

# A STUDY OF THE EFFECT OF INQUIRY TRAINING MODEL IN CHEMISTRY SUBJECT

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## Abstract

The research undertaken is a quantitative study on the effect of inquiry training model developed by Richard Suchman. The aim of the study was to find the effect of ITM compared to the traditional teaching method on the achievement of the student in chemistry subject. A total of 60 students are selected from Ahmedabad district (urban) from Gujarat board, English medium. They were selected using stratified random sampling on the basis of gender, the students were from the same academic institution in the age group of 15-16. This research is an experimental study with two equivalent groups, post test design only. The outcomes can be helpful for teachers considering the methods to teach chemistry in their respective school district.

**Keywords:** inquiry training model, traditional method, chemistry education, teaching, science education

## INTRODUCTION

Through the ages, educational reformers have developed various methods through which the process of teaching-learning could be improved and even make it more effective. The teaching strategy is something that can be considered as a general plan for the lesson. This will comprise of all the aspects of the unit being taught viz. learning targets, strategies for achieving the target, predicted effect on the learner etc. The need for different learning strategies arose because educationists realized that the students would not learn from the same method, they have studied from viz. the traditional method of learning (lecture method) where the teacher shares their knowledge and the student receives it. The examination judges the student's memory retention capacity and not their actual understanding. A new learning movement developed during the 1960s; in comparison to the traditional teaching learning method, a newer form of method referred to as inquiry training model or inquiry-based learning was developed. This philosophical method was based on the learning theories such as on the works of Dewey, Vygotsky, Piaget and Freire [2,3,4] amongst others and thus is a constructivist philosophy. Inquiry based learning model is based on questioning and answering and can be applied to all disciplines, and questioning is an important factor of inquiry training model. Richard Suchman developed the inquiry training model which has been used in the research undertaken.

Richard Suchman was the pioneer behind developing the Inquiry training model. The model of Inquiry fosters in a disciplined way the art of independence. The model developed by Suchman was used to teach learners to process and analyse the information given by themselves. Richard Suchman indicates that people inquire naturally by what puzzles them and they can become conscious and learn to analyse new strategies that can be helpful to them. This process aids students to develop critical thinking skills and provide explanations to questions or problems set in familiar as well as unfamiliar situations. The general inquiry process has a general goal of helping students develop the necessary intellectual discipline and skills to raise questions and find answers to any questions coming to them with their curiosity.

**Suchman, J. (1966). Inquiry Development Program. Chicago: Science Research Associates,**

The Inquiry Training Model by Suchman [12] indicates the following:

- 1) People naturally inquire when they are presented with a puzzling situation
- 2) Individuals can get conscious and learn to analyse their thinking strategies.
- 3) New strategies can be added to the existing repository of the individual thinking strategies.
- 4) Cooperative inquiry facilitates students to learn the emergent nature of knowledge and appreciate alternative explanations.

## I Background Study

According to Suchman, "Inquiry Training Model is a scientific process which is desired to bring through exercise that compress the scientific process in students for small periods of time." The objective of the inquiry training mode is to help the students understand the concepts thus gaining a conceptual clarity of the topics. The essence is that the students gain a deeper understanding by themselves through carefully structured inquiry and hypothesis, thus develop a healthy respect for the subject and learn the limitations of their knowledge and how

reliable it is. Kabita Dey [9] worked on the inquiry training model in life science, using the research tool; self-made scholastic achievement, creative inquiry scale and thinking scale and using statistical analysis found that the achievement was significant when the students were taught using the inquiry training model. Jogendra Singh [8] took a sample of 120 senior secondary school students in urban and rural setting to find the effectiveness of inquiry-based learning in chemistry subject for high school students. The findings of the study suggested that inquiry-based learning method is more effective than traditional teaching method and also gave suggestions to improve the academic method. It was accepted that the method was beneficial for both urban and rural area schools. Ali Abdi [1] on a sample of 40 students at 5<sup>th</sup> grade in primary schools in Kermanshah, Iran, based on the findings obtained it was seen that there is a significant difference between the achievement levels of the students who were educated using the traditional method of teaching versus the inquiry-based instructions. Madhuri S Issave [7] in their study on inquiry-based method in reducing stress in visually impaired students found that the biological science inquiry training model was effective to develop inquiry approach in visually impaired students, they used stress reduction model which was effective to reduce general stress of the visually impaired. The overall responses of experts suggested that the integrated model was helpful in the area of special education. Rohini P Upadhyay [16] investigated the effectiveness of inquiry training model in secondary science education. The effectiveness of inquiry training model was compared with the help of analysis of covariance. The change in the students' attitude towards science was studied by using t-test, it was concluded that both inquiry training model and traditional method were equally effective in terms of higher mental ability of the students in science of class IX students. Neelam Choudhary [5] compared the effectiveness of advance organizer model, biological inquiry model and traditional method in biology teaching at secondary level on a random sample of 240 students of grade IX C.B.S.E board the prime objective was to develop and validate the lesson plans of the advance organiser model and biological science inquiry on "cells and tissues" in biology, the findings using ANOVA and t value suggested that there is a significant difference in the achievement of the subject biology taught through all three models. Nainesh Bhatt [10] worked with 160 students of grade IX in Gujarat. Multiple lesson plans were devised for the teaching of mathematics using the inquiry training model, the study concluded that the effect of inquiry training model was highly positive on the students on grade IX and the effect was more effective on female students over male students. Neeru [11] compared the effectiveness of inquiry training model and mastery learning model for teaching mathematics in the context of different cognitive styles, through purposive sampling method. A sample of 108 students was taken and descriptive statistics as well as analysis of variance of the mean gain on achievement scores, retention scores and self-concept. The objective was to develop teaching resources based on inquiry training model and mastery learning model for teaching mathematics to grade V students. The research suggested they yielded different mean gains on the achievement scores. Lokesh TN [15] worked with a sample of 40 students of grade IX from Karnataka, using scientific attitude scale developed by Dr. Smt. Shailaja (2006) and statistical tools such as mean, standard deviation and t-test were applied to calculate difference between the two groups. SPSS statistical package for social science was used for data analysis. Based on the findings it was concluded that inquiry-based method develops scientific attitudes and should be used in teaching secondary school students.

**Statement of problem:** How does the method of teaching affect the scholastic achievement of the students.

## OBJECTIVES OF THE STUDY

1. To study and compare the scholastic achievement of students studying through Inquiry training model and traditional teaching
2. To study and compare the scholastic achievement of male students studying through Inquiry training model and traditional teaching
3. To study and compare the scholastic achievement of female students studying through Inquiry Training model and traditional teaching

## HYPOTHESIS

H<sub>01</sub> There is no significant difference between the mean scores of post-tests of students of experimental group and controlled group.

H<sub>02</sub> There is no significant difference between the mean scores of post-tests of boys of experimental group and controlled group.

H<sub>03</sub> There is no significant difference between the mean scores of post-tests of girls of experimental group and controlled group.

## II METHODOLOGY AND PROCEDURE

**Design:** The research method is experimental post-test only group design, as the students are selected with random sampling technique and only the experimental group is given the treatment i.e., Inquiry based instruction while the controlled group is given the Traditional instruction.

**Population:** The population of the study comprises of grade X students of GSEB, English medium of Ahmedabad district (urban).

**Sampling method and sample of the study:** In the present study, stratified random sampling method was used to select 60 students for the present study. Sampling was done on the basis of gender and marks of the midterm exams. Both the control group and experimental group had 30 students, all the students were in the age group 15-16 and were of the same academic institution and board as well as medium of education.

**Tool:** Self-made scholastic achievement test consisting of 20 multiple choice question and rest were structured questions, the maximum marks for the test was 50. Descriptive as well as inferential statistical techniques viz. Mean, Median, standard deviation, t-test.

**Experimental procedure:** The inquiry-based method was used while giving instruction (teaching) the experimental group and traditional teaching method was used for the control group. The topic selected was “chemical reactions” and were taught for a total of 7 periods of 60 minutes each per group, 1 session was taken for revisiting the topics and one for the assessment.

**Statistical procedure:** The data was analysed and tabulated for the interpretation and presentation. Differential and Inferential statistical tools such as mean, median, standard deviation and t-test were applied to calculate the difference between the control and experimental group.

## III. DATA COLLECTION AND ANALYSIS

The following study is experimental in nature; the control group and the experimental group were given a post test (scholastic achievement test) prepared by the researcher which consisted of multiple choice and structured questions. The data was collected in the form of raw marks, tabulated and analysed as shown below:

Variable	Number	Mean	Standard Deviation	t-value	Level of significance
Control	30	31.1	8.13	3.4963	Significant at 0.05
Experimental	30	37.5	6.42		

Figure 3.1 Level of significance between the mean scores of controlled and experimental group

The calculated t value 3.49 is greater than the tabulated value at 0.05 level of significance. From the above data analysis, it can be said that the null hypothesis  $H_{01}$  “There is no significant difference between the mean scores of post-tests of students of experimental group and controlled group” is rejected.

Variable	Number	Mean	Standard Deviation	t-value	Level of significance
Control	20	30.1	7.93	4.2048	Significant at 0.05
Experimental	20	39.15	5.46		

Figure 3.2 Level of significance between the mean scores of boys of controlled group and experimental group

The calculated t value 4.20 is greater than the tabulated value at 0.05 level of significance. From the above data analysis, it can be said that the null hypothesis  $H_{02}$  “There is no significant difference between the mean scores of post-tests of boys of experimental group and controlled group” is rejected.

Variable	Number	Mean	Standard Deviation	t-value	Level of significance
Control	10	33.1	8.6	0.5433	NS
Experimental	10	34.2	7.19		

Figure 3.3 Level of significance between the mean score of girls of controlled group and experimental group

The calculated t value 0.54 is less than the tabulated value at 0.05 level of significance. From the above data analysis, it can be said that the null hypothesis  $H_{03}$  “There is no significant difference between the mean scores of post-tests of girls of experimental group and controlled group” is retained.

## IV. DISCUSSION OF RESULTS:

From the collected data and the interpretation, it can be understood that there is a significant increase in the mean scores of the students of grade X who are taught using the inquiry training model compared to those who are taught using the traditional method. The  $H_{01}$  and  $H_{02}$  prepared by the researcher were rejected while the  $H_{03}$  was retained which suggested that there is no significant difference between the mean scores of girls who are taught using the inquiry training model and the traditional method.

## V. CONCLUSION

Based on the findings it can be concluded that inquiry training model helps develop positive scientific temperament; hence should be used in teaching different disciplines. The use of the model should be given emphasis in the curriculum of schools especially in the field of sciences.

## VI. RECOMMENDATIONS FOR FUTURE RESEARCHERS

The study was limited to Gujarat secondary education board, a comparative study between different boards can be undertaken for better understanding of the effect of the inquiry training model.

The study was undertaken only for the urban area, rural setting can also be undertaken for a better understanding.

The study can be done for a larger sample size for better representation of the population.

The study may be extended by allowing the students to get a hang of the inquiry training model by teaching a number of units based on the model.

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