SUMMARY
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6.0.0 INTRODUCTION

As a result of grand achievements in the field of science and technology, which are now-a-days considered as just oxygen is for life, science education has become an integral part of school curriculum. Throughout most of the world’s educational history, the methods of teaching have been the central feature. From the ancient period, philosophers have contributed significantly to teaching methodology. More significance to methods of teaching was given after the emergence of various theories of learning and their impact upon human behaviour. The modern approaches to instructions have been influenced by cognitive, behaviouristic and humanistic psychological orientations (Singh and Jamini, 1989). Earlier the classroom instructions were mainly content based, but the tremendous explosion of knowledge in all spheres of educational curricula have resulted in learner based instructions. The modern teacher realises it- 'to teach is to nourish or cultivate the growing child'. Thus the new approaches and techniques of teaching which are replacing the traditional methods have emerged.

Elton (1977) identified mass communication instruction, individualised learning and group learning as the main
fields of development. The introduction of educational technology in the form of hardware and software approach has also brought significant changes on the teaching learning scenario. Various researchers have made attempt in the direction on finding out the relevance of different methods or approaches or presentation modes. Now as the science has been influencing our life and its impact upon our society is quite remarkable, a need arises to look for an effective mode of imparting scientific information to the learners. It will be quite appropriate to search for a mode which enhances the insight of pupils into the basic nature of science so that the problems related to broad human concern like pollution and population can be controlled for better life.

Gardener (1975) emphasised a resemblance between the science taught in the schools and the science used by practising scientists. This search led to the development of various approaches like laboratory method, heuristic method, or problem solving method etc. Along with it new modes like video and computer teaching have also been explored and developed due to their potentialities. The investigator in this study found out the effectiveness of four different presentation modes i.e. demonstration mode (DM), video instructions mode (VM), video instructions followed by teacher's discussion mode (VDM) and students' learning
through self-experimentation under the guidance of teacher mode (SLM). The purpose of the investigation was to study the effect of these four classroom presentation modes on the achievement of secondary students in science. These four presentation modes were selected because these can be used as being independent of each other and can be conducted in actual classroom situations for teaching physics, chemistry, and biology.

6.1.0 STATEMENT OF THE PROBLEM

EFFECT OF FOUR CLASSROOM PRESENTATION MODES ON THE ACHIEVEMENT OF SECONDARY STUDENTS IN SCIENCE

6.2.0 OBJECTIVES

Following were the objectives of the study:

(1) To compare the pupils' achievement in science adjusted on intelligence, socio-economic status and pre-achievement in science, taught through Video instructions followed by teacher's discussion mode (VDM) and Demonstration mode (DM).

(2) To compare the pupils' achievement in science adjusted on intelligence, socio-economic status and pre-achievement in science, taught through Video instructions followed by teacher's discussion mode (VDM) and Video instructions mode (VM).
(3) To compare the pupils' achievement in science adjusted on intelligence, socio-economic status and pre-achievement in science, taught through Video instructions followed by teacher's discussion mode (VDM) and Students' learning through self-experimentation under the guidance of teacher mode (SLM).

(4) To compare the pupils' achievement in science adjusted on intelligence, socio-economic status and pre-achievement in science, taught through Demonstration mode (DM) and Video instructions mode (VM).

(5) To compare the pupils' achievement in science adjusted on intelligence, socio-economic status and pre-achievement in science, taught through Demonstration mode (DM) and Students' learning through self-experimentation under the guidance of teacher mode (SLM).

(6) To compare the pupils' achievement in science adjusted on intelligence, socio-economic status and pre-achievement in science, taught through Video instructions mode (VM) and Students' learning through self-experimentation under the guidance of teacher mode (SLM).

### 6.3.0 HYPOTHESES

In order to achieve objectives, the following hypotheses were formulated:

(1) There is no significant difference in the mean achievement scores of secondary students in science,
taught through Video instructions followed by teacher’s discussion mode and Demonstration mode.

(2) There is no significant difference in the mean achievement scores of secondary students in science, taught through Video instructions followed by teacher’s discussion mode and Video instructions mode.

(3) There is no significant difference in the mean achievement scores of secondary students in science, taught through Video instructions followed by teacher’s discussion mode and Students’ learning through self-experimentation under the guidance of teacher mode.

(4) There is no significant difference in the mean achievement scores of secondary students in science, taught through Demonstration mode and Video instructions mode.

(5) There is no significant difference in the mean achievement scores of secondary students in science, taught through Demonstration mode and Students’ learning through self-experimentation under the guidance of teacher mode.

(6) There is no significant difference in the mean achievement scores of secondary students in science, taught through Video instructions mode and Students’ learning through self-experimentation under the guidance of teacher mode.
6.4.0 METHOD AND PROCEDURE

6.4.1 DESIGN

In the present study, effect of four presentation modes viz. (i) demonstration mode; (ii) video instructions mode; (iii) video instructions followed by teacher’s discussion mode and (iv) students’ learning through self-experimentation under the guidance of teacher mode, was studied regarding the achievement of secondary students in science. To achieve the objectives of the investigation pre-test post-test group design was employed. The design comprised of four different secondary schools. Forty students of tenth class were selected from each school. Achievement in science was the dependent variable whereas four different presentation modes were the independent variables. The intervening variables were controlled either statistically or administratively. The students of all the four groups were administered intelligence test and socio-economic status scale. The pre-achievement of these students i.e. the marks obtained by these students in science in their ninth class was noted from school records. The scores of intelligence test, socio-economic status scale and pre-achievement were the control variables which were adjusted statistically. The study was conducted in three stages:

(1) Pre-test stage
(ii) Experimental treatment stage and
(iii) Post-test stage.

An achievement test, developed by the investigator himself, was administered before (pre-test stage) and after (post-test stage) the experimental treatment.

6.4.2 SAMPLE

The sample consisted of 160 students, studying in the tenth class of four different secondary schools of Rohtak city. Forty students from each school were selected at random as the sample for the study.

6.4.3 TOOLS USED

Two types of tools were used in the present investigation i.e. instructional tools and measuring tools. Instructional tools in the form of lesson plans and video lessons were developed for providing instructions to the pupils. An achievement test was developed by the investigator to note the achievement of students in science. This achievement test, Prayag Mehta's group intelligence test and Kuppuswamy's socio-economic status scale were used as measuring tools.

6.4.4 EXPERIMENTAL TREATMENT

After administration of the achievement test, the four different groups were provided experimental treatment. One group was taught through demonstration mode,
second group got the instructions through video instructions mode, third had to carry on through video instructions followed by teacher's discussion mode whereas fourth group was put to the students' learning through self-experimentation under the guidance of teacher mode. A school period of forty minutes was utilised for teaching. Thirty lessons in total (ten each from physics, chemistry and biology) were taught during the experimental treatment.

6.4.5 CONTROLS USED

It was felt necessary to identify and control all those variables that may affect the dependent variable. The dependent variable was the achievement of the students. The variables like intelligence, socio-economic status, grade level, prior knowledge of the subject etc. were controlled either statistically or administratively.

6.4.6 STATISTICAL TECHNIQUES USED

To interpret the data collected, Analysis of Co-Variance (ANCOVA) was employed as the statistical measure for testing the significance of difference of the mean achievement scores of secondary students in science. For significant F-ratio 't' test was applied taking two treatments together at a time.

6.5.0 FINDINGS

The statistical data of the present study revealed
the following findings:

(1) A significant difference was observed between the mean achievement scores of video instructions followed by teacher's discussion mode group and demonstration mode group with F-value of 9.39 at 0.01 level of significance (Table 4.2). Hence the null hypothesis, "There is no significant difference in the mean achievement scores of secondary students in science, taught through video instructions followed by teacher's discussion mode and demonstration mode", is rejected. The t-value of 3.78 for VDM and DM groups is significant at 0.05 level (Table 4.3). This indicates a significant difference between the mean gain achievement scores of secondary students in science taught through VDM and DM. The mean gain achievement score of 29.52 of video instructions followed by teacher's discussion mode group is higher than the mean gain achievement score of 22.82 of demonstration mode group. This indicates that the achievement of secondary students when taught through VDM is significantly higher than the students taught through DM.

(2) A significant difference was observed between the mean achievement scores of video instructions followed by teacher's discussion mode group and video instructions mode group with F-value of 35.30 at 0.01 level of significance (Table 4.5). Hence the null hypothesis, "There is no
significant difference in the mean achievement scores of secondary students in science, taught through video instructions followed by teacher's discussion mode and video instructions mode", is rejected. The t-value of 6.86 is significant at 0.05 level (Table 4.6). This indicates a significant difference between the mean gain achievement scores of secondary students in science taught through VDM and VM. The mean gain achievement score of 29.52 of VDM group is greater than that of 18.05 for the VM group. This shows that the achievement of secondary students when taught through VDM is significantly higher than the students taught through VM.

(3) A significant difference was observed between the mean achievement scores of video instructions followed by teacher's discussion mode group and students' learning through self-experimentation under the guidance of teacher mode group with F-value of 304.31 at 0.01 level of significance (Table 4.8). Hence the null hypothesis, "There is no significant difference in the mean achievement scores of secondary students in science, taught through video instructions followed by teacher's discussion mode and students' learning through self-experimentation under the guidance of teacher mode", is rejected. The t-value of 16.15 is significant at 0.05 level (Table 4.9). This indicates a significant difference between the mean gain achievement
scores of secondary students in science taught through VDM and SLM. The mean gain achievement score of 29.52 of VDM group is greater than that of 11.52 for the SLM group. This shows that achievement of secondary students when taught through VDM is significantly higher than the students taught through SLM.

(4) A significant difference was observed between the mean achievement scores of demonstration mode group and video instructions mode group with F-value of 9.38 at 0.01 level of significance (Table 4.11). Hence the null hypothesis, "There is no significant difference in the mean achievement scores of secondary students in science, taught through demonstration mode and video instructions mode", is rejected. The t-value of 9.38 is significant at 0.05 level (Table 4.12). This indicates a significant difference between the mean gain achievement scores of secondary students in science taught through DM and VM. The mean gain achievement score of 22.82 of DM group is greater than that of 18.05 for the VM group. This shows that the achievement of secondary students when taught through DM is significantly higher than the students taught through VM.

(5) A significant difference was observed between the mean achievement scores of demonstration mode group and students’ learning through self-experimentation under the guidance of teacher mode group with F-value of 51.81 at 0.01
level of significance (Table 4.14). Hence the null hypothesis, "There is no significant difference in the mean achievement scores of secondary students in science, taught through demonstration mode and students' learning through self-experimentation under the guidance of teacher mode", is rejected. The t-value of 7.53 is significant at 0.05 level (Table 4.15). This indicates a significant difference between the mean gain achievement scores of secondary students in science taught through DM and SLM. The mean gain achievement score of 22.82 of DM group is greater than that of 11.52 for the SLM group. This shows that the achievement of secondary students when taught through DM is significantly higher than the students taught through SLM.

(6) A significant difference was observed between the mean achievement scores of video instructions mode group and students' learning through self-experimentation under the guidance of teacher mode with F-value of 16.70 at 0.01 level of significance (Table 4.17). Hence the null hypothesis, "There is no significant difference in the mean achievement scores of secondary students in science, taught through video instructions mode and students' learning through self-experimentation under the guidance of teacher mode", is rejected. The t-value of 4.76 is significant at 0.05 level (Table 4.18). This indicates a significant difference between the mean gain achievement scores of secondary
students in science taught through VM and SLM. This shows that the achievement of secondary students when taught through VM is significantly higher than that of the students taught through SLM.

6.6.0 CONCLUSIONS DRAWN

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

(1) Video instructions followed by teacher's discussion mode (VDM) was found to be superior to other three modes namely video instructions mode (VM), demonstration mode (DM), and students' learning through self-experimentation under the guidance of teacher mode (SLM). The achievement of the students when taught through VDM was significantly higher than the achievement of the students when taught through VM, DM, and SLM.

(2) The relative comparison of DM, VM and SLM indicates that DM was superior to both the VM and SLM regarding the achievement of secondary students in science. The students who were taught through DM showed better achievement as compared to the students taught through VM or SLM. But on the other hand DM was found to be less effective as compared to VDM. The students taught through VDM showed higher achievement than the DM taught students.
(3) It was also observed that VM was superior to SLM. The students taught through VM showed higher achievement in science as compared to students taught through SLM.

(4) Out of these four modes, SLM was found to be least effective of all. The achievement of the students taught through SLM had the lowest achievement as compared to VDM, DM or VM taught groups.

To sum up, VDM was found to be most effective in terms of achievement of secondary students in science as compared to VM, DM and SLM. DM was superior to VM whereas VM in turn was found to be superior to SLM. The SLM was found to be least effective of all the four presentation modes.

6.7.0 **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 science teachers who are teaching physics, chemistry and biology at secondary school stage.

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