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Effctveness Of Inductive Thinking Model Over Conventional Teaching Method On Academic Achievement For Science And Technology Subject

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Abstract

This Study investigated the effectiveness of Inductive Thinking Model over Conventional teaching method on Academic Achievement of Science and Technology at the upper secondary level of Science and technology students. A total of 100 students were taken in the study as Experimental work has to be done. The author selected purposive two equivalent groups, pre-test post-test design in true experimental design. The effect of the classroom teaching for the units based on Science and Technology content through Inductive Thinking Model over conventional teaching as experimental research has to be done. The effect of the classroom teaching for the units based on Science and Technology content through Inductive Thinking Model over Conventional teaching was found by using ANCOVA statistical method "t" Values. Results revealed a statistically significant effect of Inductive Thinking Model over conventional teaching method on Academic achievement of students. Based upon the achievement test in Science and Technology related Science and technology (CRT), teaching of Science and technology through the Inductive Thinking Model may be advocated as a better tool than conventional method for teaching science and technology at secondary level. In context to gender purpose both male and female students have the same effect of Inductive Thinking Model and Conventional method of Teaching for the Science and technology related knowledge.However, the work carried out is having certain limitations such as the unit of lesson-plans based on Science and technology content of Std.IX science and Technology, GSEB, Gujarat related whole content was specified only for 4 sub-units.

Key Words: Achievement Test(CRT), Inductive Thinking Model, Conventional Teaching Method

1. Introduction

Sternberg and Baron (1985) believe whenever our focus is on primary level education, the basic concepts of maths, or basic and ultimate goal of education has been to teach to children to think critically and independently. Hence, it is pertient for Science and Maths teachers to raise questions at the elementary or upper primary school level. The primary task of the science teacher is the transmission of selected experiences in science to his students.

Now-adays, number of efforts were made to identify teaching skills for teachers for teaching different subjects. Brown and Campione's (1994) had developed Community of Learners' programs and proved that Cognitive, affective and psychomotor behaviour must be developed in a balanced and integrated fashion, and for that Models of Teaching have great potentiality for achieving this goal of education. Joyce et al (1992) provides a much more effective way to teach children to think critically and independently.

Hilda Taba (Joyce et al , 1997, pp 15-16) has studied how to teach students to find and organized information and to create and to test hypothesis describing relationship among sets of data, inductive thinking model has been used in a wide variety of curriculum areas and with students of all ages. Even if concepts learning were not so critical in the development of thought, the organization of information is so fundamental to curriculum areas that inductive thinking would be very important model for learning and teaching school subjects. It is a method of instruction where teachers use powerful examples to help students learn a concept, principle, generalization or academic rule. The goals of inductive instructions are to help students construct a deep and thorough understanding of specific topics, that understanding and to help students gain skill and confidence in making sense of their own environment. .

Related to Models of Teaching, this vital area of research in India first study at Ph.D. level was completed in 1983 by Chitriv at Nagpur, while at M.Ed level the first study was conducted in 1979 by Buddhisagar at Indore. By now a large number of

studies have been completed. These relate to studies where in models of teaching have for teaching and for training of teacher educators and student-teachers in Models of Teaching. Inductive Thinking Model (Livingstone,1981; Bellack,1982 ; Garrett,1985; Hota,1986) have been investigated where in teaching has been done with the help of models of teaching. Livingstone (Hota,1981) has studied the effect of Inductive instruction in general semantics on critical thinking ability. He observed that the students critical thinking ability improved as a result of instruction through inductive approach. Bellack (Hota,1982) attempted to know about the attitude of Teachers towards Inductive Science Teaching and Inquiry method in the Secondary School Science. He found that there was no significant difference in the attitude of male and female teachers of different ages towards Inductive teaching and Inquiry method & found that Attitude and training had impact on teaching . Garrett (Hota ,1985) has investigated for an analysis of teaching for critical thinking outcomes in Albena public junior and community college history course through inductive approach and found that the development of value clarification skills and occasional Inductive instruction help pupils in the development of critical thinking skills. Hota (1986) has carried out an investigation on a study of effectiveness of Inductive thinking model on pupils' achievement and creativity in comparison to traditional teaching. He found that Inductive thinking Model has been superior in imparting education instructions to pupil in comparison to Traditional teaching. I.T.M. has been found good for promoting creativity amongst IX class learners.

In this study, the effect of Inductive Thinking Model(ITM) developed by Hilda Taba and Conventional Method (CM) on criterion referenced test of students (CRT) of a secondary school of Gujarat, India was investigated.

2. Objectives of the Study

The objectives of this study were:

1. To construct Inductive Thinking Model based on content of Science and technology of grade IX

2. To compare the relative effectiveness of Inductive Thinking Model and conventional teaching method in terms of secondary level pupils achievement in teaching Science and technology
3. To examine the relative effectiveness of Inductive Thinking Model with regards to types of gender in terms of secondary level of pupils achievement in teaching Science and technology
4. To seek the opinions of the students of the experimental groups of secondary level towards Inductive Thinking Model based teaching programme

3. Methodology

- **Design of the Study:**

In present study the researcher selected the purposive groups, pre-post design in true experimental design as shown in Table 1.

Table 1 : Purposive Groups, pre-test ;- post –test Design

Purposive Designed	**Pre-test**	**Independent Variable**	**Post-test**
Experimental Group-1	T_1E	Teaching through Inductive Thinking Model	T_2E
Control Group	T_1C	Teaching through CM	T_2C

In this design, subjects were assigned to the experimental group and control group by random procedures and administered a pre-test CRT(T_1) as a measure of the treatments to these groups for a stipulated time period. At the end of experiment the Experimental (Exp.) and Control (Cont.) groups were administered the post test CRT (T_2) as a measure of dependent variable. The difference scores were compared with the help of an appropriate statistical tool in order to ascertain whether the experimental treatments has produced a significant effect than the control group.

- **Sampling :**

In the present study purposive sample of the 100 students of class IX, were taken as the sample. The sample comprises 57 boys and 43 girls from the secondary school situated in Ahmedabad City of Gujarat. Out of 100 , 48 are in Experimental group and remaining 52 are in control group. Among these 25 boys and 23 girls were chosen for the sample of Experiment group.

- **Tools Used for administration:**

To collect evidence or data for a study, the researcher has to make use of certain testing and non testing tools. In present study the investigator used the tools as shown below in conducting the experiment.

Instructional Tools : 1. Inductive Thinking Models

2. CM Plans based on Herbartion Steps

Measuring Tools :

Criterion-Reference Test on sciences and technology (CRTs) : 1. Pre-test

2. Post-test

- **Variables:**

In the present study, the researcher selected the variables are

Independent Variable : 1. Teaching Through CM

2. Teaching Through Ind.TM

Dependent Variable : Criterion-Reference Test on sciences and technology (CRTs)

- **Experimentation:**

The researcher used the following two treatments in the present study:

a. Taught by using Inductive Thinking Model (ITM)

b. Taught by using Conventional Model (CM)

For experimental groups, treatment (a) was provided; provided; similarly in case of Control group, treatment (b) was followed as shown in Table 2.

Table 2: Assignment of treatment to groups

Treatment group	Treatment	Name of school
Experimental Group	Taught by InductiveThinking Model (IndTM)	Sharda Vidhyalay Ahmedabad. Gujarat, India
Control Group	Taught by Conventional Method (CM)	

At first the researcher started his work with giving pre-test CRT(T_1) based on science and technology to each of the both groups students of SV, ahmedabad, Gujarat.

At the beginning of the experiment grade IX section A students (E) were taught by using ITM ; while setion B students (C) were taught by CM based on Herbartion steps simultaneously periods. The post-test CRT(T_2) was given after end of programme.

- **Data Collection:**

At the starting and on the completion of each group's experimentation the researcher administered the pre-test and post-test upon each group. Two types of scores were obtained i.e. pre-test scores and post-test scores. These scores were used for analysis of data. Experimental group students opinions towards the Inductive Thinking Model based learning were also taken by giving opionionries for qualitative evaluation.

- **Statistical techniques used :**

In the present study, the researcher has used different types of statistical techniques. They were Mean, Median, Mode, Standard Deviation. Co-efficient of

variability, Skewness, kurtosis, t-value.For these calculation SPSS-17 and NRTVB computer programme packages were applied. For qualitative evaluations of applied ITM experiment programme, the frequencies were calculated for students' responses towards given subjective free-answered questions for Inductive Thinking Model teaching.

4. Results and Discussion

In the present study Criterion-referenced Test (Pre and Post) of science and technology related units were taken in the beginning of and at the end of the experiment in order to measure the effect of independent variable (Teaching Methods) on the dependent variable (Educational Achievement in CRT).The researcher applied a statistical tool called t-test to test the significance of the difference between two means scores of the students obtained in CRTs. The author has tested the following hypothesis :

Table 3 : Showing the Value of "t" for different between the Experimental group students and Control group students (pre-test) in CRT

Levels Compared	No. of Pupils	M	D	SE_D	Calculated t	Significant level (Tabulated t=1.96)
Inductive Thinking Model Experimental Group(E)	48	51.232	6.12	1.13	1.84	Not Significant at 0.05 level
Control Group ©	52	49.143	5.10			

Table 4 : Showing the Value of "t" for different between the Experimental group students and Control group students (post-test) in CRT

Levels Compared	No. of Pupils	M	D	SE_D	Calculated t	Significant level (Tabulated t=1.96)
Inductive Thinking Model Experimental Group(E)	48	72.333	5.89	1.14	3.02	Significant at 0.05 level
Control Group (C)	52	68.918	5.42			

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Table 5: Showing the value of "t" for difference between the Boys and Girls taught by Inductive Thinking Model (pre-test) in CRT

Levels Compared	No. of Pupils	M	D	SED	Calculated t	Significant level (Tabulated t=1.96)
Experiment Group (Boys)	25	71.224	5.89	1.60	1.28	Not Significant at 0.05 level
Experiment Group (Girls)	23	69.157	5.42			

Table 6: Showing the value of "t" for difference between the Boys and Girls taught by Inductive Thinking Model (post-test) in CRT

Levels Compared	No. of Pupils	M	D	SED	Calculated t	Significant level (Tabulated t=1.96)
Experiment Group (Boys)	25	78.292	5.68	1.68	1.30	Not Significant at 0.05 level
Experiment Group (Girls)	23	76.105	6.10			

- **Hypothesis 1** : There exists no significant difference between total students of experimental group(E) taught through Inductive Thinking Model and total students of control group (C) taught through Conventional teaching method in their Academic Achievement in pre-test of science and technology . The "t" value was found from Table 3 to be 1.84 was not significant at 0.05 level and it indicates that the null hypothesis was accepted i.e., there exists no significant difference between the experimental group (E) students and control group (C) students. Overall, both the groups were similar before applying methods for science and technology .

- **Hypothesis 2**: There exists no significant difference between total students of experimental group (E) taught through Inductive Thinking Model and total students of Control group (C) taught through Conventional teaching method in their Academic Achievement in post-test of science and technology . The "t" value was found from Table 4 to be 3.02 was significant at 0.05 level and it indicates that the null hypothesis was rejected. i.e., there exist significant difference between the experimental group (E) students and control group(C) students. Overall, the learning through Inductive Thinking Model was more effective than the learning through Conventional method for science and technology.
- **Hypothesis 3**: There exist no significant difference between the total students of experimental group boys and experimental groups girls in their Academic Achievement in pre-test of science and technology . The "t" value was found from Table 5 to be 1.28 was not significant at 0.05 level and it indicate that the null hypothesis was accepted, i.e, there exist no significant difference between the experimental group boys and experimental group girls before applying Inductive Thinking Model based on science and technology teaching .
- **Hypothesis 4**: There exist no significant difference between the total students of experimental group boys and experimental groups girls in their Academic Achievement in post-test of science and technology . The "t" value was found from Table 6 to be 1.30 was not significant at 0.05 level and it indicate that the null hypothesis was accepted, i.e, there exist no significant difference between the experimental group boys and experimental group girls after applying Inductive Thinking Model based on science and technology teaching. Overall, the learning through Inductive Thinking Model was proved similarly effective on boys and girls.
- The expansion of the simplicity values of total 43 items of the opinion series meant for the qualitative evaluation of the study program through Inductive Thinking Model was from 0.42 to 1.00. With reference to quality, the items of Inductive Thinking Model opinion series were appropriate.
- The expansion of discriminating values of total 43 items of the opinion series meant for the qualitative evaluation of the study program through Inductive Thinking Model

was from 0.10 to 1.00. 86% items of IndTM of the opinionerie were appropriate from the discriminating value viewpoint.

- With reference to the reliability value of the opinion series of Inductive Thinking Model Cronbac Alfa number values was 0.67. Inductive Thinking Model reliability has been established appropriately.
- The validity value of the opinion-series of Inductive Thinking Model Cliff`s number was 0.94 .The opinionrie of Inductive Thinking Model was proved effective tool for getting responses of students towards this method of teaching.
- In the opinion-series second part the experimental group's students conveyed the short answers towards the learning through Inductive Thinking Model method were as follow:

a. It was enjoyful to make groups based on the information given at the beginning of Inductive Thinking Model application teaching.

b. We liked to study science and technology content by organizing given information and sets the given data to predict about the presented experiment reasons.

c. In beginning of this experiment, we were feeling this method of teaching boring when we could not any ideas for dividing groups for presented information.

d. After getting information related to presented phenomenon we were asked for making and testing the relevant hypothesis, this was too difficult for us at the beginning of this new method of teaching but later , we were able to do this.

e. We never forget this innovative method of teaching, our whole content should be developed based on Inductive Thinking Models.

5. Educational Conclusions

In the absence of proper teaching strategies students can't learn basic concepts of science and technology so that they are not interested to develop true interest toward learning science proves more difficult to them in higher standards at school

level. If science is taught through innovative method like Inductive Thinking Model learning become effective and raise the level of educational achievement of the students higher that this study findings have been proved scientifically. Last but not least, the author hardly and heartily believes that the Inductive Thinking Model arms the students with the right type of attitudes, values, skills and knowledge that enable them explore in their social environment.

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