



An Impact of Teaching through Virtual Reality Based Multimedia Package on Achievement in Chemistry Subject of Students of Standard-XI

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Abstract:

Virtual reality is becoming increasingly important as a learning tool in the school as well as in university. Recent research has investigated the use of an Immerse a Desk in an effort to teach students to better understand concepts that do not fit with their pre-existing conceptualizations by guiding them through a series of exercises that confront their pre-existing knowledge with alternative ideas. For example, young students are quick to disbelieve their teachers when they are told that the atoms or molecules are spherical. For most young students, the molecule is simply flat 2d picture of text book, and they do not have the cognitive capacity, nor the conceptual firepower, to make the leap from what they see and experience (a flat picture of molecule) to what they do not see. For this reason, charting the strengths and limits of virtual reality is vital for educational technology. In this research, researcher has constructed software in chemistry subject on the basis of virtual reality in a unit of chemistry subject of standard 11th and examined the effect on the achievement of students' chemistry subject.

Keywords: *Achievement, Educational technology Virtual reality, Multimedia package*

1. Introduction

Today in every field technological revolution takes place. Scientific inventions modernized every field like medical, agriculture, management and education. Education field is also inspired by modernization. There are many teaching methods invented in educational field like demonstration method, programmed learning method, experimental method, conceptual education, multimedia method, etc. Every method is useful though there are some limitations in each method. Specially while teaching micro physics or chemistry, concepts of atom, its particles like electron, proton neutron, atomic and molecular orbital's are unable to explain through charts, drawings or models. The pictures are two dimensional, so physical structure of atom, molecule and its orbital's could not be explained properly. By virtual reality this limitation can be removed almost, so students can understand these concepts easily. Educating children now and in the future to live in an information society is critical. There is also a need to provide life-long education for all citizens and to support a flexible workplace. VR (virtual reality) technology has been widely proposed as a major technological advance that has potential to support for such education. There are several ways in which VR technology is expected to assist learning. Most importantly it allows students to visualize abstract concepts, to observe events at atomic or planetary scales, and to visit environments and interact with events that distance, time, or safety factor make unavailable. The types of activities supported by this technology promote current educational thinking that students are better able to master, retain, and generalize new knowledge when they are actively involved in constructing that knowledge in a hand on learning environment.

2. Introduction to Multimedia Package

The researcher has created a multimedia package based on virtual reality for a unit called "Hydrocarbons" in chemistry subject of standard 11th. In this multimedia package researcher has created virtual classroom environment, videos, 3d applications, materials, tests, a whole detailed periodical table, a dictionary containing definitions of difficult words and a small search engine to search a specific content. The package containing a whole self learning material through which students can learn themselves. Basically it was the self learning type multimedia package, but researcher also has to check the effectiveness of package when it is used as teaching material. So it is a comparative study between effect of this virtual reality based multimedia package used as a learning material and teaching material on achievement in chemistry of students of standard XI. A short explanation of different parts of this multimedia package is given below.



To create a virtual class room environment researcher used some 3d software like Autodesk Maya, Autodesk 3ds max, Google Sketch up, etc. By using these software researcher has created a high tech virtual class room containing furniture, digital screens as shown in picture 1.

Picture 1
Virtual Classroom Environment

2.1 Chroma Keyed Video

Chroma key is a special technique use in animation. By this technique the background of any video of green or blue color can be deleted. In this technique researcher first captured a video of him teaching students in front of green or blue screen and then the background was deleted using chroma key technique. This video is called chroma keyed video. Then this video is inserted in virtual classroom created in 3d software. By combination of virtual classroom and chroma keyed videos, high tech class room environment was evolved.

2.2 Control Panel

Control panel contains some buttons of different applications like 3d mouse interactive molecules, tests, materials (notes), search engine, etc. By using these buttons you can open different applications created by researcher as mentioned above.

2.3 Other Features

- **Mouse interactive 3d molecules:** The most important application of this software is mouse interactive 3d molecules. Researcher has created more than hundred 3d molecules in flash based application. In this application a 3d molecule is seen on the screen. The learner can interact with 3d molecule using mouse. The molecule can be zoomed, panned or rotated by using different buttons of mouse.
- **Self Evaluation Tests:** By clicking button of this application a test containing MCQ based questions opens. Researcher created a question bank of 188 questions. The application is made in such a way that the question shown randomly each time. The order of questions and order of responses also changed. After completing the test result generated itself in which total numbers of questions, total true responses, total false responses, percentage, date and time of test seen on the screen. The learner can take a printout of result by clicking 'Print' button.

- **Printed Materials:** The researcher has created a detailed material of content and embedded in .pdf format. The learner can read and printout the material.
- **Search Engine:** The researcher has created a small application known as search engine. If learner wants to go direct any specific topic by typing a single word, she/he can use this application. After typing a specific word in this application and clicking search button the shortcuts of windows containing topics related to that word are created and by clicking these shortcuts the learner can directly reach to the specific topic. So it is very useful application for those who want to learn a specific topic either whole chapter.
- **Periodical Table:** In this application the detailed information about all elements are given. By clicking specific element the window containing the whole information about specific element opens. In this window the information about the inventor of element, physical and chemical properties of element and electronic configuration of elements are given.
- **Dictionary:** In this application all terminology of the chapter, its' meaning and definition are given. It is also a search engine. By typing a difficult word the learner will directly reach to the information about that specific word.

So, at last the researcher tried to create a perfect learning material by which learners can learn and evaluate them perfectly.

3. Objectives of Study

1. To study the effect of virtual reality based multimedia package on achievement in chemistry of students of group 1.
2. To study the effect of virtual reality based multimedia package on achievement in chemistry of students of group 2.
3. To compare the effect of virtual reality based multimedia package on achievement in chemistry of students of group 1 and group 2.

4. Hypothesis

There will be no significant difference between mean score of achievement test of students of Experimental group 1 and group 2.

5. Delimitations of Study

1. The present study was conducted in a Gujarati medium school of Ahmedabad city.
2. The students of standard XI from science stream were involved in this study.

6. Significance of Study

The researcher has created a virtual reality based multimedia package in chemistry subject of standard XI. To create this package researcher has used the latest techniques. So the software is ultramodern. In every field the latest technologies are used to develop the field. The latest technologies can be used in education field to improve teaching learning process. In education field to create high-tech software that can help teacher and students to improve teaching learning process a teacher must involve with the process of software creation. It is not easy. Because to create high tech virtual reality based learning material one should have both the knowledge of computer and subject deeply. Generally teacher has subject related knowledge but lack in computer knowledge. At other end an IT professional does not have enough knowledge in subject. Here researcher is very familiar with knowledge in chemistry subject because he is M.Sc. with chemistry. He acquired enough knowledge of computer spending his valuable 2.5 years after different application of computer. After hard work researcher created a high-tech virtual reality based teaching learning material. Now it is time to check the effect of this material

on the achievement of students of standard 11. So researcher conducted this research.

7. Sample of Study

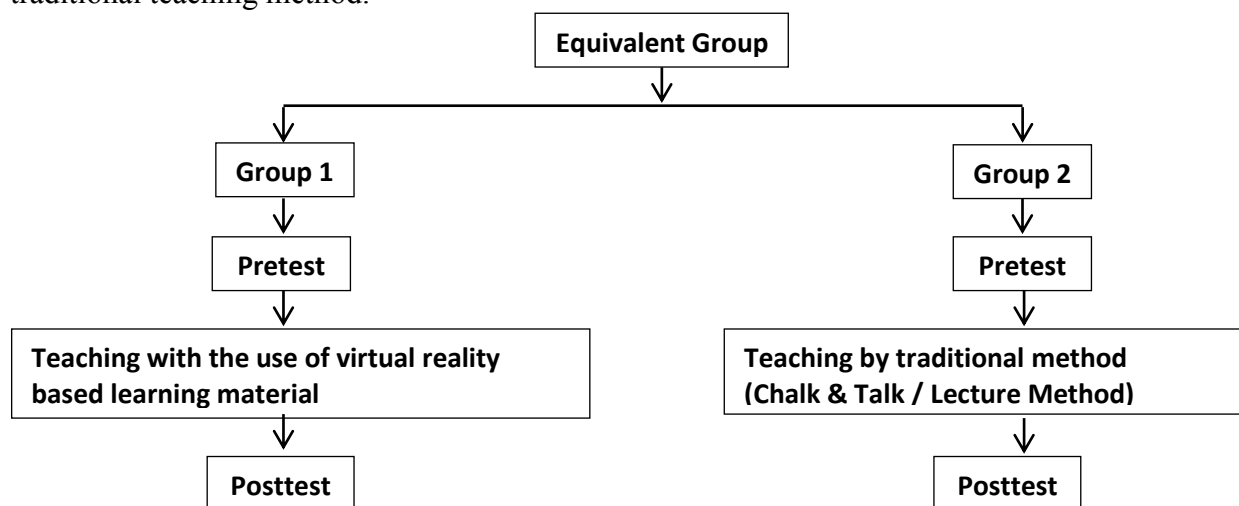
The researcher randomly selected 80 students out of 188 and conducted a chain of tests to check homogeneity of sample. Then researcher distributed 80 students in two equivalent groups of 40 students in each group.

8. Method of Study

The researcher had to check effect of new teaching method, so he has selected experimental method for study.

9. Experimental Design

Pretest- Posttest equivalent group experimental design was selected by researcher to conduct this study. Both the groups were given pretest before experiment and a posttest after experiment. Group 1 was treated with reality based multimedia package as a teaching material and researcher explain all contents of chemistry subject with the use of this package. Group 2 was treated with traditional teaching method.



10. Collection of Data

The researcher administrated pretest before conducted experiment, and posttest after conducted experiment.

11. Data Analysis

To analyze the data different statistical methods were used by researcher.

1. To check the normality of sample mean, median, mode, kurtosis and skewness of sample were calculated.
2. To check homogeneity of variance of sample Bartlett's test and Kolmogorov-Smirnov test were performed by researcher.
3. To check equivalency between two groups t-test was performed.
4. To prove hypothesis ANCOVA was performed by researcher.

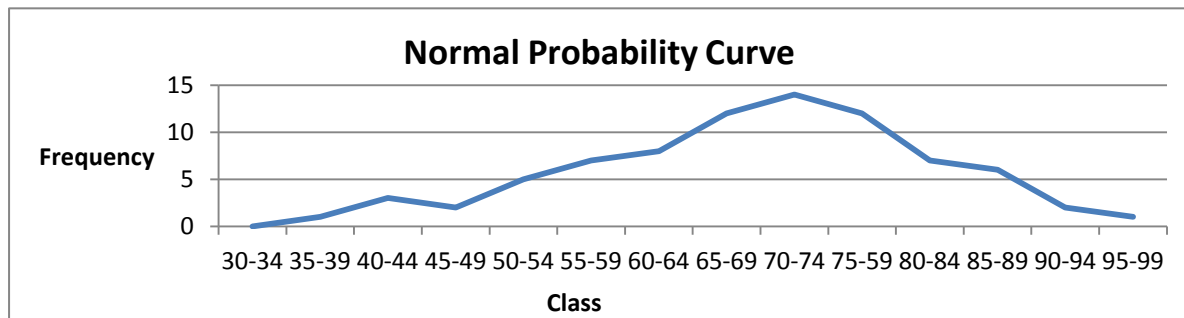
12. Results

To perform different types of tests Microsoft Excel program was used. The results of different tests are as in table 1.

Table 1
Frequency distribution of sample

Class	Med value	Frequency
30-34	32	0
35-39	37	1
40-44	42	3
45-49	47	2
50-54	52	5
55-59	57	7
60-64	62	8
65-69	67	12
70-74	72	14
75-59	77	12
80-84	82	7
85-89	87	6
90-94	92	2
95-99	97	1

Graph 1
Normal Distribution of Sample



The shape of above histogram seems approximately bell shape. So we can say that the sample selected by researcher is normally distributed. The following results calculated by data also support the normality of sample distribution.

Table 2
Values of Mean, Median, Mode, Kurtosis and Skewness

Character	Value
Mean	68.78
Median	70
Mode	70
Kurtosis	-0.23244
Skewness	-0.38488

The mean, median and mode are approximately same. The value of Kurtosis is -0.23244 which is very near to zero. The value of skewness is -0.38488 which is also near to zero. So from the value of kurtosis and skewness we can say that the sample is normally distributed.

1. Testing of homogeneity of variance between groups

- Result of Bartlett's test

Table 3
Results of Bartlett's test

N-K	K-1 (df)	V	Table Value (X^2)	
			0.05	0.01
78	1	0.595	3.841	6.635

From above result, the calculated value of V is 0.595. For $df_1 = 1$ the calculated value of V is lower than the table value at both the levels 0.05 and 0.01. Therefore it said that the variances between two groups are homogenous.

- Result of Kolmogorov-Smirnov test

Table 4
Results of Kolmogorov-Smirnov test

N1	N2	K _D	Table Value (L)	
			0.05	0.01
40	40	1	13	13

According to result the value of K_D is 1 which is less than table value at both the levels 0.05 and 0.01. Therefore it is said that the variance between experimental group 1 and experimental group 2 are equal.

2. Testing of equivalency between groups

To check equivalency between groups t-test was performed. The results of t-test are as below.

Table 5
Results of t-test

Group	N	M	SD	SED	t	Remark
1	40	68.825	13.28	2.93	0.06	NS
2	40	68.65	12.54			

df	0.05	0.01
78	1.99	2.64

From above table it seems that the calculated value of t is 0.06. For df = 78 table value of t are 1.99 at 0.05 level and 2.64 at 0.01 level. Therefore calculated value of t is smaller than table value at both the levels. So it is concluded that two groups are equivalent according to their educational achievement.

13. Testing of Hypothesis

To check hypothesis ANCOVA is performed in which marks of pretest and posttest are used. The results of ANCOVA are as below.

H₀₁ There will not be any significant difference between the mean score in posttest of students of experimental group 1 and experimental group 2

Table 7
Details of N, Σx, Mean, SD

Students	Exp - 1			Exp -2		
	X ₁	Y ₁	X ₁ Y ₁	X ₂	Y ₂	X ₂ Y ₂
N	40	40	40	40	40	40
ΣX	2753	3142	221270	2746	2832	199796
Mean	68.825	78.55	5531.75	68.65	70.8	4994.9
SD	13.452	11.476	1775.45	12.70887	11.835	1680.268

According to above results the values of mean and standard deviation of experimental group 1 for pretest are 68.83 and 13.45 respectively. While mean and standard deviation of the same group for posttest are 78.55 and 11.48 respectively. The values of mean and standard deviation of experimental group 2 for pretest are 68.65 and 12.71 respectively. While mean and standard deviation of the same group for posttest are 70.8 and 11.84 respectively. So it is concluded that the effect of experiment on experimental group 1 is more positive than controlled group 2.

Table 8
Results of ANCOVA

Variable	SS _x	SS _y	SS _{xy}	df	SS _{yx}	MS _{yx}	F	Conclusion
SS _{bt}	0.6125	1201.3	27.125	1	1159.32	1159.32	35.722	**
SS _{wg}	13357	10598	10401.05	77	2498.96	32.4541		
SS _t	13357	11800	10428.18	78	3658.29			

According to above table the calculated value of F is 35.72. For degree of freedom $df_1 = 1$ and $df_2 = 77$ the table value of F at 0.05 level and 0.01 level are 3.96 and 6.96 respectively. So the calculated value of F is higher than table value for both the levels. Therefore it is concluded that the above null hypothesis is rejected and there is significant difference between the achievement of students of experimental group 1 and controlled group 2. The achievement of experimental group 1 is higher than the achievement of controlled group 2.

14. Conclusions

1. So from above analysis it is concluded that effect of virtual reality based multimedia package is much more on achievement of group 1 students who are treated with this package.
2. The achievement of group 2 students who are treated with traditional teaching method is less than group 1.
3. From above two conclusions it is said that the effect of virtual reality based multimedia package on achievement of students is very high than traditional teaching method.

References

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