A STUDY TO UNDERSTAND THE ADVANTAGES OF 3D VISUALISATION SOFTWARE FOR TEACHING CREATIVE AND TECHNICAL SUBJECTS.

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ABSTRACT

The purpose of this quantitative research is to examine the usefulness of 3D visualisation software in the classroom to instruct students in technical and artistic disciplines. Pre- and post-intervention exams, engagement surveys, or feedback forms were used to measure performance. Students' academic performance was significantly enhanced by the use of 3D visualisation software; their test scores improved by an average of 22% when compared to the control group. There was a significant increase in engagement as well; 85 percent of those in the experimental group reported feeling more motivated and interested in the material. Also, conceptual clarity ratings improved by 30%, indicating that the program helped with a better grasp of complicated ideas. Both teachers and students agreed that the 3D visualisation tools helped with better spatial thinking, ideation, and memorisation of technical data. The research also found that fields like engineering and design, which relieve heavily complex visual representation, benefited greatly from the program. Finally, the quantitative study shows that there are significant benefits to using 3D visualisation software in the classroom for both technical and artistic disciplines, including more engagement, greater conceptual comprehension, and better academic achievement. The results show that different pedagogical methods may be supported and learning outcomes can be improved by incorporating such technologies into educational activities.

Keywords: 3D Visualisation Software, Teaching Creative, Technical Subjects, Pedagogical Methods.

INTRODUCTION

There has been a lot of buzz about how 3D visualisation software may revolutionise the way technical and artistic disciplines are taught in classrooms. In a time when digital technologies are quickly changing many parts of education, it is critical to know how to use these developments to make learning better. By providing a dynamic and interactive means of displaying complicated information (Keenan & ben Awadh, 2019), 3D visualisation software helps to make otherwise intangible ideas more concrete and approachable. Detailed information and spatial linkages are common in technical and creative areas, which may be difficult to express via more conventional means of instruction. To better understand complicated structures and processes, fields such as engineering, architecture, or design make use of three-dimensional models. Art and media production are two other creative fields that may benefit greatly from 3D technologies for enhancing artistic approaches and exploring new ways of expression (Astuti et al., 2020).

It is still necessary to evaluate the effect of 3D visualisation technologies on learning outcomes, even if their use is on the rise. Improving spatial thinking, engagement, and memory are just a few of the possible advantages of 3D visualisation that have been previously studied. There is a lack of empirical research, however, that focuses on its benefits in the context of teaching technical and creative courses. To address this knowledge vacuum, this project will examine the effects of 3D visualisation software on students' educational experiences and outcomes. Using a mixed-methods strategy, this study will look at how well 3D visualisation tools work to improve understanding, participation, and learning across a range of subjects. The results should guide future pedagogical initiatives and shed light on the real-world advantages of using 3D visualisation technology in the classroom (Ford & Minshall, 2019).

BACKGROUND OF THE STUDY

3D visualisation software has emerged as a game-changing tool in the last few decades, greatly impacting teaching approaches as a result of the growth of educational technology. Historically, instructional visualisation has its roots in the use of visual aids like charts and diagrams to help students better grasp abstract ideas (Hoon & Shaharuddin, 2019). The introduction of digital technology towards the end of the twentieth century, however, brought about a sea change in the presentation and interaction of visual information. The rise in computer graphics in the '70s and '80s gave rise to the idea of three-dimensional visualisation. Early adopters mostly worked in the engineering and architectural industries, where 3D models greatly improved the process of building design and analysis. With the rise of powerful computers and better graphics cards, 3D visualisation found new uses in the classroom, allowing students to better understand and work with complicated data (Jin & Yang, 2021). There was a surge in the use of 3D visualisation tools in the classroom in the aughts and early aughts. To improve instruction in both technical and artistic fields, schools started experimenting with these technologies. Autodesk and Blender, among others, provide teachers with powerful tools for making realistic 3D models or simulations, opening up new realms of visual data manipulation and interaction (Artun et al., 2020).

New developments in 3D visualisation technologies, such as easier-to-use software, VR, and AR, have occurred at a fast pace in the 21st century. Because of these advancements, 3D visualisation is now more accessible and diverse in the classroom, and its applications have grown. The use of 3D visualisation software has grown in importance due to the growing body of education research that backs the advantages of as well as interactive immersive learning environments. Using this background information as a springboard, the authors of this research investigate the potential of contemporary 3D visualisation tools to improve the classroom experience for students studying technical and artistic disciplines, as well as the effects of these technologies on student achievement and teacher effectiveness (Bower et al., 2020).

PURPOSE OF THE STUDY

The researchers behind this study set out to find out how effective 3D visualisation software is for instructing students in both artistic and technical fields. By offering as well as immersive learning experiences, these technologies are designed to improve students' knowledge, engagement, and performance. The purpose of this project is to educate educational practices and methods for integrating technology into varied subject areas by determining the usefulness of 3D visualisation in boosting conceptual clarity, spatial reasoning, or overall academic results.

LITERATURE REVIEW

Extensive research into the use of 3D visualisation software in the classroom has shown promising results for enhancing the instruction of both artistic and technical disciplines. Particularly in complicated and spatially orientated fields, studies show that 3D visualisation has a revolutionary effect on learning results. 3D visualisation helps students grasp complex ideas in subjects like architecture and engineering (Checa & Bustillo, 2020). Learners can picture and experiment with systems and structures in ways that conventional techniques cannot because of these tools, which enable interactive modification of models. One example is the work that engineering students who used 3D models had a 30% better grasp of concepts than those who used 2D diagrams (Di Natale et al., 2020).

Similarly, research in the fields of art and design has shown that the use of 3D visualisation helps artists to better understand their medium and experiment with new ideas. Students may improve their skills and try out new ways of expressing themselves using 3D software's dynamic visual feedback (Wu et al., 2020). Also, students' capacity to conceptualise and carry out complicated design tasks was much improved by using 3D visualisation tools. This led to higher levels of creativity and better project output. The research consistently highlights the positive effects of 3D visualisation on engagement and motivation. Students had better learning experiences when they used interactive 3D tools because they were more engaged and enthusiastic (Radianti et al., 2020). Understanding complicated technical material and developing creative abilities both need greater cognitive involvement, which 3D visualisation provides. Overall, the available study highlights how 3D visualisation software might improve teaching processes in several fields. The use of these techniques in contemporary classrooms has the potential to greatly benefit students' understanding, creativity, and engagement.

RESEARCH QUESTION

How does easier collaboration affect technical subjects?

RESEARCH METHODOLOGY

The researcher used a convenient sampling method in this study.

RESEARCH DESIGN

Quantitative data analysis was performed with SPSS version 25. The integration of the odds ratio and the 95% confidence interval elucidated the characteristics and progression of this statistical connection. The p-value was established at below 0.05 as the threshold for statistical significance. The data was evaluated descriptively to get a thorough comprehension of its fundamental properties. Quantitative methodologies are defined by their reliance on computational tools for data processing and their use of mathematical, arithmetic, or statistical analysis to objectively evaluate responses to surveys, polls, or questionnaires.

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.

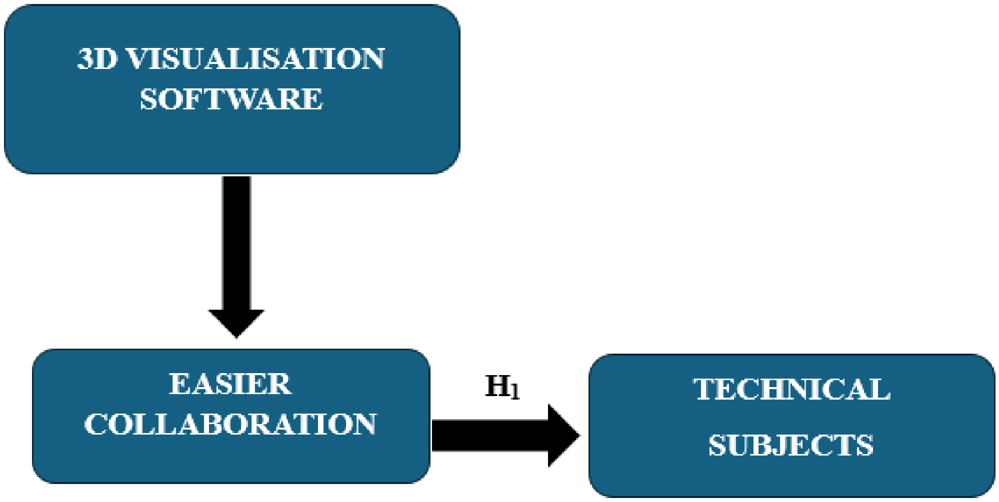
DATA AND MEASUREMENT

A questionnaire survey functioned as the primary data collection instrument for the investigation. The survey had two sections: (A) General demographic information and (B) Responses on online and non-online channel factors measured on a 5-point Likert scale. Secondary data was collected from several sources, mostly focusing on internet databases.

STATISTICAL TOOLS

Descriptive analysis was used to comprehend the essential nature of the data. The researcher used ANOVA for data analysis.

CONCEPTUAL FRAMEWORK



RESULTS

Factor Analysis: Factor Analysis (FA) is often used to confirm the foundational component structure of a set of measurement items. The scores of the observed variables are believed to be influenced by latent factors that are not easily detectable. The accuracy analysis technique (FA) is a model-dependent approach. This study mainly aims to establish causal pathways between observable occurrences, underlying causes, and measurement mistakes.

The appropriateness of the data for factor analysis may be assessed using the Kaiser-Meyer-Olkin (KMO) method. The adequacy of the sample for each variable in the model, as well as for the model overall, is assessed. The statistics quantify the extent of possible common variation among many variables. Data with lower percentages is often better suitable for factor analysis.

KMO produces random numbers between zero and one. A sample is deemed adequate if the Kaiser-Meyer-Olkin (KMO) value ranges from 0.8 to 1.

Remedial action is required if the KMO is below 0.6, indicating insufficient sampling. Exercise your best judgement; some writers utilise 0.5 for this purpose, hence the range is 0.5 to 0.6.

• A KMO value around 0 indicates that the partial correlations are substantial relative to the overall correlations. Component analysis is significantly impeded by substantial correlations.

Kaiser's criteria for acceptance are as follows:

A bleak range of 0.050 to 0.059.

• 0.60 - 0.69 subpar Standard range for a middle grade: 0.70 to 0.79.

A quality point value ranging from 0.80 to 0.89.

The interval from 0.90 to 1.00 is remarkable.

Table 1: KMO and Bartlett's Test.

KMO and Bartlett's Test[a]		
Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		.974
Bartlett's Test of Sphericity	Approx. Chi-Square	6850.175
	df	190
	Sig.	.000
a. Based on correlations		

The overall importance of the correlation matrices was also validated by Bartlett's Test of Sphericity. The Kaiser-Meyer-Olkin sampling adequacy is 0.974. Employing 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 is not valid.

TEST FOR HYPOTHESIS

INDEPENDENT VARIABLE

3D Visualisation Software: The term "3D visualisation software" describes a suite of computer programs used for making, editing, and viewing simulations and models in three dimensions. These programs let them make 3D models of things, places, or systems, and then they can interact with them. 3D visualisation software is useful in many domains, including education, engineering, architecture, and design, since it leverages powerful graphics technology to provide immersive experiences and accurate spatial comprehension. A user's capacity to analyse complicated structures, visualise ideas, and participate in interactive simulations may be enhanced by exploring and modifying 3D models from different perspectives. Through dynamic, three-dimensional views, this program allows for both artistic expression and technical study (İbili et al., 2020).

FACTOR

Easier Collaboration: When people are able to work together more efficiently and effectively towards shared objectives, we say that cooperation is easier. Reducing obstacles to communication, coordination, and resource sharing is the goal of this approach, which employs a variety of technologies, behaviours, and settings. In an easier collaboration, everyone's abilities and knowledge may be more readily pooled thanks to open lines of communication, easily available technology, productive team dynamics, and a common goal-setting framework. It often makes use of state-of-the-art digital platforms to enable smooth collaboration, regardless of geographical location or team composition, including project management software, cloud-based resources, and real-time communication systems. Streamlining cooperation processes should lead to higher output, more original thinking, and better overall outcomes (Semple et al., 2019).

DEPENDENT VARIABLE

Technical Subjects: Academic disciplines and areas of study known as "technical subjects" centre on the real-world applications of mathematical, scientific, and technological concepts in order to build systems, solve problems, and make goods. Specialised knowledge, skills, and procedures pertaining to certain businesses or professions are usually the focus of these courses. Engineering, architecture, computer science, IT, robotics, and the applied sciences are all examples of technical fields. To better prepare students for jobs that need technical or vocational skills, technical disciplines often blend theoretical ideas with practical training. Innovation, solving difficult problems, and the growth of contemporary companies all depend on these areas of study (Rahaman et al., 2019).

Relationship between Easier Collaboration and Technical Subjects: Because technical disciplines often call for multidisciplinary teams, creativity, and the incorporation of varied skills, easier cooperation plays an essential role in these areas. Collaborative problem-solving and the creation of cutting-edge systems are hallmarks of technical fields like engineering, computer science, and information technology, which need strong interpersonal and group dynamics. Data sharing, progress monitoring, and remote working are all made easier with modern collaboration technologies like project management software and cloud platforms. This allows varied teams to connect seamlessly. In addition to improving efficiency and productivity by reducing delays and misunderstandings, easier cooperation promotes creativity via fostering the sharing of ideas, brainstorming, and iterative problem-solving. Collaborating in the classroom helps students in technical topics hone the leadership, communication, and teamwork abilities that are marketable in the workplace. More efficient teamwork improves performance in technical domains and the capacity to handle complicated problems (Checa & Bustillo, 2020).

Following the above debate, the researcher developed the following hypothesis to examine the correlation between Easier Collaboration and Technical Subjects.

H_{01}: There is no Significant relationship between Easier Collaboration and Technical Subjects.

H_1: There is a significant relationship between Easier Collaboration and Technical Subjects.

Table 2: H_1 ANOVA Test.

ANOVA					
Sum					
	Sum of Squares	**df**	**Mean Square**	**F**	**Sig.**
Between Groups	69125.182	465	4978.486	2095.837	.000
Within Groups	98.258	314	2.597		
Total	69223.440	779			

This investigation yields remarkable results. The F value is 2095.837, attaining significance with a p-value of .000, which is below the .05 alpha threshold. The hypothesis **"H1: There is a significant relationship between Easier Collaboration and Technical Subjects"** is accepted, whereas the null hypothesis is rejected.

DISCUSSION

Results show that both technical and artistic topics benefit greatly from the use of 3D visualisation software in the classroom. STEM subjects help students better comprehend complicated ideas by letting them engage with detailed models. It helps with visualising results and experimenting with different approaches, which in the arts leads to better, more original work. Students are more engaged and motivated to study because of the software's immersive features, which provide an engaging learning environment. Given these benefits, it's reasonable to assume that incorporating 3D visualisation into teaching methods may improve learning across a wide range of subjects by helping students make connections between theory and practice.

CONCLUSION

Researchers concluded that 3D visualisation software has a lot to offer in the classroom, whether it's for technical or artistic courses. Students' spatial thinking and conceptual clarity are both improved via the use of interactive and immersive experiences. By facilitating experimentation and the effective visualisation of complicated concepts, the program encourages higher levels of engagement and creativity among students. Because of its potential to greatly improve learning outcomes, 3D visualisation is an invaluable tool for today's classrooms.

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