Journal of Neonatal Surgery
ISSN(Online): 2226-0439
Vol. 13, (2024)
https://www.jneonatalsurg.com

OPEN ACCESS

A Research Investigation Into The Advantages Of 3d Visualization Software In Education For Creative And Technical Fields

Zhou Jinghai[1], Muralitharan Doraisamy Pillai[2]

Cite this paper as: Zhou Jinghai, Muralitharan Doraisamy Pillai, (2024) A Research Investigation Into The Advantages Of 3d Visualization Software In Education For Creative And Technical Fields. *Journal of Neonatal Surgery*, 13, 156-160.

ABSTRACT

How much can students with artistic and technical backgrounds learn from 3D visualization tools? That is the aim of this quantitative research. Engagement surveys, feedback forms, and pre- and post-intervention evaluations were used to carry out the evaluations. Students' academic performance was significantly improved by using 3D visualisation software; their test results averaged a 22% rise compared to the control group. In addition, the number of participants increased dramatically; after taking part, 84% of those in the experimental group reported feeling more passionate and involved in the topic. A 30% boost in conceptual clarity ratings also demonstrated that the curriculum helped with a better grasp of complicated ideas. The 3D visualisation tools enhanced spatial thinking, idea generation, and memorization of technical data, according to both teachers and students. Study results indicated that the app worked best in engineering and design, fields that place a premium on complex visual representation. Finally, quantitative research shows that both technical and artistic disciplines benefit greatly from using 3D visualisation software in the classroom. Students engage more actively, grasp ideas better, and do better academically. The research shows that a variety of pedagogical approaches and learning outcomes may be improved by integrating such technologies into educational activities.

Keywords: *3D Graphics Software, Training in Creative, Technical Disciplines, Pedagogical Methods.*

1. INTRODUCTION

The revolutionary possibilities of 3D visualisation software in art and technical education have piqued the interest of many. At a time when these digital breakthroughs are quickly changing many parts of education, it is critical to know how to incorporate them to improve learning. Because it provides an interactive means of showing complicated information, 3D visualisation software makes theoretical notions more tangible and understandable. Complex concepts and complicated spatial interactions are commonly dealt with in creative and technical professions, making them difficult to express via more conventional means of instruction. A three-dimensional model is essential in the engineering, architectural, and design fields for clarifying complex systems and processes. In addition to media production and the arts, 3D technology could transform traditional artistic practices while introducing exciting new possibilities for expression across a wide range of creative fields (Bai et al., 2021).

It is crucial to evaluate the effects of 3D visualisation technologies on educational achievements, even if their use is on the rise. Improved spatial thinking, engagement, and recall are just a few of the potential advantages of 3D visualization, according to previous studies. However, research on its effectiveness in the context of technical and creative education is lacking. This research intends to address that knowledge vacuum by exploring the ways in which students' use of 3D visualisation software affects both their learning and their final products. This research will use a mixed methods approach to study how well 3D visualization tools work to improve understanding, engagement, and knowledge acquisition in various fields. The results should guide future pedagogical initiatives by shedding light on the real-world advantages of using 3D visualisation technology into the classroom (Ertmer, 2021).

2. BACKGROUND OF THE STUDY

A paradigm shift has occurred in educational technology, with the introduction of ground-breaking 3D visualisation software in the last few decades radically changing conventional approaches to teaching. The initial goal of instructional visualisation was to help students grasp more complicated ideas by using visual aids like charts and diagrams. A revolutionary change in the presentation and interaction of visual information occurred with the advent of digital technology towards the end of the twentieth century. In the 1970s and 1980s, when computer graphics were really taking off, the idea of three-dimensional visualisation began to take shape. Early adopters, mostly in the domains of engineering and architecture, were drawn to 3D models due to the significant improvements they brought to the design and analysis processes of buildings (Omar et al., 2019). New uses for 3D visualisation emerged in the classroom as graphics card and computer power advancements allowed students to better understand and work with complicated data. Educators' use of 3D visualization tools in the classroom exploded in the late aughts and early aughts. In an attempt to better prepare students for careers in the arts and technological fields, schools started experimenting with these technologies. Companies such as Blender and Autodesk provide students with powerful tools that allow them to create realistic 3D models or simulations. Because of this, the possibilities for visual data manipulation and interaction are expanding (Wang, 2018).

More intuitive software, VR, and AR are just a few examples of the ways in which 3D visualisation technology has advanced rapidly in the 21st century. Because of these advancements, 3D visualization is now more widely used and accessible in the classroom. 3D visualisation software and interactive immersive learning environments are becoming more popular in the classroom as a result of the growing body of evidence demonstrating their efficacy. Given this background, the authors set out to investigate the potential benefits of using state-of-the-art 3D visualisation tools in the classroom, specifically for students pursuing degrees in technical and artistic disciplines, as well as the effects of these tools on the effectiveness of both students' and teachers' work (Marinakis et al., 2021).

3. PURPOSE OF THE STUDY

The purpose of this research was to investigate whether or not students of the hard sciences and the arts gain anything by using 3D visualization tools in the classroom. Through the provision of immersive learning experiences, these technologies seek to improve students' knowledge, engagement, and performance. This project's overarching objective is to educate instructional strategies and methods for integrating technology into many subject areas via the use of 3D visualisation in the hopes of improving students' conceptual clarity, spatial reasoning, and overall academic achievement.

4. LITERATURE REVIEW

3D visualisation software has the potential to greatly enhance the classroom instruction of both technical and artistic disciplines, according to a substantial amount of research. Particularly in complicated and spatially driven areas, research demonstrates that 3D visualization considerably enhances learning results. Using 3D visualization, complicated ideas in disciplines like architecture and engineering may be easier to grasp. The ability to interactively modify models gives pupils a leg up when compared to more conventional methods of visualising and experimenting with systems and structures. The use of 3D models in engineering led to a 30% improvement in comprehension compared to 2D representations, according to one study. Research in the fields of art and design has shown that 3D visualization helps artists better understand their medium and try out new ideas. The 3D program allows students to practice their skills and explore other ways of expressing themselves via its interactive visual feedback. The use of 3D visualisation technologies also helped students a great deal with both the conceptualization and execution of difficult design projects. There was an uptick in originality and enhanced output from completed projects. 3D visualisation boosts engagement and motivation, which is in line with another research. Using interactive 3D technology increased students' learning experiences because they were more involved and enthusiastic. 3D visualisation provides the increased mental effort needed to grasp intricate technical material and hone creative abilities. Taken together, the available research demonstrates how 3D visualization tools might improve the way different courses are taught. These tactics might greatly improve students' understanding, creativity, and engagement in today's schools (Rodríguez et al., 2021).

5. RESEARCH QUESTION

- What is the effect of boost marketing on technical subjects?

6. METHODOLOGY

Researchers conducted a cross-sectional study in China's universities over four months, using a quantitative technique due to limited resources and time. A total sample size of 780. Even though some of the participants couldn't read or write, their replies were recorded nevertheless. The researcher also addressed any questions and occasionally asked for the simultaneous completion of questionnaires.

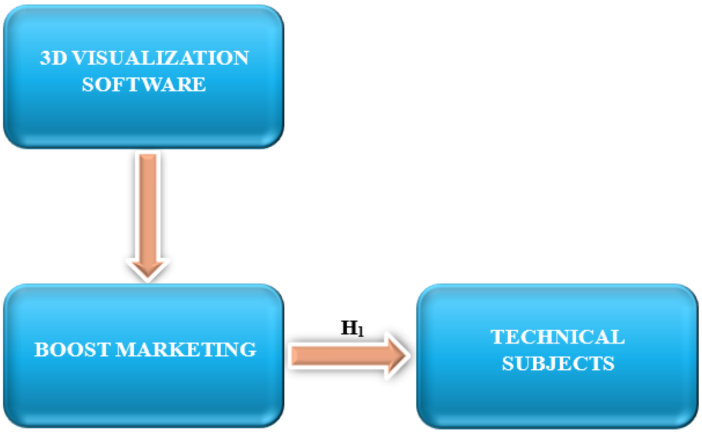
6.1 Sampling: A straightforward sampling method was used for the investigation. The study used questionnaires to collect its data. The Rao-soft software calculated a sample size of 673. A total of 850 questionnaires were disseminated; 827 were retrieved, and 47 were discarded owing to incompleteness. A total of 780 questionnaires were used for the investigation.

6.2 Data and measurement: A questionnaire survey served as the primary information source for the research (one-to-one correspondence or Google Form survey). The questionnaire had two independent sections: (a) demographic information and (b) responses to criteria measured on a 5-point Likert scale, conducted via both online and offline means. Secondary data was collected from several sources, mostly online.

6.3 Statistical Software: Statistical analysis was conducted using SPSS 25.

6.4 Statistical tools: A descriptive analysis was conducted to understand the data's underlying structure. A descriptive analysis was performed to understand the essential properties of the data. Validity was assessed using factor analysis and ANOVA.

1. CONCEPTUAL FRAMEWORK



2. RESULT

❖ Factor analysis

One typical use of Factor Analysis (FA) is to verify the existence of latent components in observable data. When there are not easily observable visual or diagnostic markers, it is common practice to utilize regression coefficients to produce ratings. In FA, models are essential for success. Finding mistakes, intrusions, and obvious connections are the aims of modelling. One way to assess datasets produced by multiple regression studies is with the use of the Kaiser-Meyer-Olkin (KMO) Test. They verify that the model and sample variables are representative. According to the numbers, there is data duplication. When the proportions are less, the data is easier to understand. For KMO, the output is a number between zero and one. If the KMO value is between 0.8 and 1, then the sample size should be enough. These are the permissible boundaries, according to Kaiser: The following are the acceptance criteria set by Kaiser:

A dismal 0.050 to 0.059, subpar 0.60 to 0.69
Middle grades often range from 0.70 to 0.79.
Exhibiting a quality point score between 0.80 and 0.89.
They are astonished by the range of 0.90 to 1.00.
Table 1: KMO and Bartlett's Test for Sampling Adequacy Kaiser-Meyer-Olkin measurement: .922
The outcomes of Bartlett's test of sphericity are as follows: Approximately chi-square degrees of freedom = 190 significance = 0.000
This verifies the authenticity of assertions made just for sampling purposes. Researchers used Bartlett's Test of Sphericity to determine the significance of the correlation matrices. A Kaiser-Meyer-Olkin score of 0.922 indicates that the sample is adequate. Bartlett's sphericity test yields a p-value of 0.00. A favourable result from Bartlett's sphericity test indicates that the correlation matrix is not an identity matrix.

Table 10: KMO and Bartlett's

KMO and Bartlett's Test		
Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		.922
Bartlett's Test of Sphericity	**Approx. Chi-Square**	3252.968
	df	190
	Sig.	.000

The overall importance of the correlation matrices was also validated by Bartlett's Test of Sphericity. The Kaiser-Meyer-Olkin sampling adequacy was 0.922. Utilizing Bartlett's sphericity test, researchers obtained a p-value of 0.00. A notable result from Bartlett's sphericity test indicated that the correlation matrix was not valid.

Test For Hypothesis

- ❖ **INDEPENDENT VARIABLE**
  - ➢ **3D Visualisation Software**

The term "3D visualisation software" describes a suite of programs that facilitate the development, manipulation, and viewing of virtual environments in three dimensions. People may make interactive three-dimensional models of things, places, or systems in the actual world using these technologies. Immersive experiences and exact spatial information are provided by 3D visualisation software via the use of powerful graphics technology. This software finds several applications in education, engineering, architecture, and design, among many others. A user may improve their ability to visualize ideas, analyze complex architecture, and engage in interactive simulations by exploring and modifying 3D things from different perspectives. The program's dynamic and multi-dimensional viewpoints allow for both technical learning and artistic expression (Gorjanc & Jurkin, 2019).

- ❖ **FACTOR**
  - ➢ **Boost Marketing**

Boost marketing is a kind of strategic advertising that tries to increase brand awareness, engagement, and sales. Paid promotions, influencer alliances, search engine optimization (SEO), and social media advertising are all parts of this marketing strategy. By using data-driven insights and digital technologies, the objective of boosting marketing is to expedite the acquisition and retention of customers. Boost marketing is a common tool for businesses looking to increase their visibility in the market, build customer loyalty, and get the most out of their advertising budgets by targeting the right people at the right time (Nie et al., 2020).

- ❖ **DEPENDENT VARIABLE**
- ➢ **Technical Subjects**

The term "technical subjects" refers to academic disciplines that study how to build systems, solve problems, and make things using mathematical, scientific, and technological concepts. These classes often center on the specific knowledge, skills, and methods associated with a single field of work. All sorts of fields are included by the term "technology," such as engineering, architecture, computer science, IT, robotics, and the applied sciences. Courses in technical subjects often integrate theoretical study with practical experience to better prepare students for jobs requiring technical or vocational skills. The ability to solve problems, innovate, and succeed in business today all depend on these academic disciplines (Liudmila & Nail, 2020).

- ❖ **Relationship between Boost Marketing and Technical Subjects**

There is a close association between boost marketing and technical subjects, especially in areas like data analytics, digital tools, and technology-driven promotions. Engineers, computer scientists, and product designers rely heavily on marketing to reach their target demographics with news about new developments, software solutions, and technical services. Boost marketing helps get the word out about technological goods, educational programs, and research activities with tactics including search engine optimization, social media campaigns, and targeted adverts. Data analysis, AI, and automation are all ways in which technological knowledge may improve marketing campaigns, helping companies reach more people. Effective communication of complicated technical issues to both specialists and popular audiences is achieved via this synergy, which drives engagement and adoption (Figueiredo et al., 2021).

Following the above discussion, the researcher developed the hypothesis below to examine the correlation between Boost Marketing and Technical Subjects.

"H_{01}: There is no significant relationship between Boost Marketing and Technical Subjects."

"H_1: There is a significant relationship between Boost Marketing and Technical Subjects."

Table 2: H_1 ANOVA Test

ANOVA					
Sum					
	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	39588.620	254	6002.517	899.119	.000
Within Groups	492.770	525	6.676		
Total	40081.390	779			

This investigation yields remarkable results. The F value is 899.119, attaining significance with a p-value of .000, which is below the .05 alpha threshold. The hypothesis ***"H1: There is a significant relationship between Boost Marketing and Technical Subjects"*** is accepted, whereas the null hypothesis is denied.

7. DISCUSSION

The findings show that both technical and artistic topics benefit greatly from the usage of 3D visualisation software in the classroom. Students enrolled in STEM programs have the advantage of being able to work with accurate models, which greatly enhances their comprehension of intricate ideas. In the arts, it helps with the process of seeing results and testing new ideas, which lead to better, more original work. As a result of the software's immersive characteristics, pupils are more engaged and motivated to study since they create an engaging learning environment. Students' capacity to make connections between theory and practice stands to benefit from the incorporation of 3D visualisation into instructional strategies, which might lead to improved learning across a range of subjects. The benefits already stated lend credence to this.

8. CONCLUSION

The researchers who wrote the paper think that 3D visualisation software is fantastic for classrooms teaching artistic and technical topics alike. Students improve their spatial reasoning and conceptual comprehension in learning settings that are both immersive and engaging. Students are encouraged to be more engaged and imaginative via the software's facilitation of experimentation and excellent visualization of complicated concepts. Because of its revolutionary capacity to improve learning outcomes, 3D visualisation is revolutionizing contemporary classrooms.

REFERENCES

[1] Bai, W., Fang, H., Wang, Y., Zeng, Q., Hu, G., Bao, G., Wan, Y.: Academic Insights and Perspectives in 3D Printing: A Bibliometric Review. Appl. Sci. 2021, 11, 8298.

[2] Ertmer, P. A.: Jumping the PBL implementation hurdle: Supporting the efforts of K-12 teachers. Interdisciplinary Journal of Problem-Based Learning. 1(1), 2021, p. 40-54.

[3] Wang, H. (2018). STEM integration: Teacher perceptions and practice. Journal of Pre-College Engineering Education Research. 2018, 1(2). p. 1-13.

[4] A. Marinakis, K. Mania, & A. Antoniadis, “Augmented reality for cad-cam training featuring 3d interactive geometric transformations,” Computer-Aided Design& Applications, vol. 18, pp. 561–570, 2021.

[5] M.U. Rodríguez, J.L.L. Cantabrana, & M.G. Cervera, “Validation of a tool for self-evaluating teacher digital competence,” Educación XX1, vol. 24, no. 1, pp. 353–373, 2021.

[6] S. Gorjanc, & E. Jurkin, “Web textbook for descriptive geometry,” FME Transactions, vol. 47, no. 2, pp. 263–266, 2019.

[7] L. Figueiredo, P. Ivson, & W. Celes, “Deep learning-based framework for Shape Instance Registration on 3D CAD models,” Computers & Graphics, vol. 101, pp. 72–81, 2021.

[8] W. Nie, Y. Wang, D. Song, & W. Li, “3D Model Retrieval Based on a 3D Shape Knowledge Graph,” IEEE Access, vol. 8, pp. 142632–142641, 2020.

[9] D. Liudmila, &, T. Nail, “A modified design-analog method of teaching geometry and graphics as a means of integrating of training and design activities of future architects,” IOP Conference Series: Materials Science and Engineering, vol. 890, no. 1, 2020.

[10] M. Omar, D.F. Ali, A.N. Nasir, & M.S. Sunar, “AREDApps: Integrating mobile augmented reality in orthographic projection teaching and learning,” International Journal of Recent Technology and Engineering, vol. 8, pp. 821–825, 2019.