

MEASURING EFFECTIVENESS OF INFORMATION, COMMUNICATION AND TECHNOLOGY (ICT) TOOLS IN TEACHING SCHOOL CHILDREN: A CASE STUDY FROM CHATTISGARH STATE, INDIA

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ABSTRACT

The study was conducted to determine the effectiveness of Information Communication and Technology tools viz DLP (Distance Learning Projector) and Computer/Laptop in comparison with selected instructional media for teaching primary and secondary school pupils. It examined the effect of grade on the performance of the pupils taught with four instructional media. 100 pupils from 3 schools in Durg, Raipur and Rajnandgoan districts respectively from Chatisgarh state, India, were taught three topics drawn from syllabus. The non-randomized quasi-pre-test post-test experimental design was used in finding out which of the pupils in the four experimental groups – DLP, Computer/laptop, Chart and Chalk Talk Method performed best. The study revealed that the pupils taught with the DLP performed equally as well as those taught with Computer/laptop. The study concludes that ICT Tools were more effective than conventional methodologies in teaching school children learning issues. This confirms the claim of many researchers of the prospective of using ICT Tool as an instructional medium in teaching varying subjects to adults, youths and children in the formal school system. The advantages far overshadow the disadvantages. The four methods that can be used by the teacher were recommended. An organisational structure in each state and ICT equipment needed for effective take off of the ICT programme in schools in Chatisgarh were suggested.

Keywords: DLP Instructional Medium Teaching, Children.

INTRODUCTION

Motivation

ICT revolution is a revolution in learning, it has transformed available technologies, the mean and methods of studying, the modalities of school operations, the manner of speculation and disbursement of resources and the very way we think about education could be and should do. For extending the learning of students, use of ICT is acknowledged as a learning tool for pupils and has acknowledged how pupils who are confident and proficient in ICT can bring with them opportunities for extending their learning as they use their ICT in subjects in the school curriculum. However, existing and emerging ICT teaching tools provide further opportunities to enhance subjects and add value to teaching and learning. For example, the use of interactive whiteboards, video projection units, microscopes connected to computers,

prepared spreadsheets to capture and model data, CD-ROMs, presentations with video and carefully selected resources from the Internet all provide examples of how ICT can be embedded into subject teaching. A growing body of literature argues the need to create Internet-based learning solutions that are explicitly grounded in learning theory [1 & 2]. Use of ICT by a teacher may involve little or no use of ICT by pupils and, consequently, may do little to apply and develop their ICT capability. However, use of ICT by the teacher can enhance and stimulate the learning experiences of pupils and contribute to the achievement of subject objectives. It is important to recognize the different contributions that ICT can make to teaching and learning. Research has shown that the learning environment is an alterable educational variable which can directly influence cognitive and affective outcomes [3 & 4]. Langford pointed out that 30–60% of our learning

was due to our brain's wiring and 40–70% was a result of the environmental impact [5]. From this suggestion, it is obvious that, while the environment is not the only variable which affects learning outcomes, it is a very important one. Cooke pointed out that all innovative approaches, no matter how simple or complex should be designed with the students in mind. Students' perspective on such innovations is critical [6]. In this new era, due to development of tools, educational institutions are serving more ethnically, and culturally diverse student body than ever before. Studies about education have offered new insights on how humans learn. In addition, the blend of technology has redefined work skills and society's expectations about what it means to be an educated person. Teachers are using different methodologies to teach their students in a better way. There are a number of techniques and methodologies for diverse situations in the classrooms, and also many learning theories given by different psychologists. With the help of the technology, students gain understanding about their world, and enhance their learning and work by increasing their connections with resources outside school walls. Depending on the parameters set by teachers, the students may be in complete control of their topics and their explorations.

Information Communication and Technology is a potential window that can interpret the minds and heart of many school children to modern concepts, far more than the traditional classroom teacher can achieve. Children are so rapt with TV and movies that their interest can be subjugated in the school system in teaching in vivid and entertaining manner. The use of modern technology in teaching languages has been dramatically increasing worldwide over the past decade [7]. With the creation of the World Wide Web, it has become possible and feasible for language teachers to make effective use of instructional materials, especially in teaching language and culture [8]. Teachers play a crucial role in the adoption and implementation of ICT in education since they are the key to making learning happen. Earlier studies for example, Pelgrum have reported, teacher's lack of ICT knowledge and skills to be a major obstacle to implementation, and consequently pointed to the need for further training for teachers [9]. According to Zandvliet and Fraser, students'

satisfaction with their learning and classroom independence and task orientation are related to teachers' behaviors, instructional strategies, learning processes and learning settings. Although these factors are related to classroom psychosocial environment, no direct association between student satisfaction and measures of the physical classroom aspects (such as work space and visual environments) was found [10]. Of course, there has been some concern that educational institutes are investing in such delivery modes as a response to a 'technological imperative' or as a cost-cutting exercise [11], rather than for good educational and pedagogical reasons. Further, it has been argued that such educational delivery neither is what students wants [12], nor delivers a good learning environment. There is a strong need for an alternative technique of teaching the children if the goal of 100% literate state is to be achieved. Chhattisgarh, located in Central India, has been carved out of Madhya Pradesh to become the 26th state of the Indian Union. It is endowed with huge mineral deposits and forest resources. Chhattisgarh also has the largest concentration of Schedule Tribes in the country. Its cities, especially Raipur are full of migrants from other parts of the country. Chhattisgarh has 16 districts: Bastar, Bilaspur, Dantewada (South Bastar), Dhamtari, Durg, Janjgir-Champa, Jashpur, Kanker (North Bastar), Kawardha, Korba, Koriya (Korea), Mahasamund, Raigarh, Raipur, Rajnandgaon, and Surguja.

The rate of development in the field of education is slow still the state has committed to spread the knowledge and freedom of thought among its citizens, which is reflected in its policy. The overall literacy rate for the state as per census 2001 is 65.12%, with male literacy rate at 77.86% and female literacy rate at 55.28%. The state has been providing free and compulsory education to its children until they complete the age of fourteen years. The state government is emphasizing more on the educational interests of the underprivileged sections, particularly, the Scheduled Castes and Scheduled Tribes to raise their literacy standards.

The state follows a uniform system of school education i.e. the 10+2 pattern. Schools in Chhattisgarh are either run by

the Central government, State government or privately by trusts and individuals. Students after completion of their +2 (class XII) prepare to go for higher study. They continue their study with the subjects taken in +2 level or switch over to professional degrees like engineering, management and medical. The state is stepping forth with focused growth on education particularly at the primary and secondary levels. The study focused on the effectiveness of ICT tools viz DLP and Computer/Laptop here. The effectiveness was determined by the performance of pupils taught certain subject matter.

Purpose of The Study

The purpose of this study was to determine the effects of four instructional methods on the achievement test scores of 100 students. The following research question was designed to address the problem according to their pretest and post-test results:

Does ICT tools/models help teachers in effective teaching as compared to traditional/conventional teaching methods?

Hypothesis

To test the Null Hypothesis(H₀) that there is no difference between achievement test scores of the four groups i.e X1 (treatment with DLP), X2 (treatment with Computer/Laptop), X3 (treatment with Chart), X4 (treatment with Chalk Talk) at the alpha .05 level.

Methodology

DLP and Computer/Laptop were considered as ICT tools in this study. Non-randomized quasi-pretest and posttest experimental design was used in conducting the study. This design involves administering an achievement test to the pupils before and after teaching the topics. The study was conducted in three districts viz Raipur, Durg and Rajnandgoan of Chattisgarh state India. One school each was selected from three districts. The three typical schools were purposively selected and stratified random sampling technique was used to select the 100 pupils involved in the experiment. The pupils were stratified along class primary and secondary. In each school, 25 pupils were placed in each of the treatment groups: DLP, Chart, Computer/laptop and Chalk Talk Method group. This

means that 25 pupils each were taught with DLP, Chart, Computer/laptop and the control group (Chalk Talk Method).

The achievement test used to determine the performance of the pupils consists of multiple choice questions with 4 options on the three topics – Various Modes of Transportation, basic pollution causes and Tips for healthy living. The topics were taken from the primary school curriculum. The DLP clip on the three topics were produced locally and edited for its suitability for teaching children. The socio-cultural status of the children was put into consideration in producing the DLP. The DLP group was taught with the DLP alone with the intervention of the teacher. The Computer/laptop group was taught by the teacher with demonstration of the practice. The teacher taught the Chart group with Chart containing diagrams, drawing and pictures of the concept taught. The Chalk Talk Method group was taught using lecture method without any instructional material. An interval of three hours was given between pre-test and post-test.

Analysis of variance was used in comparing the performance of all four groups. Scores of each pupil before instruction and after instruction were computed. Difference between pre and post-test (the average gain) was calculated (Table 1) and (Table 2).

Data Analysis/results

Performance of the pupils in each treatment group in the achievement tests

The mean average gain score, which is the difference between the pre-test and the post-test, was computed for the four treatment groups. The DLP group is slightly higher than the Computer/laptop group (55.68 % and 51.96 % respectively). The chart group scored 42 % while the Chalk Talk Method group scored 31.92%. This result in Table 3 confirms the assertion of Isiaka (2000), Dopemu (1990), Ahmad (1990) and Talabi (1989) that DLP can be effective in teaching both adult and children varying subject matter. Since the information in the DLP clip is as real as life, it is not surprising that the performance of the DLP group is slightly higher than the Computer/laptop group.

Table 4 shows that the F cal of 24.47 is greater than the F tab of 2.76 at alpha 0.05. Hence, the Null Hypothesis(H₀) may

1 st Group X ₁	(X ₁) ²	2 nd Group X ₂	(X ₂) ²	3 rd Group X ₃	(X ₃) ²	4 th Group X ₄	(X ₄) ²
67	4489	63	3969	54	2916	21	441
39	1521	39	1521	30	900	43	1849
65	4225	61	3721	52	2704	22	484
43	1849	45	2025	28	784	44	1936
66	4356	60	3600	52	2704	23	529
50	1000	43	1849	27	729	42	1764
66	4356	63	3969	55	3025	23	529
43	1849	40	1600	26	676	43	1849
67	4489	64	4096	50	100	22	484
41	1681	43	1849	30	900	44	1936
66	4356	62	3844	31	961	22	484
40	1600	50	100	39	1521	44	1936
69	4761	62	3844	51	2601	25	625
49	2401	38	1444	40	1600	41	1681
67	4489	64	4096	51	2601	26	676
51	2601	44	1936	29	841	39	1521
70	4900	43	1849	53	2809	24	576
42	1764	41	1681	31	961	38	1444
52	2704	68	4624	54	2916	24	576
55	3025	35	1225	36	1296	36	1296
69	4761	62	3844	53	2809	28	784
41	1681	39	1521	38	1444	35	1225
68	4624	60	3600	55	3025	23	529
39	1521	51	2601	33	1089	41	1681
67	4489	59	3481	2	2704	25	625

Table 1. Data for Calculating Average gain and Analysis of Variance(ANOVA). Here X1 is treatment with DLP, X2 is treatment with Computer/Laptop, X3 is treatment with Chart, X4 is treatment with Chalk Talk

$\sum X_1 = 1392$	$\sum (X_1)^2 = 80992$	$\sum X_2 = 1299$	$\sum (X_2)^2 = 70289$	$\sum X_3 = 1050$	$\sum (X_3)^2 = 47016$	$\sum X_4 = 798$	$\sum (X_4)^2 = 27460$
$\bar{X}_1 = 55.68$		$\bar{X}_2 = 51.96$		$\bar{X}_3 = 42$		$\bar{X}_4 = 31.92$	
$\sum X = \sum X_1 + \sum X_2 + \sum X_3 + \sum X_4$		$\sum (X)^2 = \sum (X_1)^2 + \sum (X_2)^2 + \sum (X_3)^2 + \sum (X_4)^2$		$\sum X = 1392 + 1299 + 1050 + 798$		$\sum (X)^2 = 80992 + 70289 + 47016 + 27460$	
$\sum X = 4539$		$\sum (X)^2 = 225757$					

Table 2. Data Calculations

Instructional media	Pretest score in %	Posttest score in %	Average gain score	Ranking
DLP	23.37	79.05	55.68	1st
Computer/laptop	22.94	74.9	51.96	2nd
Chart	22.2	64.2	42	3rd
Chalk Talk Method	22.53	54.45	31.92	4th

Table 3. Average gain score of the pupils' performance in the test

be rejected. This implies that there is a significant difference amongst the four mean average gain scores of the pupils taught with varying methods.

Findings and Conclusion

Based on the findings of this study, it is concluded that ICT tools/models help teachers in effective teaching as compared to traditional/conventional teaching methods.

Sources of variance	Sum of square (ss.)	Degree of freedom (df.)	Variance estimate (MS.)	F cal	F tab (p<.05)	Remarks
Between group (x=b)	8549.55	3	2849.85			There is significant difference
Within group (x=w)	11182.24	96	116.48167	24.47	2.76	
Total (x=t)	19731.79					

Table 4. Test of Significance using analysis of variance (ANOVA) of the average gain scores of the four groups

It is further clarified that the use of DLP in teaching school pupils is as effective as when the teacher uses the Computer/laptop in teaching. The use of ICT tools is more effective as compared to Chart and Chalk Talk method (Figure 1).

Discussion and Recommendations

Looking at the advantages of teaching with ICT tools and in view of the challenges rural school teachers are facing in Chhatisgarh and also the weak reach of the Government to address the worrisome issues, it is suggested that School Management Board and the government agencies that oversees the running of schools in each district and procure necessary funds, to put the ICT tools infrastructure in place. The structure includes both institutional organizations and ICT tools. The School Management Board should establish a unit, which could be called ICT RESOURCE CENTRE with the organizational structure.

There should be a communication unit in each of the district's School Management Board. The unit should consist of three sections: ICT tools production section, research assessment and liaison section and technical section. The ICT tools production section should be responsible for the construction of instructional packages specifically for school children. Relevant DVD/CD clips from various

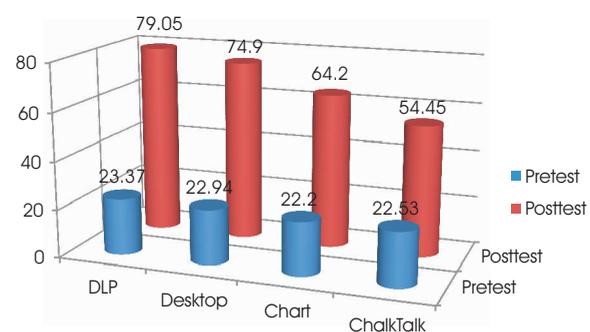


Figure 1. Showing results after teaching through four methods

sources are to be procured and edited to make them suitable for the children. The DVD/CD clips are to be multiplied and disseminated to the schools. The research assessment and liaison section should be mainly involved in conducting research on various issues on the effect, response on the ICT tools instruction and comments of the teachers, pupils, parents and the production team. Linkage is to be established with stakeholders in the educational system-Non-governmental organizations, teachers, parents, and so on.

The technical unit is to be involved with the repairs and servicing of all ICT tools apparatus in all the viewing centers. Selected people, teachers and pupils are to be trained in operating the ICT tools equipment and to handle minor repairs and routine maintenance. These could be adopted with modification in schools in Chhatisgarh. Surely teaching through Information Communication and Technology tools has more advantages than teaching through other resources.

The adoption of any of these four methods is dependent on the technical competence of the teachers in learning. With low level of motivation, huge paper work, low competence of school teachers and inadequate number of teachers to teach the subject matter the first option is readily feasible in school system in Chattisgarh. The teachers will be as excited as the pupils in learning side-by-side via the ICT programs.

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APPENDIX 1

ANOVA Calculations

The analysis of variance consists of following operations.

- The variance of the scores for four groups is combined into one composite group known as the total groups variance(V_t).
- The mean value of the variances of each of the four groups, computed separately, is known as the within-group variance(V_w).
- The difference between the total groups variance and the within-groups variance is known as the between-groups variance($V_t - V_w = V_b$).

$$F = V_b/V_w = (\text{between-group variance})/(\text{within-group variance})$$

The critical values of the F ratio are found in an F table, which indicates the critical values necessary to test the null hypothesis at selected levels of significance. The calculation of F involves finding the mean of the deviations from the mean, squared. The formula then becomes

$$F = MS_b/MS_w \text{ Page 10 of 11}$$

$$F = (SS_b/df_b)/(SS_w/df_w) \text{ where,}$$

SS_b = Sum of squares between-groups

SS_w = Sum of squares within-groups

df_b = degrees of freedom between groups

df_w = degrees of freedom within-groups

The first step is to find the sum of the squared deviations of each person's score for the mean of all of the groups. This is known as the sum of squares(SS_t) and can be found by using the following formula,

$$SS_t = \sum X^2 - (\sum X)^2/N$$

$$SS_b = (\sum X_1)^2/n_1 + (\sum X_2)^2/n_2 + \dots - (\sum X)^2/N$$

$$SS_w = \sum (X_i)^2 - (\sum X_1)^2/n_1 + \sum (X_2)^2 - (\sum X_2)^2/n_2 \dots + \sum (X_i)^2 - (\sum X_i)^2/n_i$$

where N = the number of samples for all the groups combined

n = the number of samples in a group

In this case, this would be,

$$SS_t = 225757 - (4539)^2/100 = 19731.79$$

$$SS_b = (1392)^2/25 + (1299)^2/25 + (1050)^2/25 + (798)^2/25 - (4539)^2/100 = 8549.55$$

$$SS_w = 80992 - (1392)^2/25 + 70289 - (1299)^2/25 + 47016 - (1050)^2/25 + 27460 - (798)^2/25 = 11182.24$$

$$df_b = 03$$

$$df_w = 96$$

$$MS_b = SS_b/df_b = 8549.55/3 = 2849.85$$

$$MS_w = SS_w/df_w = 11182.24/96 = 116.48167$$

$$F = MS_b/MS_w = 2849.85/116.48167$$

$$F = 24.46608$$

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