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Teacher-Assisted multimedia instructional package-An inevitable modus to enhance retention capacity of secondary school students

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Abstract
The study purported to develop a Teacher-Assisted Multimedia Instructional Package in Physics and to test its effectiveness in enhancing Retention Capacity of Secondary School Students of Kerala. Further, this effectiveness was to be compared with that of the Activity Oriented Method of Instruction. The Quasi Experimental Method with the Pre-Test Post-Test Non Equivalent Groups Design was found to be suitable for the study. The Teacher-Assisted Multimedia Instructional Package and the Activity Oriented Method of Instruction were the independent variables while the Retention Capacity was the dependent variable of the study. The experiment was conducted on a sample of 400 Secondary School Students of Kerala with 200 each in the Experimental and Control Groups. The results of the study showed that the Teacher-Assisted Multimedia Instructional Package in Physics is more effective than the Activity Oriented Method of Instruction in enhancing Retention Capacity of the Students.

Keywords: Multimedia, Retention Capacity, Instructional Package

1. Introduction

Education makes our life progressive, cultured and civilized. Science is an inseparable part of modern life. It is viewed by common man as a body of scientific information. The conventional teaching methods do not meet up to the intellectual, psychological and emotional needs of the students and are insufficient to actively involve students in studying Science. The methods of teaching need a radical change and it should be more student-centered. Modern instructional strategies provide divergent thinking that facilitates better learning and longer retention. Due to the rapid expansiveness of technology and its wide array of uses, the incorporation of technology in learning has become a viable and inexpensive option.

Multimedia is becoming popular in all spheres of learning. The challenge for educators is to determine the appropriateness of multimedia use and ensure its success in the classroom. In the classroom, Multimedia should be used as a tool rather than as a novelty. Multimedia has an undisputed place but certainly will not replace good teaching. Schools are perhaps the best places for tapping the potentials of multimedia. Many educators perceive multimedia as a panacea to all educational woes. Lots of new technologies are emerging in the field of teaching Physics, with ongoing research in teaching Physics using Multimedia. The role of Multimedia is also evident in the documentation of Physics practices. Most of the teachers practice traditional methods for teaching Physics. Since the classrooms are crowded, the teachers are unable to capture the attention of the students. Consequently, the percentage of marks and percentage of passes in a year, with regard to Physics, is obviously poor. Interactive Multimedia is an answer to this situation.

Physics is a subject that gives meaning to nature and natural phenomena. It is essential that students be taught in the natural set up. Though the traditional method of teaching helps to some extent, Multimedia is capable of motivating students towards self-achievement. For example, when the concept of waves and oscillation is to be taught, Multimedia animation comes in handy. When the concept of relativity and mass energy relation is explained, graphics and animation are useful in driving home the idea of natural phenomena in a clear cut way. In electronics, it is not known in which direction the flow of electronic current is made, but this could be clearly conveyed using Multimedia.

2. Need & Significance of the Study

Multimedia is a popular technology that serves as a communication facilitator; it also serves as an instructional delivery medium. The conception of the Multimedia as a learning environment is instantiated in varied forms, from online versions of traditional computer assisted instruction to innovative individual and group virtual – learning modes. When multimedia is used effectively, it can fascinate an audience, tug emotions, maintain attention, and contextualize scenario-based learning. The multimedia can stimulate more than one sense at a time which is crucial for maintaining concentration of students. Use of multimedia in learning enhances attention getting and attention holding of students and it encourages deep reflective thinking and retention capacity of them.

Teacher-Assisted Multimedia Instruction is a powerful interaction medium that enables students to communicate with peers, teachers, and experts and conduct collaborative work (Mioduser, 2000) [13]. Teacher-Assisted Classroom Instruction is a method in which the teacher will contact the suitable web site and collect more and recent information related to a topic and use it in the classroom teaching. Abstract ideas can be explained easily with 3D pictures, animation and Multimedia.

Many studies have concluded that Multimedia can improve the quality of achievement in many areas. Multimedia based instruction is effective for improving achievement in Science among primary school students (Krishnan, 2013) [9]. Most of the Multimedia programmes for educational purpose create situations such that Students can interpret information for their own understanding (Kumar and Hebtemariam, 2010) [11]. The results of the study conducted by Kumar and Devika (2008) [12] shows that the Multimedia Learning Instructional Package in Social Science is very helpful in improving the achievement of the students. These results point to the fact that Multimedia has high significance and immense prospects in shaping the Retention Capacity of students in the field of Science education. Retention Capacity is the power of the students to remember or retain what they have learned in the class room. Proper development of Instructional Package in Physics can be ensured by making students feel that Multimedia is an important object of instruction. This can be done only by means of an effective method of Instruction. A Multimedia Instructional Package is bound to have profound influence on the Retention Capacity of students. Further, it could foster and motivate the students towards learning the subject.

The Investigators, both having long innings in the field of Teaching, felt that several researchers have developed various instructional strategies in Physics for Secondary School Students, but none was found that could enhance Retention Capacity. So it was decided to develop a Teacher-Assisted Multimedia Instructional Package to enhance Retention Capacity of Secondary School Students. In the present study, a Teacher-Assisted Multimedia Instructional Package in Physics for Secondary School Students was developed and its effectiveness tested in enhancing the Retention Capacity of Secondary School Students of Kerala.

3. Hypothesis of the Study

It was hypothesised that the Teacher-Assisted Multimedia Instructional Package will be significantly more effective than the Activity Oriented Method of Instruction in enhancing Retention Capacity of Secondary School Students for the Total sample.

4. Objective of the Study

The objective of the study was to compare the effectiveness of the Teacher-Assisted Multimedia Instructional Package and that of the Activity Oriented Method of Instruction in enhancing Retention Capacity among Secondary School Students for the Total sample.

5. Methodology in Brief

The Quasi Experimental Method with the Pre-Test Post-Test Non Equivalent Groups Design was adopted for the present study. The Teacher-Assisted Multimedia Instructional Package and the Activity Oriented Method of Instruction were the independent variables while Retention Capacity was the dependent variable of the study. Experimental verification was imperative to determine the effectiveness of the Teacher-Assisted Multimedia Instructional Package over the Activity Oriented Method of Instruction on Retention Capacity of Secondary School Students.

Random Sampling Technique was employed for gathering data giving due representation to Gender of students. The total sample comprised 400 Secondary School Students, with 200 each in the groups randomly assigned as the Experimental and Control Groups, from schools in Thrissur and Ernakulam Districts of Kerala.

The materials used for the experiment were:

1. Teacher-Assisted Multimedia Instructional Package(Jaise and Murali, 2011)
2. Lesson Plans based on Activity Oriented Method of Instruction (Jaise and Murali, 2011)

They were developed from three Units of the Physics Textbook of Standard VIII, viz. Magnetism, Static Electricity and Celestial Sights.

The tools used for the study were:

1. Evaluation Pro forma for Validating the Teacher-Assisted Multimedia Instructional Package (Jaise and Murali, 2011)
2. Comprehensive Test of Process Skills in Physics (Jaise and Murali, 2011)
3. Test on Retention of Process Skills in Physics (Jaise and Murali, 2011)

The Evaluation Pro forma was used for validating the Teacher-Assisted Multimedia Instructional Package. The Comprehensive Test of Process Skills in Physics was initially administered to the Experimental and Control Groups in order to assess the level of Process Skills of Secondary School Students. The scores obtained were taken as the Pre-Test scores. The Experimental Group was exposed to the Teacher-Assisted Multimedia Instructional Package while the Control Group was exposed to the Activity Oriented Method of Instruction. After experimental treatment, the Comprehensive Test of Process Skills in Physics was again administered on both Experimental and Control Groups. The scores obtained thus were considered as Post-Test scores.

Three weeks after the Post-Test on Process Skills in Physics, a 'Test on Retention of Process Skills in Physics' (TRPSP) was administered. The TRPSP scores of students in the Experimental and Control Groups were tabulated and analysed using statistical techniques like Arithmetic Mean, Standard Deviation and Critical Ratio (Test of Significant Difference between Means).

6. Findings and Discussions of Results

A comparison was made of the effectiveness of the Teacher-Assisted Multimedia Instructional Package and the Activity Oriented Method of Instruction on the Retention Capacity of Secondary School Students for the Total Sample and the analysis is presented in two parts, viz.

A. Comparison of the scores of Post-Test on Process Skills in Physics and Test on Retention of Process Skills in Physics among Secondary School Students in the Experimental Group
B. Comparison of the scores Post-Test on Process Skills in Physics and Test on Retention of Process Skills in Physics among Secondary School Students in the Control Group

The analyses conducted follows.

A. Comparison of Scores of Post-Test on Process Skills in Physics and Test on Retention of Process Skills in

Physics among Secondary School Students in the Experimental Group

The Means and Standard Deviations of the Post-Test scores and the Retention-Test scores of the Experimental Group in each of the eight Basic Process Skills in Physics, five Integrated Process Skills in Physics and the Total Process Skills in Physics were compared. The data and results of the test of significance of difference in the Mean scores were computed and the data are given in Table 1.

Table 1: Data and Results of Test of Significance of the Difference between the Mean Scores of Post- and Retention-Tests for Process Skills in Physics in Experimental Group (N=200)

Process Skills in Physics		Type of Test	M	SD	't' value	P
Basic Process Skills in Physics	Observing	Post-Test	1.85	0.36	1.46	P > 0.05
		TRPSP	1.79	0.45		
	Inferring	Post-Test	2.41	0.51	0.74	P > 0.05
		TRPSP	2.37	0.57		
	Measuring	Post-Test	1.88	0.35	1.55	P > 0.05
		TRPSP	1.82	0.42		
	Communicating	Post-Test	1.49	0.53	1.12	P > 0.05
		TRPSP	1.43	0.54		
	Classifying	Post-Test	2.31	0.58	0.65	P > 0.05
		TRPSP	2.27	0.64		
	Predicting	Post-Test	2.33	0.55	0.84	P > 0.05
		TRPSP	2.28	0.64		
	Using Numbers	Post-Test	1.74	0.44	1.42	P > 0.05
		TRPSP	1.67	0.54		
	Space-Time Relationships	Post-Test	1.69	0.46	1.39	P > 0.05
		TRPSP	1.62	0.53		
Integrated Process Skills in Physics	Controlling Variables	Post-Test	1.12	0.46	0.83	P > 0.05
		TRPSP	1.08	0.50		
	Defining Operationally	Post-Test	1.67	0.55	1.04	P > 0.05
		TRPSP	1.61	0.61		
	Formulating Hypothesis	Post-Test	1.39	0.52	0.93	P > 0.05
		TRPSP	1.34	0.55		
	Interpreting Data	Post-Test	1.09	0.43	1.11	P > 0.05
		TRPSP	1.04	0.47		
	Experimenting	Post-Test	1.52	0.55	0.69	P > 0.05
		TRPSP	1.48	0.61		
Basic Process Skills in Total		Post-Test	15.68	1.29	1.44	P > 0.05
		TRPSP	15.44	1.97		
Integrated Process Skills in Total		Post-Test	6.79	1.07	1.15	P > 0.05
		TRPSP	6.65	1.34		
Total Process Skills in Physics		Post-Test	22.29	1.89	1.39	P > 0.05
		TRPSP	21.89	3.58		

B. Comparison of Scores of Post-Test on Process Skills in Physics and Test on Retention of Process Skills in Physics among Secondary School Students in the Control Group

The Means and Standard Deviations of the Post-Test scores and the Retention-Test scores of the Control Group in each of the eight Basic Process Skills in Physics, five Integrated Process Skills in Physics and the Total Process Skills in Physics were compared. The data and results of the test of significance of difference in the Mean scores were computed and the data are given in Table 2.

Table 2: Data and Results of Test of Significance of the Difference between the Mean Scores of Post- and Retention-Tests for Process Skills in Physics in Control Group (N=200)

Process Skills in Physics		Type of Test	M	SD	't' value	P
Basic Process Skills in Physics	Observing	Post-Test	1.39	0.49	4.26	P < 0.01
		TRPSP	1.13	0.71		
	Inferring	Post-Test	1.64	0.60	4.25	P < 0.01
		TRPSP	1.32	0.88		
	Measuring	Post-Test	1.56	0.51	5.51	P < 0.01
		TRPSP	1.18	0.82		
	Communicating	Post-Test	1.27	0.65	5.14	P < 0.01
		TRPSP	0.89	0.82		
	Classifying	Post-Test	1.56	0.53	2.68	P < 0.01
		TRPSP	1.40	0.66		
	Predicting	Post-Test	1.39	0.54	4.83	P < 0.01
		TRPSP	1.07	0.76		
	Using Numbers	Post-Test	1.56	0.55	6.21	P < 0.01
		TRPSP	1.12	0.84		
	Space-Time Relationships	Post-Test	1.05	0.37	3.04	P < 0.01
		TRPSP	0.92	0.48		
Integrated Process Skills in Physics	Controlling Variables	Post-Test	0.97	0.42	6.95	P < 0.01
		TRPSP	0.63	0.55		
	Defining Operationally	Post-Test	1.44	0.88	3.45	P < 0.01
		TRPSP	1.10	1.08		
	Formulating Hypothesis	Post-Test	1.09	0.48	3.07	P < 0.01
		TRPSP	0.93	0.55		
	Interpreting Data	Post-Test	0.89	0.57	3.84	P < 0.01
		TRPSP	0.66	0.63		
	Experimenting	Post-Test	1.11	0.71	4.16	P < 0.01
		TRPSP	0.80	0.78		
Basic Process Skills in Total		Post-Test	11.39	1.51	4.75	P < 0.01
		TRPSP	9.91	4.15		
Integrated Process Skills in Total		Post-Test	5.47	1.61	2.84	P < 0.01
		TRPSP	4.91	2.28		
Total Process Skills in Physics		Post-Test	16.86	2.39	6.18	P < 0.01
		TRPSP	13.58	7.24		

From Table D, for df 198(Total), $t_{0.01}$=2.60

The obtained't' values are 4.26, 4.25, 5.51, 5.14, 2.68, 4.83, 6.21, 3.04, 6.95, 3.45, 3.07, 3.84 and 4.16 for each of the eight Basic Process Skills in Physics as well as five Integrated Process Skills in Physics and 4.75, 2.84 and 6.18 for Basic Process Skills in Total, Integrated Process Skills in Total and Total Process Skills in Physics respectively, all of which are significant at 0.01 level.

This means that there is significant difference between the Mean Scores of the two Tests. The Mean Scores of the Post-Test are significantly higher than those of the Retention-Test. This indicates that those students who were exposed to the Activity Oriented Method of Instruction were unable to retain their Process Skills in Physics.

The above findings establish the fact that the Teacher-Assisted Multimedia Instructional Package is highly effective in enhancing Retention Capacity of Process Skills in Physics as compared to the Activity Oriented Method of Instruction. The Means of Post-Test scores and Retention-Test scores of the Experimental and Control Groups are depicted in Figure 1.

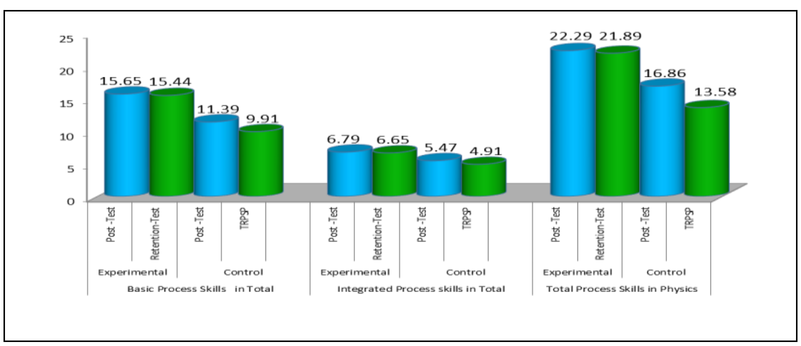

Fig 1: Comparison of Mean Total Scores of Post- and Retention-Tests for Process Skills in Physics in Experimental and Control Groups

Figure 1 shows that the Teacher-Assisted Multimedia Instructional Package has an advantage of helping the students to retain their Process Skills in Physics for a long period. Such an advantage is not obvious in the case of the Activity Oriented Method of Instruction. This gives a clear indication of the effectiveness of the TAMIP over the AOMI for enhancing Process Skills in Physics.

7. Conclusion

The results of the study show that there is excellent Retention of Process Skills in Physics among those Secondary School Students in the Experimental Group. Students who were exposed to the Teacher-Assisted Multimedia Instructional Package have high Retention Capacity as compared to those who were exposed to the Activity Oriented Method of Instruction. Thus, the Multimedia Instructional Package developed for the study is very effective in enhancing Retention of Process Skills in Physics among Secondary School Students. The above findings may be because the Multimedia Instructional Package could have helped the students to understand concrete ideas and derive many solutions for the problems themselves. Also, the Multimedia activities provided in the Package could have helped the students to sustain in memory the learnt matter. Usage of TAMIP has a long term effect in the classroom learning process. It serves to enhance Retention of Process Skills in Physics.

These findings are supported by the research studies of Fulick (2004) [5], George (2006) [6], Strawitz (2006) [16], Abbas (2012), Kesan and Caliskan (2013) [7], Krishnan (2013) [9], Baby (2014) as well as Kulkarni **(**2014**)** [10] and where Retention was seen to be enhanced by using Multimedia.

8. Educational Implications of the Study

The findings of the study have certain educational implications that are outlined below:

- Multimedia Instructional Packages need to be developed so as to help students to develop higher intellectual skills. Such Instructional Packages will help students to be aware of the changes in education arising from technological advances,
- Multimedia Instructional Packages will go a long way in positively influencing the Retention Capacity of the students.
- Digital content that is meaningful, culturally responsive and has high quality must be made available for use of both teachers and students. This will have high prospects for influencing the Retention Capacity of students.
- Facilities must be provided in educational institutions to organise Multimedia classes.
- Multimedia Instructional Packages will help to turn Teacher-centred lessons into Student-centred ones. Such a shift in focus is likely to bring about a vast change in the Retention Capacity of students.
- Multimedia presentations in the classroom will go a long way to tackle classroom management issues.
- Multimedia Instructional Packages led to subjective involvement and rising interest and wish in students.
- Multimedia Instructional Packages caused better perception of textbook contents and hence, better retention capacity of the students.
- Multimedia classes will provide teachers with a platform for sharing the subject matter as well as the scope of the feedback.
- The Teacher-Assisted Multimedia Instructional Package provides a successful platform to convey concepts effectively and help the students to enhance their Retention Capacity. This Package also helps to actively participate in the learning process.
- Secondary School teachers should make conscientious efforts to integrate the use of Innovative Multimedia based instructional strategies in their teaching.
- In service and refresher courses should be organized for Secondary School teachers in order to familiarize them with the new trends and patterns of Multimedia with a view to draw out more involvement of students in studies.

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