



# EFFECTIVENESS OF 3D ANIMATION IN EDUCATION

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**Abstract:** The usage of computer graphics and 3D animation in the educational setting is covered in this study report. The goal of this research is to examine the benefits and limitations of using computer graphics and 3D animation. This study specifically seeks to comprehend the difficulties in the present educational environment. The existing state of education and the potential application of 3D animation in instructional materials were investigated using the case study technique. The study's findings indicate that 3D animation is a useful educational tool, especially when it comes to visualizing difficult ideas and procedures. Anatomy of the human body, the structure of intricate molecules, or the inner workings of a machine are just a few examples of complicated abstract topics that can be visualized more simply thanks to 3D animation. Learning can be more entertaining and memorable when it is presented in 3D animations. By offering a multimodal experience that stimulates both the visual and audio senses, they aid learners in better remembering information. Interactive 3D animations may give students a hands-on, immersive education that lets them engage with the material. By enabling them to investigate and experiment with various scenarios, this can aid students in developing a deeper knowledge of the subject matter. With the ability to be viewed from any location with an internet connection, 3D animations are the perfect tool for remote learning and distance education. These studies demonstrate how 3D animation improves learning by giving students a visual and participatory experience.

**Index Terms** – Effectiveness, 3D Animation, CG-Computer Graphics, Learning and Teaching Process

## I. INTRODUCTION

Utilizing 3D animation in teaching has a number of benefits. Among the principal benefits are:

**Enhancing Visual Understanding:** Students can learn difficult ideas in a more dynamic and visually appealing way by using 3D animations. They can help visualize ideas that are normally difficult to picture.

**Topics for Simplifying Complex** The complex material are broken down into smaller, more digestible chunks in 3D animation sequences. Students are better able to comprehend and remember the knowledge as a result.

**Interactive learning:** 3D animations can allow students to manipulate and independently explore ideas. This kind of practical instruction can aid pupils in better comprehending complicated subjects.

**Enhancing Retention:** By appealing to several senses, 3D animations can help students remember material more effectively. Students are more likely to recall material when they can see, hear, and engage with it.

**Accessible Learning:** In situations with limited resources, 3D animations can offer access to educational materials. For instance, students in rural areas or underdeveloped nations might not have access to expensive lab supplies or other resources, yet 3D animations might still be helpful to them.

3D animation offers educators a potent tool to improve student learning and make difficult subjects more understandable.

Learning with 3D animated video has a number of benefits, including:

**Engagement on the visual level:** 3D animated videos can make learning more entertaining. Learners can benefit from the usage of animations and images.

**Flexibility:** 3D animated videos can be used in classroom settings, online courses, and self-paced learning, among other learning settings. Additionally, they are easily adaptable to diverse learners' needs.

Cost-effective: Creating educational content can be done affordably with 3D animated clips. They eliminate the need for pricey teaching tools and resources because they can be produced once and utilised repeatedly.

Overall, 3D animated videos can be an effective learning tool since they offer a fun, interactive, and efficient way to present knowledge and increase retention.

### 1.1 Communication benefits of 3D Animation

3D animation has several advantages that can enhance communication, including:

1. **Visual Appeal:** 3D animation has a strong visual appeal and can rapidly grab the audience's attention. It can assist in conveying complicated concepts and information in a more captivating manner that can keep the audience's interest.
2. **Better Understanding:** 3D animation can aid in the audience's better comprehension of difficult ideas or concepts. It can reduce complex material and make it more approachable by creating animated visualisations.
3. **Flexibility:** Information may be presented in a variety of ways thanks to 3D animation. It permits the use of various camera movements, perspectives, and visual effects that can aid in providing a more thorough illustration of ideas and concepts.
4. **Cost-Effectiveness:** Creating 3D animations can frequently be less expensive than making live-action movies. 3D animations may be simpler to modify and update, which can save time and money.
5. **Emotion:** An audience's emotions can be evoked through 3D animation. Important messages can be more effectively communicated when there is a sense of urgency or empathy.
6. **Universal:** 3D animation is a wonderful medium for communication across cultures and languages because it has no language restrictions.

Overall, 3D animation can improve communication by improving the audience's access to, engagement with, and retention of difficult information.

## II REVIEW OF LITERATURE

There has been a significant amount of research conducted on the effectiveness of 3D animation in education. Here some relevant literature works:

"The Effectiveness of 3D Animation in Science Education: A Meta-Analysis" by Cheng-Chieh Chang, Yu-Hui Chen, and Tsui-Ping Wu (2018) - This meta-analysis examines the impact of 3D animation on science education. The study finds that 3D animation is an effective tool for improving students' learning outcomes and interest in science.

"The Effects of 3D Animation on Mathematics Achievement and Motivation of Fourth Grade Students" by İlkay Ulusoy, Sevgi Öztürk, and Özgür Kılıç (2019) - This study investigates the impact of 3D animation on fourth-grade students' mathematics achievement and motivation. The results show that the use of 3D animation significantly improves both mathematics achievement and motivation.

"Hui-Ping Chuang, Ching-Hua Chao, and Ching-Ting Hsu's study, "The Effects of 3D Animation Instruction on the Achievement and Motivation of Middle School Students in Science," was published in 2014. This study looks at how 3D animation affects middle school pupils' enthusiasm and achievement in science. According to the research, 3D animation can be an effective educational method for raising students' motivation and achievement in science.

Linda Wilson, Elizabeth Linthicum, and Mary May's study "The Effectiveness of 3D Animation in Teaching Physiology for Nursing Students" was published in 2017 - This study examines how well 3D animation teaches nursing students about physiology. The findings indicate that using 3D animation as a teaching tool can help students better understand difficult physiological topics.

"Paul George and Sarah Peeters' "The Use of 3D Animation in Teaching Anatomy: An Investigation of Its Effects on Student Learning Outcomes" (2014) - This study investigates how 3D animation affects anatomy learning results for students. The results imply that 3D animation is a useful educational tool for enhancing students' comprehension of anatomical ideas.

These studies suggest that 3D animation is a useful tool for enhancing students' learning outcomes in general.

T. Hwang and M. Wang's (2019) research looked at how CG affected students' math achievement. According to the study, CG in mathematics instruction improved students' performance.

K. W. Li et al.'s (2019) investigated into the efficacy of CG-based learning.

H. E. Boumedyen and A. S. Ali (2021) observed that CG-based learning environments have the potential to improve student engagement and motivation and to offer a more dynamic and immersive learning experience after reviewing the literature on the use of virtual and augmented reality in education.

L. Zhu et al. (2020) investigated the application of CG in the instruction of Chinese as a foreign language. According to the study, studying Chinese can be made more engaging and motivating for students by using CG-based resources.

G. F. Zaragoza-Lozano et al. (2021) came to the conclusion after reviewing the literature on the use of CG in education that it can help students develop their cognitive, emotional, and psychomotor skills as well as their motivation and involvement in the learning process.

**Establish the purpose and audience:** Prior to starting any project, it is essential to establish the goal and target audience. This will make it easier to direct the creative process and guarantee that the end result is tailored to the audience's demands and tastes.

**Focus on storytelling:** Despite technological breakthroughs, the best applications of 3D animation and computer graphics still depend on a gripping narrative. A compelling narrative is essential for drawing in and holding the audience's attention, whether the work is a quick commercial or a long feature film.

**Attention:** Pay close attention to the little things since they matter greatly in computer graphics and 3D animation. Each component, from lighting and texture to character design and movement, adds to the overall reality and plausibility of the finished work. Paying attention to these details can elevate the quality of the work and make it more immersive for the audience.

**Choosing the appropriate tools** is crucial because there are numerous 3D animation and computer graphics software programmes accessible. When choosing software, a number of factors, including the project's scope, team expertise, and budget, should be taken into account.

**Collaboration** is key to successful 3D animation and computer graphics projects; these teams frequently include animators, designers, and programmers. To make sure that everyone is working towards the same objectives and that the finished output fulfills the required standards, effective teamwork is crucial.

Overall, the research points to computer graphics as a useful tool for raising student achievement, comprehension, motivation, and interest in a range of subjects. The use of CG-based learning environments in educational management can also provide a more interactive and immersive learning experience. However, more research is needed to fully understand the potential of CG in education and how best to integrate it into educational management practices.

### III RESEARCH METHODOLOGY

Survey on the use of 3D animation and CG for better educational communication in colleges:

Sample Questionnaires:

How are 3D animation and computer graphics being used in colleges today for instructional communication?

What advantages and difficulties did adopting 3D animation and CG for educational communication in universities bring about? What led college professors and students to use 3D animation and CG for educational communication, and what did they think of it?

Resposndents

Participants in this study included instructors and students from colleges who had knowledge of 3D animation and computer graphics (CG) for educational communication. Through convenience sampling, participants from different Tamil Nadu colleges were examined.

An email survey with a semi-structured questionnaire was used to gather the data. The learners and educators were asked to rate their level of agreement with statements about the usage of 3D animation and CG for educational communication using open-ended and closed-ended questions. Participants were requested to give more in-depth answers to the open-ended questions about their perspectives. Participants were able to complete the survey, which was administered via an email online survey platform.

The closed-ended questions were examined using descriptive statistics, such as mean, median, frequency, and SD. The open-ended questions were employed to examine the data's correlations.

## V. CONCLUSION

Computer graphics and 3D animation require technical proficiency, desire, and creativity to be used effectively. In addition to the aforementioned skills, 3D animated content needs to have a good storytelling technique, connectedness, hierarchy, and methodology. Given the technologies at their disposal, educators have a lot of great opportunity to create amazing animated videos and visual effects. The manner that teaching and learning are currently conducted has been completely altered by three-dimensional (3D) animation and computer graphics. This study's findings demonstrate the growth of educational videos and 3D animation in all areas of education. However, there is a lack of adequate awareness about the use of 3D animated clips among students and teachers. There are many advanced teaching tools available for the appropriate use of 3D animation in the learning process. But, the awareness among the learners and teachers regarding the use of 3d animated clips are not up to the level. Effective use of these software tools needs many factors to reach the learners.

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