members, and students for this study.

In the study, semi-structured interviews were conducted with subject-matter experts and faculty members from the Animation Department and the Faculty of Pharmacy during the needs assessment process. Criterion sampling was used to determine the subject-matter experts. In this context, the criteria were set as; having knowledge and experience in the field of medical animation, producing medical animation, and having already participated in academic studies on this subject. Five experts who met these criteria were reached. Two of the participating experts are from the medical field and continue their studies in medical illustration/animation. The other 3 participating field experts conduct studies in the field of medical animation in their academic life. The criterion for determining the other target audience of the semi-structured interviews, the faculty members, was set as working as a faculty member in the Department of Animation and the Faculty of Pharmacy in different universities in Türkiye and teaching for at least 3 years at the undergraduate level. In this context, 10 faculty members from the Department of Animation and 11 faculty members from the Faculty of Pharmacy were determined as participants.

Another group from whom data was collected in the research's needs assessment process consisted of students from the Cartoon and Animation Department and the Faculty of Pharmacy. According to the 2022 Higher Education Institutions Exam Higher Education Programs and Quotas Guide, all Cartoon and Animation Department (approximately 750) and pharmacy (approximately 20,000) students in Türkiye were accepted as the universe. It was considered important that the sample to be taken from this universe should be sufficient to represent the universe.[7] In determining the sample size, the table created by Bartlett, Kotrlik, and Higgins, which is used to determine the sample size according to the universe size, was utilized.[8] As a result, a total of 789 students were determined as participants. Based on this, 77.8% of the students who answered the survey study at the Faculty of Pharmacy, while 22.2% study at the Cartoon and Animation Department. 175 of the students who answered the survey are Cartoon and Animation Department students, while 614 are Faculty of Pharmacy students.

Data Collection Tools

In the study, three different qualitative and quantitative data collection methods were utilized: "Semi-structured interview form for the subject matter expert", "Semi-structured interview form for the faculty members of the Cartoon Department and the Faculty of Pharmacy" and "Needs Assessment Survey for the students of the Cartoon Department and the Faculty of Pharmacy".

The "Semi-Structured Interview Form for Subject Matter Expert", consisting of 11 questions, was developed by the researchers. The interview questions were revised in line with the opinions of three field experts and an expert in educational sciences. This interview form aimed to reveal the opinions of field experts on the design of the medical animation course planned to be prepared.

"Semi-structured Interview Form for the Lecturers of Cartoon and Animation Department and Faculty of Pharmacy" was developed by the researchers and two separate interview forms were prepared for both fields. Each form consists of 7 questions. The interview questions were arranged in line with the opinions of 3 field experts and 1 expert in educational sciences.

It was aimed to reveal the needs of students regarding medical animation with the survey titled "Needs Determination Survey for Cartoon and Animation Department and Faculty of Pharmacy Students". The survey questions were examined by three field experts and an educational sciences field expert in terms of content validity and comprehensibility. Questions that were not understandable and clear were edited. There are a total of 13 questions in the survey aimed at determining student needs regarding medical animation.

Data Collection Process and Analysis

Data collection was conducted via online surveys distributed through Google Forms created by the researchers. The survey period spanned from April 5, 2023, to May 22, 2023, during the Spring Semester of the 2022-2023 academic year. Personal information was not required to be shared in the survey forms, and demographic information that would not be used in the research was not requested from the students in this context. While interpreting the survey responses, responses of "1- Strongly disagree" and "2- Disagree" were grouped together, as were responses of "6- Agree" and "7- Strongly agree." Additionally, the research findings were analyzed using the SPSS data program to determine frequencies and percentages.

Semi-structured interviews were conducted by the project team. After the participants had been identified, appointments were made for suitable days and times. The decision on whether to conduct the interview via Zoom, face-to-face, or another platform of their choice was left to the participants

Content analysis was used in the analysis of the data obtained from the semi-structured individual interview forms used to obtain data in the research. In this research, content analysis was performed through the NVIVO package program. Audio recordings obtained from semi-structured individual interviews were transcribed by the project team. The transcripts made by the project team were listened to again by the project team and the transcripts were confirmed. The qualitative data obtained in the research were analyzed through content analysis. The audio recordings obtained from the semi-structured individual interviews were transferred to the NVIVO program after being transcribed in a computer environment. Themes were created from the data through the program for the research questions and the data were interpreted. The reliability of the themes and sub-themes that emerged in the content analysis was calculated with the inter-coder reliability formula (Reliability= agreement / agreement + disagreement).[9] Using the Miles-Huberman reliability formula, a value of at least 70% is sought between the researcher and the experts.[9] In this research, it was determined that the reliability value was above 0.70. In the reliability study, 83% agreement was achieved in the interviews with the field experts, 86% in the interviews with the faculty members of the cartoon and animation department, and 87% in the interviews with the faculty members of the Faculty of Pharmacy.

Ethics Committee Statement

Necessary permissions were obtained for this study with the document of Anadolu University Social and Human Sciences Scientific Research and Publication Ethics Committee dated 19.08.2022 with the letter numbered E-54380210-050.99-361586. In addition, all participants were informed with a voluntary participation form before the application and the necessary permissions were obtained.

RESULTS

Findings Regarding the Medical Animation Course Requirements of Students from the Department of Cartoon and Animation and the Faculty of Pharmacy

The first question addressed in the study is to determine the needs of students from the Department of Cartoon and Animation and the Faculty of Pharmacy regarding the medical animation course. In this context, the "Needs Assessment Survey for Students of the Department of Cartoon and Animation and the Faculty of Pharmacy" was completed by a total of 789 students. The findings obtained from the analyses are presented in Table 1.

Table 1. Needs of Cartoon and Animation Department and Faculty of Pharmacy Students Regarding Medical Animation

Survey for Needs Assessment Targeting Students of the Department of Cartoon and Animation and the Faculty of Pharmacy								
Survey Items		Strongly Disagree	Disagree	Partially Disagree	Neutral	Partially Agree	Agree	Strongly Agree
I have an idea about medical animation.	%	14.6	21.4	9.8	14.6	23.3	13.7	2.7
	f	115	169	77	115	184	108	21
I have knowledge about the purpose of medical animation.	%	13.4	20.8	8.2	13.7	24	16.6	3.3
	f	106	164	65	108	189	131	26
I know the importance of medical animation.	%	12	16.2	8.2	16.9	18.8	21.5	6.3
	f	95	128	65	133	148	170	50
I have seen medical animation examples before.	%	14.3	19%	5.6	12.5	19.3	19.6	9.6
	f	113	150	44	99	152	155	76
I have knowledge about the usage areas of medical animations.	%	13.2	24.8	9.5	17	23.2	10	2.3
	f	104	196	75	134	183	79	18
I have knowledge about the benefits of medical animations in the field.	%	12.7	19.8	9.1	14.6	23.1	16.3	4.4
	f	100	156	72	115	182	129	35
I have been in medical animation production process before.	%	61.1	26.1	3.3	3.9	2.7	1.8	1.1
	f	482	206	26	31	21	14	9
I follow the studies in the field of medical animation.	%	37.1	36.2	9.8	6.6	7.1	2.5	0.6
	f	293	286	77	52	56	20	5
I have knowledge about the technology used in medical animation production.	%	32.3	32.4	10.8	9.1	10	4.2	1.1
	f	255	256	85	72	79	33	9
I have knowledge about the work to be done in the field of medical animation.	%	29.8	31.7	11.3	10.9	11.8	3.2	1.4
	f	235	250	89	86	93	25	11
I have knowledge about medical animation production process.	%	33.8	33.1	9	10	10	2.9	1.1
	f	267	261	71	79	79	23	9
I follow artists/companies working in the field of medical animation.	%	43.1	36.8	6.3	5.8	5.7	1.3	1
	f	340	290	50	46	45	10	8
There are researchers I follow on medical animation.	%	42.7	38.4	5.3	5.8	5.3	1.4	1
	f	337	303	42	46	42	11	8

f: Frequency

As seen in Table 1, it was determined that students more frequently selected the "strongly disagree" option for most of the questions in the survey, whereas the "strongly agree" option was marked at a significantly lower rate. It was observed that all students responded to the item " I have an idea about medical animation" in the survey form. When the distribution of responses was examined, it was found that 36% of the students had no knowledge about medical animation. It was identified that 9.8% of the students selected "partially disagree" for the statement "I have an opinion about medical animation," while 14.6% indicated "neutral." Based on the students' responses to the survey item, it was observed that 23.3% of the students had partial knowledge about medical animation, and 16.4% had knowledge about medical animation.

It was concluded that 34.2% of the students had no knowledge about the purpose of medical animation, based on the item "I have knowledge about the purpose of medical animation" included in the survey questions. It was indicated that 8.2% of the students who responded to the survey partially disagreed with this statement, while 13.72% were Neutral. It was observed that 24% of the respondents had partial knowledge about the purpose of medical animation, and 19.9% were knowledgeable about it.

Findings Regarding the Opinions of Subject Area Experts and Instructors on Medical Animation Curriculum Design

The second question addressed in this research is what the opinions of subject-area experts and faculty

members from the Cartoon and Animation and Pharmacy departments are regarding how the medical animation curriculum should be designed. For this purpose, data were collected through semi-structured interviews. The findings are presented sequentially.

Findings From Semi-Structured Interviews with Subject Area Experts

The themes and sub-themes obtained from the analysis of semi-structured interviews with field experts regarding the design of the medical animation course are presented in Table 2.

As seen in Table 2, from the interviews conducted with field experts, on the theme of "contributions of the field of medical illustration-animation to the related scientific discipline," sub-themes were obtained in the form of diversity of animation techniques, richness of expression language, making scientific data understandable, and Communicating Scientific Data to the Target Audience.

It was stated by the participants that there are different styles of medical animation within the "diversity of animation techniques" sub-theme, regarding the contributions of the medical illustration/animation field they work in to the related scientific field they work in. It was also emphasized that medical animation can be used to explain patients' treatment processes, surgical operations, or examinations. In this regard, one of the experts in the field expressed their views as follows: "ANIU2: ...Mobilization is already very important in surgery, so it's not just a photo or just a shape, it's very important to shape an operation, an intervention or an examination, an approach to the patient in a certain sequence, in a certain order. At the same time, it is not enough to show some procedures just as a video. It may also be possible to explain this to students at different levels of education by converting it into animation with different colors and simplified designs from different angles..."

The importance of effectively conveying studies and surgical procedures in the medical field was emphasized under the sub-theme of "richness of narrative language." by participitans. The significance of visuals and animations for education and presentations was also highlighted. The necessity of qualified visuals for effectively communicating surgical or medical innovations was underlined. Additionally, the importance of using medical visuals and animations to explain diseases to patients and help them better understand treatment processes was pointed out. Regarding the sub-theme of "making scientific data understandable", which was derived from the analysis

Table 2. Themes and Subthemes Obtained from Semi-structured Interviews with Subject Area Experts on Medical Animation Curriculum Design

Themes	Sub-Themes	Frequency
Contributions of Medical Illustration-Animation to the Related Discipline	a. Diversity of Animation Techniques	2
	b. Richness of Narrative Language	2
	c. Making Scientific Data Understandable	4
	d. Communicating Scientific Data to the Target Audience	3
Differences of the medical illustration-animation field from the image production-animation processes outside the subject area		4
Similarities of image production and animation processes outside the subject area of the medical illustration-animation field		4
Similarities and Differences of the Use of Cinematographic Elements in Medical Illustration-		4
Animation Production Processes with Image Generation-Activation Processes Outside the Subject Area		
The Importance of Visual Effects, Sound and Typography Arrangements in Medical Illustration-Animation Production Processes		4
The Use of Basic Design Elements in Medical Illustration-Animation Production Processes, Differences or Similarities According to Visual Production Processes Outside the Subject Area		4
Course Objectives	a. Basic Knowledge-Skills	4
Content		5
Learning-Teaching Process	a. Interdisciplinary Study	1
	b. Weight of Theory-Practice Courses	5
	c. Teaching Method-Technique	3
Measurement-Evaluation Process		5
Suggestions for the Product at the End of the Course		1

of interviews conducted with participants in the study, participants' views were expressed as follows: "AIİU3: ...I would say that there were periods when the use of correct illustrations and animations were common both to explain your discovery and product to scientists in scientific environments and to enlighten the public or to inform students in educational fields, or in other words, the teachers who use illustration and animation widely and use them well have better lessons, and the students have a better command of the subject. The success of scientific companies that use illustration and animation correctly is also higher..."

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Table 3. Themes and Subthemes Obtained from the Semi-Structured Interviews Conducted with the Faculty Members of the Department of Cartoons and Animation

Themes	Sub-Themes	Frequency
Animation Artists-Collaboration with Medical Professionals	Needs improvement	3
	Sufficient	1
	Insufficient	4
Vocational Courses for Animation	Story Design	1
	Voice Acting & Sound Editing	2
	2D-3D Animation & 3D Modeling	2
	Cinema	2
	Anime-Manga	1
	Stop-Motion Animation	1
	Not available	6
	Cinema/TV Graphics	1
	Character Design	1
	Television Advertising	1
	Media Theories	1
	Comic Book	3
	Motion Capture	1
	Script Writing	2
	Children's Book Illustration	1
Uses of Animation outside the Entertainment Sector	Archaeology	2
	Engineering	1
	Defense Industry	3
	Game Industry	2
	Industrial Design	3
	Advertising Sector	6
	Education Area	6
	Cinema-TV	2
	Gastronomy	1
	Social Media	1
	Health Sector	9
	Tourism	1
	Architecture Area	4
	Contemporary-Digital Art	1
Sufficiency of the Usage Area of Animation outside the Entertainment Sector	Needs improvement	4
	Sufficient	3
	Insufficient	3
Studies on the Use of Animation in Different Disciplines	Collaboration with Animation Artists and Experts in the Field	5
	Target Audience	2
	Creating a Common Terminology	2
Including a Course on Medical Animation in the Curriculum		10
Suggestions for the Creation of a Course on Medical Animation	Purpose	2
	Content	3
	Learning-Teaching Process	4
	Identification of Needs	4
	Collaboration with Field Experts-Consultancy	5

It was expressed by the participants that surgical illustrations and animations are of great importance in various fields within medicine, such as books, scientific journals, presentations, posters, websites, and patient education. It was emphasized that these visuals play a significant role in informing patients, obtaining consent, and advancing physicians' careers. Additionally, it was noted that these visuals are indispensable for introducing new surgical techniques and practices.

Findings From the Semi-Structured Interviews with the Lecturers of the Department of Cartoon and Animation

The themes and sub-themes obtained from the analysis of the semi-structured interviews conducted with the faculty members of the Department of Cartoons and Animation in the research are presented in Table 3.

As seen in Table 3, responses to the theme "Animation Artists-Collaboration with Medical Professionals" regarding the medical animation course design were provided by the faculty members of the department of cartoon and animation under the sub-themes "Needs improvement","sufficient", and "Insufficient". The opinion that it is sufficient was expressed by "ANIOE8: Frankly, I find the work of animation artists in the medical sense successful. I can explain this as follows (...) it is very, very important for people who have not received health education, as ordinary citizens, to learn by seeing some things, and since the images here are sensitive materials, I think the most important contribution of medical animation is in this sense. ...Because today, when you go to a hospital, while waiting for something, while waiting in line at the hospital, we even watch works related to medical animation there. The people who do this do it very successfully..." in the form of an opinion.

As seen in Table 3, the sub-theme most emphasized in relation to the theme of "studies on the use of animation in different disciplines," which emerged from the analysis of data obtained from the interviews, was collaboration with animation artists and experts in the respective field. On this subject, the opinion that support from experts in the field should be sought and the work should be conducted collaboratively during the production process of animation studies in different disciplines was expressed by the participant. Opinion on this matter as follows: "ANIOE6: ...Yes, I am in favor of experts from two fields, two disciplines coming together and understanding each other's problems first. I mean, different disciplines are already together. Animation now works with different disciplines. ... but there is a communication gap in a

different way. The two sides don't know how to come together and how to tell each other their problems. At least when field experts come and explain their problems in their own language or in a language that the other field will understand, I think we can meet on a good base and reach a conclusion.". Consequently, the execution of animation studies conducted in different disciplines through collaboration and mutual expert consultation between the two disciplines was emphasized by the participants.

Findings Obtained From Semi-Structured Interviews with Faculty of Pharmacy Lecturers

The themes and sub-themes obtained from the analysis of the semi-structured interviews conducted with the faculty members of the Faculty of Pharmacy are given in Table 4.

When Table 4 is examined, it is observed that the findings obtained as a result of the analysis of the semi-structured interviews conducted with the academic staff of the Faculty of Pharmacy include the "The Necessity of Visualizing Scientific Data". It was stated by all academic staff members that the need to visualize scientific data related to their field of study is felt. One participant expressed their opinion on this matter as follows: "ECZK10: Yes, we do. Especially in these recent periods, with the pandemic we have experienced in recent years, with the earthquake we have experienced more recently, with the transition to distance education, we have definitely felt that there are deficiencies in the development of this field. I think it should also be developed." emphasized the need to visualize scientific data in this manner.

One of the sub-themes that emerged under the theme of "studies on the use of animation in different disciplines" derived from the analysis of the data obtained from the interviews, is "Being Goal-Oriented". It was emphasized by the teaching staff during the interviews that animations used in different disciplines need to be developed purposefully. In the interview, a participant's thoughts on this subject were expressed as follows: "ECZK6: I think that the work on animation in different thoughts should serve the purpose of the animation to be made here a little more. Now let's go from our own field for a simple example. An animation describing the extreme detail in toxicology may not be very interesting for a different discipline. So what is the purpose here should be decided first. So the goal is to make an animation that will appeal to a general audience of common points, or the goal is to make an animation that only the experts of this business can understand ..."

Table 4. Themes and Subthemes Obtained from the Semi-Structured Interviews Conducted with the Faculty of Pharmacy Instructors Regarding the Medical Animation Curriculum Design

Themes	Sub-Themes	Frequency
The Necessity of Visualizing Scientific Data		11
Studies on the Use of Animation in Different Disciplines	Collaboration Among Field Experts	3
	Being Goal-Oriented	2
	Being Target Audience-Oriented	2
	Being Functional	5
Participants' Opinions on the Benefits of Using Visual Materials in Their Fields	Ensuring Effective Learning	5
	Providing an Opportunity to Demonstrate Theoretical Knowledge Practically	5
Participants' Utilization of Visualization in Their Scientific Studies	Photograph	4
	Graphics	2
	Microsoft Programs	4
	Simulation	1
	Video	7
Participants' Awareness of Studies in the Field of Medical Animation	I Follow	2
	I Don't Follow	9
Suggestions for the Creation of a Course on Medical Animation	Purpose	2
	Content	5
	Teaching-Learning Process	8
	Measurement-Evaluation	10
	Product-Oriented Suggestions	4
Opinions on the Inclusion of a Medical Animation Course in the Curriculum	Not Necessary	1
	Providing Efficiency/Benefit	8
	Lifelong Learning	3
	Meeting the Needs of the Day	3

CONCLUSION AND DISCUSSION

The need for designing an interdisciplinary curriculum for students from the Department of Cartoon and Animation in the Faculty of Fine Arts and departments affiliated with the Faculty of Pharmacy, who are attending formal undergraduate education in the field of medical animation with widespread use potential in Türkiye and worldwide, was aimed to be revealed. One of the questions sought to be answered in this study is the needs of students from the Department of Cartoon and Animation and the Faculty of Pharmacy regarding a medical animation course. When the responses given to the items in the survey used in the research are examined, it has been determined that students generally lack information about medical animation and the processes of medical animation production. It is observed that 36% of the students participating in the survey have no information about medical animation. It is noted that 87.2% of the students have not been involved in the animation production process, 61.5% are not informed about the tasks in the field of medical

animation, and 73.3% do not follow works done in the field of medical animation. Based on this, it can be said that there is a need for a medical animation course among students from the Department of Cartoon and Animation and the Faculty of Pharmacy. In this context, the course design aimed at "creating awareness about medical animation among undergraduate students" can be described as having significant impact.

Another question sought to be answered in the research was regarding what the opinions of the lecturers from the Departments of Cartoon and Animation and Pharmacy and subject area experts were about how the curriculum for medical animation courses should be designed. It was determined that the views of the subject matter experts and the instructors from the Departments of Cartoon and Animation and Pharmacy on the design of the medical animation curriculum were similar in many respects.

The importance of effectively conveying medical procedures and surgical operations visually has been emphasized by subject area experts. At the same time, the significance of visuals and animations for education and presentations has been highlighted, stating that high-quality visuals are necessary to effectively communicate surgical or medical innovations. Moreover, the importance of using medical visuals and animations to explain diseases to patients and help them better understand treatment processes has been pointed out. It has been noted that the visual narration of education, communication, and presentations in the medical and surgical fields goes beyond photography in explaining details such as surgical anatomy, the stages of surgical procedures, and instrument design. Additionally, the importance of visuals for both education and patient communication has been underscored, clearly expressing the needs by noting that patients research their diseases online. Particular attention has been drawn to the considerations necessary when using animation for educational purposes. Medical educators are increasingly incorporating animations into their teaching activities. However, the creation process of computer animations is known to be time-consuming and costly. Furthermore, animations are not always effective. Therefore, it is necessary for educators using animations in the medical field to know when and how to use them effectively.[10] In his article titled "Using animations to teach biology: past & future research on the attributes that underlie pedagogically sound animations," O'Day has compiled significant studies aimed at developing high-quality animations for teaching biological phenomena and processes, and has summarized the essential features for effective educational animations in a table based on these studies.[11]

A need for a course on medical animation by the instructors of the Cartoon and Animation Department and the Faculty of Pharmacy has been observed. It has been stated by the instructors of the Cartoon and Animation Department that opening a course focused on medical animation could play a significant role in increasing interdisciplinary studies and create a new employment area for individuals working in this field. It has been expressed that the course content should be delivered theoretically, that 3D animation should be included in the course content, and that illustration-based education and an artistic perspective should also be incorporated. The necessity for the process to be conducted collaboratively for both disciplines, involving theoretical knowledge transfer and the use of common terminology, has been emphasized. However, opinions have been expressed that the process should generally be carried out with a focus on application and practice. Attention has been drawn by the instructors of the Faculty of Pharmacy to the aim of creating a product through interdisciplinary collaboration that would raise awareness on societal issues, among the suggestions for establishing a course related to medical animation. It has been mentioned that the course content should address current issues, adapt to changing trends in public health, and that content could be revised periodically if necessary. Emphasis has been placed on addressing the terminology and basic knowledge deficiencies arising from interdisciplinary differences through joint courses.

In light of the data obtained, it is observed that the opinions of subject area experts and the lecturers from the Faculty of Cartoon and Faculty of Pharmacy regarding how the medical animation course curriculum should be designed are similar.

The importance of using animation in various disciplines, specifically medical animation for health sciences in this study, for educational purposes is demonstrated by different studies as well. According to Mayer; "Medical education often involves multimedia learning, which I define as learning from words and pictures. …. Medical education should be informed by a researchbased theory of how people learn (i.e. the science of learning) and evidence-based principles for how to design effective instruction (i.e. the science of instruction)".[12] Multimedia learning is particularly associated with medical education… Medical education should be implemented based on nine evidence-based principles for effective teaching (Cognitive Load Theory, the Cognitive Theory of Multimedia Learning, and new evidence-based principles).[12] In Mayer's Multimedia Principle; "…Students are reported to engage in deeper learning in environments that

include both animation and narration compared to narration alone. According to the theoretical rationale of this principle, when corresponding words and images (e.g., animation and narration) are presented simultaneously, learners are better able to construct mental connections. When only a single medium is provided (e.g., narration alone), the learner is required to mentally create the missing medium themselves. In four experimental studies, providing a verbal explanation (e.g., narration) alongside a pictorial explanation (e.g., animation) was shown to lead to a noticeable improvement in learners' problem-solving performance.[13] It is evident that a medical animation course designed from this point would be beneficial in providing students who choose the course with an interdisciplinary work environment related to their fields, visualizing scientific knowledge, learning the terminology of a different discipline to produce joint works with a common language, and creating new job and employment opportunities. However, along with this, there is also the potential for the produced medical content to be transformed into educational material for health fields or for patients. Therefore, based on both the findings of the research and the studies in the literature on this topic, it has been concluded that there is a need for a medical animation course design. Such studies can be expanded with further research.

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AN INTERDISCIPLINARY STUDY: DETERMINING THE NEEDS FOR MEDICAL ANIMATION COURSE DESIGN