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Multimedia compared to Text for Online Learning in India

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ABSTRACT :

Educational innovations and technology emphasize on various approaches of teaching and learning. Multimedia approach is one such modern method where educational technology mirrors the progress in education process. Multimedia technology is able to motivate learners to learn due to the fact that it can touch their various modalities. The present study was undertaken to study the effectiveness of multimedia over the conventional method in teaching bloom's taxonomy to distance mode teacher trainees. The sample consisted of 124 teacher trainees pursuing B.Ed. through distance mode. Pretest-post test control group design was followed for the study. The study sample responded to criterion test on bloom's taxonomy developed by investigators. Data analysis involved the use of two way ANOVA (2x2factorial design) and t-test. The results indicated that (a) the teacher trainees when exposed to multimedia program yielded better learning and retention as compared to those taught through conventional method of teaching, and (b) multimedia proved to be more effective for low achievers as compared to high achievers teacher trainees.

1. INTRODUCTION :

In the present scientific and technological age, the conventional teaching methods are not sufficient to kindle interest among the students and do not meet up to the intellectual, psychological and emotional needs of the students. The presence of multimedia technology opens a new era in the development of teaching and learning media. CAI and multimedia technology has broken the traditional philosophy of education (Zhu, 2011). The potential of multimedia in education does have a theoretical foundation. Bagui (1998) and Daniels (1995) summarized the theory of multi-channel communication in support of the potential for multimedia. According to this theory, humans have several channels by which data are communicated and imbibed. If information is presented via two or more of these channels, there will be additional reinforcement and, consequently, greater retention, thereby improving learning (Ellis, 2004).

Multimedia is considered as an impressive learning media because of its capability in activating our perception such as our sight, our hearing, and our tactile. According to Mayer (1999), one of the most important promises of multimedia is that learners appreciate multimedia explanations better than just a word alone. Learners can comprehend pictures and sound more easily than words. If words alone are presented to the learners, they try to form their own mental images and this may cause them to miss the actual points of learning. Through

multimedia students learn because the instruction is presented to them in a meaningful way using sounds, pictures and animations. Undoubtedly, these little animations and pictures foster deep learning (Praveena & Srinivasa,2011).

Schade's study (cited in Hoogeven, 1995) implies that ability to recall something learnt by self-memorizing is the lowest (1%). However, when using teaching aids such as television and video, the capacity of memory is improved by 25%-30%. Further, if three dimension media (3D) are used, the ability to recall may reach 60%. Wolfgram (1994) states, "People only remember 15 percent of what they hear and 25 percent of what they see, but they remember 60 percent of what they interact with". Schade believes that "Multimedia improves sensory stimulation, particularly due to the inclusion of interactivity". Learning theorists state that to reach an objective or to acquire a skill, the learner must be actively involved through practice to cognitively incorporate it into long-term memory. The interaction or 'doing the objective' helps the learner reach the objective and recall the information, skill, or behavior that was learned (Dick & Carey, 1990).

Al-Seghayer (2001) compared various types of media in literacy teaching and learning. The study revealed that video clip provides more meaningful impression towards vocabulary acquisition (90%) in comparison to pictures (76%) and text (60%). Multimedia has also the ability to perform 3D concept impressively, as long as the curriculum can be planned systematically, communicatively, and interactively during the teaching and learning process. The findings inspired Heller (cited in Hoogeven, 1997) to state "A strong paradigmatic belief can be noted in the benevolent effects of multimedia for a wide variety of application domains, particularly Multimedia Assisted Instruction (MAl)". The study conducted by Magidson(1978) has shown that the teaching and learning process assisted by computer could improve the learners' skills. Several dozen studies indicate that computer-based multimedia can improve learning and retention of material presented during a class session or individual study period, as compared to traditional lectures or study materials that do not use multimedia(Bagui, 1998 ; Fletcher, 2003 ; Kozma, 1991 ; Mayer, 2001).

Bartsch & Cobern attempted to quantify the effectiveness of PowerPoint in the classroom. They tested and concluded that power point lectures are liked more and would lead to better grades than using lectures supported by overhead transparencies. The study concluded that students preferred lectures that were accompanied by PowerPoint presentations than those with transparencies. "Students believed that they learned more from power point presentations." Interestingly enough there was no statistically significant difference in mastery of learning between power point and transparency based lecture. There was a difference between a basic power point presentation and an expanded power point presentation. The finding was that power point presentations that have sound and graphics that are unrelated to the text resulted in a significant drop in mastery of learning (Bartsch & Cobern,2004).

Studies by several workers have reported that students' satisfaction and motivation are higher in courses that use multimedia materials (Astleitner & Wiesner, 2004; Yarbrough, 2001).

Being teacher educators the investigators felt that the conventional teaching methods were not sufficient to motivate, evolve interest among distance mode teacher trainees and capture their attention. A demand for continuous and formative assessment and improvement in this area was perceived. To improve the level of understanding, develop the interests of trainees and purposeful enhancement of motivation, an alternative process of teaching was to be adopted. Multimedia was one of the solutions to overcome this and in achieving the overall objective of the B.Ed. curriculum.

The purpose of B.Ed. is to equip trainees with the knowledge, attitudes, behaviors and skills they require to perform their tasks effectively in the classroom and school. Instructional objectives play an important role in the learning and instruction process

When developing instructional objectives, providing instruction, and evaluating student performance, it is important to keep in mind that there are different levels or outcomes of learning. Benjamin Bloom created taxonomy for categorizing and classifying levels of intellectual learning that commonly occur in the classroom setting. The taxonomy contains three domains: the cognitive, psychomotor, and affective. Within the cognitive domain Benjamin Bloom identified six levels that have become commonly known as bloom's taxonomy. The six levels of bloom's taxonomy, from lowest to highest, are: knowledge, comprehension, application, analysis, synthesis, and evaluation. These different levels of bloom's taxonomy have become an extremely useful guide for teachers in their instruction and evaluation process. It is true that a teacher can really become professional teacher by implementing Bloom's taxonomy. But generally taxonomy proves to be awesome for trainees and they are not inclined towards it.

Keeping in view the above facts, the investigator felt it appropriate to investigate the effects of multimedia package in teaching Bloom's taxonomy to distance mode teacher trainees.

The present research was designed to answer the following research questions ;

1. Is there any difference among distance mode teacher trainees taught through multimedia approach and conventional method on post-test and retention scores?
2. Is there any difference among high achievers and low achievers distance mode teacher trainees on post-test and retention scores ?
3. Is there an interaction between the two instructional treatments and levels of achievement on post-test and retention scores ?

The objectives of the study were ;

1. To compare the post-test scores of the distance mode teacher trainees taught through different instructional treatments (multimedia approach and conventional method).
2. To study the effectiveness of these two instructional treatments for high and low achievers distance mode teacher trainees.
3. To compare the retention scores of the distance mode teacher trainees exposed to different instructional treatments.
4. To study the effectiveness of the two instructional treatments for high and low achievers distance mode teacher trainees with respect to retention.

2. METHODS :

The design applied in this study was pretest-posttest control group design which is illustrated as follows ;

Randomly Picked Experimental Group (R E)	Pre-test (O_1)	Special Instructional Treatment (T_1- Multimedia Approach)	Post-test (O_2)
Randomly Picked Control Group (R C)	Pre-test (O_3)	No Special Instructional Treatment (T2 - Conventional Method)	Post-test (O_4)

The participants of the study included 124 teacher trainees pursuing B.Ed. through distance mode from M.D.U., Rohtak having center for Personal Contact Programme (Dec 27, 2010 - Jan 20, 2011) attending the Vaish College of Education, Rohtak, Haryana, India.

The instruments used included ;

1. Criterion test on Bloom's taxonomy prepared by the investigators. The test was constructed after a thorough review of the techniques of test construction. Consent of experts was also weighed in construction of test. The test contained 25 multiple choice test items. These test items were based on the 6 levels of cognitive domain of bloom's taxonomy i.e. knowledge, comprehension, application, analysis, synthesis and evaluation.
2. Multimedia program on Bloom's taxonomy to teach the experimental group developed by the investigators. The contents of the program included audio- visual clips for the (a) Meaning of

taxonomy, (b) Domains of human learning, (c) Hierarchy of levels of cognitive domain, (d) Bloom's taxonomy action vocabulary for writing each level objective, (e) corresponding sample question items and potential activities, and (f) Use of Bloom's taxonomy in the classroom.

Sample teachers were distributed equally in to two groups, i.e.62 teachers in the experimental group and the 62 teachers in the control group by adopting the random sampling technique. After the allocation of the teacher trainees to the instructional treatments, the experiment was conducted in four phases:

Phase1: Administration of the pre-test

In this phase the trainees of the experimental group and control group were pretested with a criterion test. On the basis of pre- test scores the trainees of both groups were divided in to two halves, i.e. high achievers (above the mean score) and low achievers (below the mean score).

Phase 2: Conducting the instructional programme

In this phase the experimental group was taught by multimedia approach and control group was taught by conventional method of teaching.

Phase 3: Administration of the post test

After the instructional treatment of 2 days, criterion test was administered to both the experimental and control groups to know the effect of treatment.

Phase 4: Administration of the Retention Test

Twenty days later, same criterion test was again administered as a surprise test to measure the retention of both the control and experimental groups.

Raw scores obtained from pre test, post test and retention test were presented in tabulation form for the purpose of interpretation. For the manipulation of data, the means, the standard deviations and the differences of the means were computed for each group. Significance of difference between the mean scores of both the experimental and control groups on the variable of pre test scores, post test scores and retention test scores was tested by applying t-test. To examine the treatment effects on low achievers and high achievers of both the groups, the two way ANOVA (2x2 factorial design) was applied on post test scores and retention test scores.

The factorial design is symbolized as ;

	Experimental Group	Control Group
High Achievers	Cell 1 (n=30)	Cell 2 (n=31)
Low Achievers	Cell 3 (n=32)	Cell 4 (n=31)

The collected data were subjected to statistical analysis and the results obtained were interpreted under the following subheads.

Table 1 : Scores on Pre-Test

Group	N	Mean	S.D.	t-value	Remark
Experimental	62	6.95	2.2	1.26	NS
Control	62	7.51	2.7		

From Table 1 it is evident that t-value is not significant even at the 0.05 level of significance. It indicates that the teacher trainees of the experimental group do not differ significantly from the trainees of the control group in their mean scores at the pre-test level.

Table 2 : High Achievers on Pre-Test

Group	N	Mean	S.D.	t-value	Remark
Experimental	30	8.9	3.1	1.61	NS
Control	31	7.8	2.1		

From Table 2 it is evident that t-value is not significant even at .05level of significance. It indicates that no significant difference was found between mean scores of high achievers of experimental and control groups on pre test.

Table 3 : Low Achievers on Pre-Test

Group	N	Mean	S.D.	t-value	Remark
Experimental	32	6.02	2.01	1.8	NS
Control	31	5.12	1.9		

From Table 3 it is evident that t-value is not significant even at .05level of significance. It indicates that no significant difference was found between mean scores of low achievers of experimental and control groups on pre test.

3. RESULTS :

Table 4 : ANOVA for Post-Test Scores

Source of Variation	df	Sum of Squares	Mean Square	F	p
Treatment	1	150.82	150.82	93.37	<.01
Achievement Level	1	280.29	280.29	173.53	<.01
Interaction	1	18.94	18.94	11.73	<.01
Within Cell	120	193.83	1.61		

From Table 4 it can be seen that the F-value for the difference in the post test scores of the two treatment groups is significant at 0.01 with df=1/120. It shows that two instructional methods yielded different mean scores on post test. In order to interpret this, t-test was applied. The results for the same are given in Table 5.

Table 5 : Differences on Post-Test

Group	N	Mean	SD	t-value	p
Experimental	62	17.68	2.34	6.04	<.01
Control	62	15.53	1.62		

From Table 5 it is evident that t-value is significant at the 0.01 level of significance. It indicates that the mean post-test scores of teacher trainees taught by multimedia approach and the teacher trainees taught by traditional method of teaching differ significantly. Further, mean post-test scores of teacher trainees taught by multimedia approach is 17.68 which is significantly higher than that of teacher trainees of taught by traditional method whose mean test score is 15.53. It may therefore be said that post-test scores were found to be significantly higher in case of teacher trainees taught by multimedia approach in comparison to teacher trainees taught by conventional method.

From Table 4 it can be seen that the F-value for the difference in the mean post-test scores of two levels of achievement, viz. high achievers group and low achievers group was found to be significant at the 0.01 level with df=1/120. This indicates that the high achievers and low achievers groups yielded different mean scores on post-test. In order to interpret this, the t-test was applied. The results for the same have been given in Table 6.

Table 6: Differences on Post-Test

Group	N	Mean	SD	t-value	p
High Achievers	61	18.11	2.04	1.93	NS
Low Achievers	63	17.51	1.34		

From Table 6 it is evident that t-value is not significant even at the 0.05 level of significance. It indicates that the mean post-test scores of high achievers teacher trainees and the low achievers teacher trainees do not differ significantly.

The F-ratio (vide Table 4) for the interaction between treatment and level of achievement for mean post test scores was found to be significant at the 0.01 level of significance, leading to the inference that these two variables interact with each other. To investigate further, the t- ratios were then computed. The results for the same have been given in Table 7 below.

Table 7 : Differences in Post-Test Scores for Treatment (T) and Achievement (A)

Group	T_1A_1 17.63	T_1A_2 15.84	T_2A_1 16.95	T_2A_2 14.42
T_1A_1 17.63	-	1.91 NS	1.85 NS	14.89
T_1A_2 15.84	-	-	1.93 NS	17.05
T_2A_1 6.95	-	-	-	7.44
T_2A_2 14.42	-	-	-	-

Table 7 shows that

- The high achievers teacher trainees taught through the multimedia approach (M=17.63) and the low achievers teacher trainees taught through the multimedia approach (M=15.84) yielded comparable mean post-test scores.
- The high achievers teacher trainees taught through the multimedia approach (M=17.63) and the high achievers teacher trainees taught through the conventional teaching method (M=16.95) yielded comparable mean post-test scores.
- The high achievers teacher trainees taught through the multimedia approach (M=17.63) and the low achievers teacher trainees taught through the conventional teaching method (M=14.42) yielded comparable mean post-test scores.
- The high achievers teacher trainees taught through conventional teaching method (M=16.95) fared better in comparison to low achievers teacher trainees taught through multimedia approach (M=15.84).
- The low achievers teacher trainees taught through the multimedia approach (M=15.84) fared better in comparison to the low achievers teacher trainees taught through the conventional teaching method (14.42).
- The high achievers teacher trainees taught through the conventional method (M=16.95) fared better in comparison to the low achievers teacher trainees taught through the conventional teaching method (14.42).

Table 7 also shows that high achievers teacher trainees taught through multimedia approach have maximum post-test scores (M=17.63), while the low achievers teacher trainees taught through conventional method have the lowest post-test scores (M=14.42).

Table 8 **:** ANOVA for Retention Test

Source of Variation	df	Sum of Squares	Mean Square	F	p
Treatment	1	184.52	184.52	72.44	<.01
Achievement Level	1	615.63	615.63	241.67	<.01
Interaction	1	105.42	105.42	41.35	<.01
Within Cell	120	305.68	2.55		

From Table 8 it can be seen that the F-value for the difference in the retention test scores of the two treatment groups is 72.44 which is significant at the level of 0.01 with df=1/120. It shows that the two instructional methods yielded different mean scores on the retention test. In order to interpret this, the t-test was applied. The results for the same have been given in Table 9.

Table 9 : Differences on Retention Test

Group	N	Mean	SD	t-value	p
Experimental	62	11.58	3.59	4.49	<.01
Control	62	9.24	1.99		

From Table 9 it is evident that the t-value is significant at the 0.01 level of significance. It indicates that the mean retention test scores of teacher trainees taught by the multimedia approach and the teacher trainees taught by the traditional method of teaching differ significantly. Furthermore, the mean retention test scores of teacher trainees taught by the multimedia approach is 11.58 which is significantly higher than that of the teacher trainees taught by the traditional method whose mean test score is 9.24. It may therefore be concluded that the retention test scores were

found to be significantly higher in case of teacher trainees taught by the multimedia approach in comparison to the teacher trainees taught by the conventional method.

From Table 9 it can be seen that the F-value for the difference in the mean retention test scores of two levels of achievement, viz. high achievers and low achievers group was found to be significant at the 0.01 level. This indicates that the high achievers and the low achievers groups yielded different mean scores on the retention test. In order to interpret this, the t-test was applied. The results for the same have been given in Table 10.

Table 10 : Differences on Retention Test

Group	N	Mean	SD	t-value	p
High Achievers	61	12.66	2.80	1.37	NS
Low Achievers	63	11.99	2.60		

From Table 10 it is evident that t-value is not significant even at the 0.05 level of significance. It indicates that the mean retention test scores of the high achievers teacher trainees and the low achievers teacher trainees do not differ significantly.

Table 11 : Differences in Retention Test Scores for Treatment (T) and Achievement (A)

Group	T_1A_1 14.83	T_1A_2 9.53	T_2A_1 10.55	T_2A_2 7.94
T_1A_1 14.83	-	1.95 NS	1.82 NS	15.06
T_1A_2 9.53	-	-	1.89 NS	1.98
T_2A_1 10.55	-	-	-	6.85
T_2A_2 7.94	-	-	-	-

The F-ratio (vide Table 8) for the interaction between treatment and level of achievement for mean retention test scores was found to be significant at the 0.01 level of significance, leading to the inference that two variables interact with each other. To investigate further, the t- ratios were computed. The results for the same have been given in Table 11.

Table 11 shows that

- High achievers teacher trainees taught through multimedia approach (M=14.83) and low achievers teacher trainees taught through multimedia approach (M=9.53) yielded comparable mean retention test scores.
- High achievers teacher trainees taught through multimedia approach (M=14.83) and high achievers teacher trainees taught through conventional teaching method (M=10.55) yielded comparable mean retention test scores.
- High achievers teacher trainees taught through multimedia approach (M=14.83) retained better in comparison to low achievers teacher trainees taught through conventional teaching method (M=7.94).
- High achievers teacher trainees taught through conventional teaching method (M=10.55) and low achievers teacher trainees taught through multimedia approach (M=9.53) yielded comparable mean retention scores.
- Low achievers teacher trainees taught through multimedia approach (M=9.53) retained better in comparison to low achievers teacher trainees taught through conventional teaching method (M=7.94).
- High achievers teacher trainees taught through conventional method (M=10.55) retained better in comparison to low achievers teacher trainees taught through conventional teaching method (7.94).

Table 11 also shows that high achievers teacher trainees taught through multimedia approach have maximum retention test scores (M=14.83), while low achievers teacher trainees taught through conventional method have lowest retention test scores (M=7.94).

4. DISCUSSION :

Comparison of the pre-test scores of both the experimental and control groups by applying statistical analysis reflected that there existed no significant difference between the two groups (Table 1), and both the groups were almost equal with respect to their performance on criterion test.

Moreover, the comparison between mean pre-test scores of high achievers of the experimental and control group was insignificant (Table 2). This indicates that high achievers of both the experimental and control groups were almost equal with respect to their performance on criterion test at the beginning of the experiment.

Similarly, the comparison between mean pre-test scores of low achievers of the experimental and control group was insignificant (Table 3). This indicates that low achievers of both the experimental and control groups were almost equal with respect to their performance on criterion test at the commencement of the experiment.

The study reveals that the experimental group performed better than control group on post test (Table 5). This means the teacher trainees taught with the help of multimedia program fared better than the teacher trainees taught through the traditional method. These results are in consonance with the findings of Anboucarassy (2010), Nimavathi & Gnanadevan (2008), and Singh (2010) who found that the students learning with the help of multimedia program are better in biology than the students learning through the traditional method.

The findings further indicate that experimental group retained better than control group (Table 9). The finding is consistent with that of Neo (2005) who concluded multimedia motivates learners to continue learning and obtain knowledge faster and above all sustain the knowledge gained. Similarly use of multiple channels was proved to be supportive in achieving additional reinforcement and with greater retention (Ellis, 2004).

The performance of experimental group was significantly better than control group for low achievers as compared to the high achievers. Furthermore, the comparison of high achievers of both experimental and control groups on post-test scores depicted that difference between mean scores of both groups was insignificant at the 0.05 level while comparison of mean scores of low achievers of the experimental and the control groups showed significant difference (Table 7). Thus multimedia approach promises to be more effective for low achievers.

Results also reveal that retention of low achievers of experimental group was significantly better than low achievers of the control group.

Moreover, comparison of mean scores of high achievers of the experimental and the control groups on retention test (Table 11) reflected insignificant difference at the 0.05 level.

On the other hand, the comparison of mean scores of low achievers of both the experimental and control groups on retention test (Table 11) showed a significant difference at the 0.05 level in favor of the experimental group. This shows that multimedia is a potent contributor to enhance the retention of low achievers.

Regarding interactional effects, the joint effect of factors treatment and level of achievement is found significant on learning and retention. This joint effect of various interactions may be significant due to the two different ways in which each factor is varying viz. multimedia approach and conventional method; high achievement and low achievement.

On the whole, it can be said that multimedia group performed significantly better than the group taught by traditional method of teaching. This endorses the well known fact that knowledge acquired through the use of more than one sense organ is more useful and retentive. The finding is supported by the observation reported by Cheng (2010) that multimedia may benefit students by stimulating their initiative, enthusiasm and all kinds of senses which leads to an effective interaction between teachers and students. However, multimedia approach proved to be more favorable for low achievers as compared to high achievers.

5. IMPLICATIONS :

1. The study has revealed that the multimedia approach is effective in not only increasing learning output of teacher trainees but also enhancing retention in Bloom's taxonomy. More units can be taken up to analyze the effectiveness of multimedia. Study may be extended to other subjects also.

2. Multimedia approach pushes traditional teacher educators to accomplish their ends by new means in order to garner many advantages from it. Hence it is recommended that teacher educators should adopt it in order to make class room teaching-learning process effective.

3. Keeping in view the importance of multimedia approach in enhancing learning and retention, the results of the present study is especially applicable in context of low achievers and students having low retention power.

4. It is recommended that this approach be given wide publicity so that many more programs can be developed for pre-service and teacher trainees/ trainees pursuing B.Ed. on different sub units especially which are difficult to understand. Keeping the results of the study in mind the NCTE should take up the work of producing multimedia programs. Different multimedia programs can be developed and supplied to all colleges of education.

5. The teacher educators should be given orientation and sufficient training as to how to develop multimedia programs. It will reduce the dependency of teacher educators on technology experts who are not in general academicians.

Teaching via traditional printed formats should be well supported by multimedia packages. The onus of distributing and marketing such packages should be taken by the publishers and both printed and electronic ways of education should coexist and not compete with each other.

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