Comparative Study of Effectiveness of Inquiry Training Model with Traditional Teaching in Terms of Problem Solving Ability of Middle School Students

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Abstract

The present study is from the area of educational technology namely models of teaching .The present study was pretest-post test control group design and experimental in nature. In the present study purposive sampling were employed. The investigator selected two English medium schools for the study. Both the schools were affiliated with M.P. board of secondary education, Bhopal. The sample was constituted of 30 students of class VII for the purpose of control group and 30 students of class VII for the purpose of experimental group students(social science subject). Though the medium of instruction was English. Admission criteria of all the students were same. To assess the problem solving ability of the students, Problem solving ability test was selected. This test is prepared by L.N.Dubey (1971) . The split-half reliability coefficient for the test is 0.789 and rational equivalence co-efficient was 0.768. The content validity is also established for the tool. Two groups named experimental group and control group were randomly assigned the treatment. Twenty lessons of geography were presented through ITM to the students belonging to experimental group while the students belonging to control group were taught same content and same duration through traditional method. Inquiry training model was found effective than traditional method, when the mean Problem solving ability scores of experimental group students was compared to control group students and Inquiry training model was found effective than traditional method, when the mean Problem solving ability scores of experimental group students was compared.

Key Words: Inquiry Training Model, Traditional Teaching, Problem Solving Ability

INTRODUCTION

Teaching is a process which facilitates learning." Bruce Joyce and Marsha Weil (1985) defined teaching as a process by which teacher and student create a shared environment including sets of values and beliefs which in turn colour their views of reality." Models of teaching have such potentials which generate real classroom environment where teacher and student work together. Educators and psychologist have designed several types of teaching models which provides suitable guidelines for teachers for modifying the behavior of the learners. Thus models of teaching are prescriptive teaching strategies, which are designed to realize specific instructional objectives. Models of teaching are not the substitute of teaching skills methods but the complementary.

Operational definitions

Inquiry Training Model: Inquiry Training Model is a model which helps the students to develop the intellectual discipline necessary to search out data, process it, and apply logic to it.

Traditional Teaching: Traditional teaching means communicating information through lecture to the students in the classroom in a group. In this study, 'control group' was taught through traditional method.

Problem Solving Ability: Problem solving is a process of overcoming difficulties that appear to interfere with the attainment of a goal. It is a procedure of making adjustments inspite of interferences.

Definitions of models of teaching

"Model of Teaching is a well described plan which is based upon the well defined principles. It is based upon systematic steps, which are used by the teacher to create certain effects on the part of the learners."

Inquiry Training Model

Inquiry training model is one of the models of teaching which has its own peculiar approach. Bruce Joyce and Marsha Weil have put this model in the family of Information-Process teaching models. Inquiry Training Model is one such strategy in teaching which helps to the attainment of the sufficient objectives. Suchman, along with Taba and Ausubel thought of an approach to develop these desired qualities amongst the children. Suchman's Inquiry Training Model is based upon the organization of data and to build concepts of Taba and the presentation of concepts and then with data to be organized around concepts of Ausubel.

The major essentials of Suchman's model are- to establish facts, to build concepts, to generate explanations or theories, to organize knowledge, to generate principles leading to causation. This model has been aimed to develop the intellectual powers, such as, search for data, processing of data and applying logic to it. The pupils are trained also, to establish causal relationship among phenomenon. "Inquiry Training Model is a model which helps the students to develops the intellectual discipline necessary to search out data, process it, and apply logic to it".

Syntax: The syntax of the model involves a description or structure of activates. It indicates the shape of the activities which specify educational environment relating to each model It refers to presentation aspect of teaching . The Inquiry training model can also be described in this manner. It involves the following steps or phases.

Fig 1.1 Syntax of the Inquiry Training Model

PHASE ONE:	PHASE TWO:
Encounter with	Data Gathering
The problem	Verification
PHASE THREE	**PHASE FOUR**
Data's Gathering- Experimentation	Formulating of Explanation

Instructional and Nurturant Effects of ITM

The model promotes strategies of inquiry and the values and attitudes that are essential to an inquiring mind, including

*Process skills (Observing, Collecting and organizing data, identifying and Controlling Variables, formulating and testing hypotheses and explanations).

* Active autonomous learning
* Verbal expressive Creativity
* Tolerance of ambiguity
* Logical thinking
* Attitude that all knowledge is tentative

The chief learning outcomes of inquiry training are the processes involved-observing, collecting and organizing data, identifying and controlling variables, making and testing hypotheses, formulating explanations and drawing inferences (see figure 1.1). The model splendidly integrates these process skills into a single meaningful unit of experience.
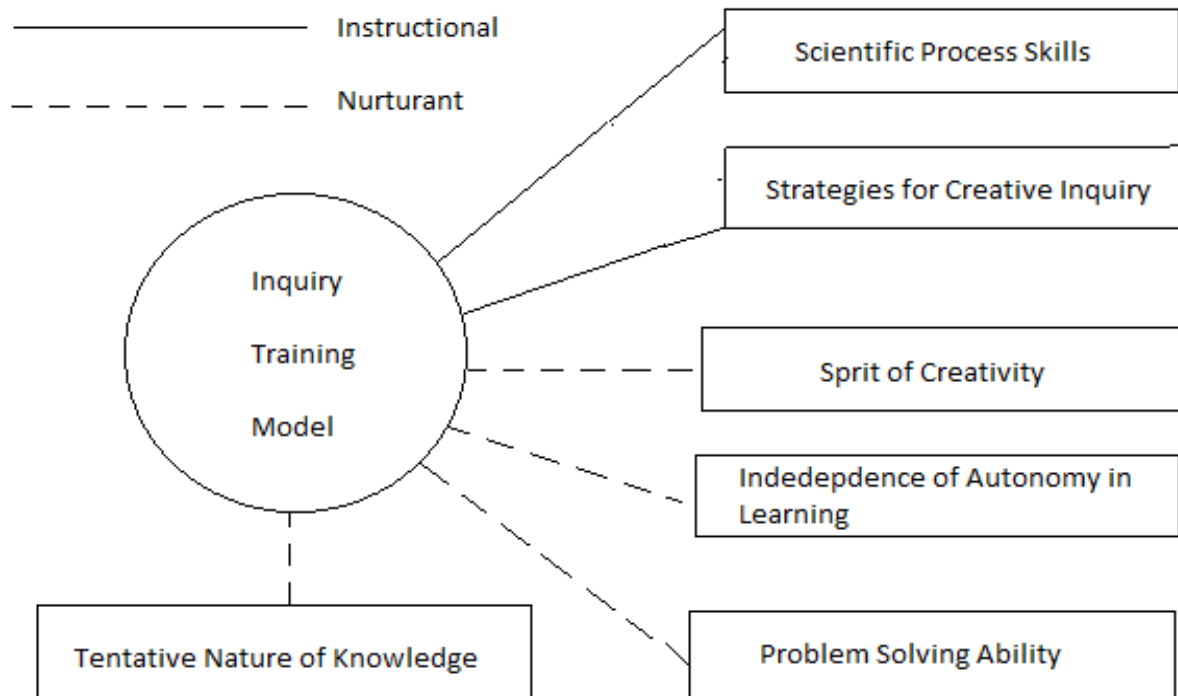
Fig. 1.2 Instructional and Nurturant Effects:

Social system: The social system of a teaching model includes three things a) a description of the kinds of the student teacher roles b) a description of hierarchal relationship and c) a description of the kinds of norms are encouraged and student behavior which is rewarded.

In inquiry training model the teacher acts to generate a free intellectual environment. He responds to learners for information and provides stimulus for summarizing inquiry. It is highly structured. The teacher controls all the activities and presents the inquiry procedure. Thus the teacher motivates students to initiate inquiry as much as possible.

Principle of Reaction

The most important reactions of the teacher takes place during the phase II and phase III. Main task of the teacher is to motivate the students to inquire. He or she should give answers in 'yes' or 'no'. If the teacher is asked questions that cannot be answered in 'yes' or 'no', he must ask students to rephrase the questions. In phase IV the teachers help the students to frame explanations. Guide the students to think in various directions.

Support system

The support system is needed in order to create the environment specified by the model. It is additional requirement specified by the model. It is additional requirement beyond the usual human skills, capacities and technical facilities.

The teacher has to provide maximum support to the learners to encounter to the problem. He should understand the process and strategies of inquiry. The teacher enjoys helping the student analysis, his own pattern land work towards greater effectiveness.

Inquiry training model has been designed for students' scientific strategies of inquiry. It has been developed specially to teach children for improving their strategies of inquiry for creativity and independence or autonomy in learning. It helps in developing spirit of creativity among the children.

Problem solving

Man faces many problems in course of living. He needs to have some will to live, desires some, to achieve some and to continue to do certain things up to his satisfaction. But all his attempts may not be successful due to obstacles and interferences. These need a serious attention to overcome them, he may have to think and reason to proceed systematically. Gagne proposed problem solving ability as the highest level of learning in the proposed hierarchies which depend on the mastery of lower levels of learning. Though some people deny the problem a thinking man faces it to overcome the obstacles and to reach the goal successful.

Problem situation are to be faced in socio-economic and technological fields. The progress of an individual as well as of the society depends on solving them scientifically. Meaning and nature of it can be more clearly through understanding its definitions.

Steps involved in problem solving or reflective thinking

1) Awareness of the problem
2) Locate and define difficulty
3) A) locate, evaluate and organize information Classify the data collect and all the relevant information about the problem by all possible means, consult experienced people, recall experiences and read about it.
   B) Discover relationships, Formulate Hypothesis. Think out all the possible solutions

4) Evaluation of hypothesis

5) Application of solution to the specific situations especially in cases of intellectual problems.

Problem solving in classroom

Problem solving is an individualized process which requires various strategies to tackle. A teacher has to develop a scientific approach to solve problems.

1) Moderate motivation keeps one away from excessive emotional involvement and also sustains interest in approaching any complex task.
2) Encourage divergent thinking rather than conventional thinking.
3) Problem is to be presented as a whole than in piecemeal.
4) Level of difficulty of the problem should suit the age and ability of students.
5) Active manipulation of problem by using diagrams or figures of conceptualize abstract problems.
6) Practice is to given in solving problems.
7) Incomplete solution is to be given to students by the teacher. This is better retained. He should develop the spirit of formulating tentative conclusions of the problem.
8) Should develop scientific attitude in students.

Rationale

In the context of explosion of knowledge, it is essential to find more effective ways of gaining the knowledge. One of the ways of gaining the knowledge is through Inquiry Training Model. It is helpful in developing creative inquiry strategies among the students. Scientific processing skills will be developed among the students with the help of this model. But as compared to other models it is relevantly unexposed; especially in case of school teaching. In this direction attempts have been made by various researchers. After going through the related literature, the investigators realized that there are few studies which have been conducted to develop. Inquiry training model at school level to teach science subjects (Katyal 1986, Dubey 1986). They found it effective in terms of achievements. Most of the studies have been conducted at teacher's training level. The only study (Boonate 1986) has been conducted at college level. Above

scenario reflected that no study has been conducted to teach social science at school level. There was also a need to study the effectiveness of Inquiry Training Model in terms of creativity and problem solving skills among students. Thus the researcher has chosen this field which is very important in present contexts. Through this Inquiry Training Model the students can develop independent thinking, can explore feelings and thoughts underlying in their mind, can explore different ways to solve these problems. Inquiry Training Model can help children in getting various proposed solutions for discussing which is better and why. Thus a strong need was felt to study the effectiveness of Inquiry Training Model in terms of creativity and problem solving ability of students.

Objectives of the Study

The following objectives were prepared for research work

1. To compare the mean Problem Solving Ability scores of experimental group students and control group students.

2. To compare the mean pre and post Problem Solving Ability scores of experimental group students.

Hypotheses

The following hypotheses were prepared for present research work

1. There is no significant difference between the mean Problem Solving Ability score of experimental group students and control group students.

2. There is no significant difference between the mean pre and post Problem Solving Ability scores of experimental group students.

Method

Sample: In the present study purposive sampling was employed. The investigator selected two English medium schools for the study. Both the schools were affiliated with M.P. board of secondary education, Bhopal. studying social science subject. The sample was constituted of 30 students of class VII for the purpose of control group and 30 students of class VII for the purpose

of experimental group students. Though the medium of instruction was English, the students were able to understand Hindi also. Socio-economic status of the entire student was different. Admission criteria of all the students were same. Details of the sample has been given in table 1

TABLE 1 Schools affiliated and number of students of experimental and control group.

Group	School affiliated	No. of student	Total
Experimental group	M.P. BOARD	30	30
Control Group	M.P. BOARD	30	30

Tools

To assess the problem solving ability of the students, Problem solving ability test was selected. This test is prepared by L.N. Dubey (1971) . There are twenty problems in the test. Each problem has 4 alternative answers. Out of these four answers only one is correct. The test is suitable for the age group of 12-17 years. The split-half reliability coefficient for the test is 0.789 and rational equivalence co-efficient was 0.768. The content validity is also established for the tool.

Design: The present study was pretest-post test control group design and experimental in nature. Two groups named experimental group and control group were randomly assigned the treatment. Twenty lessons of Geography(part of social science subject) were presented through ITM to the students belonging to experimental group while the students belonging to control group were taught through traditional method.

Treatment of ITM to the experimental group was given for 20 days. In the first period the treatment was given to experimental group students. In the same day the same content was given to the students of control group through traditional method. Schematic representation of designs is given under the table

Table 2 Schematic Representation of Design

Activity	Experime-ntal Group	Control group	Type of variable	Time taken

Orientation of ITM	* treatment	Lecture method **0**	**Independent**	**40mints 1day**
Pre test problem solving	* treatment	* treatment	**Dependant**	**40mints1day**
Teaching through ITM	* treatment	Lecture method **0**	**Independent**	**40mints 20days**
Teaching through traditional method	**0** Lecture method	* treatment	**Independent**	**40mints 20 days**
Post test problem solving	* treatment	* treatment	**Dependant**	**40mints 1day**

*stands for treatment with ITM   Total 24 days

0 stands for treatment with Lecture method

Looking at the above table it can be predicated that experiment was completed within 24 days. In the study, treatment was taken as independent variable and problems solving ability scores were taken as dependant variables.

Procedure Of Data Collection: For the purpose of data collection, first the permission from the head/principal of the school was taken and after that permission from the class teacher/in-charge was sought by the researcher. Then the rapport was established with the students and the researcher acquainted them with the aims of the experiment and the purpose for which the gathered information will be used. After this the students of experimental group was oriented to inquiry training model. The syntax of the model and procedure was demonstrated to the students with the help of one demonstration lesson. One discussion was also held to clarify the doubts of the students regarding the teaching through ITM. Then the lessons of Geography were taught through Inquiry training model to the experimental group students. At the time of teaching through model, the students were asked to prepare a worksheet. Sufficient time was given to the students to ask questions and to make the hypothesis. On the same day the control group was taught the same lesson through traditional method. This teaching was continued for 20 days. But

before giving treatment, the researcher conducted a pre-test and after that the treatment of 20 days was given. Then the tests of problem solving ability were administered on both the groups

Results

Comparison of mean problem soving ability scores of experimental group students and control group students.

The first objective was "to compare the mean problem solving ability scores of experimental group students and control group students". The data were analyzed through independent sample t-test. The results are given in table 4.2

Table 3: Group Wise Mean, SD, N, Df And T-Values of Problem Solving Ability

Group	N	Mean	SD	Df	t
Experimental	30	16.20	1.94	58	6.24*
Control	30	12.03	3.10		

*significant at 0.01 level

From the table 3 it is evident that the t-value is 6.24, which is significant at 0.01 level with df 58. It shows that the mean scores of problem solving ability of experimental group students and control group students differ significantly. In this context, the null hypothesis that "there is no significant difference between the mean scores of problem solving ability, of experimental group students and control group students" is rejected. Further, from table 4.2 it is evident that the mean scores of problem solving ability of experimental group students is 16.20, which is significantly higher than that of control group students which is 12.03. It may, therefore, be concluded that inquiry training model could significantly improve the problem solving ability of the students.

Discussion

The causes of the above obtained results may be as under:

Problem solving Ability

The mean problem solving ability scores of students treated with Inquiry Training Model is significantly higher than the control group students treated with traditional method.

The reason behind this may be the treatment of Inquiry Training Model. Because during the treatment when discrepant event was presented for solution, students were in puzzling situation and thinks many aspects of problems and try to find out related facts. So for that besides convergent thinking student emphasis on divergent thinking. This is problem solving situation. Students tolerate this situation with the help of questioning. After some time they are in position to face the puzzling situation. From this experiment researcher could say that problem solving is the ability which occurs after the discrepant event is presented pupils tolerate the situation. So as a result mean problem solving ability are much higher after the treatment.

Comparison Of Mean Pre And Post Problem Solving Ability Scores Of Experimental Group Students.

The second objective was, "To compare the mean pre and post problem solving ability score of experimental group students". The results are given in table 4.4

Table 4: Test-wise mean, SD, N, df, and t-values of problem solving ability of experimental group students

Test	N	Mean	SD	Df	t
Pre-test	30	9.40	4.49	29	6.20*
Post test	30	15.6	3.67		

*Significant at 0.01 level

From the table 4 it is evident that the t-value is 6.20, which is significant at 0.01 level with df 29.It shows that the mean pre and post problem solving ability scores of experimental group students differ significantly. In this context, the null hypothesis that "there is no significant difference between the mean pre and post problem solving ability scores of experimental group students" is rejected. Further from the table 4.4 it is evident that the mean post problem solving ability scores of experimental groups is 15.6, which is significantly higher than that of the pre problem solving ability scores of the same group which is 9.40. It may therefore be concluded that inquiry training model has the potentially in improving the problem solving ability of students significantly. Thus inquiry training model was also found effective on the basis of problem solving ability.

Findings

The following were the findings of the present study:

* Inquiry training model was found effective than traditional method, when the mean Problem solving ability scores of experimental group students was compared to control group students.

* * Inquiry training model was found effective than traditional method, when the mean Problem solving ability scores of experimental group students was compared.

Implications

The present study is related to the teaching of social science through Inquiry Training Model for class VII. The findings of this study have implications for teachers ,students, text book writers and researchers.

For Teachers

When discrepant event was presented during the treatment through Inquiry Training Model, the students were in puzzling situation. For coming out from this situation students start thinking. This thinking helps them to look at the problem from different angles. In other words they try to find out the solution of the problem with different related facts. When students try to find out solution in different ways this forces them to think in divergent way. Hullfish (1963) is of the opinion that one of the goals of education is to assist pupils in development of their thinking process .The situation when one can not establish relationship between cause and effect is ambiguous situation, with the help of teacher, students try to face puzzling situation .This exercise develops problem solving ability among students. Therefore teachers should use Inquiry Training Model in class room for effective teaching learning process.

For Text book writers

Students are mainly concerned with textbooks .So, text book is the basic source of knowledge for students .Due to routine evaluation system students are always motivated towards rout memorization. Though rout memorization is necessary in some aspects but it does not help in understanding of the content. When the basic knowledge is used in solving problems and higher mental abilities are used in solving in problems this helps in developing cognitive affective and

psychomotor domains. Therefore textbook writers should give some puzzling situation or problems in between content wherever it is possible. This will help students in better understanding of content.

For Students

The main purpose of the model is to develop the strategies of Inquiry and values and attitudes among students. When students are encountered with puzzling situation they are continuously busy in finding solution of the problem. For this they are making and testing hypothesis. Therefore the model is mainly beneficial for students.

Bibliography

Buch, M.B. (1983-88). Fourth survey of research in Educational research and training, New Delhi.Vol.II.

Das, M. (1994). Effectiveness of CAM and Inquiry Training Model in terms of Pupil's Achievement and Their Reactions. (Unpublished Ph.D. Thesis, Edu). Devi Ahilya Vishwavidyalaya, Indore, India.

Gay, L.R.(2000). Educational Research :Competencies for Analysis and   Application . Prentice Hall, New jersy, America.

Joyce, B. and Weil, M. (1985). Models of Teaching, Prentice Hall of India Private Limited, New Delhi, India.

Khatri, K. (2007). Comparison of Reception concept Attainment Model Concept Attainment model only with positive examples and conventional method in terms of science concept understanding of cass VII Students, (Unpublished Ph.D. Thesis, Edu.), Devi Ahilya Vishwavidyalaya, Indore, India.

Koul, L. (2007). Methodology of Educational Research . Vikas publishing house, New Delhi, India.

Patra, A.K. (1992). Effectiveness of CAM for Teaching Economics in terms of Achievement and General Mental Ability, (Unpublished Ph.D. Thesis, Edu.), Devi Ahilya Vishwavidyalaya, Indore, India.

Singh, S. (1994). Comparison of Inductive Thinking Model with Traditional method of teaching economics to XI Class student in terms of relected cognitive variable, (Unpublished Ph.D. Thesis ,Edu.), Devi Ahilya Vishwavidyalaya, Indore, India.