Comparative Study of the Effectiveness of three Instructional Systems for Teaching Information Technology to Secondary School Students

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ABSTRACT

Information Technology is the fastest growing feld in India. Proper teaching of this subject at secondary level is very important. This study attempts to find out the best instructional method out of three i.e. Conventional Instructional System (CIS), Audio-Video Instructional System (AVIS) and Multimedia Instructional System (MIS) for teaching Information Technology at the secondary level. For this purpose total 120 students were randomly selected from three CBSE affiliated schools. They were assigned to three groups on the basis of their acores in Intelligence test. These three groups were taught by three different methods. Four tools were used in this study out of which, except for Intelligence test all other tools were developed by the researcher. After attaining the raw scores and applying different statistical techniques like ANOVA, t-test and factorial design, it was found that MIS is the best method, AVIS is the second best and CIS is the third best method for taking Information Technology at secondary level.

Introduction

In the age of Science and Technology 'Instructional Technology' is used in schools to make the teaching-learning effective. Planned efforts in Education would mean identifying educational activity, ensuring their potential and evolving effective ways of Instructional Technology. Instructional Technology is the application of scientific and technological principles into teaching and learning situations. It is the systematic use of scientific knowledge to plan, realise and to

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assess the teaching learning process. Instructional Technology is a science of technique which helps to solve the problems. In education, many issues are arising everyday because of explosions of population and knowledge, aspirations of the people and expectations from the students. Within the limited time and money, available more knowledge has to be given to students. This can be achieved only through the proper use of Instructional Technology.

Audio-Video instructional system is a strategy of teaching-learning which refers to the wise use of senses of hearing and sight, magnificently helpful in making the learning more meaningful, more interesting and more effective in the realisations of the teaching objectives. Multimedia instructional system is a strategy of teaching learning which concerns to systems that integrate video, audio, text, graphics, animation. The computer is the best multimedia instructional system in teaching learning. We are living in the era where globe has become a virtual family. We can communicate to any person in any corner of the world from anywhere in the world through computer. And the credit for all this goes to communication revolution that has happened in this century especially in the last thirty years. Advances in the communication technology techniques, coupled with evolving computer technology in the form of multimedia have made possible nearly everything we dreamt of. Experts are of the opinion that different media serve different educational functions so that various media should not be used in isolation instead they should be integrated. Computer Assisted Instruction approach comes under multimedia instructional system. Media combinations are generally referred to as multimedia system. Multimediations means "many media". The term 'multimedia instructional system' refers to the uses of appropriate and carefully selected varieties of learning experiences which are presented to the learner through selected teaching strategies which reinforce and strengthen one another so that the learner will achieve predetermined and desired behavioural objectives.

The potential of modern Instructional technology has a direct bearing on the education system. Thoughtfully and judiciously used Instructional Technologies can massively extend educational opportunities and improve the quality of education. The State and Central government is also introducing the multimedia approach like computers in the curriculum of school students and college students.

After going through the study of literature in education including Buch's surveys of research in education reveals that no such type of study has been undertaken so far in the field of education.

Statement of the Problem

Comparative Study of the effectiveness of three Instructional Systems for Teaching Information technology

Definition of Terms

Effectiveness- It is the indicator to evaluate the standardised achievement criteria test of Secondary school students for teaching of "Information Technology" by three strategies i.e. Conventional system of instruction, Audio-Video instructional system and Multimedia instructional system and comparing them to judge the indication in the form of effectiveness.

Achievement- Good (1973) in his dictionary defined achievement as academic knowledge defined or skills developed in the School subjects, usually designed by test scores or by marks assigned by teachers or both. In the present venture, achievement. means scores of the students on the criterion test in a particular discipline i.e. 'Information Technology'

Instructional Technology - It is the system of transmission or sharing of ideas, facts, data for the individual or for collective activity by some means, media, channel in the field of education through which communication takes place is called Communication Technology in Education. The various media of Communication Technology are-Printed study material, Audio-Video Cassettes, Radio, Television, Telephone, Computer, Internet, E-mail, Fax, Video-Disc, Computer Disc, Multimedia Tools etc. Communication Technology is a vital area of instruction. It is an instructional tool. In the present investigation, investigator have taken two types of communication technologies as instructional tool viz-Audio-Video instructional system and Multimedia instructional system.

Instructional System- In accordance with UNESCO (1977), "Education is an organised and sustained instruction designed to communicate of knowledge, skills and understanding valuable for all activities of life." If, instruction is not made to contribute effectively to education, the aims of education cannot be realised. It is a means employed by the teachers, designers of material and curriculum specialists to promote learning. A planned instruction has the purpose of helping each person to develop optimally in the direction of his own tendencies, innate and/or acquired.

In the present investigation, investigator have taken two types of communication technologies as instructional tool viz-Audio-Video

instructional system and multimedia instructional system.

Conventional Instructional System (C.I.S.)- Conventional instructional system of teaching in which teacher is the centre of class-room activities of teaching - learning process. According to Good's dictionary, conventional teaching is that type of teaching, which is out growth of custom or common practice. It is the teacher, who presents the entire content to be learnt in the final form. In this approach, the student is not required to make any lecture hall which exemplifies conventional teaching. The terms connected with conventional instructional system are expository, traditional and lecture method. All these further, most of the researchers have taken conventional teaching as it exists in the class room today. In these class rooms, lessons are not planned, objectives are not stated in behavioural terms and stepwise evaluation of students is not done during teaching. But in the present study, Conventional instructional System means that teaching process where the teacher plays the major role. But the lesson is planned, objectives are framed in the behavioural terms and stepwise evaluation of students is done at every stage.

Audio-video Instructional System (V.I.S.)- The Audio-Video Instructional System is a strategy which call upon the auditory and visual senses of the learners. The Audio-Video Instructional System have the wise use of our senses of hearing and sight proving magnificently helpful in making the learning more meaningful, more interesting and more effective. It is the strategy which help the teacher in effective realisation of his teaching objectives by calling upon the auditory & visual senses of his students.

Multimedia Instructional System (M.I.S.) - Multimedia Instructional System is the strategy which belongs to systems that integrate video, audio, text, graphics, animation. Multimedia Strategy call for the use of number of media, devices and techniques for teaching - learning for an effective realisation of teaching objectives in a best possible way, for example - Computer Assisted Technology is the best technique of multimedia approach.

Multimedia instructional system ultimately aims for the creation of such teaching learning environment that may prove helpful in making students learning an independent and individualised activity. Accordingly, there needed a significant change in the attitude and role of the teacher. His task in the multimedia approach is not limited to the imparting of knowledge and disseminating information to the students. Consequently, there will be a shift of his role from direct

communication of information to guiding students in learning. He has to make his students active participants in the process of learning instead of learning passive. The learning experiences are to be designed by him by adopting multimedia approach in such a way that the students may be able to proceed on the path of learning quite independently. Slowly and slowly they are to lead on the path of auto-instruction and self-learning. The role of the teacher thus needs a major shift in the shape of guide, adviser and organiser in place of a mere communicator, demonstrator or tutor etc.

Information Technology- An information technology can be simply defined as the interacting of man and machine which, under man's control, gathers data and disseminates information. The main objective of such a system is to provide information to its user. To accomplish this, data must be evaluated, analysed and processed to produce meaningful and useful information. 'Information Technology' is widely used in education along with other fields.

Objectives of the Study

The study envisages the following objectives—

(1) to compare the effectiveness of Audio-Video Instructional System, Multimedia Instructional System and Conventional Instructional System in terms of achievement.

(2) to study the relative retention in learning through Audio-Video Instructional System, Multimedia Instructional System and Conventional Instructional System.

(3) to study the Interaction effects of Instructional Systems at different level of intelligence.

(4) to study the interaction effects of Instructional Systems at different levels of sex.

(5) to study the interaction effects in different levels of intelligence and sex factor.

(6) to study the interaction effects in terms of achievement in 'Information Technology' having three instructional system, two levels of intelligence and two levels of sex.

Hypothesis

In order to realise the objectives of the study, the following hypothesis will be formulated for testing.

H-1 There is no significant difference between the mean achievement of students receiving instructions through Audio-Video Instructional System, Multimedia Instructional System and Conventional Instructional System.

H-2 There is no significant difference in the relative retention of students receiving instructions through Audio-Video Instructional System, Multimedia Instructional System and Conventional Instructional System.

H-3 There is no significant interaction between three instructional systems and two levels of intelligence..

H-4 There is no significant interaction between three instructional systems and two levels of sex.

H-5 There is no significant interaction between two levels of intelligence and two levels of sex.

H-6 There is no significant interaction between three instructional systems, two levels of intelligence and two levels of sex.

Delimitation of Study

The propose study will be delimited with respect to area, discipline, method, sample and tools, However, some of the delimitations are listed below :

Area - The study will be confined to the Secondary Schools (Affiliated by C.B.S.E, New Delhi) of Bhiwani City (Haryana)

Grade - The study will be delimited to Secondary school students.

Discipline - The study will be confined to only 'Information Technology' contents of the Secondary school students (Affiliated by C.B.S.E, New Delhi)

Sample - The sample will be restricted to the available Secondary school students only.

Limitation of Study

Total 120 students were selected randomly from three CBSE affiliated schools. Three equal matched groups of 40 students were taken from each school considering their previous numbers in 'Information Technology' subject in their previous class to reduce the school effect.

Research Design

Methodology

Experimental research method will be adopted in the present investigation.

Sample

The school will be selected randomly. All the available Secondary school students (Affiliated by C.B.S.E, New Delhi) will be taken. They will be assigned to three groups on the basis of their scores in Intelligence Test so as to obtain three equal groups (I, II, III) matched with respect to Intelligence.

Group I One Group of Secondary School Students will be taught Information Technology by Audio-Video Instructional System.

Group II Second Group will be taught Information Technology by Multimedia Instructional System.

Group III Third Group will be taught Information Technology by Conventional Instructinal System.

Tools

The following tools will be used to collect the data.

1. Intelligence test for making the three equal matched Groups. (Group I, Group II, Group III)
2. Achievement Test for Secondary School Students for teaching of Information Technology will be used for measurement of dependant variable. (To be developed by the Investigator)
3. Preparation of Audio-Video Instructional System for teaching of Information Technology of Secondary School Syllabus (To be developed by Investigator)
4. Preparation of lesson by animation in computer under Multimedia Instructional System for teaching of Information Technology (To be developed by investigator)

Procedure of the Study

In the present study, pre-test control group design will be employed. It will include three groups of students, two experimental and one control group. The achievement test of Secondary School Students of Information Technology will be the criterion test.

After selection of the sample institutions, investigator will divide all the available students into three homogenous groups. Before teaching the content, achievement test as pre-test will be given to all the students of three groups. All the students of three groups will be exposed to the three types of Communication Technology viz. Audio-Video Instructional System, Multimedia Instructional System and Conventional System of Instructions, assigned randomly to three groups.

After completion of the instructions, again achievement test as first post-test will be given to all the students. After fifteen days the same test will be readministered to study retention in learning. Again achievement test as second post-test will be given to all the students Thus, obtained scripts will be scored and submitted for further statistical treatments.

Statistical Analysis

The following statistical techniques will be employed for the analysis of data collection.

1. Analysis of variance. (ANOVA)
2. 't'-test & F-test
3. Factorial design (3x2x2)
4. Any other statistics as warranted by the data will be used.

Analysis and Interpretation of Data

H-1 There is no significant difference between the mean achievement of students receiving instructions through Audio-Video Instructional System, Multimedia Instructional System and Conventional Instructional System.

TABLE 1
Analysis of Variance Table on Gain in Achievement Scores

Sources of Variance	*df*	*SS*	*MS*	*F*	*Level of Sign.*
BT	2	720.07	360.04	F=28.29	0.01
WT	117	1483.80	12.68		

The obtained F value is 28.29 is siginifant at 0.01 level of siginifance i.e.4.80 with df (2, 117). The null hypothesis is rejected

and it may be stated that there is significant difference among three methods. 't' test is used for comparing the effectiveness of three instructional systems using ANOVA.

TABLE 2
Comparison of various Pairs of Means of three Groups on Gain in Achievement Scores Using 't' Test

Various pairs	*Mean Difference*	*SEdm*	*'t' value*	*df*	*Level of Sign.*
A.V. inst. System & Multimedia inst. system	3.05	0.72	4.10	78	0.05
A.V. inst. system & conventional inst. system	2.95	0.74	4.12	78	Significant
Multimedia inst. system conventional inst. system	6.00	0.92	6.52	78	

From the above table 't' value shows that their is significant different between (AVIS and MIS), (AVIS and CIS), (MIS and CIS). From the mean values of above three instructional system it shows that MIS is the first most best method and AVIS is the second test method and CIS is the third best method.

H-2 There is no significant difference in the relative retention of students receiving instructions through Audio-Video Instructional System, Multimedia Instructional System and Conventional Instructional System.

TABLE 3
Analysis of variance table on Retention

Source of variance	*df*	*SS*	*MS*	*F*	*Level of Sign.*
Between (A)	2	405	202.50	F=25.31	0.01
within	117	935.50	8.00		Significant

The obtained F value is 25.31 with df (2,117) is significance at 0.01 level (i.e.4.80) The null hypothesis is rejected and it may be stated that there is significant difference among the three methods on retention.

't' test is used for comparing the effectiveness of three instructional system on retention using ANOVA.

TABLE 4
Comparison of Various Pairs of Means of three Groups on Gain in Achievement Scores Using 't' Test

Various pairs	*Mean Difference*	*SEdm*	*'t' value*	*df*	*Level of Sign.*
A.V. inst. System & Multimedia inst. system	2.25	0.442	5.09	78	0.01
A.V. inst. system & conventional inst. system	2.25	0.735	3.06	78	0.01
Multimedia inst. system conventional inst. system	64.50	0.680	6.62	78	0.01

From the above table 't' value shows that their is significant difference between AVIS, MIS and AVIS and CIS and MIS and CIS. From the mean values of above three instructional system on retention shows that lower mean value shows better on retention, so MIS is the better than AVIS and CIS on retention.

H-3 There is no significant interaction between three instructional systems and two levels of intelligence.

Interaction Effects (A B)

F_{AB} ratio for interaction between three instructional systems and two levels of intelligence i.e. 45.37 from table No. 6 was found to be significant at 0.01 level of significance. So null hypothesis is rejected. Therefore, the interaction of three instructional systems and two levels of intelligence is significant.

H-4 There is no significant interaction between three instructional systems and two levels of sex.

Interaction Effects (A C)

F_{Ac} ratio for interaction between three instructional systems and two levels of sex i.e. 0.008 from table 6 was found to be insignificant at

0.01 level of significance. So null hypothesis is accepted. Therefore, interaction of three instructional systems and two levels of sex is not significant.

H-5 There is no significant interaction between two levels of intelligence and two levels of sex.

Interaction Effects (B C)

F_{BC} ratio for interaction between two levels of intelligence and two levels of sex i.e. 19.01 from the above table was found to be significant at 0.01 level of significance. So null hypothesis is rejected. Therefore, there is interaction between two levels of intelligence and two levels of levels of sex.

H-6 There is no significant interaction between three instructional systems, two levels of intelligence and two levels of sex.

Interaction Effects (A B C)

F_{ABC} ratio for interaction between three instructional system, two levels of intelligence and two levels of sex i.e. 20.48 from the above table was found to be significant at 0.01 level of significance. So null hypothesis is rejected. Therefore, there is interaction between three instructional system, two levels of intelligence and two levels of levels of sex.

Conclusions

On the basis of these findings, the following conclusion have been drawn:

1) Multimedia instructional system was found to be the best instructional system than two instructional systems i.e. Audio-Video instructional system and Conventional instructional system. Audio-Video instructional system was better than the Conventional system.

2) The relative comparison of three instructional systems on retention by using the assumption that a method lower on mean score i.e. mean score of Multimedia instructional system would be termed as more effective on retention as compared to a method having higher mean scores i.e. Audio-video instructional system and Conventional instructional system on retention.

TABLE 5
AxBxC Factorial Design

(B) Intelligence Level (12 n) (n = 10) A	*(C) Sex Factor*	*Instructional System (A)*			*Total*
		l (C.I.S.) (4n)	*A2 (V.I.S.) (4n)*	*A3 (M.I.S.) (4n)*	
High Intelligence (6n)	Boys (C1)	ΣA2B1C1 = 505 M = 50.5 S.D. = 2.75 n = 10	ΣA2B1C1 = 477 M = 47.7 S.D. = 1.41 n = 10	ΣA3B1C1 544 M = 54.4 S.D. = 1.95 n = 10	ΣB1C1 = 1526
B1	Girls (C2)	ΣA1B1C2 = 435 M = 43.5 S.D. = 1.95 n = 10	ΣA2B1C2 = 453 M = 45.3 S.D. = 1.88 n = 10	ΣA3B1C2 528 M = 52.8 S.D. = 1.68 n = 10	ΣB1C1 = 1416
Average Intellignece (6n)	Boys (C1)	ΣA1B2C1 = 406 M = 40.6 S.D. = 1.42 n = 10	ΣA2B2C1 = 494 M = 49.4 S.D. = 2.11 n = 10	ΣA3B2C1 487 M = 48.7 S.D. = 3.71 n = 10	ΣB2C1 = 1387

B2	Girls (C2)		ΣA1B2C2 = 436 M = 43.6 S.D. = 1.77 n = 10	ΣA2B2C1 = 476 M = 47.6 S.D. = 10.7 n = 10	ΣA3B2C2 463 M = 46.3 S.D. = 1.49 n = 10	ΣB2C1 = 5704
Total			**ΣA1 = 1782**	**ΣA2 = 1900**	**ΣA3 = 2022**	**T = 5704**

ΣB1 = ΣB1C1 + ΣB1C2 = 1526 + 1416 = 2942
ΣB2 = ΣB2C1 + ΣB2C2 = 1387 + 1375 = 2762
ΣC1 = ΣB1C1 + ΣB2C1 = 1526 + 1387 = 2913
ΣB2 = ΣB1C2 + ΣB2C2 = 1416 + 1375 = 2791
ΣB = ΣB1 + ΣB2 = 2942 + 2762 = 5704
ΣC = ΣC1 + ΣC2 = 12913 + 2791 = 5704

TABLE 6
Analysis of variance table for (3 2 2 Design) for 'F' Ratios
(Three way classification)

Source	*df*	*SS*	*MS*	*F Values*
A. Teaching Methods	2	720.07	360.03	$\frac{360.03}{4.21} = 85.51^*$
B. Intelligence	1	270.00	270.00	$\frac{270.00}{4.21} = 64.13^*$
C. Sex	1	124.03	124.03	$\frac{124.03}{4.21} = 29.46^*$
A B Intelligence	2	382.2	191.03	$\frac{191.03}{4.21} = 45.37^*$
B C Intelligence	1	80.04	80.04	$\frac{80.04}{4.21} = 19.01^*$
A B C Intelligence	2	172.46	86.23	$\frac{86.23}{4.21} = 20.48^*$
Between Cells	11	1748.87	...	
Within Subjects	108	455	4.21	
Total	**119**	**2203.87**		

Analysis of variance table for 3 2 2 design having 7F values.
3F values for main effects, 3F values for interaction effects of two factors and 1F values for interaction effects of three factors.

* Significant at 0.01 level of significance.

3) In factorial design (3 2 2), the interaction of teaching methods and intelligence level is significant. There is an interaction between teaching methods and intelligence levels. The high and average level of intelligence learn differently interacting with three instructional systems. It may be concluded that when three instructional system (A) and two levels of intelligence (B) are taken jointly, they do effect the dependent variable i.e. Achievement scores of students in 'Information Technology'

4) In factorial design (3 2 2), the interaction of teaching methods with sex levels is not significant. There is no interaction between teaching methods and sex levels. The male and female secondary school students have no difference in learning through three different teaching methods. It may be concluded that when three instructional system (A) and two levels of sex (C) are taken jointly, they do not effect the dependent variable i.e. Achievement scores of students in 'Information Technology'

5) In factorial design (3 2 2), the interaction of different levels of intelligence and levels of sex is significant. There is an interaction between two levels of intelligence and two levels of sex. It may be concluded that when two levels of intelligence (B) and two levels of sex (C) are taken jointly, they do effect the dependent variable i.e. Achievement scores of students in 'Information Technology'

6) In factorial design (3 2 2), the interaction of three instructional systems (A), two levels of intelligence (B) and two levels of sex (C) is significant. There is an interaction between three instructional systems, two levels of intelligence and two levels of sex. It may be concluded that when three instructional system (A), two levels of intelligence (B) and two levels of sex (C) are taken jointly, they do effect the dependent variable i.e. Achievement scores of students in 'Information Technology'

Educational Implications

The findings of the study have their implications for students, teachers, teacher educators, curriculum planners, media persons, administrators and education policy makers. The findings have special relevance to the 'Information Technology' teachers who are teaching 'Information Technology' and computers to secondary school students.

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