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Research Article

Effectiveness Of Extended Reality In Visualizing Solid Shapes Among Viii Standard Boys Students

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ABSTRACT

This study is attempted to evaluate effectiveness of extended reality in visualizing solid shapes among VIII standard boys students. The sample of the study consist of VIII standard boys students and they are drawn from Government higher secondary school Velachery and Chennai higher secondary school Velachery in Chennai district of Tamil Nadu. The Solomon four group design has been employed for this study. The VIII standard students in control group were taught visualizing solid shapes by using traditional teaching method. The VIII standard students in experimental group were taught visualizing solid shapes by using extended reality. The results reveal that the VIII standard boys in experimental group scored more in their post test than the control group students.

Keywords: Effectiveness, Extended Reality, Visualizing Solid Shapes

INTRODUCTION

Extended Reality (XR) is the combination of Virtual Reality (VR), Augmented Reality (AR), and Mixed Reality (MR) to create dynamic environments where digital content interacts seamlessly with the real world or entirely replaces it. At its core, XR alters our perception of reality by integrating computer-generated sensory inputs such as visuals, audio, and haptic feedback. This fusion enables users to interact with digital content in ways previously unimaginable, fostering new avenues for entertainment, education, communication, and productivity. Applications of Extended Reality span various industries, including gaming, healthcare, education, architecture, retail, and manufacturing. From immersive gaming experiences to virtual training simulations and remote collaboration tools, XR technologies are revolutionizing how we interact with digital content and each other.

LITERATURE REVIEW

Alice, Canto, et al (2021) made a study on Social Virtual Reality (VR) applications enable real-time interpersonal conversation and allow users to perform activities together. Students from Germany and the Netherlands engaged in High-immersion VR (HiVR) virtual exchange sessions, using Spanish as a lingua franca at A2 level. International dyads carried out four interaction tasks in Alt space VR, using head-mounted devices. To examine students' HiVR virtual exchange experiences, different sources of data were gathered: questionnaires, reflection diaries, recordings, and focus group interviews. The preliminary result is based on the survey and reflection journals and this might enhance engagement and lower anxiety levels.

Eleni, Stavroulia, et al (2020) made a study on differences between two dimensional and three-dimensional geometric shapes among primary school student. we investigate the potential of using virtual and augmented reality technologies for teaching the lesson of geometric solids to primary school children. As part of the study 30 fourth, fifth and sixth class primary school students were divided into three groups that include a control group and two experimental groups. The first and second experimental groups used dedicated virtual and augmented reality applications to learn about geometric solids, The results indicate that the implementation of new technologies in education of virtual and augmented reality improve interactivity and student interest in mathematics education, contributing to more efficient learning and understanding of mathematical concepts when compared to traditional teaching methods. No significant difference was found

between virtual and augmented reality technologies with regard to the efficiency of the methods that contribute to the learning of mathematics, suggesting that both virtual and augmented reality display similar potential for educational activities in Mathematics.

Iskrenovic-Momcilovic, Olivera (2020) investigated the effectiveness of Scratch's application in mathematics, in the study of basic geometric shapes. The analysis has shown that there is a statistically significant difference in achievement among students who have learned the basics of geometry based on the perception and recognition of geometric shapes on models and bodies and those who have used the programs implemented in Scratch. Scratch is a tool for initial learning of programming, but also for creating educational and entertainment content, making mathematical and scientific projects, simulating and visualizing experiments. The results obtained are in a positive correlation with the students' overall school performance and show that there are no differences in achievement between boys and girls. Scratch is an environment that has allowed mathematics to become more interesting and interesting to students.

Fombona-Pascual, Alba, et al (2022) made a study on Atomic/molecular visualization for human sight is usually generated by a software that reproduces a 3D reality on a 2D screen. Although Virtual Reality (VR) software was originally developed for the gaming industry, now it is used in academia for chemistry teaching. This work reviews the scientific literature on 3D visualization in stereoscopic vision, the VR. VR has the capability to simulate reality since we do not observe these real particles, but it reproduces their shapes and movements digitally. The aim of this study is to present the applications of this technology and to show the function of VR in the field of chemistry and the potential for implementation of VR in research and educational settings. The review is based on 219 articles and meeting papers, between 2018 and 2020, obtained from Web of Science (W.S). A series of registers from the W.S repository was analysed and assigned to three groups, an analysis of 2D support software, analysis of research on Virtual Reality (VR), and research on Virtual Laboratories (VL). Finally, the article compares the main features and the learning outcomes of the VRL and the traditional laboratory.

OBJECTIVES OF THE STUDY

1. To find out the significant difference between Experimental Group pre test and post test scores in the criterion test.
2. To find out the significant difference between Control Group pre test and post test scores.
3. To find out the significant difference between Control Group pre test scores and Experimental Group pre test scores
4. To find out the significant difference between Control Group post test scores and Experimental Group Post test scores.
5. To find out the significant difference between the Post test scores of Experimental Group II and Control Group II.
6. To find out the significant difference between the Post test score of Control Group I and Control Group II.
7. To find out the significant difference between Control Group I Pre test and Control Group II Post test scores.
8. To find out the significant difference between the Post test scores of Experimental Group I and Experimental Group II .

HYPOTHESES OF THE STUDY

1. There is no significant difference between Experimental Group pre test and post test score in the criterion test.
2. There is no significant difference between Control Group pre test score and post test scores in the criterion test.
3. There is no significant difference between Control Group pre-test scores and Experimental Group pre test scores.
4. There is no significant difference between Control Group post test scores and the Experimental Group Post test scores.
5. There is no significant difference between Experimental Group II Post test and Control Group II Post test scores.
6. There is no significant difference between Control Group I Post test and Control Group II Post test scores.
7. There is no significant difference between Control Group I Pre test and Control Group II Post test scores.
8. There is no significant difference between Experimental Group I Post test and Experimental Group II Post test scores.

METHODOLOGY

The design selected for the present study is Solomon four group design. The design of the study has the following structure.

TABLE 1.0- Design of the Study

GROUP	EXPT	PRE TEST	POST TEST
EG1	Given	Yes	Yes
CG1	Given	Yes	Yes
EG2	Given	No	Yes
CG2	Given	No	Yes

EG- Experimental group CG-Control Group

The Researcher has selected 2 groups of students, control group and the experimental group.

The pre test and post test were given to Control Group 1 and only post test was given to Control Group 2. They were taught using Traditional learning method.

The pre test and post test were given to Experimental Group 1 and only post test was given to Experimental Group 2 . They were taught using Extended Reality.

VARIABLES OF THE STUDY

1. Learning the concept 'Visualizing solid shapes' through Extended reality.
2.Criterion test for 'Visualizing solid shapes'.

TOOLS USED IN THE STUDY

1. Criterion test on the 'Visualizing solid shapes' constructed and validated by the researcher S.Vijayasanthi, with the help of the research supervisor Dr. V. Sharmila, (2023).
2. The stimulus material used is Extended Reality developed and validated by the researcher S.Vijayasanthi, with the help of the research supervisor Dr.V. Sharmila, (2023).

HYPOTHESIS-1

There is no significant difference between Experimental Group pre test and post test scores in the Criterion test.

TABLE 1.1 N, MEAN AND STANDARD DEVIATION VALUES OF EXPERIMENTAL GROUP PRE TEST AND POST TEST SCORES

Variables	N	Mean	S.D	't'	Significance
Experimental Group Pre test scores	**12**	**26.16**	**3.66**	**10.06**	Significant for the df of 11 at 0.05 level (1.79)
Experimental Group Post test scores	**12**	**33.91**	**3.52**		

It is evident from the above table that the 't' value found out is 10.06. It is higher than the critical value of 1.79 and it is significant at 0.05 level. Hence, it is concluded that there exists significant difference between the pre test and post test scores of experimental group. The mean value of the post test (33.91) scores of experimental group is higher than the mean value of pre test (26.16) scores of experimental group. The experimental group has performed well after the experiment. So, the null hypothesis stated is rejected. It can be interpreted that the student learnt Visualizing solid shapes through Extended Reality scored higher marks in their post test compared to their pre test scores. Thus there is a significant difference between Experimental group Pretest scores and Post test scores.

HYPOTHESIS - 2

There is no significant difference between Control Group pre test scores and post test scores.

TABLE 1.2 N, MEAN AND STANDARD DEVIATION VALUES OF CONTROL GROUP PRE TEST AND POST TEST SCORES.

Variables	N	Mean	S.D	't'	Significance
Control Group Pre test scores	**12**	**24.91**	**3.08**	**8.84**	Significant for the df of 11 at 0.05 level (1.79)
Control Group Post test scores	**12**	**26.75**	**3.16**		

It is evident from the above table that the 't' value found out is 8.84. It is higher than the critical value of 1.79 and it is significant at 0.05 level. Hence, it can be concluded that there exists significant difference between the pre test and post test scores of control group . The mean value of the post test (26.75) scores of control group is higher than the mean value of pre test (24.91) scores of control group. So, the null hypothesis stated is rejected. It is concluded that the students who were taught Visualizing solid shapes through traditional method

scored high marks in their post test than their pre test scores. Thus there is a significant difference between Control group Pre test scores and Post test scores.

HYPOTHESIS-3

There is no significant difference between the Pre test scores of Experimental Group and Control Group.

TABLE 1.3 N, MEAN AND STANDARD DEVIATION VALUES OF EXPERIMENTAL PRE TEST AND CONTROL GROUP PRE TEST

Variables	N	Mean	S.D	't'	Significance
Control Group Pre test scores	**12**	**24.91**	**3.08**	**1.23**	Not Significant
Experimental Group Pre test scores	**12**	**26.16**	**3.66**		

It is evident from the above table that the 't' value found is 1.32. It is lower than the critical value of 1.71 at 0.05 level. It is not significant. Hence, it can be concluded that there is no significant difference between the experimental group and control group in their pre test scores. So, the Null hypothesis stated is accepted. Thus There is no significant difference between Experimental Group and Control Group in their Pre test scores..

HYPOTHESIS-4

There is no significant difference between the Post test scores of Experimental Group and Control Group.

TABLE 1.4 N, MEAN AND STANDARD DEVIATION VALUES OF EXPERIMENTAL GROUP POST TEST SCORES AND CONTROL GROUP POST TEST SCORES

Variables	N	Mean	S.D	't'	Significance
Control Group Post test scores	**12**	**26.75**	**3.16**	**5.23**	Significant for the df of 11 at 0.05 level (1.79)
Experimental Group Post test scores	**12**	**33.91**	3.52		

It is evident from the above table that the 't' value found is 5.23. It is higher than the critical value of 1.79 and it is significant at 0.05 level. It is significant. Hence, it can be concluded that there exists significant difference between the experimental group and control group in their post test scores. The mean value of the post test (33.91) scores of experimental group is higher than the mean value of post test (26.75) scores of control group. So, the null hypothesis stated is rejected. The students belong to the experimental group excelled in their post test scores than their control group. It is evident that the experimental group students can understand the Visualizing solid shapes through Extended Reality very clear than their counter parts. Thus there is a significant difference between Experimental Group post test scores and Control Group Post test scores.

HYPOTHESIS-5

There is no significant difference between the Post test scores of Experimental Group 2 and Control Group 2.

TABLE 1.5 N, MEAN AND STANDARD DEVIATION VALUES OF EXPERIMENTAL GROUP 2 AND CONTROL GROUP 2 POST TEST SCORES

Variables	N	Mean	S.D	't'	Significance
Control Group 2 Post test scores	**11**	**23.36**	**2.9**	**8.05**	Significant for the df of 11 at 0.05 level (1.79)
Experimental Group 2 Post test scores	**11**	**25.72**	2.45		

It is evident from the above table that the 't' value found is 8.05. It is higher than the critical value of 1.79 and it is significant at 0.05 level. Hence, it can be concluded that there exists significant difference between the experimental group 2 and control group 2 in their post test scores. The mean value of the post test (23.36) scores of experimental group is higher than the mean value of post test (25.84) scores of control group. So, the null hypothesis stated is rejected. The students belong to the experimental group excelled in their post test scores than their control group. Thus there is a significant difference between Experimental Group post test scores and Control Group Post test scores.

HYPOTHESIS-6

There is no significant difference between Control Group 1 post test scores and Control Group 2 Post test scores.

TABLE 1.6 N, MEAN AND STANDARD DEVIATION VALUES OF CONTROL GROUP 1 AND CONTROL GROUP 2 POST TEST SCORES

Variables	N	Mean	S.D	't'	Significance
Control Group 1 Post test scores	**12**	**27.27**	**2.72**	**1.233**	**Not Significant**
Control Group 2 Post test scores	**11**	**25.72**	2.45		

It is evident from the above table that the 't' value found is 1.23. It is lower than the critical value of 1.812 at 0.05 level. It is not significant. Hence, it can be concluded that there is no significant difference between the Control group 1 and control group 2 in their post test scores. So, the Null hypothesis stated is accepted. Thus There is no significant difference between Control Group 1 and Control Group 2 in their Post test scores..

HYPOTHESIS-7

There is no significant difference between Control Group1 Pre test score and Control Group 2 Post test scores.

TABLE 1.7 N, MEAN AND STANDARD DEVIATION VALUES OF CONTROL GROUP 1 PRE TEST SCORES AND CONTROL GROUP 2 POST TEST SCORES

Variables	N	Mean	S.D	't'	Significance
Control Group 1 Pre test scores	**12**	**25.45**	**2.58**	**1.9**	Significant for the df of 10 at 0.05 level (1.81)
Control Group 2 Post test scores	**11**	**25.72**	**2.45**		

It is evident from the above table that the 't' value found is 1.9. It is higher than the critical value of 1.81 and it is significant at 0.05 level. Hence, it can be concluded that there exists significant difference between the control group 1pre test scores and control group 2 post test scores. The mean value of the post test (25.72) scores of control group 1 post test scores is higher than the mean value of pre test (25.84) scores of control group 1. So, the null hypothesis stated is rejected. The students belong to the control group 2 excelled in their post test scores than the control group 1. Thus there is a significant difference between control Group 1 pre test scores and Control Group 2 Post test scores.

HYPOTHESIS-8

There is no significant difference between the post test scores of Experimental Group 1 and Experimental Group 2.

TABLE 1.8 N, MEAN AND STANDARD DEVIATION VALUES OF EXPERIMENTAL GROUP 1 AND EXPERIMENTAL GROUP 2 POST TEST SCORES

Variables	N	Mean	S.D	't'	Significance
Experimental Group 1 Post test scores	**12**	**33.9**	**3.7**	**0.315**	**Not Significant**
Experimental Group 2 Post test scores	**11**	**26.75**	**3.16**		

It is evident from the above table that the 't' value found is 0.315. It is lower than the critical value of 1.81 at 0.05 level. It is not significant. Hence, it can be concluded that there is no significant difference between the Experimental group 1 and Experimental group 2 post test scores. So, the Null hypothesis stated is accepted. Thus There is no significant difference between Experimental Group 1 and Experimental Group 2 Post test scores..

Table 1.5 Effectiveness of Extended Reality among VIII Standard boys Students

VARIABLES	SIGNIFICANCE	REMARKS
Pre test scores and Post test scores of Experimental Group 1	Significant	Experimental Group post test scores > Experimental Group pre test scores
Pre test and Post test scores of Control group 1	Significant	Control group post test scores > Control group pre test scores
Pre test scores of experimental group 1 and control group 1	Not Significant	Experimental group Pre test scores = Control group pre test scores
Post test scores of experimental group 1and control group 2	Significant	Experimental Group post test scores > Control Group post test scores

Post test scores of experimental group 2 and Control group 2	Significant	Experimental Group 2 post test scores > Control Group 2 post test scores
Post test scores of control group 1 and Control group 2	Not Significant	Control group 1post test scores = Control group 2 post test scores
Control group 1 pre test scores and control group 2 post test cores	Significant	Control group 2 post test scores > Control group 1 pre test scores
Post test scores of experimental group 1 and experimental group 2	Not Significant	Experimental Group 1 post test scores = Experimental Group 2 post test scores

CONCLUSION

The study reveals that VIII standard boys students in experimental group who have studied the visualizing solid shapes through extended reality excelled in their post test scores than their counter parts who studied the Visualizing solid shapes through traditional learning. It is concluded that the extended reality is highly effective for Visualizing solid shapes among VIII standard boy students. This elucidate that the Extended reality is more effective tool for teaching solid shapes in mathematics to VIII standard students.

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