

Effect of Concept Mapping Strategy on Achievement in Chemistry among IX Grader Boys

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Abstract

The study was carried out to investigate the effect of teaching through Concept mapping on the achievement in Chemistry among boys. Sample of the study consisted of 150 (75 Experimental group and 75 Controlled group) IX class boys from four Government schools of Ludhiana city of Punjab. Experimental group was exposed to Concept mapping method and the controlled group was exposed to Conventional method (lecture and discussion) for twenty five days. Mixed group test of intelligence (MGTI) by Mehrotra (2008) was used to match the group. Achievement test in Chemistry (developed and standardized by the investigator) was used as tool for data collection. The results of the study showed that achievement in Chemistry of the boys taught by Concept mapping was significantly better as compared to group taught by Conventional method at 0.05 level of significance.

KEYWORDS: Concept mapping, Experimental Group, Controlled Group, Boys, Achievement in Chemistry

Introduction: “All round development” will be the answer of every person, especially associated to the field of education directly or indirectly, when one is asked about ultimate aim of education. It is perhaps the most appropriate answer to the question also, but question arises, do we have such a perfect education system? Do our education policies are self sufficient to cater the needs of the society? Do our schools are actually providing such facilities to the teachers as well as to the students so as to facilitate the process of achieving this aim? Or do we have well equipped teachers with full knowledge of latest methods and techniques required to achieve such aim? Vivekananda points out that the defect of the present day education is that it has no definite goal to pursue. A sculptor has a clear idea about what he wants to shape out of the marble block; similarly a painter knows what he is going to paint. But a teacher, He says, has no clear idea about the goal of his teaching. His words clearly reflected the scenario of education system in the country like India (Nithiya, 2012).

So the demand of today education is to shift from verbalism or lecture method to learning by doing, learning by actively involving the students i.e. Collaborative learning, Cooperative learning, Concept mapping .It clearly indicates in order to cater the needs of the students of 21st century teachers are suppose to change their methods of teaching thereby adopting the role of facilitator in the process of teaching and learning. “Method refers to the formal structure of the sequence of acts commonly denoted by instruction. The term ‘method’ covers both strategies and tactics of teaching and involves the choice of what is to be taught, and in which order it is to be presented (Broudly ,1963) as quoted by Kothari (1111).

Concept mapping strategy is one of the new innovations in the field of education. It can be considered as somewhat similar to a spider chart, an organized chart of a flow

diagram i.e. a concept map for teaching and learning is one, arranged in a hierarchical organization in which the more inclusive concepts at the top of the map and the more concrete and specific ones at the bottom.

Originally the method was developed by Novak at Cornell University in the 1960s. This concept emerges in the field of learning after new school of constructivism, which accepts active participation of the learner in construction of knowledge. It is the unique way of representing information. Three features are used in creating Concept Maps:

- (a) A list of concepts,
- (b) Lines that represent the relational links between these concepts, and
- (c) Labels for these linking relationships.

Concept maps are generally confused with mind maps but these are two different ways of classifying and representing information. In mind maps, one main concept is taken as starting point, and becomes the “central word”. Further five to 10 main ideas (also called child words) are then plotted around the central word, with links back to the central word. Another five and 10 ideas can be added to anyone to these child words, creating an ever growing pattern of network of concepts around the central one (Buzan, 1993). In a mind maps links are usually “passive”, not representing anything more than association. In concept maps the links are labeled with descriptions, representing anything more than, defining the association between concepts.

Wang, Cheung, Lee and Kwok (2006) remarked that concept maps have been widely put to educational uses. They possess a number of appealing features which make them a promising tool for teaching, learning, evaluation, and curriculum planning. Wang, Cheung, Lee and Kwok (2006) remarked that concept maps have been widely put to educational uses. They possess a number of appealing features which make them a promising tool for teaching, learning, evaluation, and curriculum planning. Ruiz-Primo and Shavelson (1995) discussed more research needs to be done to provide reliable and valid information on the effect of different Concept mapping techniques.

Review of related literature:

Concept mapping and Chemistry: Few studies were traced which were conducted on effectiveness of Concept mapping in the subject of Chemistry, It includes the studies of Markow and Lonning (1998), Brandt et al. (2001), BouJaoude and Attieh (2003), Aggarwal (2012), Agboola and Oloyede (2013), Ezeudu (2013), Jack (2013), Julius and Wachanga (2013), Fatokun and Eniayeju (2014), Nwagbo and Okonkwo (2014), Victoria and Paul (2014), Chawla and Singh (2015) showed its positive effect on achievement and various other variables excluding the study of Brandt et al.(2001).

Justification of the problem: It was reviewed few studies were conducted to determine the effect of Concept mapping in the field of Chemistry and out of these most of the studies had been undertaken in foreign countries as BouJaoude and Attieh (Lebanon), Brandt et al. (Flanders,), Agboola and Oloyede (Osun State, Nigeria.), Fatokun and Eniayeju (Nasarawa State, Central Nigeria), Nwagbo and Okonkwo (Nnewi Education Zone of Anambra State, Nigeria). Victoria and Paul (Nasarawa State, Nigeria),

Jack (Senatorial districts of Taraba state), Markow and Lonning (Connecticut) only one study of Aggarwal (2012) was found in India which was conducted on the population of Amritsar. No, study has been found specifically done on the population of Punjab Government school students on subject of Chemistry. Moreover no study included the sample of IX class and especially with respect to boys. The proposed study thus seems fully justified as it checks the effect of teaching through Concept mapping on achievement in Chemistry of grade IX graders boys.

Objective:

To investigate the significance of difference in Achievement in Chemistry of the boys taught through Concept mapping and Conventional teaching.

Hypothesis:

H₀ 1 There will be no significant difference in Achievement in Chemistry of the boys taught through Concept mapping and Conventional teaching.

Method and Procedure: To study the effectiveness of Concept mapping strategy on the Achievement in Chemistry among IX grader boys randomized groups pretest- posttest design was used. Here in the first phase concept maps were constructed and Chemistry achievement test was constructed and standardized. Test of intelligence was used to match two groups A1 and A2, Experimental and Controlled groups respectively. In the second phase Chemistry achievement test was applied as a pre test. In the third phase students of Experimental group and Controlled were exposed to Concept mapping method and Conventional teaching respectively. In the last phase Chemistry achievement test was applied again as a post test. The difference of scores of post test and pre test which is termed as mean gain scores is index with which effectiveness of two methods could be compared.

Independent variables- The investigator had taken two strategies, traditional (Lecture and discussion) method and Concept mapping strategy.

Dependent variable- In the present study acquisition of Chemistry concepts (Achievement) was considered as dependent variable. This was evaluated by the mean gain scores $(\text{Post-test scores} - \text{Pre-test scores})$ of Achievement test in Chemistry of the students.

Control: Extraneous variables were controlled by various steps. Method of randomization was adopted while selecting the sample for the study. Students were matched on the basis of intelligence, age group of the students was also considered along with their socio-economic status. Nature and subject mastery of the teacher was controlled as investigator herself taught both the groups. The analysis was done on the gain scores in order to eliminate the effect of the prior knowledge of the students about the subject. Only Government school boys were taken for the sampling, so that the effect of environmental factor can also be nullified. Investigators made students comfortable with respect to medium. For this purpose Chemistry achievement test was translated and revalidated in all the three languages-English, Hindi and Punjabi.

Control: Sample of the study: For the present study, sample of IX grader boys from four Government schools of Ludhiana city were selected through the randomization technique. Here 75 boys were taken as Experimental group and other 75 boys were taken as Controlled group.

Tools:

- (a) Mixed group intelligence test by Mehrotra (2008)
- (b) Achievement test in Chemistry (developed and standardized by the investigator)

Results and discussion: The result is discussed in Part I and Part II given below:

Part I- Matching of the groups: The Experimental and Controlled groups were checked for their homogeneity on the basis of Intelligence. The t-ratios were worked out and the values are given in table 1:

Table 1- Matching on the basis of intelligence

Group	N	Mean	Standard Deviation	t-ratio
Experimental	75	31.46	10.28	0.19 (N.S)
Controlled	75	31.72	6.92	

N.S. means non-significant (value of t-ratio significant at 0.05 level = 1.96)

Table 1 reveals that mean scores of the Experimental group (group taught through Concept mapping method) for intelligence is 31.46 and Standard deviation for the same is 10.28 where as mean scores of the Controlled group (group taught through Traditional Method) for intelligence is 31.72 and Standard deviation for the same is 6.92. The value of t-ratio came out to be 0.19 which is non-significant. Thus there exists no significant difference in both the groups with respect to intelligence.

Part II (a) Significance of difference in Achievement in Chemistry of the boys taught through Concept mapping and Conventional teaching.

t-test was applied between boys of Experimental group and Controlled group to investigate the significance of difference in Achievement in Chemistry of the boys taught through Concept mapping and Conventional teaching. The values are given in 2(a) and 2(b) below:

Table 2 (a) Group Statistics

Group	N	Mean	Standard Deviation	Standard Error of Mean
Experimental	75	18.05	8.69	1.004

Group	N	Mean	Standard Deviation	Standard Error of Mean
Experimental	75	18.05	8.69	1.004
Controlled	75	11.75	6.97	0.805

Table 2(b) Independent Samples Test

		Levene's Test for Equality of Variances		t-test for Equality of Means						
		F	Sig.	t	Df	Sig.(2-tailed)	Mean Difference	Std. Error Difference	95% Confidence Interval of the Difference	
									Lower	Upper
Gain Scores	Equal variances assumed	3.009	0.052	4.901	148	0.00	6.31	1.287	3.764	8.850
	Equal variances not assumed			4.901	141.35	0.00	6.31	1.287	3.763	8.850

Table 2(a) reveals that value of mean of gain scores in Chemistry of the Experimental group is 18.05 whereas mean of achievement in Chemistry of the boys of Controlled group for is 11.75 respectively. On application of F-test through SPSS Table 2(b) table of independent sample test is obtained, this table reveals results of two tests-Levene's Test for equality of variances and t-test for equality of means. The table contains two sets of analysis, the first one assuming equal variances in the two groups and the second one assuming unequal variances. Above table reveals that F value is 3.009 and P=0.052 which is non-significant at 0.05 level of significance. It indicates that the two groups have equal variances. Therefore, the statistics associated with equal variances assumed should be used for the t-test for equality of means. The t-test results (with equal variances assumed) show t value is 4.901 with 148 degrees of freedom the corresponding two tailed p-value is 0.00, which is less than 0.01. Therefore the null hypothesis is rejected at 1% level of significance, which means that the boys of Experimental and Controlled groups significantly differ in their Achievement in Chemistry i.e. boys of Experimental group (Mean = 18.05) are significantly better in Achievement in Chemistry than the boys of controlled group (Mean = 11.75).

Discussion: The findings of the present study clearly reveal that Concept mapping is the strategy leading to higher achievement of students. This finding is well supported by the studies of Montiel (1980), Jegede and Okebukola (1990), Horton et al. (1993), Wilkes et al. (1999), Sungur et al. (2001), Novak (2002), Preszler (2004), Snead and Snead (2004), Wang and Dwyer (2004), Novak and Canas (2006), Olgun and Sila (2008), Aydin et al. (2009), Okoye and Okechukwu (2010), Kamble (2012), Nwagbo and Okonkwo (2014), Chawla and Singh (2015).

Educational implications of the study: Results of present study also supported that Concept mapping strategy is useful for teaching Chemistry concepts. Concept mapping technique is thus strongly recommended for teaching Chemistry in Government Schools of Punjab.

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