

DISCUSSION

CHAPTER-V

5.0: DISCUSSION

Methods are the windows of effective teaching. The appropriate use of methods in teaching science is an important technique for all categories of learners. Proper use of methods can enhance teaching –learning process. The appropriate use of different methods in teaching science have been explained by different scholars like Siddiqi and Siddiqi (1998), Kohli (1988), Yadav (1977), Soni, Kulshrestha, and Pasricha (2006). This view is also supported by various commission and policies. According to Kothari Commission (1964-66), method of teaching and evaluation in training institutions are extremely important. It helps the student teachers to discriminate between the teaching they already taught, and they should be taught after training in school. Every method has its own merits and demerits. Method should be flexible according to the need and capabilities of the students and the specific demand of the environment, keeping in view the aim of teaching science (Sharma and Walia, 1992). The suitable effect of methods on teaching general science is an established fact. However the present investigation was carried out to find out the effectiveness of the three different methods viz (I) Lecture cum demonstration (II) Inquiry (III) Laboratory Methods in teaching general science with regard to the academic achievements of the students at secondary level. For this purpose pre-test and post-test design of experimental method was applied. To test the significance of data i.e. achievement scores, t-test and F-test are applied. Survey method was used for Teachers' view and opinion regarding the use and effectiveness of methods. Data are collected with the help of teacher schedule and analyzed the data with χ^2 (chi square) tests. All the three methods were properly used by 76 science teachers in 60 selected schools of Kamrup district of Assam. The findings reveal, all the three methods of teaching science show significant differences in comparison to pre-test scores of students. This result reflects effectiveness of methods in teaching science which lead

the performance of students in progressive way. For the convenience of comparison the results are discussed under the following heads:

5.1 The Effect of the Three Methods on Teaching General Science through Students Performance:

5.2 The views and opinion of teachers regarding the use and effectiveness of methods in teaching General Science:

5.1 The Effect of the Three Methods on Teaching Science through Students Performance:

For this purpose pre-test and post-test design of experimental method was applied. To test the significance of data i.e. achievement scores t-test and F-test are applied. The pre-test scores of student are not significant as teaching was provided by the simple traditional method, but when modern methods are used in teaching general science the average scores of all the three methods are differed significantly. The findings reveal, all the three methods of teaching general science show significant differences in comparison to the pre-test and post-test scores of students. These results reflect effectiveness of methods in teaching, which lead the performance of students progressively. This view is supported by different scholars. According to Sharma (2003) pupil centric methods (modern) are more effective than the teacher centric methods (traditional) because these are scientific, psychological and logical in nature. The effect of the three methods on teaching general science is discussed below:

a) Lecture cum demonstration method: Out of the three methods lecture demonstration is seemed to be the less responsive in teaching science (9.95), in comparison to the other two methods (10.68, 12.35, Table-3,4,5). It shows the significant effect over the control group (Simple lecture method=7.32). Similar effect is observed in case of private schools (11.37) and urban schools (10.84). Out of the three board /certificate, students studied in ICSE shows high performance while students of SEBA shows comparatively low performance (Figure-8). Students of CBSE also shows progressive results due to enhancement of teaching science. The increase of achievement scores of sample students was

found to be associated with the use of methods in teaching general science. Out of the three methods laboratory method is found to be highly effective (12.35) followed by inquiry method (10.68) in teaching science at class X. It means that through laboratory method students' learning may be enhanced.

It is noticed that both the methods under child-centric approach shows high efficacy (John Dewey, 1963) while lecture cum demonstration under teacher centric approach shows low efficacy. This finding shows that child centric methods are more suitable than the teacher centric method, which is supported by Kothari (1960) and Sharma (2003). Similar enhancing report of child-centric methods on pupils achievement is made earlier in discovery method in teaching science. The result shows the effectiveness of discovery method over lecture method (Yadav, 1977 and Badola, 1980). To study the academic achievement of the students, Goyal (1975) conducted a study, on methods which indicate the trend of improvement in students' performance from lecture to discovery method in science teaching, and findings are in favor of discovery method.

The results of lecture cum demonstration method are supported by different scholars. Sharma in 1980 suggested that Lecture method is best and suited for teaching in higher classes, and suitable for imparting factual information and starting new topics.

Choudhury in 2005 shows the effectiveness of lecture cum demonstration method over the lecture method. She also suggested that in case of lower classes lecture cum demonstration should be used in place of traditional method, which creates better teaching- learning process in science stream. An effective use of method in teaching science may raise the mental ability of students, so students may think and learn better than that of traditional methods. This finding is similar with present result and better performance of students may be due to better thinking and learning through lecture demonstration method.

- b) Inquiry method:** Inquiry method shows significant difference in teaching general science (10.68). In case of different parameters same results are found. This result is supported by the views of Bruner. Bruner (1963) states that, enquiry approach helps in conservation of memory, and acts in a better way in memory retention which increases the achievement level of the students. In 2010, Yen Chang & Ling Mao examined the comparative efficacy of inquiry-group instruction and traditional teaching methods on high school students' achievement and attitude towards earth science in Taiwan. They found that, the students in the experimental group i.e. inquiry group instruction had significantly higher achievement scores than the students in the control group i.e. traditional approach. There were statistically significant differences in favour of the inquiry group instruction on students attitudes towards the subject. Ediger (2016) suggested that inquiry method should resonate throughout the science curriculum. It also provides excitement for learners in making discoveries. According to Lent and Gilmore (2014) inquiry creates a sense of curiosity and a desire to learn. This finding shows the effect of enquiry method with promoting trend in academic achievement of students in comparison to the traditional method which is supportive of Chun-Yen Chang & Song-Ling Mao's findings.
- c) Laboratory method:** Laboratory method is seemed to be the most effective one in teaching science at secondary level (12.35). It shows significant differences in relation to management, locality and board/certificate respectively. In private (13.98, Table-13) and urban (13.47, Table-15) schools efficacy of this method is more than the government (11.78) and rural (11.45) schools. Out of SEBA (12.72, Table-19), CBSE (13.40, Table-21) and ICSE (18.27, Table-23) boards, students studied in schools under ICSE shows the best performance in general science subject. These finding shows the effectiveness of laboratory method which can highly influence the terminal behavior of students at secondary level. The similar reports are forwarded by different scientist and educationist like, Kothari (1966), Holstein and Lunette (2003). As we know that by performing

experiment students feel joy and lively which is useful for better understanding. Science experiments provide excellent settings for enthusiasm in learning by discovery.

Secondary education is consisted with different significant aspects, among which teacher training is the most sensitive part. In teacher training highest stress is imposed on teaching methods. The student teachers should strengthen their teaching process with the latest developments in content and methods of teaching (Guru, 2007).

5.2 The views and opinion of teachers regarding the use and effectiveness of methods in science teaching:

From teachers opinion the effectiveness of methods is also reflected in teaching Science. A positive view of teachers regarding the use of methods in general Science teaching is essential which can make teaching -learning process very effective. The positive views and interest of teachers can bring effectiveness towards science teaching at secondary level. It can enhance science education in future course of action at different levels.

a) Lecture cum demonstration method: It is observed, 77.58% teachers believe that demonstration method is not replaced by lecture method; while 17.09% teachers believe that demonstration is replaced by lecture method. Most probably, from psychological point of view, the nature of demonstration method (to observe) attract the teachers to a large extent. As we know that learning by observation is much better than only to listening.

- 93.36% teachers interacted with the students during demonstration, use some strategies to keep the students active and alive, and motivate the whole class. In this way they convert the teacher-centric demonstration method to childcentric approach.

b) Inquiry method: It is observed that, 98.63% teachers are able to encourage the students to clarify their doubts. They develop divergent thinking, enquiring attitude among the students.

- It is found that, 93.37% teachers observe inquiring attitude among the students while 6.58% is not. They try to develop problem solving attitude among the students which help them to solve every day's problem of life.
- 86.79% teachers give training for investigatory science activities while 9.21% teachers unable to do.

c) Laboratory method: 76.27% teachers applied different skills during activity in teaching general science. Drawing skill and manipulation skill are essential for science teaching and learning.

- Almost all the teachers (92.05%) are satisfied with the behavioural change of students after individual performance in laboratory, while 6.57% teachers are not able to observe the same. It helps to access students' capabilities to solve the problems in new situation or unfamiliar situation.
- 61.80% teachers are satisfied with the performance of students during laboratory condition, while others are (32.87%) not. But they prefer the activity method during teaching process in the class room situation.

d) Responses of Teachers Regarding Combination of Methods in teaching general science: 95.99% teacher prefers combination of methods in teaching general science.

- 59.18% prefers lecture cum demonstration methods in science teaching.
- 5.26% prefers inquiry methods in science teaching.
- 35.51% prefers laboratory methods in science teaching.

e) Responses of Teachers regarding effectiveness of methods in teaching general science: 92.05% teachers were satisfied with students' responses in science class. Only 7.89% teachers were dissatisfied.

- All the teachers (100%) are found effective in summarization of the topics or subjects.
- 98.625% teachers encourage the students for discussion during implementation of methods. The rest (1.32%) are indifferent towards active participation of students.
- 82.84% teachers were satisfied with terminal behaviour of students.

From the experimental and descriptive findings covered so far, it may be concluded as follows:

When methods are used in general science teaching it shows significant differences between the control and treated groups. The post-test results are far better than the pre-test results, which can be concluded that proper methods can enhance the achievement level of students. This view is supported by the critical study of Dev (1981) as he found the significant effect of methods in teaching science and improvement in terminal behavior of students in science subject at secondary level. Similar results were also found by Bhalwankar (1983) when he administered a pre-achievement test to compare the methods in teaching science in terms of knowledge, understanding and application level. Finding shows the progressive effect in teaching science. Out of the three methods, the efficacy of Laboratory method is highly responsive, followed by inquiry method. This is supported by many scholars which is an established fact. Although the use of lecture cum demonstration method is preferred by the science teachers (Goel & Agbebi, 1990), most of the teachers are in favour of combinations of methods.

Among the three pairs Lecture cum demonstration method and Inquiry method is the best pair. Combination of methods is supported by the teachers. It can be concluded that modern methods are very effective way to teach, also important to change the mind set of teachers as they are in favour of lecture cum demonstration method which may be due to indifferent attitude towards modern methods or unavailability of equipments in science laboratory. It is the high time to give emphasis on method and develop appropriate strategies for teaching general science in secondary schools, so that constructivism can be focused in our class-room.