

RELATIVE EFFECT OF INDUCTIVE THINKING MODEL AND ADVANCED ORGANIZER MODEL OF TEACHING ON ACADEMIC ACHIEVEMENT IN LIFE SCIENCE

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This research was conducted to study the relative effect of inductive thinking and advanced organizer models of teaching on academic achievement of 9th grade students in life science. The investigator used Experimental Method and 82 Grade IX students of life science were selected through purposive sampling technique for conducting the experiment. Sample was divided into two groups using intelligent test scores. A pre-test was conducted on both the groups and then each group was given the experimental treatment with ITM and AOM respectively for fifteen days. After intervention post-test was administered to get their final score on the achievement test. Result showed that there exists significant effect of ITM and AOM on academic achievement of 9th grade students in Life sciences. Result further indicated that both ITM and AOM induced significant effect on academic achievement.

Key Words: Inductive Thinking Model (ITM), Advanced Organizer Model (AOM), Academic achievement.

INTRODUCTION

Academic Achievement: Academic achievement is one of the important part of a student's educational career. It is judged by knowledge attainment and skill acquired by students in school subjects through various assessments. Different models of teaching can have significant effect on performance of the students. Sreelekha and Nayar (2004) compared the achievement of students taught with traditional method and concept attainment model in chemistry. The major finding revealed that CAM was effective in improving the overall level of achievement in chemistry. A teaching model is prototype or plan which is used to shape curriculum, to design instructional material and to direct activities of teacher (Joyce et.al.,1982). Apart from the above uses, it creates the necessary environment which facilitates the teaching learning process. The core of the teaching learning process is the learning environment in which student interact (Dewey,1933). Thus, a teaching model includes guiding principles for designing teaching learning activities. It specifies acts of teaching and learning that are planned to achieve definite goals (Joyce and Weil,1985). As a teacher, one needs to determine various models of teaching and to choose one to master in that suits the needs of the students and topic to attain efficacy in teaching. Models are majorly classified into four families on the basis of the objectives for which they are designed for their major functions. These are

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1. The Information Processing Models
2. The Social Interaction Models
3. The Personal Models
4. The Behavioural Modification Models

Inductive thinking model: This model is designed by Hilda Taba and is an information processing model based on three postulates about thinking such as thinking can be taught, thinking is a dynamic transaction among learners and information, processes of thought is developed by a sequence that is “lawful.” Model designed by Hilda Taba help students improve their ability to categorize and to use categories. Her model is an example of concept formation. Here students group examples together on any base and form as many group, as they want. Each group illustrates a different concept. The requirement of concept attainment teaching is minimal; an array of instance or example that are alike in some ways and different in others. She suggested that the cognitive task of concept formation involves three major steps:

1. **Identifying and listing the items of data**, which are related to a problem. It includes the overt activity –enumeration and listing and covert activity -differentiation
2. **Grouping the items on the basis of similarity-** It includes the overt activity, grouping and covert activity, identifying common properties and abstraction.
3. **Developing of categories and labels for the groups** which include overt activity labelling and categorizing and covert activity as determining the hierarchical order of items. i.e. super and sub ordination, Determining the cause effect relationship, going beyond what is given and finding implication and extrapolating.

Hilda Taba suggested a strategy to induce students to expand the conceptual system with which they process information. She concluded that while the thought processes are psychological and hence to subject to psychosomatic analysis, the result and subject matter of thought must be evaluated on rational criteria and laws of logic. Silas and Bright, (2012) studied the effectiveness of inductive inquiry and transmitter of knowledge models on achievement of students in Mathematics. The result revealed the students exposed to inductive inquiry model are performed better than the group exposed to the transmitter of knowledge model. The chief application of model is to widen thinking horizons. However, in the itinerary of widening horizons, the strategies require students to chew and process large amount of information. Niak (1996) intended to compare the use of inductive thinking model over the traditional method in developing inductive thinking to try out the efficiency of this model in terms of the achievement of pupils. The findings of the

study revealed that Inductive Thinking Model was effective in increasing reasoning ability than the conventional method and this model was more interesting for the pupils to learn through it.

The main purpose of the model is to teach for concept formation. It nurtures logical reasoning comprehension, awareness to the environment and classification of concepts. Inducing student to go ahead of the given information is purposeful attempt to augment dynamic or innovative thinking. Verma, (2001) compared the effectiveness of mastery learning model and inductive thinking model on pupils' achievement in science and their creative thinking abilities. The study revealed that the group exposed to mastery learning model and inductive thinking model have scored significantly higher on the criterion achievement test than the group taught through conventional method and further group students exposed to inductive thinking model have scored significantly higher on the criterion achievement test and creative thinking abilities test than mastery learning group.

Advanced Organizer Model: Learning science through conventional lecture method is necessarily rote and meaningless. Moreover, if students' minds are not prepared, the students must fall back to learning by rote, which is hazardous and highly subject to forgetting. Ausubel opined that use of advance organizers facilitates students' trigger their past knowledge in the new instructional situation and makes the course meaningful for them. (Ausubel, 2000). The Advanced Organizer strategy operates both substantively and programmatically on the learning material. Substantively it utilizes the basic organizing concepts and principles with the widest explanatory power, inclusiveness, generality and readability of a given discipline. In this way the availability of relevant subsumes in the cognitive structure is ensured. Ausubel emphasizes that in learning, meaningful process is essential. Material has to relate to established ideas in the cognitive structure of the learner in terms of ideas, which enable the material to be learned in a logically coherent way.

Ausubel developed two principles to organize curriculum and instruction: progressive differentiation and integrative reconciliation. Former suggests that the general ideas of the subject are presented first and followed by a regular increase in particulars and preciseness. Integrative reconciliation refers to the practice of interrelating or cross referencing these units or ideas so that significant similarities and differences are recognized and real or apparent inconsistencies are reconciled. Integrative reconciliation in general means that new ideas should be intentionally related to prior information. Effective Advance Organizers connect new information to existing schemata and provide students with a means to create new schemata. They are at a advanced level of abstraction than the content for which they are organized and they subsume this information (Luiton, Ames, & Ackerson,1980). Vandana and Jadhav (2011) conducted an investigation to examine the effectiveness of AOM over customary method in the teaching of Physics to grade IX students and found that AOM strategy was more effective than conventional strategy of

teaching physics. On the similar lines, Pachpande (2012) conducted a study to check the affect of AOM on the performance of students in school level mathematics. Study concluded that AOM was more effective than regular ways of teaching mathematics to school students. AOM has three phases of activity.

1. **Presentation of the advance organizer**- this phase is based on designing the objectives of lesson, presenting the organizer and developing consciousness regarding new information.
2. **Presentation of the learning task or learning material**-this involves presentation of material using variety of methods, techniques, devices and aids.
3. **Strengthening of cognitive organization**-The purpose of this step is to fix the new material in the existing cognitive structure of the students.

Creativity in science would be a casualty in future. Hence, interest in science learning should be developed at school level itself by adopting a variety of strategies of teaching science and models of teaching. Models of teaching science should be incorporated by teachers while selecting good teaching strategies for classroom so as to overcome the problems of dull science teaching methods in classroom. This will not only be helpful in raising the achievement of the students in the subject rather these will develop the students into a personality full of scientific attitude and logical bent of mind. Vishwanathan (2002) studied the effectiveness of inductive thinking and advanced organizer models over NPM on achievement 10th standard students in environmental science and result revealed that students taught through ITM and AOM shows significant improvement in their achievement over the student taught through NPM. Similarly, Mandal, (2013) studied the effectiveness of ITM and AOM for teaching chemistry. Findings revealed that showed that both models were equally effective for teaching chemistry to higher secondary students.

Models are numerous and they adequately cover the wide range of objectives. Each model has its own goal, theoretical assumption, principle and major concept underlying it. Some models are designed for very specific purposes while others have general applicability. As a consequence, the researcher felt the need for determining the most effective models for teaching Life Science in high school classroom settings. It was clearly noted by the researcher that even among the few studies done, comparisons had been made only with one or two models of teaching with each other and with the conventional method of teaching. However, from the review of literature it is very clear that no study has been done to find out the most effective models of teaching for teaching Life Science in relation to achievement of students given performance levels. In fact this prompted the researcher to take up the present study of comparing the effectiveness of two models of teaching the concepts of life sciences in relation to the academic achievement of students in life science.

OBJECTIVES

The objectives of study were as follows:

1. To study the effect of ITM on academic achievement of 9th grade students in Life science.
2. To study the effect of AOM on academic achievement of 9th grade students in Life science.
3. To compare the effectiveness of ITM and AOM in teaching life sciences to 9th grade students.

HYPOTHESES

The above objectives can be achieved through aforementioned hypotheses.

1. There exists significant effect of ITM on academic achievement of 9th grade students in Life sciences.
2. There exists significant effect of AOM on academic achievement of 9th grade students in Life sciences.
3. There exists no significant difference in the effectiveness of ITM and AOM in teaching life sciences.

METHOD AND PROCEDURE

The study employed experimental method of research to collect the data and relevant information. Eighty two IX grade students were selected from two CBSE schools of Chhapra city of Saran district of Bihar using purposive sampling technique. Intelligence test developed and standardized by G.C.Ahuja (1979) was administered to divide them into groups on the basis of their IQ scores. Pre-test and post-test randomized matched group design was used to explore the effectiveness of two models. Self constructed pre-achievement test in life sciences was administered on both the groups followed by experimental treatment in which one group was taught selected topics of life sciences syllabus through ITM and other was exposed to same topics through AOM for fifteen days by preparing the lesson plans using two models. At the end of the experimental treatment, a post-test was conducted on both the groups and their scores on pre and post-test were compared and analyzed by employing t-test.

RESULT AND DISCUSSION

Result of the study is presented below

1. Result pertaining to effectiveness of Inductive Thinking Model (ITM).

To study the effect of Inductive Thinking Model on academic achievement of students' t-test was used. Result of the pre-test and post-test is shown in the below table.

TABLE 1: ACADEMIC ACHIEVEMENT SCORE OF GROUP EXPOSED TO ITM.

<i>Test</i>	<i>No. of Student</i>	<i>Mean</i>	<i>SD</i>	<i>t- Value</i>	<i>Remarks</i>
Pre- Test	41	24.92	3.3	9.31	Significant at 0.01 level.
Post- Test	41	32.34	5.66		

Table 1 shows the mean and SD of the pre-test and post-test scores of the students exposed to ITM. A look at the table reflects that mean score of the pre-test and post-test are 24.92 and 32.34 respectively, SD are 3.3 and 5.66 respectively. The t-value showing the difference between mean score on pre and post-test (9.31) is significant. This indicates that ITM has significant effect on academic achievement of 9th grade students in life science. Hence the hypothesis, “there exists significant effect of Inductive Thinking Model on academic achievement of 9th grade students in Life sciences” is accepted. This result is supported by Niak (1996) who compared the effectiveness of ITM with traditional teaching method used to teach mathematics and revealed that ITM is effective in increasing the reasoning ability in comparison to traditional method of teaching Mathematics.

2. Result pertaining to effectiveness of Advanced Organizer Model (AOM).

To study the effect of ITM on academic achievement of students' t-test was used. Result of the pre-test and post-test is shown in the below table.

TABLE 2: ACADEMIC ACHIEVEMENT SCORE OF GROUP EXPOSED TO AOM

<i>Test</i>	<i>No. of Student</i>	<i>Mean</i>	<i>SD</i>	<i>t- Value</i>	<i>Remarks</i>
Pre- Test	41	24.12	3.2	10.11	Significant at 0.01 level.
Post- Test	41	35.78	6.35		

Table 2 shows the mean and SD of the scores gained by the students before and after teaching using AOM. A look at the table reflects that mean score of the pre-test and post-test are 24.12 and 35.78 respectively, SD are 3.3 and 6.35 respectively. The t-value showing the difference between mean score on pre and post-test (10.11) is significant. This indicates that AOM has significant effect on academic achievement of 9th grade students in life science. Hence the hypothesis, “there exists significant effect of Advanced Organizer Model on academic achievement of 9th grade students in life sciences” is accepted. This result is supported by Vandana and Jadhav (2011) who compared the effectiveness of AOM over the traditional techniques of teaching Physics and revealed that ITM is effectual in increasing the reasoning ability in comparison to traditional method of teaching Mathematics.

3. Result pertaining to comparison of effectiveness of ITM and AOM.

To make comparison between the post-test results of both experimental groups t-test was used. Results of the post-tests are reflected in the table below.

TABLE 3: DIFFERENCE BETWEEN THE ACADEMIC ACHIEVEMENT OF GROUP OF STUDENTS TAUGHT THROUGH INDUCTIVE THINKING AND ADVANCED ORGANIZER MODEL OF TEACHING.

<i>Test</i>	<i>No of Student</i>	<i>Mean</i>	<i>SD</i>	<i>t- Value</i>	<i>Remarks</i>
Post-Test (ITM)	41	32.34	5.66	2.55	Significant at 0.01 level.
Post- Test (AOM)	41	35.78	6.35		

Table 3 is indicating the mean and SD of post-achievement test scores of both experimental groups. The mean score of group exposed to ITM is 32.34 and group exposed to 35.78 is AOM. The SD of ITM and AOM group is 5.66 and 6.35 respectively. A look at the table reflects that t-value (2.55) is significant. Therefore, both the models are equally significant in teaching life sciences to 9th grade students. Hence, the hypothesis, “there exists no significant difference in the academic achievement of students taught with Inductive Thinking Model and Advance Organizer Model of teaching” is accepted. The result is supported by Mondal (2013) who studied the effectiveness of ITM and AOM for teaching chemistry to higher secondary students and founded that both models are equally effective in teaching chemistry to higher secondary students.

CONCLUSIONS

The study compared the effectiveness of ITM and AOM in teaching life sciences to 9th grade students and it was found that both the models are equally significant in teaching life sciences in comparison to traditional method of teaching. So, it is recommended that school authorities should encourage the teachers to use these models to teach life sciences as per the suitability different topics to enhance the achievement of students and foster creativity and constructivism among students. Orientation and refresher courses as well as workshops should be arranged by the colleges of education or university department of education for school teachers to train them in developing and using these models of teaching.

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