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Effect of field based instruction and traditional instruction on attitude towards chemistry in relation to ability grouping

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Abstract
The present study found the effect of field based instruction and traditional instruction method on attitude of senior secondary chemistry students in relation to ability grouping. Researcher conducted this study to know that which of the instructional strategy is more useful to improve the attitude in chemistry and which ability group will get more benefit of instructional strategies. For this purpose, experiment carried out involved pre-test post-test control group design with two groups of students. The group, taught through Field Based Instruction (FBI) was taken as experimental group while the group taught through Traditional Instruction (TI) was taken as control group. The classifying variable was ability grouping and dependent variable was attitude towards chemistry. Researcher selected 120 students from the senior secondary schools of Himachal Pradesh, India, and then classified them into two ability groups (high and average ability group) using Raven's Progressive Matrices and further distributed into two groups FBI and TI. t-test was used to find out the significant differences. Results of the study showed that students taught through TI showed significantly better results in attitude in chemistry as compared to that taught through FBI; both the groups (high and average ability) in TI showed improvement in attitude towards chemistry after treatment, while in case of FBI only high ability group showed significant improvement. From, these results it can be concluded that teaching through FBI is not equally beneficial as TI in improving the attitude towards chemistry. Students acquired better attitude form after teaching through TI as compared to FBI, and high ability group gained more as compared to average ability group.

Keywords: FBI-field based instruction, TI- traditional instruction

1. Introduction
Learning brings change in behaviour. In the process of learning, there is an interaction between the instructor, learner and learning material. In now days, classrooms are becoming more and more learner oriented, so are the teaching methodologies changing in recent times. The academic standard in the subject of chemistry is deteriorating and there is urgent need to reform methods of teaching this subject. There is urgent need to find effective methods of teaching that will develop spirit of enquiry, provide training in problem solving skills, independent thinking, develop the skills of establishing and studying relationship, analyzing the data and verifying the result, among students.

Field based instruction is an approach that moves theory into practice and reflection into action. Key areas within this option are differentiated instruction, formative assessment, and any research-based instruction strategies (Doyle & Suleiman, 2009) [4]. Falk & Dierking (1997) [5] found that field trips promote long-term recall and 80% of children and adults could recall three or more specific concepts linked with a field trip. Field trips clarify and reinforce the abstract information delivered in the lecture environment (Boyle *et al*, 2007) [2]. The field studies help students better appreciate their own 'ecological footprint' as consumers of many environmental resources, develop a more holistic perspective of the myriad connections between our biophysical world and human societies and provides ample opportunity for cultural exchanges with folks.

Since long, Traditional Instruction is in common use for providing instructions in different levels of educational institutions. It appears that this method is deeply ingrained in our educational system and currently is the most widely used in science subjects in spite of its

Shortcomings. Most of science teachers use it, perhaps, due to habit or tradition. It may also be due to certain assumptions about this method. The teachers who use this method feels that students need to know information and he is one of the best sources who can give them this required knowledge. Further, it is the most strongly criticized form of communication for learning.

2. Field Based Instruction

The term field based instruction originated from naturalism which encourages observation method. Field based instruction includes direct purposeful experience. Field based instruction is a form of active learning and has proven very worthwhile in enhancing students' achievement in science (Kozar & Marcketti, 2008) [8].

2.1 Teaching Chemistry through FBI

Field based instruction include all type of activities out of classroom which helps students to encounter directly with the natural environment and teaching of science through these activities benefitted and emphasized the process of inquiry among the learners (Hurd, Roger, Jane, & Yager, 1980) [7].

2.2 Objectives of FBI in Chemistry Teaching

- FBI programs helps in learning of certain knowledge with more effectiveness by providing first hand experiences outside the institution.
- FBI boosts the connection between the cognitive and effective outcomes of the students.
- Habit of active participations can be developed between students by using FBI.
- It also helps in fulfilment of some of those educational objectives which are not being met effectively by traditional instructions.
- Learning through FBI is more active as compared to other traditional learning strategies.
- More useful practical knowledge can be provided by using FBI.

Moreover, Field based instructions provide a special kind of natural laboratory situation where students conduct experiments, collect data and draw inferences. In other situations students collect data with direct observation in the lap of nature.

3. Review of Related Literature

Study conducted by (Tretinjak, 2001) [13] showed that students' enjoyment and engagement are higher on field trips as compared to the classroom teaching. Horvath (2005) [6] used a mixed method in education research to assess the effect of field based instructions on the students learning outcomes. He reviewed the emergence of mixed methods as well as the used of quantitative, qualitative, and mixed methods in the field of educational research. Results of his study showed significantly higher scores on the general participation factor that emerged from the survey, thus indicating that students had a more favourable impression of field trips. Davidson (2006) [3] in his study concluded with recommendations for informal and classroom educators, especially to find out what students are interested in, give them choices, and connect trips to classroom activities. Rubin (2007) [12] developed a digital public history of virtual field trips as engaged learning. The ways students are taught must engage them in a journey of self-discovery in order for them to become self-directed, lifelong learners. Bhatia (2009) [1] synthesized the museum and school partnership for learning on field trips. Findings suggest a coordinated partnership between the museum and schools for annual field trips to supplement classroom teaching. Patterson (2009) [10] evaluated the effectiveness of field experience in science grade students a mixed methods study of learning environments. Nesbit (2010) [9] reported shifting attitudes: the influence of field trip experiences on student beliefs. Results of the study are put in the context of the literature and strategies are recommended for optimizing affective learning within experiential, informal activities such as field trips.

4. Rationale of the Study

Science educators are interested in modifying science education in such a way with which quality learning in science can be enhanced. The objectives of learning of science at school level, according to them are to make the students understand and appreciate natural phenomena, to develop positive attitudes and interests towards science, believing in cause and effect, training in scientific method to name a few besides academic achievement.

Studying chemistry is no longer confined to a few seriously devoted persons. Since life in the present world invariably warrants to variable degrees, knowledge of scientific facts and laws, chemistry has become everyday chemistry for everybody. Teaching of everyday chemistry for everybody has become an unavoidable part of general education. The teacher needs to utilize various teaching methods in order to achieve the objectives of teaching chemistry. One teaching method may be suitable for some students and some other methods suitable to some other students or one method may be suitable for one topic and other for another. Chemistry teacher should be discrete in choosing how to teach the course, so that it helps to develop the attitude of students towards chemistry. The teacher should also provide course content and the teaching materials of all kinds which is suitable for smooth learning. Then, there will be good understanding as well as the high attitude of the students. This will also help the students in achieving the objectives of teaching chemistry.

Traditional learning is not enough to cope with the problems of educational field. In order, to remove the basic problems of the traditional learning, strategies like FBI should be introduced in the traditional learning method. The educational institutions and teachers cannot absolutely give up lectures and other natural methods of learning which are easy to fall back on. Field Based Instruction is one such method which is also favoured by naturalists. Researchers did not come across many studies to evaluate comparatively attitude after students have been taught by Field based instruction, and Traditional Instruction. The present study will compare the effect of teaching in virtual and natural setting on attitude with respect to Ability grouping.

5. Objectives of the Study

1. To examine the effect of Field Based Instruction on Attitude towards Chemistry.
2. To examine the effect of Traditional Instruction on Attitude towards Chemistry.
3. To examine the effect of Field Based Instruction on Attitude towards Chemistry for high ability group.

4. To examine the effect of Field Based Instruction on Attitude towards Chemistry for average ability group.
5. To examine the effect of Traditional Instruction on Attitude towards Chemistry for high ability group.
6. To examine the effect of Traditional Instruction on Attitude towards Chemistry for average ability group.
7. To compare the effect of Field Based Instruction and Traditional Instruction on Attitude towards Chemistry for high ability group.
8. To compare the effect of Field Based Instruction and Traditional Instruction on Attitude towards Chemistry for average ability group.

6. Hypothesis of the Study

1. Subjects in Field Based Instruction group will improve significantly on Attitude towards Chemistry after treatment.
2. Subjects in Traditional Instruction group will improve significantly on Attitude towards Chemistry after treatment.
3. Subjects with high ability in Field Based Instruction group will improve significantly on Attitude towards Chemistry after treatment.
4. Subjects with average ability in Field Based Instruction group will improve significantly on Attitude towards Chemistry after treatment.
5. Subjects with high ability in Traditional Instruction group will improve significantly on Attitude towards Chemistry after treatment.
6. Subjects with average ability in Traditional Instruction group will improve significantly on Attitude towards Chemistry after treatment.
7. Subjects with high ability in Field Based Instruction group after treatment will be significantly better on Attitude towards Chemistry as compared to those in Traditional Instruction.
8. Subjects with average ability in Field Based Instruction group after treatment will be significantly better on Attitude towards Chemistry as compared to those in Traditional Instruction.

5. Methodological Procedure

5.1 Sample

The population of this study comprised of all students of class XI studying in Senior Secondary Schools situated in the District Una, of Himachal Pradesh, India. Four schools were selected randomly for this study, two for each instructional strategy. On the basis of marks obtained on Raven's Progressive Matrices (Raven, 2000) [11], students were divided into high and average ability group. A sample of 120 students were taken from 4 schools selected randomly, 30 students from each school comprising 15 students of high abilities and 15 students with average abilities.

5.2 Tools

Raven's Progressive Matrices (Raven, 2000) [11], was used to divide the students into high and average ability group. An attitude scale and lesson plans in Chemistry including activities were constructed by the researchers to teach the students through FBI and TI.

5.3 Treatment

Pre-test in attitude was given to the students. Experimental Group students were taught by researcher in the natural environment using FBI, for this purpose investigator took the students to the field, while control group was taught by chalk-board and lecture method. After, treatment post-test was given to the students. Gains in attitude scores were calculated.

6. Analysis and Interpretation of Results

The data obtained from experiments has been subjected to descriptive as well as to suitable inferential statistical techniques. Obtained data was processed, analyzed to meet the objectives and hypotheses of the study.

6.1 Effect of Instructional Strategies on Attitude towards Chemistry

Table 6.1.1: shows statistics effect of FBI on attitude

Statistics	Pre-test	Post-test	t-ratio
Mean	20.50 (n=60)	25.06 (n=60)	2.59*
S.D.	8.12	11.04	

* Significant at.05 level

Pre-test and post-test level scores from table 6.1.1 reveals that, there was a significant difference between the mean attitude scores. Level of significance was found to be (t_{59}=2.59; p<.05). This indicates that FBI was effective to improve the attitude of students towards chemistry.

Table 6.1.2: shows statistics effect of TI on attitude

Statistics	Pre-test	Post-test	t-ratio
Mean	18.50 (n=60)	35.12 (n=60)	7.52*
S.D.	9.22	14.42	

*Significant at.01 level

Table 6.1.2 reveals that there was a significant difference in the mean attitude scores after the treatment for the TI group. The significance level was found to be (t_{59}=7.52; p<.01), which reveals that TI is an effective strategy is improve the subjects attitude towards chemistry.

Table 6.1.3: shows statistics effect of FBI on attitude in high ability group.

Statistics	Pre-test	Post-test	t-ratio
Mean	20.63 (n=30)	28.90(n=30)	3.91*
S.D.	7.67	8.52	

* Significant at.01 level

The data in table 6.1.3 shows that the attitude in chemistry after administration of FBI is significantly improved (t_{29} = 3.91; p<.01) which shows that FBI affect attitude significantly in high ability group.

Table 6.1.4: shows statistics effect of FBI on attitude in average ability group.

Statistics	Pre-test	Post-test	t-ratio
Mean	20.16 (n=30)	22.81 (n=30)	1.50*
S.D.	6.09	7.06	

*Not significant

Data in table 6.1.4 shows that the gain in attitude after administration of FBI is not significant in case of average ability group (t_{29} = 1.50; p>.01).

Table 6.1.5: shows statistics effect of TI on attitude in high ability group.

Statistics	Pre-test	Post-test	t-ratio
Mean	20.12 (n=30)	42.44 (n=30)	8.11*
S.D.	8.34	12.55	

*Significant at.01 level

The data in table 6.1.5 indicates that the gain after administration of TI is significant ($t_{29} = 8.11$; $p<.01$) as far as attitude towards chemistry is concerned. This holds for high ability group.

Table 6.1.6: shows statistics effect of TI on attitude in average ability group.

Statistics	Pre-test	Post-test	t-ratio
Mean	17.06 (n=30)	28.62 (n=30)	3.87*
S.D.	8.04	14.18	

*Significant at.01 level

Data in table 6.1.6 shows that the gain in attitude towards chemistry after administration of TI is significant in case of average ability group also ($t_{29} = 3.87$; $p<.01$).

6.2 Comparisons of Effect of Instructional Approaches on Attitude towards Chemistry for Ability Groups

Table 6.2.1: represents the comparison of t-ratio for gain scores in FBI & TI methods on attitude in high ability group

Methods	Mean	S.D.	t-ratio	Significance level
FBI (n=30)	8.27	8.02	5.85	$p<.01$
TI (n=30)	22.32	10.36		

Table 6.2.1 shows that the difference in mean gain scores in attitude of FBI & TI interventions is significant for high ability group ($t_{58} = 5.85$; $p<.01$) in favour of TI group. The TI group gains in attitude significantly more than FBI group.

Table 6.2.2: represents the comparison of t-ratio for gain scores in FBI & TI methods on attitude in average ability group.

Methods	Mean	S.D.	t-ratio	Significance level
FBI (n=30)	2.65	5.92	4.41	$p<.01$
TI (n=30)	11.56	9.37		

The difference in mean gain scores in attitude of FBI & TI interventions is significant for average ability group ($t_{58} = 4.41$; $p<.01$) again in favour of TI group. Thus, it was inferred that students exposed to TI teaching strategy gained significantly more than the students exposed to FBI teaching strategy on attitude towards chemistry.

7. Conclusion

Teaching through different instructional strategy like FBI is not equally beneficial as TI in improving attitude of students towards the chemistry. Students acquired better attitude towards chemistry after teaching through traditional instruction as compared to field based instruction.

For both the interventions FBI and TI, subjects in TI intervention showed significant improvement in the mean attitude scores in chemistry after treatment, while in FBI intervention only high ability group significant showed significant improvement. Students taught through TI showed significantly better results in attitude towards chemistry as compared to that taught through FBI. This shows instructional strategy like FBI is not equally effective in improving attitude towards chemistry. So, for improvement of attitude towards chemistry TI intervention found to be more useful.

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