# IMPACT OF 3D ANIMATION IN RECOLLECTING THE SUBJECT OF RESPIRATORY SYSTEM AMONG SCHOOL CHILDREN

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**Abstract:**

3D animation is a form of educational media that aids in assisting viewers in better understanding concepts. The purpose of this paper is to determine whether 3D animated video content can help school children to recollect the subject better. 3D animation of the lungs(3DLungs) was created and was given to school children in the age group of 15 to 16 who are in the 11th standard where they have a subject on the respiratory system. The survey approach is employed, and we chose a control group of 40 numbers who will learn the subject through the conventional method and another set of 42 students (experimental group students) who will learn it with the animation. A questionnaire is provided to students after the subject was taken in the class using the chalk & board method. The same set of questionnaires was given to the students who attended the session using 3D Animation. Of the 82 samples, 80 were taken for analysis, and the remaining two were outliers. The results showed that students who learned with the help of 3D were able to recollect the parts of the lungs better, and they found it more interesting to attend the 3D class when taught through animation than seeing the still image/photo given in the book and also they were able to score more marks when compared to the control group. The basic concepts were understandable by both the control and experimental group whereas 3d animation helps more in recollection. The problem students faced in remembering organs with 2 lobes like lungs, and kidney is that is the left and right identification. The images in the book and even the 3D animation show the left side of the lungs towards our right-hand side, and the right side of the image will be towards our left-hand side which makes the students confused to recollect the numbers in the lobes. Future studies have to be done to sort this out

**Keyword**s : *3D Animation, recollecting, understanding, respiratory system, lungs*

## Introduction

Information technology is growing fast and the usage of IT is also growing rapidly, of the highly developing IT sector, the animation is a part that is equally growing (Apriliyanti, 2023). We are living in the world of unlimited possibilities and all our creative imaginations that was thought not possible are made possible through Animation technology (Vishnu, 2020) Animation is consecutive changes that are made to an image which is been viewed rapidly within a short duration of time, that has been illusioned as motion due to the Principle of Persistence of vision. Dudley Andrews says that the persistence of vision might be associated with a psychoanalytic view of the mind, since the eyes are passive, and it can retain the effects

of stimuli, meaning where there is a consecutive movement (Andrews, 1976)". Animation is categorized into two one is 2D Animation and other is 3D Animation. 2D animation is created where only the length and breadth is taken for creating characters or images, whereas 3D animation takes length, breadth, and width. Graphically animated content has the finest and most positive impact on learning and understanding the concepts more easily and memorable (Zahra, 2016)(Syeda Binish Zahra)Even the experiments that we used to study in Physics in school days, we used to imagine and study when it comes to the working of the machines the diagrams that are given in the books helps us to understand a little better when compared to normal text, whereas the same working of the machine will be understood better if it is created in 3Dimesions and the working is animated and shown. So we understand exactly what is been taught , rather than imagining something that is irrelevant to the course content (Ivana Bojovic R. A., 2018). 3D Animation is well known in the Film industry, its contribution towards e-learning is relatively growing per EY estimates (Halima, 2022). Even for virtual reality 3D models will be created first and 3D VR finds its innovative applications of teaching, learning, and training (Abdul-Hadi G. Abulrub a, 2013). 3D animation always gives the end user a better understanding. Teaching methodologies can involve technologies that can focus on the holistic development of the learners (joshi, 2020). In our article, we are going to take the advent of 3D and show 3d animated lungs to the school students to find out whether they can recollect, understand, and shows interest in attending the class and whether they can score more marks.

**3D Animation**

In 3D software's like 3dsmax, Maya , Blender , the viewport is the area where the user-created objects can be viewed by the users. (Apriliyanti, 2023) The active viewport is always highlighted. Also the application allow the users to change the viewports according to their scenes . The viewports can be viewed from different angles with the help of the cameras. We can make a viewport as a camera viewport as well, where that object will be available for the scene according t the angle of the camera. The perspective camera views the scenes with a depth also when the camera focal length is more the objects looks smaller and when it is les the objects looks bigger. Though the object size is the same, according to the view of the camera lens the objects looks bigger or smaller. For example, in 3D modelling software like 3ds Max or Blender, multiple viewports display the 3D forms from different angles and projection modes When it is a orthographic camera view the object is viewed in the same as it t is seen in the scene as per the measurements we have made. It means the creation time of 3D models will consume more time and also the output has to be rendered to get the final look. All realistic materials can be created or can be taken from libraries including metal finishes fire effects and so on.3D objects always looks realistic since the created object can be viewed in all directions for perfection and also the objects can be colored and textured. All realistic images, even photographs can also be used to wrap the 3D objects, so the output looks real. Keyframes are the ones where the change in the object happens and which is the reference point for the change to start happening. Every frame need not be created. (Eric, 2022)3D object after completion has to be rendered, which gives the final output with all the lighting and materials we can apply. A texture map is wrapped on the mesh object using the texture coordinates. The realistic output

is achieved because of the detailing that can be done in 3D meshes, even the smallest vertices to the face of the mesh, and segments can be altered and even colored or materials can be applied to the particular face as well. In the education sector 3D Animation has its advent to improve skills and knowledge, it also makes students engaged and it improves imaginary skills(joshi, 2020). Even Video animations are used as an information tool for patients and the general public (Thirimon Moe-Byrne, 2022)

**Objectives**

1)      To experiment and see whether 3D animation can help students to recollect the subjects better

2)      To examine whether 3D animation creates interest among students in learning the subject

3)       To analyze whether students can understand the subjects better when they learn it through 3D

4)      To examine whether the students were able to score more marks after the usage of 3D content

**Methodology**

It is a Experimental research where 3D animation(3DANI) demonstrating the respiratory system starting from the nostrils to the exchange of gases was taken for analysis. Two section students from schools in the Tiruvallur district were taken for analysis. Students of Section A were taught through the normal chalk and board. Students of Section B were taught with the help of 3D Animation and it was shown on smart boards. On the next day of the class a survey was conducted with them with structured questionnaires mostly with measures of the nominal, ordinal and regular technical book back questions prepared by the school teachers. The interview was taken with the class teachers and also from students to authenticate the results. The collected data were statistically analyzed.

**Analysis:**

**Null Hypothesis Set**

1)      There is no significant difference in the recollecting level of the subject between the control group and the experimental group

2)      There is no significant difference in the understanding level between the control group and the experimental group

3)      There is no significant difference between the control group and experimental group with regard to the hand orientation towards book print

4)      There is no significant difference among students with regard to marks scored between the control and the experimental group.

4.1 T-test  for  no significant difference in the recollecting level of the subject   between the control group and the experimental group

Table 1- t-test for equal variance –recollecting the subject

| Mean control group | Mean experimental group | SD control group | Sd experimental group | t value | P value |
|---|---|---|---|---|---|
| 1.375 | 1.75 | 0.484 | 0.433 | 1.990 | 0.0005 |

Table 1 and Figure 1 explain about the recollection level among both the control and the experimental groups. Since the p-value is less than 0.0005 we reject the null hypothesis at a significance level of 1 %, where the experimental group students were able to recollect the parts and connectivity of the lung structure better when compared to the control group. Students, when interviewed, stated that the animation helped them to remember the connectivity of the parts, and also since there was a voice it helped them to recollect it better.
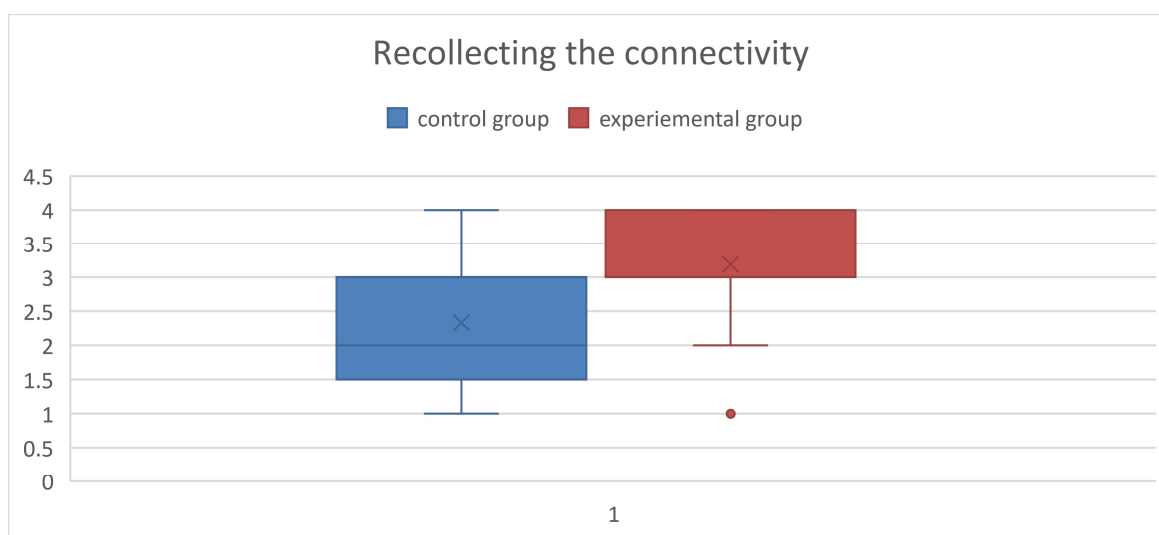


Figure 1 : Box & Whisker chart –Recollecting the connectivity

4.2 ) There is no significant difference in the understanding level of the concept  between the control group and the experimental group

Table 2- t-test for equal variance –Understanding the concepts

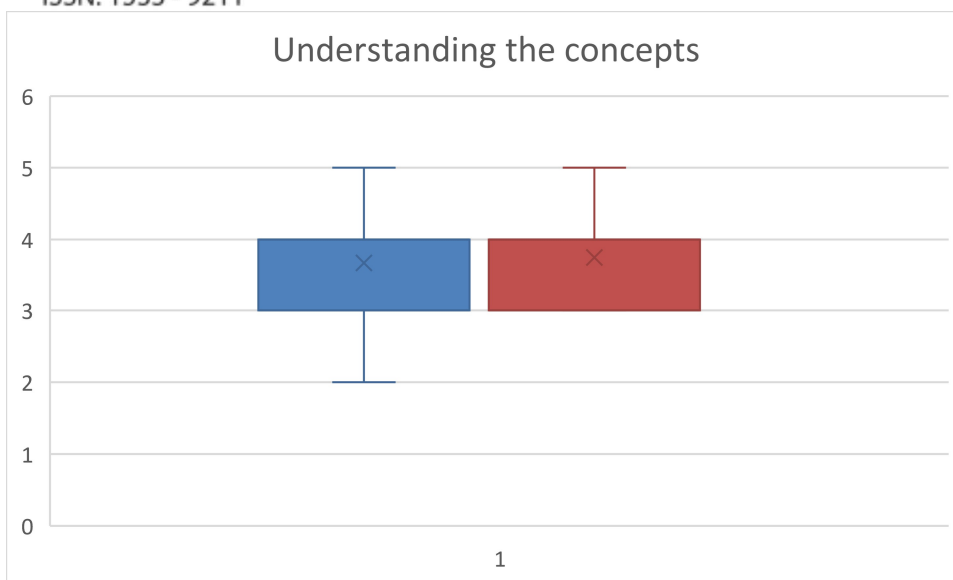| Mean control group | Mean experimental group | SD control group | Sd experimental group | t value | P value |
|---|---|---|---|---|---|
| 3.675 | 3.75 | 0.720 | 0.766 | 1.664 | 0.328 |

Figure 2 : Box & Whisker chart –Understanding the concepts

Table 2 and Figure 2 explains about the understanding level with respect to the concept between both the groups. Since the P value is more than 0.05 and less than 1 , we accept the null hypothesis, stating that there is no significant difference in the understating level of the concept of respiratory system lungs which is taught by the teacher and seen through the animation. Students' interviews revealed that teachers' explanation of the function of the lungs was understandable.

4.3)     There is no significant difference between the control group and experimental group with regard to the hand orientation towards book print

Table 3- t-test for equal variance –hand orientation towards the book print

| Mean control group | Mean experimental group | SD control group | Sd experimental group | t value | P value |
|---|---|---|---|---|---|
| 0.425 | 0.475 | 0.494 | 0.499 | 1.66 | 0.32 |

Table 3 shows the mean and the standard deviation and both the t and p values between the control and experimental group. Since the P value is more than 0.05 and less than 1, we accept the null hypothesis, stating that there is no significant difference between the control group and experimental group with regards to the recollecting level where there is a reversal of the left and right side image of the object when compared to our body's left and right side. Students' interview revealed that both the control group and the experimental group had a problem in recollecting the number of lobes in the lungs on the right and left-hand side while

they were trying to recollect since the images in the book and animation shows the images in the reversal of our own body. The left lobe in the book will be towards our right-hand side, and vice versa.

4.4)There is no significant difference among the children with regard to their mark scores between the control and the experimental group

Table 4- t-test for equal variance –skill set – marks scored

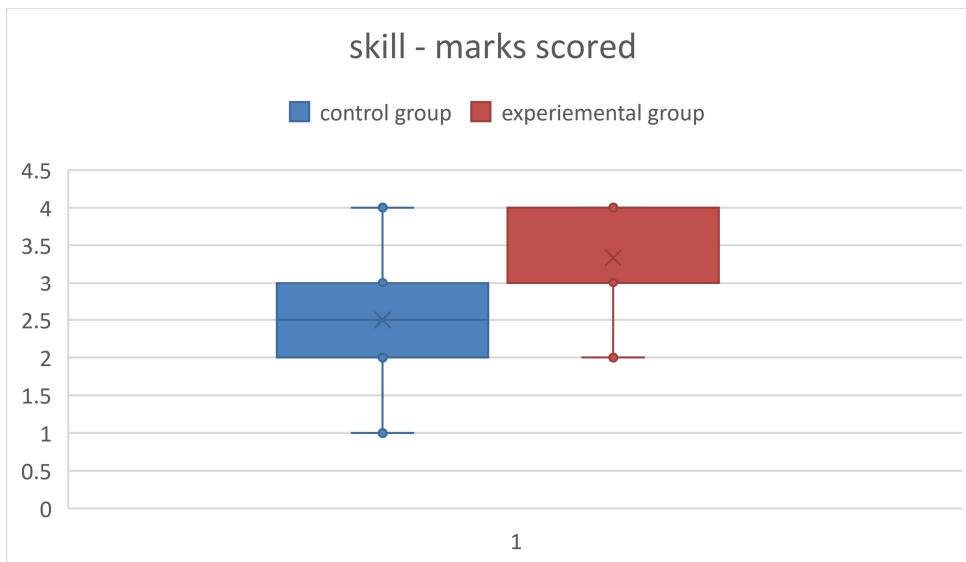| Mean control group | Mean experimental group | SD control group | Sd experimental group | t value | P value |
|---|---|---|---|---|---|
| 2.2 | 2.75 | 0.87 | 0.66 | 1.99 | 0.002 |



Figure 3 : Box & Whisker chart – Skill set – Marks Scored

Table 4 and Figure 3 shows the significant difference between the control and experimental group with respect to the marks scored. Since the p-value is less than 0.01, we reject the null hypothesis at a 1 % percent level of confidence and since it is highly significant, we state that the experimental group students were able to score more marks than the control group students. The experimental group students scored more marks in the book back questions and the interview revealed that the animation helped them to recollect the flow and since they were able to answer.

4.4)     Interest in attending the class when taught through 3D Animation

Results of  Students of Section B who attended class using 3D show that  75% of them have shown interest in attending the classes and they feel that it is not boring and helps to remember the connectivity of the parts of the lungs. This reveals that students will show liking to attend the classes if they are taught with the help of 3D Animation
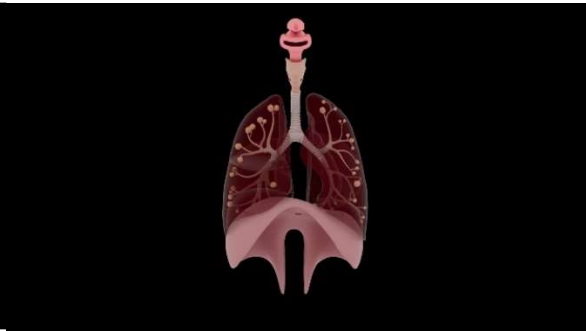
Figure 4: Lungs within the ribs

Figure 5: Left & Right Lungs

Figure 6: Lobes in the lungs

Figure 7: Air molecules passing through the Trachea, bronchioles and alveoli
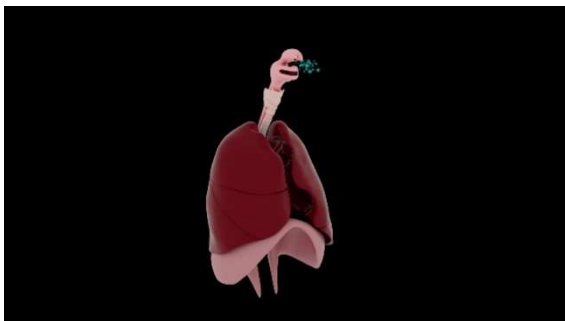
Figure 8: Breathing out        Figure 9: Oxygen molecules getting absorbed into the viens

Figure 5 to Figure 9 shows the shape of the lungs & its parts and the lobes in the lungs and also the movement of air molecules through the trachea, bronchioles and alveoli and the absorption of the oxygen molecules and release of the air molecules

**Discussions**

Statistical analysis revealed that the Experimental group who learned it with the help of 3D was able to recollect the subject better (Motsumi, 2018) when it comes to the parts of the lungs since the animation shows the flow of air through the parts of the lungs. Students didn't have to imagine and study instead they saw and studied which helped them to recollect the animation and answer well. Interviews with the teachers revealed that students showed more interest to attend the class that was taken along with 3D Animation and also there is no difference in the understanding level of the students between the control and experimental group capacity since the concepts are explained by the teachers in the control group and concepts are shown in the animation. T-test was done to find the p-value to find whether there is any significant difference in the marks scored between the children who studied with the help of 3D and without the help of 3D and the results revealed that there is a difference in the marks scored between both the groups, the experimental group scored more marks when compared to the control group. Also, one more finding is that the reversal of images in the books and animation, the left side of the lungs will be on our right-hand side in the books and similarly the right side of the lungs will be on our left-hand side. Students try to reconnect or recollect the orientation of their hands, the left lungs have 2 lobes, whereas the print in the book will show the right side of the lungs towards the left and vice versa, hence students of both groups found it difficult to recollect the lobes properly. Four parameters were found, one is on understanding, another on recollecting, next on interest towards attending the class and the fourth is about the marks scored. Interviews with the teachers revealed that showing animation creates interest among students to attend the class and also these animations can help the students to brush up on the subjects easily.

**Conclusion: -**

3D animation (3DLungs) helps students recollect the subject respiratory system better since the animation shows the flow of the air, inhalation, and exhalation, whereas students need not imagine and study. Schools can teach students using 3D animation in the classrooms as an ICT tool to make the student recollect better along with their traditional method of teaching. Also, classes taken with the help of 3D Animation are interesting to the students. Since schools have started sharing notes with children through WhatsApp after COVID, these videos can be sent to students and they can use them on their mobile for quick reference. (Ivana Bojovic R. A., 2017). Animations with a voice-over can help the students better since the voice will reemphasize the content again

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