ORIGINAL RESEARCH ARTICLE

Improve student performance in the psychiatry subject with 3D animation.

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Abstract

The integration of information communication and technology in medical education has led to the emergence of modern instructional tools, thus transforming pedagogy. Modern instructional tools like 3D animation are very effective tools for pedagogy, especially in subjects that involve complex concepts that are difficult to represent with traditional instructional tools such as textbooks, and lectures. The main objective of this study was to determine the effectiveness of using 3D animation in teaching psychiatry to clinical medicine students at the Kenya Medical Training College. The study used a randomized comparative design, where participants were randomly assigned to either a treatment group (3D animation) or a control group (textbook). Data were collected using self-administered questionnaires. The study targeted 61 respondents, and the sample size was 53 respondents (11 lecturers and 42 students). A pilot test to ensure the reliability and validity of the questionnaires was done on 30 respondents from the nursing department at Kenya Medical Training College. The analysis of the results was done using the Statistical Package for Social Sciences software version 29, whereby descriptive statistics were used to describe feedback from the lecturers and students while independent sample t-tests were used to determine the statistically significant difference in student scores. The t-test results showed a statistically significant difference in means between the two groups, with t (40) = -7.332, $p < 0.001$ (two-tailed). The mean difference between the two groups was -8.190, with a standard error of 1.117. The 95% confidence interval of the difference ranged from -10.448 to -5.933. Therefore, the use of 3D animation had a statistically significant positive effect on test scores compared to textbook instructional materials in the context of teaching psychiatry. The study recommends the integration of 3D animations in the medical education curriculum at Kenya Medical Training College and other institutions of higher learning.

Keywords: Instructional tools, 3d animation, student performance, medical education

1.0 Introduction

The dynamic nature of technology and the challenges brought about by the COVID-19 pandemic have led to the emergence of different teaching models and instructional tools in education. The teaching and learning approach is no longer based on the use of traditional instructional tools but on the use of modern instructional tools (3D animation) to deliver

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successful pedagogy. The point of focus turns to instructional tools and materials that can be accessed asynchronously, such as recorded lectures, e-modules, podcasts, and animations. Animation is a technique in which images are manipulated in order to appear as if they are moving. Traditionally, animated images were drawn or painted by hand on transparent celluloid sheets, then photographed and exhibited on film. 3D animation is the process of creating moving images in a three-dimensional digital environment. It involves the use of specialized software and techniques to create and manipulate 3D models, characters, and environments to produce realistic or stylized animated scenes. According to Weldon et al. (2019), educational animations are animations produced for the specific purpose of fostering learning. They utilize technological tools to support teaching and learning, thereby improving student performance. 3D animation helps students learn in two ways: by facilitating the creation of mental models of concepts and phenomena and by replacing difficult cognitive processes such as abstraction or imagination. The use of computer animation in medical education has been less studied despite its qualities that are best suited for this use. Zheng (2016) states that there is ample precedent for the use of 3D animation in education, though little research on specific applications in the field of medicine. 3D animations in medical education can be used as a tool to capture the learner's attention, direct it to the appropriate content, and display a clear, abstract procedure that the learner can comprehend, perform, and remember.

Cecilio et al. (2020) state that teaching students self-directed learning skills has the potential to increase knowledge retention in the absence of in-class teaching. Therefore, learning materials should be optimized for mobile device accessibility for students who lack personal computers. In this regard, institutions of higher learning the world over have embraced the use of multimedia elements embedded on eLearning platforms, such as animations, videos, audio, and images, to develop and deliver quality instructional materials.

According to Joseph et al. (2020), medical educators today face challenges that include the needs of a new generation of learners, demands for developing new competencies in contemporary medical school curricula, and limitations of instructional activities due to social distancing occasioned by the COVID-19 pandemic. In order to address the stated challenges, there is a need to utilize advanced technological tools for teaching in medical education, such as 3D animations, virtual computer simulations, 3D modeling, and 3D printing tools (Pottle, 2019).

To this end, it will be prudent for KMTC lecturers to embrace the different types of instructional tools, including 3D animations, in teaching psychiatry. The current advancement in technology has brought about the development of multimedia tools such as computer animations, which can be utilized to deliver engaging and entertaining instructional materials to students. According to Rotich et al. (2022), embracing technology can enhance communication among stakeholders, therefore 3D animation videos can be utilized as instructional tools by both teachers and learners in the modern classroom setting (eLearning) to supplement traditional classroom teaching tools. According to Janssen (2021), psychiatry is a subject in medicine that deals with mental, emotional, and behavioral disorders. It explains

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the biochemical process between our emotions, unlike psychology, which describes the connection between them. This has made psychiatry a complicated subject with concepts that are difficult to explain using traditional classroom tools.

According to Mwangi (2022), the adoption of technology in the medical field has enabled simulations of various surgical approaches making it possible to choose the best execution method in a timely manner. Therefore utilizing modern instructional tools such as 3D animation videos enhances pedagogy for the learner and ensures efficiency for the instructor.

The traditional teaching method, which relies on oral lectures and textbooks, does not engage the modern learner, who is more acquainted with digital platforms, as much as animation would. Many studies have focused on the effects of animations in education, but according to Gicheru and Muteti (2019, 2020), few studies have been done in Kenya to establish the effect of using 3D animations in education. It is against this backdrop that this study seeks to find out the effectiveness of using 3D animation in teaching psychiatry to new preservice students at KMTC.

2.0 Materials & methods/methodology

2.1 Study design

The study used a randomized comparative design, which is generally used in experiments testing the effectiveness and/or safety of one or more interventions (Bedada et al., 2019). It utilized both a qualitative and quantitative approach (Mugenda & Mugenda, 2003). The target population was 61 respondents, of which the entire group of individuals and objects had similar observable characteristics (Kothari, 2004; Mugenda & Mugenda, 2003).
A sampling frame of 11 lecturers and 50 newly admitted clinical medicine students was used for this study at Kenya Medical Training College, Makueni.

Table 1: Population sample of respondents

Population Category	Number	Total
Lecturers	11	11
Students	50	50

2.2 Study area

This study was conducted at Kenya Medical Training College—Makueni, with a focus on newly enrolled preservice medical students in the clinical medicine department. It used 3D animated video to teach and learn about psychiatric (mental health) conditions.

2.3 Study population

The study population included both lecturers and newly admitted medical students in the department of clinical medicine at Kenya Medical Training College—Makueni. The population was drawn from a single department in the college, which consisted of 11 lecturers and 50 students, for a total of 61 people.

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2.4 Sampling

The study had a target population of 61 people, which included both lecturers and students. The target population was eventually reduced to a sample size of 53, which included 11 lecturers and 42 students. All 53 study participants responded. The sample size was determined using cluster sampling and the Cochran formula, resulting in a 95% confidence level and a 5% precision rate. The sample size was calculated using the Cochran formula, as recommended by Taherdoost (2017).

The Cochran formula is:

$$n_0 = \frac{Z^2 pq}{e^2}$$

Where:
e is the desired level of precision (i.e. the margin of error),
p is the (estimated) proportion of the population which has the attribute in question,
q is 1 – p.
Z is z value

For instance to calculate sample size for half of the unknown population (at 95% confidence level and = 0.05) = $((1.96)^2 (0.5) (0.5)) / (0.05)^2 = 385$.

Since the population studied was small, the Cochran formula was modified as follows;

$$n = \frac{n_0}{1 + \frac{(n_0 - 1)}{N}}$$

Where:
n_0 is Cochran's sample size recommendation.
N is the population size.
n is the new, adjusted sample size.

$$n = 385 / (1 + (385 / 61) = 52.65 = 53$$

Table 2: Sample size of the respodents

Population Category	Population	Sample size
Lecturers	11	11
Students	50	42

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2.5 Methodology

This was a randomized comparative study conducted in the department of clinical medicine at the Kenya Medical Training College-Makueni. The psychiatry subject is taught to pre-service students. The inclusion criteria were 11 full-time clinical medicine lecturers and 42 newly admitted clinical medicine students undertaking the psychiatry subject. The lecturers and students from the other departments did not take part in the study. The creation of the 3D animation video was through computer-generated imagery using Blender animation software, which was encoded as a video file that was transmitted over the internet through streaming on YouTube. To conduct the study, 21 students were randomly assigned to the control group (CG) and the other 21 students to the experimental group (EG). The primary comparative factor in determining the effectiveness of 3D animation as an instructional tool on students' performance in the psychiatry subject was the students' test scores on the psychiatry exam.

2.5.1 Control group (CG)

The psychiatry topic was taught by full time clinical medicine lecturers, whereas the control group was exposed to learning using traditional instructional tools, which included textbooks and lectures.

2.5.2 Experimental group (EG).

The treatment group was exposed to 3D animation video, whereby the students were allowed to pause, rewind, and re-watch the video within the prescribed lesson time. Below is the storyboard that outlines the different sections and how they were presented using some select images from the 3D Animation video.

1. **Introduction to psychiatry (mental health):**

The video begins with a rotating representation of a human head with a brain, accompanied by music and sound. The timing principle ensured that the video's pacing was appropriate and that the audience had enough time to absorb the information. The animation then cuts to a narrator explaining what psychiatry is and why it is important.

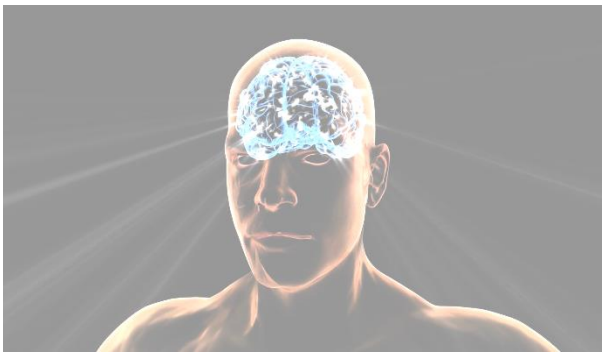

Figure 1: Representation of the human head with a brain

2. **Brain structure:**

The video zooms in to reveal the different layers of the brain during the section on brain structure. This creates excitement in the audience, while the model depicts the various regions

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of the brain and their functions. Narration and on-screen text are also used to provide additional explanation in the video.

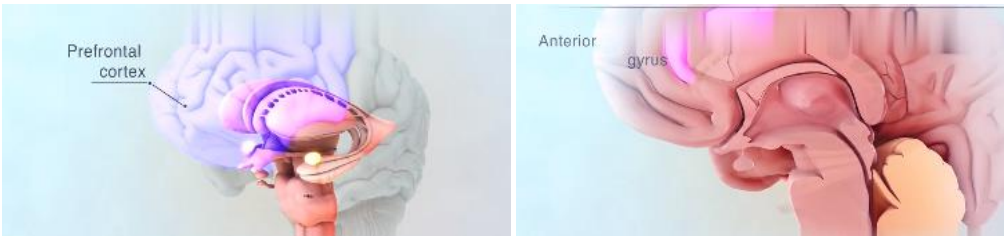

Figure 2: Structure of the brain

3. Messages passing in the brain:

The 3D animation in this section depicts how different parts of the brain collaborate to process information. The principle of exaggeration is used to emphasize the importance of certain neurotransmitters and how they affect brain function. A neuron firing and transmitting a signal to another neuron is depicted in the neuron animation model. The video also employs on-screen text and voiceover to further explain the process.

Figure 3: Message passing in the brain

4. Brain disorders:

The video depicts how neuronal impulses move throughout the brain, a process that can result in mental disorders. A voiceover is also used in the video to explain the symptoms and causes of these disorders.

Figure 4: neuron impulses moving within the brain

5. Factors contributing to mental illnesses (psychiatric disorders):

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The 3D animation video used a combination of visual aids and text to illustrate the factors that contribute to mental illnesses. The video demonstrates how genetic, environmental, and social factors all play a role in the development of mental illness. The video used the principle of secondary action to demonstrate how various factors interact and affect one another. A voiceover was also used in the video to explain the various factors in greater detail.

Figure 5: Factors contributing psychiatric disorders

6. Chemical messengers in the brain and psychiatric disorders:

This video demonstrates how neurotransmitter imbalances can affect brain function over time. The timing principle was used to emphasize the significance of proper diagnosis and treatment. The video also used on-screen text and voiceover to explain how chemical messenger imbalances can lead to mental illness.

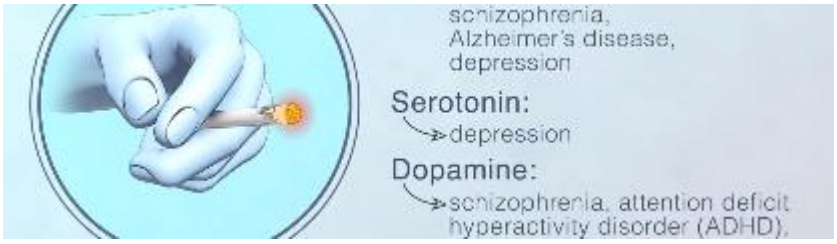

Figure 6: Psychiatric disorders and chemical messengers' imbalances

7. Treatment of mental illness:

Illustrations were used to demonstrate how medications or therapy can affect the brain and the various treatments available for mental illness. The video used voiceover to explain the advantages and disadvantages of various treatments, as well as how different treatments can be combined for maximum benefit.

Figure 7: Treatment of Mental illnesses

Psychiatry test.

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The psychiatry test was based on the following subtopics and scored at 40 points.

- Introduction to Psychiatry (Mental Health)
- structure of the brain
- Messages passing in the brain
- Brain disorders
- Factors contributing to mental illnesses (psychiatric disorders)
- Chemical messengers in the brain and psychiatric disorders
- Treatment of mental illness

After receiving instruction on a psychiatry lesson, the student participants underwent a continuous assessment test. The primary factor used to compare the effectiveness of 3D animation as an instructional tool on student performance in the psychiatry subject was their scores on the psychiatry exam.

Following the intervention, the participants filled out self-administered questionnaires to evaluate the outcomes associated with the instructional tool used. The survey questions were developed using the TPACK framework. The first section of the questionnaire was dedicated to gathering demographic information about the respondents, while the second section focused on the three study variables.

2.6 Data collection

Qualitative and quantitative data collection techniques were employed to collect data using self-administered questionnaires. To ensure reliability, a pilot study was done prior to the main study, which led to the discovery of questions that were not clear, thus causing confusion among the participants. Modifications were made to the questions to make them more precise and to the point, resulting in the questionnaire results returning high internal consistency and reliability. To ensure validity, the questionnaires were scrutinized by a panel of peer reviewers. The questionnaire sought the following types of data: demographic characteristics of the respondents, perceptions towards 3D animation as a teaching tool, effectiveness of 3D animation in teaching psychiatry subject and feedback on the quality of 3D animation used in the study.

2.7 Data analysis and presentations

The collected data was entered into an Excel spreadsheet for cleaning, sorting, and classification as either qualitative or quantitative data. The Statistical Package for the Social Sciences, version 29, was used to analyze the collected data, whereby descriptive statistics were used to describe feedback from the lecturers and students, such as the demographic characteristics of the participants and their perception of a textbook or 3D animation instructional tool, while independent sample t-tests were used to determine the statistically significant difference in student scores based on the instructional tool used in pedagogy. Tables, graphs, and pie charts are used to present the analyzed data. The study findings were reported; hence, conclusions and recommendations were made.

3.0 Results & discussion

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3.1 Results

This study included eleven lecturers and forty-two students. Students' participants provided 42 data points, 21 from the control group and 21 from the experimental group. The posttests were graded on a score of 40. The mean scores in the control and experimental groups were 22.43 and 30.62, respectively, as shown in Table 9.

3.2 Demographic Information

3.2.1 Demographic characteristics of Lecturers

According to (table 3) below, there were a total of 11 lecturers. There were 8 male participants (72.7%) and 3 female participants (27.3%). The percentages added up to 100%, indicating that there weren't any missing values in the gender variable.

Table 3: Gender of Lecturers

Gender

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Male	8	72.7	72.7	72.7
	Female	3	27.3	27.3	100.0

This data set included 11 lecturers' respondents. Majority of the lecturers were male (72.7% of the sample), while the rest (37.3%) were female.

The majority of lecturers are between the ages of 41 and 50 (36.4% of the sample), with the next largest group between the ages of 31 and 40 (27.3% of the sample). The remaining individuals are between the ages of 21 and 30 (18.2% of the sample) and 51 and older (18.2% of the sample).

Table 4: Age of lecturers

Age

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	21-30 years	2	18.2	18.2	18.2
	31-40 years	3	27.3	27.3	45.5
	41-50 years	4	36.4	36.4	81.8
	51 years and above	2	18.2	18.2	100.0

The majority of lecturers (63.6%) have worked in their field for 11-15 years, while 27.3% have worked for 6-10 years. Only 9.1% of lecturers have worked in their field for 0-5 years.

Table 5: Lecturers length in profession

Length in profession

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	11-15 years	7	63.6	63.6	63.6
	6-10 years	3	27.3	27.3	90.9
	0-5 years	1	9.1	9.1	100.0

The majority of lecturers (72.7%) have a degree level of education, while (27.3%) have a

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master's level of education.

Table 6: Lecturers level of education

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Degree	8	72.7	72.7	72.7
	Masters	3	27.3	27.3	100.0

3.2.2 Demographic characteristics of Students

The sample included 42 student respondents, with 26 (61.9%) identifying as male and 16 (38.1%) identifying as female, indicating a slightly higher representation of males in the sample.

Table 7: Gender of students

Gender

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Male	26	61.9	61.9	61.9
	Female	16	38.1	38.1	100.0

According to the data, all 42 students who responded are in their first year of study.

Table 8: Students Year of Study

Year of Study

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Year 1	42	100.0	100.0	100.0

The majority of respondents (69%) in the sample size of 42 students are between the ages of 18 and 23. 14.3% are over the age of 26, while 23.8% are between the ages of 23 and 25.

Table 9: Age of Students

Age of Respondent

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	26 years and older	6	14.3	14.3	14.3
	23-25 years	10	23.8	23.8	38.1
	21-23 years	13	31.0	31.0	69.0
	18-20 years	13	31.0	31.0	100.0
	Total	42	100.0	100.0	

3.3 Lecturers' level of knowledge on instructional design concepts for developing 3D animation instructional materials.

The first objective of this study was to assess lecturers' knowledge of instructional design concepts for developing 3D animation instructional materials for teaching psychiatry. A lecturer who is well-versed in instructional design and educational technology can develop instructional materials that effectively engage students and assist them in understanding complex concepts. This has the potential to increase the overall effectiveness of using 3D animation as a teaching tool.

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Questionnaires were distributed to both lecturers and students in order to determine the lecturers' level of knowledge on instructional concepts for developing 3D instructional materials. The following factors aided in determining the lecturers' level of knowledge: organizational policy supporting the use of 3D animation instructional materials; training on instructional design concepts for 3D animation; any 3D animation instructional materials developed by the lecturers; infrastructure to support the implementation of 3D animation instructional materials.

According to (table 10) below, four of the eleven lecturers reported having received training in education technology and policy related to modern instructional tools. All 11 lecturers reported that their departments had not used modern instructional tools, such as 3D animation, in their classrooms. None of the lecturers reported having received training on modern instructional tools or developing 3D animation instructional tools. However, 9 out of 11 lecturers believed that 3D animation would be beneficial to learning.

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Table 10: Lecturers' response

Statistics

		Training on education technology	Policy on modern instructional tools	Department on modern instructional tools	Training on modern instructional tool	Developed 3D animation instructional Tools	Will 3D animation be beneficial to learning
N	Valid	11	11	11	11	11	11
	Missing	0	0	0	0	0	0

This data set included 11 lecturers respondents

Training on education technology

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	YES	4	36.4	36.4	36.4
	NO	7	63.6	63.6	100.0

Policy on modern instructional tools

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	YES	4	36.4	36.4	36.4
	NO	7	63.6	63.6	100.0

Department on modern instructional tools

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	NO	11	100.0	100.0	100.0

Training on modern instructional tool

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	NO	11	100.0	100.0	100.0

Developed 3D animation instructional Tools

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	NO	11	100.0	100.0	100.0

Will 3D animation be beneficial to learning

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	YES	9	81.8	81.8	81.8
	NO	2	18.2	18.2	100.0

According to (table 11) below, students responded to statements that sought to establish the use of 3D animation instructional materials by lecturers during training, as well as their level of satisfaction with the mode of instruction delivery. The pointer scales were; (1 Strongly Disagree, 2 Disagree, 3 Neutral, 4 Agree, and 5 strongly Agree). (1 Extremely Dissatisfied, 2 Dissatisfied, 3 Neutral, 4 Satisfied, and 5 Extremely Satisfied). (5 Excellent, 4 Good, 3 Average, 2 Fair, 1 Poor). (1 YES, 2 NO).

57.1% of the 42 student respondents thought the instructional tools, including 3D animation, were effective, while 42.9% did not. All 42 students reported that their lecturers had not used 3D animation in their classes. In terms of alignment with study objectives, 64.3% of students stated that they were neutral, while 35.7% agreed or strongly agreed that instructional

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materials aligned with study objectives. Furthermore, 85.7% of students were dissatisfied or extremely dissatisfied with the use of 3D animation in the classroom.

In terms of textbook teaching satisfaction, 38.1% were extremely dissatisfied, 7.1% were dissatisfied, 23.8% were neutral, 19.0% were satisfied, and 11.9% were extremely satisfied. The instructional tool was deemed effective by 57.1% of the 42 respondents, while 42.9% did not. All 42 respondents stated that their lecturers have not used 3D animation in their classes. When asked if the instructional materials aligned with the study objectives, 26.2% agreed, and 9.5% strongly agreed. However, 19% of respondents disagreed, and 11.9% strongly disagreed. In terms of satisfaction with lecturers' use of 3D animation in teaching, 57.1% of respondents were extremely dissatisfied, 28.6% were dissatisfied, and 14.3% were neutral. When it comes to textbook teaching satisfaction, 38.1% of respondents were extremely dissatisfied, 19% were satisfied, and 11.9% were extremely satisfied.

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Table 11: Students Response.

Statistics

		Q2: Was instructional effective	Q4: Have lecturers theImplemented the use toolof 3D animation in teaching
N	Valid	42	42
	Missing	0	0

Q2: Was the instructional tool effective

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	YES	24	57.1	57.1	57.1
	NO	18	42.9	42.9	100.0

Q4: Have lecturers Implemented the use of 3D animation in teaching

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	NO	42	100.0	100.0	100.0

Q3: Did instructional materials align to study objectives

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Strongly disagree	5	11.9	11.9	11.9
	Disagree	8	19.0	19.0	31.0
	Neutral	14	33.3	33.3	64.3
	Agree	11	26.2	26.2	90.5
	Strongly agree	4	9.5	9.5	100.0

Q5: Are you satisfied with the use 3D animation in teaching

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Extremely dissatisfied	24	57.1	57.1	57.1
	Dissatisfied	12	28.6	28.6	85.7
	Neutral	6	14.3	14.3	100.0

Q6: Satisfaction with Textbook teaching

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Extremely dissatisfied	16	38.1	38.1	38.1
	Dissatisfied	3	7.1	7.1	45.2
	Neutral	10	23.8	23.8	69.0
	Satisfied	8	19.0	19.0	88.1
	Extremely satisfied	5	11.9	11.9	100.0

3.4 Creating 3D animation instructional materials for teaching psychiatry at KMTC.

The study's second goal was to create 3D animation educational resources for psychiatry instruction. This involved a number of tasks, including the lecturers' design of lessons, their delivery of instruction, and the incorporation of 3D animation into the learning process. Examining the questionnaire replies from both lecturers and students allowed for an analysis of the created 3D animation instructional materials. The TPACK (Technological, Pedagogical, and Content Knowledge) model, according to Koehler et al. (2005), was used as an analytical tool to look at lecturers' and students' feedback represented on (table 12), below.

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Table 12: Lecturers and Students responses.

Statistics

		Training on education technology	Training on modern instructional	Will 3D animation be beneficial to learning	Level of modern tools on lecturers	Technological support	Level of modern tools on students	Developed 3D animation instructional Tools	Enough computers	Enhancing teaching and learning process 3D animation
N	Valid	11	11	11	11	11	11	11	11	11
	Missing	0	0	0	0	0	0	0	0	0

Frequency Table

Training on education technology

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	YES	4	36.4	36.4	36.4
	NO	7	63.6	63.6	100.0

Training on modern instructional tool

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	NO	11	100.0	100.0	100.0

Will 3D animation be beneficial to learning

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	YES	9	81.8	81.8	81.8
	NO	2	18.2	18.2	100.0

Level of modern tools on lecturers

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Strongly Disagree	2	18.2	18.2	18.2
	Disagree	9	81.8	81.8	100.0

Technological support

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	YES	11	100.0	100.0	100.0

Level of modern tools on students

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Strongly Disagree	1	9.1	9.1	9.1
	Disagree	8	72.7	72.7	81.8
	Neutral	2	18.2	18.2	100.0

Developed 3D animation instructional Tools

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	NO	11	100.0	100.0	100.0

Enough computers

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	YES	4	36.4	36.4	36.4
	NO	7	63.6	63.6	100.0

Enhancing teaching and learning process using 3D animation

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Disagree	2	18.2	18.2	18.2
	Neutral	3	27.3	27.3	45.5
	Agree	5	45.5	45.5	90.9
	Strongly Agree	1	9.1	9.1	100.0

From the results of the table 12 above, the researcher inferred that; only four lecturers (36.4%) out of 11 respondents had received education technology training, while the remaining (63.6%) had not. All 11 respondents (100%) had received no training on modern instructional tools. Only nine out of eleven lecturers (81.8%) thought 3D animation would be beneficial to teaching and learning. The majority of the 11 lecturer respondents (100%) agreed or strongly agreed that the level of modern tools available to lecturers was insufficient.

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Although all 11 lecturers (100%) had access to technology, 8 out of 11 (72.7%) said the level of modern tools available to students was either disagreeable or neutral. All 11 respondents (100%) stated that they had not developed 3D animation instructional tools because there were not enough computers available. Five out of eleven lecturers (45.5%) agreed that 3D animation could improve the teaching and learning process, while 18.2% disagreed.

3.5 The effectiveness of using 3D animation video in teaching psychiatry subject.

The study's third goal was to evaluate the effectiveness of using 3D animation video on students' learning of the psychiatry subject. According to the (table 13) below, the textbook group had 21 participants with a mean score of 22.43 and a standard deviation of 4.069. The standard error of the mean was.888. While the 3D animation group had the same number of participants, it had a mean score of 30.62 and a standard deviation of 3.106, with the standard error of the mean being .678.

Table 13: Frequency of Test Scores based on instructional tool utilized

Group Statistics

	Instructional Tool	N	Mean	Std. Deviation	Std. Error Mean
Test scores	Textbook	21	22.43	4.069	.888
	3D animation	21	30.62	3.106	.678

As a result of the above findings, the 3D animation group had higher test scores than the textbook group, with a mean difference of 8.19. (30.62 - 22.43). When compared to the textbook group, the scores for the 3D animation group were more tightly clustered around the mean, as indicated by the lower standard deviation and standard error mean.

According to (table 14) below, the Levene's Test for Equality of Variances, the test statistic "F" was 0.613, and the significance (Sig.) was 0.438, indicating that there was no significant evidence to reject the assumption of equal variances. The t-statistic for the independent t-test was -7.332 with a degree of freedom (df) of 40. The two-sided p-value was less than 0.001, indicating strong evidence against the hypothesis that the means were equal. The mean difference between the two groups was -8.190, with a standard error difference of 1.117. The 95% CI for the difference was -10.448 to -5.933. Finally, the results showed that there was strong evidence to suggest that the means of the two groups were significantly different, with a t-statistic of -7.332 and a degree of freedom (df) of 40. The two-sided p-value was less than 0.001, indicating strong evidence against the hypothesis that the means were equal, regardless of whether the assumption of equal variances was made or not.

Table 14: Independent Samples Test

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		Levene's Test for Equality of Variances		t-test for Equality of Means							
						Significance				95% Confidence Interval of the Difference	
		F	Sig.	t	df	One-Sided p	Two-Sided p	Mean Difference	Std. Error Difference	Lower	Upper
Test scores	Equal variances assumed	.613	.438	-7.332	40	<.001	<.001	-8.190	1.117	-10.448	-5.933
	Equal variances not assumed			-7.332	37.400	<.001	<.001	-8.190	1.117	-10.453	-5.928

Based on the data in (table 15) below, it was concluded that there was a significant difference in test scores between the two groups. This was determined by examining the point estimates of the effect sizes, which were 3.620 for Cohen's d, 3.689 for Hedges' correction, and 3.106 for Glass' delta. The effect size of 3.6 to 3.7 was indicative of a very large difference between the two groups because it was greater than 0.8.

Table 15: Independent Samples Effect Sizes

				95% Confidence Interval	
		Standardizer[a]	Point Estimate	Lower	Upper
Test scores	Cohen's d	3.620	-2.263	-3.035	-1.473
	Hedges' correction	3.689	-2.220	-2.978	-1.445
	Glass's delta	3.106	-2.637	-3.637	-1.613

a. The denominator used in estimating the effect sizes.

According to the data in (table 16) below, there were 16 passes and 5 fails for the textbook instructional tool, accounting for 38.1% and 11.9% of the total, respectively, whereas there were 21 passes and no fails for the 3D animation instructional tool. According to the percentages within the grade levels, 43.2% of students who used textbooks passed, while 100% of students who used 3D animation passed. According to the percentages of total observations, 88.1% of students passed regardless of the instructional tool used.

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Table 16: Cross tabulation of Instructional Tool against Grade

Case Processing Summary

	Cases					
	Valid		Missing		Total	
	N	Percent	N	Percent	N	Percent
Instructional Tool * Grade	42	100.0%	0	0.0%	42	100.0%

Instructional Tool * Grade Crosstabulation

			Grade		
			Pass	Fail	Total
Instructional Tool	Textbook	Count	16_a	5_b	21
		Expected Count	18.5	2.5	21.0
		% within Instructional Tool	76.2%	23.8%	100.0%
		% within Grade	43.2%	100.0%	50.0%
		% of Total	38.1%	11.9%	50.0%
		Residual	-2.5	2.5	
		Standardized Residual	-.6	1.6	
	3D animation	Count	21_a	0_b	21
		Expected Count	18.5	2.5	21.0
		% within Instructional Tool	100.0%	0.0%	100.0%
		% within Grade	56.8%	0.0%	50.0%
		% of Total	50.0%	0.0%	50.0%
		Residual	2.5	-2.5	
		Standardized Residual	.6	-1.6	
Total		Count	37	5	42
		Expected Count	37.0	5.0	42.0
		% within Instructional Tool	88.1%	11.9%	100.0%
		% within Grade	100.0%	100.0%	100.0%
		% of Total	88.1%	11.9%	100.0%

Each subscript letter denotes a subset of Grade categories whose column proportions do not differ significantly from each other at the .05 level.

4.0 Discussion

This study looked at the impact of 3D animations on student performance in psychiatry. It used an experimental research approach with a control group and an experimental group. It confirmed that knowledge of instructional design and the incorporation of 3D animation in the development of instructional materials is critical for tertiary institutions such as Kenya Medical Training College. 3D animation instructional materials were found to have a significant effect on students' performance on the psychiatry subject.

This study emphasizes the significance of using modern teaching tools, such as 3D animation, to increase college students' interest in learning and thus promote their knowledge acquisition process. Similar studies have shown that incorporating technology into pedagogy increases students' learning curiosity and influences their motivation and attitudes toward the learning environment. (Yen et al., 2018, El Hammoumi et al., 2021).

From the results of the study, it was clear that the experimental group had acquired knowledge differently from the control group. Students' knowledge acquisition was significantly impacted by the teaching method that used the 3D animated video on psychiatry. Also, it was observed

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that students who were taught utilizing the 3D animation film performed better on the exam than the students in the control group. This method of instruction delivery was judged to be more successful than textbook learning because (experimental group) pupils were able to comprehend and accurately identify the various psychiatric illnesses.

According to the students' results, the psychiatric 3D animation video effectively added value to the learning of psychiatric conditions. It encouraged clear and concise instructional content, which resulted in a better understanding of the psychiatry topic. According to the 3D animation group, which had higher test scores than the textbook group, the results were conclusive and reflected the effectiveness of the 3D animation video.

5.0 Conclusion and recommendations

An important ability that can assist create a more dynamic and effective learning environment that is better suited to the requirements and learning styles of students at tertiary institutions is 21st century expertise on the integration of new instructional tools such as 3D animations in pedagogy. Students' learning can be made more interactive and interesting through the use of 3D animations and other contemporary teaching aids. Particularly in disciplines like psychiatry and human anatomy, these methods can help make abstract notions more concrete and understandable. The students' performance in the psychiatric subject was significantly impacted by the usage of 3D animation instructional tools.

Tertiary institutions like Kenya Medical Training College should use technology to align with the development of 21st-century skills like digital literacy, critical thinking, and problem-solving, which are becoming increasingly important in today's world. To provide a well-rounded educational experience, 3D animation should be used as one of several teaching strategies and integrated with other instructional methods such as lectures, case studies, and hands-on activities. More research is needed to determine the efficacy of using other instructional strategies in education, as it is likely to be a useful tool in assisting student learning and performance in complex subjects. 3D animation videos and other modern pedagogical tools increase students' interest in a subject, allowing them to better understand and acquire knowledge and skills. The textbook or PowerPoint slides are not interesting or engaging, which reduces students' interest in the psychiatry topic and leads to low concentration, which has an impact on their knowledge acquisition process.

The study's findings offer higher education institutions a fantastic example of how to use and integrate contemporary teaching tools in pedagogy. It was made obvious how students were driven to study based on the learning environment by integrating new instructional technologies, specifically 3D animation instructional resources, in the teaching and learning of psychiatry. So, this might be used as a model for incorporating contemporary instructional techniques into teaching and learning at KMTC.

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6.4 Ethical consideration
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