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Efficacy of Web Assisted Multimedia Package on the Integrated Process Skill of Interpreting Data in Physics

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ABSTRACT

The study purported to develop a Web Assisted Multimedia Instructional Package in Physics and to test its effectiveness in enhancing Integrated Process Skill of Interpreting Data in Physics of Vocational Higher 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 Web Assisted Multimedia Instructional Package and the Activity Oriented Method of Instruction were the independent variables while the Integrated Process Skill of Interpreting Data in Physics was the dependent variable of the study. The experiment was conducted on a sample of 400 Vocational Higher Vocational Higher Secondary School Students of Kerala with 200 each in the Experimental and Control Groups. The results of the study showed that the Web Assisted Multimedia Instructional Package in Physics is more effective than the Activity Oriented Method of Instruction in enhancing Integrated Process Skill of Interpreting Data in Physics of the Students based on Gender.

Key words: Web Assisted, Multimedia, Integrated Process Skill of Interpreting Data in Physics, Instructional Package

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Introduction

Education today becomes a global phenomenon. Science is an inseparable part of modern life and 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. Multimedia holds greater promise in enhancing learning as well as in improving the quality of education. It is becoming an important part of any classroom. The challenge for educators is to determine the appropriateness of multimedia use and ensure its success in the classroom. In the classroom, 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 has been touted as the preferred medium in revolutionizing education. 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. 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 oscillation is to be taught, Multimedia animation comes in handy. When the concept of Universe is explained, graphics and animation are useful in driving home the idea of natural phenomena in a clear cut way. In electricity, it is not known in which direction the current flows, but this could be clearly conveyed using Multimedia.

Literature Review

Multimedia can enhance and strengthen the impact of activities in the Science class room. It can visually demonstrate scientific ideas and concepts. Multimedia can facilitate the development of Science Process Skills of students, necessary for students to engage in authentic scientific inquiry **(**Roth and Roychoudhury, 2006**)**.

Teaching and learning of Science needs to be characterised by focused emphasis on various Basic Process Skill of Interpreting Data in Physics, viz. Controlling Variables, Defining Operationally, Formulating Hypothesis, Interpreting Data and Interpreting Data (Science - A Process Approach SAPA, 1967). These Integrated Process Skill of Interpreting Data in Physics

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can be acquired by actively participating in the learning process. The major factors that influence Science teacher's preference for different types of instructional activities have been identified. The most important factor that has an impact on Science teachers is to motivate students to develop Science Process Skills (Talanquer, Novodvorsky and Tomanek, 2010**)**. The Multimedia Instructional Package subsumes the idea that the Integrated Process Skills once developed can be transferred to other content areas. Therefore, there is a need to develop such Multimedia Instructional Package for promoting and enhancing these Integrated Process Skill of Interpreting Data in Physics. Science is a part of our life. A Student must be able to apply the content of Science, by learning how to do the process aspect of Science. Hence, there is a need to revisit our Science teaching and change focus from the product aspect to the process aspect of Science learning.

There are several advantages to implementing Multimedia in the classroom**.** It motivates the student to learn. Multimedia crafts interesting lessons. Multimedia allows teachers to address various learning styles in the classroom - Students can see, hear, and imagine what things feel since Multimedia brings a subject to life. Besides, technology standards are also addressed. Students must be ready to compete in a highly technological world. Student-centered learning takes place and students show accountability for learning when collaborative activities or project based learning is implemented through technology. Thus, it provides occasion for differentiated instruction. Having different ways to present information to students allows teachers to meet the needs of all students.

Multimedia is also a great way to make sure the lessons are organised. There are many tools that can be used to help organise the presentation of topics, thereby making it easier to understand. Multimedia projects can raise the level of understanding and application of a subject matter. Pictures speak a thousand words. It helps students to retain and enhance learning because they are engaged in using more than one sense in scaffolding and higher order thinking.

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. Web Assisted Multimedia Instruction is a powerful interaction medium that enables students to communicate with peers, teachers, and experts and conduct collaborative work (Mioduser, 2000). Web Assisted Classroom Instruction is a method in which the teacher will contact the suitable web site and collect more and recent information

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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 Package can bring significant difference in achievement of Biological Science (Anboucarassy, 2010). Multimedia Instructional Package can bring significant difference in achievement of Physics **(**Yang and Heh, 2007**)**.

These results point to the fact that Multimedia has high significance and immense prospects in enhancing Integrated Process Skill of Interpreting Data in Physics of students in the field of science education. 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 Integrated Process Skill of Interpreting Data in Physics 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 Vocational Higher Secondary School Students have very little Integrated Process Skill of Interpreting Data in Physics. Several researchers have developed various instructional strategies in Physics for Vocational Higher Secondary School Students, but none was found that could enhance Integrated Process Skill of Interpreting Data in Physics. In the present study, a Web Assisted Multimedia Instructional Package in Physics for Vocational Higher Secondary School Students was developed and its effectiveness tested in enhancing the Integrated Process Skill of Interpreting Data in Physics of Vocational Higher Secondary School Students of Kerala.

Hypothesis of the Study

It was hypothesised that the Web Assisted Multimedia Instructional Package will be significantly more effective than the Activity Oriented Method of Instruction in enhancing Integrated Process Skill of Interpreting Data in Physics of Vocational Higher Secondary School Students for the Total sample.

Objective of the Study

The objective of the study was to compare the effectiveness of the Web Assisted Multimedia Instructional Package and that of the Activity Oriented Method of Instruction in enhancing Integrated Process Skill of Interpreting Data in Physics of Vocational Higher Secondary School Students for the Total sample.

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Methodology

The Quasi Experimental Method with the Pre-Test Post-Test Non Equivalent Groups Design was adopted for the present study. The Web Assisted Multimedia Instructional Package and the Activity Oriented Method of Instruction were the independent variables while Integrated Process Skill of Interpreting Data in Physics was the dependent variable of the study. Experimental verification was imperative to determine the effectiveness of the Web Assisted Multimedia Instructional Package over the Activity Oriented Method of Instruction on Integrated Process Skill of Interpreting Data in Physics of Vocational Higher Secondary School Students.

Random Sampling Technique was employed for gathering data giving due representation to Gender of students. The total sample comprised 400 Vocational Higher 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. Web 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 Ray Optics.

The tools used for the study were:

1. Evaluation Pro forma for Validating the Web Assisted Multimedia Instructional Package (Jaise and Murali, 2011)
2. Comprehensive Test of Process Skill of Interpreting Data in Physics (Jaise and Murali, 2011)

The Comprehensive Test of Process Skill of Interpreting Data in Physics was initially administered to the Experimental and Control Groups in order to assess the Integrated Process Skill of Interpreting Data in Physics of Vocational Higher Secondary School Students. The scores obtained were taken as the Pre-Test scores. The Experimental Group was exposed to the Web 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 Skill of Interpreting Data in Physics was again administered on both Experimental and Control Groups. The scores obtained thus were considered as Post-Test scores.

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The data gathered was then analysed using statistical techniques like Arithmetic Mean, Standard Deviation, Critical Ratio (Test of Significant Difference between Means), and Tests of Variance, viz. Analysis of Variance (ANOVA) as well as Analysis of Covariance (ANCOVA).

Findings and Discussion of Results

A comparison was made of the effectiveness of the Web Assisted Multimedia Instructional Package and the Activity Oriented Method of Instruction on the Integrated Process Skill of Interpreting Data in Physics of Vocational Higher Secondary School Students for the Total Sample.

The Pre-Test, Post-Test and Gain scores in Integrated Process Skill of Interpreting Data in Physics of the Total Sample in the Experimental and Control Groups were computed and the data are given in Table 1.

Table 1

Data for Pre-Test, Post-Test and Gain scores in Integrated Process Skill of Interpreting Data in Physics of Total Sample in Experimental(N=200) and Control (N=200) Groups

Integrated Process Skill	**Group**	**Pre-Test Scores**			**Post-Test Scores**			**Gain Scores**		
		M	**SD**	**'t' value**	**M**	**SD**	**'t' value**	**M**	**SD**	**'t' value**
Interpreting Data	Experimental	0.41	0.49	0.82	1.52	0.55	6.47	1.10	0.71	5.15
	Control	0.37	0.48		1.11	0.71		0.74	0.69	

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

From Table 1, it can be seen that the obtained 't' value is 0.82 for the Integrated Process Skill of Interpreting Data in Physics which is not significant. From these results, it can be inferred that there is no significant difference between the Pre-Test scores of the Total Sample in the Experimental and Control Groups before the Experiment. Since the Means and Standard Deviations of the Experimental and Control Groups are almost similar in value, it can be concluded that the Total Sample of Vocational Higher Secondary School Students are almost identical with regard to their Pre-Test scores in Integrated Process Skill of Interpreting Data in Physics.

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Table 1 also shows that the obtained 't' value is 6.47 for the Integrated Process Skill of Interpreting Data in Physics, which is significant at 0.01 level. From these results, it can be inferred that there is significant difference between the Mean Post-Test scores of the Total Sample in the Experimental and Control Groups after the Experiment. Since the Mean Post-Test scores of the Experimental Group is greater than those of the Control Group for the Total Sample, it can be concluded that the Web Assisted Multimedia Instructional Package is superior to the Activity Oriented Method of Instruction for the Total Sample.

From Table 1, the obtained 't' values with regard to the Gain Scores of the Total Sample is 5.15 for the Integrated Process Skill of Interpreting Data in Physics, which is significant at 0.01 level. From these results, it can be inferred that there is significant difference between the Mean Gain scores of the Total Sample in the Experimental and Control Groups. Since the Mean Gain scores of the Experimental Group is greater than those of the Control Group for the Total Sample, it can be concluded that the Web Assisted Multimedia Instructional Package is superior to the Activity Oriented Method of Instruction for the Total Sample.

The Tests of Variance were used to ascertain the genuineness of the difference in the obtained Scores. The Total Sum of Squares, Mean Square Variance and F-ratio for the Pre- and Post-Test scores of Experimental and Control Groups were computed for the Total Sample and the details of Analysis of Variance are shown in Table 2.

Table 2

Summary of ANOVA of Pre-Test (x) and Post-Test (y) Scores in Integrated Process Skills in Physics of Total Sample in Experimental and Control Groups

Integrated Process Skill	**Source of Variation**	**df**	**SS_X**	**SS_Y**	**MS_X**	**MS_Y**	**F_X**	**F_Y**
Interpreting Data	Among Means	1	0.81	20.70	0.81	20.70	3.37	61.84
	Within Groups	398	95.19	133.24	0.24	0.33		
	Total	399	96.00	153.94	0.20			
Result: F_X value is not significant **F_Y value is significant at 0.01 level**								

From Table F, for df 398 (Total), $F_{0.05}$ = 3.86 and $F_{0.01}$ = 6.70

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Table 2 shows that the obtained F_X value is 3.37 for the Integrated Process Skill of Interpreting Data in Physics, which is less than the Table values and hence are not significant. This indicates that there is no significant difference between Pre-Test scores of Vocational Higher Secondary School Students in the Experimental and Control Groups. The obtained F_Y value is 61.84 for the Integrated Process Skill of Interpreting Data in Physics, which is greater than the Table value and hence is significant at 0.01 level.

The significant F_Y values indicate that the Experimental and the Control Groups differ significantly in the Post-Test scores of the Integrated Process Skill of Interpreting Data in Physics. The significant F_Y value indicates that the Experimental and the Control Groups differ significantly in the Post-Test scores of Integrated Process Skill of Interpreting Data in Physics.

The Total Sum of Squares and Adjusted Mean Square Variance for Post-Test scores of Integrated Process Skill of Interpreting Data in Physics for the Total Sample are computed and the results of Analysis of Covariance are presented in Table 3.

Table 3

Summary of ANCOVA of Pre-Test (x) and Post-Test (y) Scores in Integrated Process Skill of Interpreting Data in Physics of Total Sample in Experimental and Control Groups

Integrated Process Skill	**Source of Variation**	**df**	**SS_X**	**SS_Y**	**SS_{XY}**	**SS_{YX}**	**MS_{YX}**	**SD_{YX}**	**F_{YX}**
Interpreting Data	Among Means	1	0.81	20.70	4.09	19.69	19.69	0.58	59.13
	Within Groups	397	95.19	133.24	9.91	132.20	0.33		
	Total	398	96.00	153.94	14.00	151.89			
Result:			**All the F_{YX} value is significant at 0.01 level**						

From Table F, for df 397(Total), $F_{0.01}$ = 6.70

Table 3 shows that the obtained F_{YX} value for the Total Sample is 59.13 for the Integrated Process Skill of Interpreting Data in Physics which is greater than the Table values, and hence the differences between the two Groups are significant at 0.01 level for the Total Sample.

From the results of ANCOVA pertaining to Integrated Process Skill of Interpreting Data in Physics of the Total Sample, the significant F-ratios for the Adjusted Post-Test scores

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show that the scores of students in the Experimental Group and in the Control Group differ significantly after they have been Adjusted for Differences in the Pre-Test scores. The significant F-ratios necessitate that the differences be tested separately by the calculation of Adjusted Mean scores (t-test). The Adjusted Means for the Post-Test scores of Total Sample in the Experimental and Control Groups were computed and the data are given in Table 4.

Table 4

Data for Adjusted Means of Post-Test Scores in Integrated Process Skill of Interpreting Data in Physics of Total Sample in Experimental and Control Groups

Integrated Process Skill	**Groups**	**N**	**M_X**	**M_Y**	**M_{XY} (Adjusted)**	**SE_D**	**'t' Value**	**P**
Interpreting Data	Experimental	200	0.45	1.52	1.51	0.058	7.59	P < 0.01
	Control	200	0.36	1.06	1.07			
	General Means		0.41	1.29				
Result:	**All the 't' value is significant at 0.01 level**							

From Table D, for df 397(Total), $t_{0.01}$ = 2.59.

From Table 4, it can be seen that the 't' value obtained is 7.59 for the Integrated Process Skill of Interpreting Data in Physics, which is significant at 0.01 level. This indicates that the two Adjusted Means differ considerably and implies that the Experimental and Control Groups differ significantly in the Integrated Process Skill of Interpreting Data in Physics.

The results of Adjusted Means pertaining to Integrated Process Skill of Interpreting Data in Physics for the Total Sample in the Experimental Groups (1.51) is greater than those of the Control Groups (1.07). This points to the fact that students in the Experimental Group are superior to those in the Control Group with regard to Integrated Process Skill of Interpreting Data in Physics for the Total Sample. It may therefore be inferred that the students who were exposed to the Web Assisted Multimedia Instructional Package have enhanced their Integrated Process Skill of Interpreting Data in Physics as compared to those who were exposed to the Activity Oriented Method of Instruction. In other words, the Web Assisted Multimedia Instructional Package is more effective than the Activity Oriented Method of Instruction in

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enhancing Integrated Process Skill of Interpreting Data in Physics among Vocational Higher Secondary School Students for the Total Sample.

Conclusion

The above results show that there is significant difference in Integrated Process Skill of Interpreting Data in Physics with regard to the Total Sample of Vocational Higher Secondary School Students in the Experimental Group. Those students who were exposed to the Web Assisted Multimedia Instructional Package show higher Integrated Process Skill of Interpreting Data in Physics as compared to those who were exposed to the Activity Oriented Method of Instruction. Such findings could only be attributed to the Web Assisted Multimedia Instructional Package that must have motivated and helped the students to enhance their Integrated Process Skill of Interpreting Data in Physics.

Educational Implications

The findings of the study have certain educational implications that are outlined here: Digital content that is meaningful, culturally responsive and has high quality must be made available for use of both teachers and students. Facilities must be provided in educational institutions to organise Multimedia classes. This will have high prospects for influencing the Integrated Process Skill of Interpreting Data in Physics of students. 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 Integrated Process Skill of Interpreting Data in Physics of students. The Web Assisted Multimedia Instructional Package provides a successful platform to convey concepts effectively and help the students to enhance their Integrated Process Skill of Interpreting Data in Physics. This Package also helps to actively participate in the learning process. In service and refresher courses should be organized for Vocational Higher 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.

References

Anboucarassy, B. (2010). Effectiveness of Multimedia in Teaching Biological Science to IXth Standard Students .*Edutracks, 9*(5),37-38.

Best, J. W., & Kahn, J. V. (2006).*Research in Education* (9thed.). New Delhi: Prentice Hall of India.

Bhatnagar, A. (2004). *Predictors of Student Involvement in Studies*. Agra: National Psychological Corporation.

Koul, Lokesh. (1998). *Methodology of educational research*. New Delhi: Vikas Publishing House.

Kumar, S., &Habtemariam, R. J. (2010). Learning with Multimedia: A constructive cooperative Approach in Education. *Edutracks, 9*(8), 15-16.

Kumar, A. G., & Devika, R. (2008). Effectiveness of Multimedia Instructional Package in teaching Social Science at Vocational Higher Secondary level, *Experiments in Education*, *6*, 3–7.

Mioduser, D., Nachmias, R., Lahav, O., & Oren, A. (2000). Web-based Learning Environments: Current pedagogical and technological state. *Journal of Research on Computing in Education*, 33 (1), 55-76.

Prakash, S. B. S. (2002). *Science Learning Interest among College Students*. Silicon Times, *2*(7). Retrieved from www.mindpowersolution.com

Reddy, E.K., Ramar, R., &Ponnambalam, L. (2009). Effectiveness of multimedia based modular instruction on the achievement of the problem students in teaching science. *Asian journal of Psychology and Education, 42,* 7-8.

Roth, W. M., & Roychoudhury, A. (2006). The Development of Science Process Skills in Authentic Contexts. *Journal of Research in Science Teaching, 30*(2), 127-152.

Science A Process Approach (SAPA). (1967). Retrieved from www. aaas.org

Talanquer, V., Novodvorsky, I., & Tomanek, D. (2010). Factors Entering Teacher Candidates' Preference for Instructional Activities: A Glimpse into their Orientations towards

Teaching. *International Journal of Science Education*, *32*(10), 1389-1406. Retrieved from www.eric.ed.gov

Yang, K. Y., & Heh, J. S. (2007). The impact of Internet Virtual Physics Laboratory Instruction on the Achievement in Physics, Science Process Skills and Computer Attitudes of 10th Grade Students. *Journal of Science Education and Technology*, *16*(5), 451-461. Retrieved from www.erc.ed.gov

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