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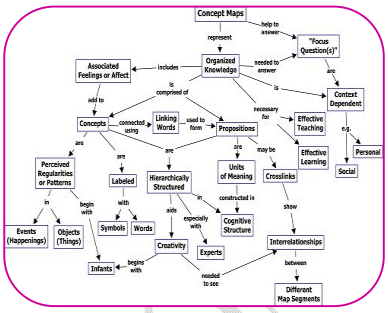
EFFECTIVENESS OF CONCEPT MAPPING TEACHING STRATEGY FOR TEACHING BIOLOGY TO CLASS IX STUDENTS



Deepika Pandey[1] and Prof. K. S. Misra[2]
[1]Research scholar, Department of Education, University of Allahabad, Prayagraj.
[2]Professor, Department of Education, University of Allahabad,Prayagraj .

ABSTRACT

The present study attempts to compare the effectiveness of concept mapping strategy of teaching biology to male and female students. 201 students (124 boys and 77 girls) of class IX were taken as a sample. The sample consisted of four groups. Two groups (male & female) were taught through concept mapping strategy of teaching and two groups (male & female) were taught through traditional teaching method. Self-constructed 'Biology Achievement Test' was used as a tool for the study. The findings of the study revealed that (1) concept mapping strategy of teaching is effective for teaching biology; (2) as compared to traditional method concept mapping strategy of teaching is more effective for teaching biology to male students; and (3) concept mapping strategy of teaching and traditional method of teaching are equally effective for teaching biology to female students.

KEYWORDS: *effectiveness, concept mapping, biology, teaching, achievement.*

INTRODUCTION

Concept mapping is a method that shows interrelationship between concepts. It is based on the theory given by Ausubel.According to Ausubel(1963) most new learning occurs through derivative subsumption i.e., deductive way to deriving subordinated concept from super ordinated concept; and correlative subsumptioni.e., learning of new concepts. He also stated that cognitive structure is organized hierarchically being subsumed under broader more inclusive concepts(Asan, 2007).Concept maps can help a student to focus on how he/she organized knowledge and its structure within a particular domain and fluency and efficiency by which knowledge can be used (Williams, 1998).To retain the information it is important to encode information into long term memory.It is only possible when learner linking new information with the existing information. Concept mapping helps in this process of linking information. (Gredler, 2001; Wang, 2003). Concept mapping, as a learning strategy enhances comprehension, memory and promotes meaningful learning(Wang, 2003).Concept mapping encourages meaningful learning by processing of the information effectively through dual coding by using both verbal and nonverbal i.e. graphic representation. It also increases possibility of information recall (Clark &Paivio, 1991; Wang, 2003). Researches show that concept mapping is effective for teaching science (Qarareh, 2010; Asan, 2007; Rao, 2004).Awofala(2011) found that concept mapping is an effective strategy for teaching and learning mathematics.The present study attempts to compare the effectiveness of concept mapping strategy of teaching biology to male and female students.

OBJECTIVE OF THE STUDY:

The objective of the study are as follows:

1- To investigate the effectiveness of concept mapping teaching strategy for teaching Biology to class IX students.
2- To compare the effectiveness of concept mapping teaching strategy and traditional method of teaching for teaching biology to class IX students.

HYPOTHESES:

The following hypotheses were formulated under the present study–

1- There is no significant difference between mean pretest and post-test scores of female students exposed to concept mapping teaching strategy.
2- There is no significant difference between mean pretest and post-test scores of male students exposed to concept mapping teaching strategy.
3- There is no significant difference between mean post-test scores of female students exposed to concept mapping teaching strategy and traditional method of teaching.
4- There is no significant difference between mean post-test scores of male students exposed to concept mapping teaching strategy and traditional method of teaching.

METHODOLOGY-

Research Design:

Experimental method of research was adopted for the present study. The Pre-test- Post-test nonequivalent group design was used for the present study.

Sample:

The sample comprised of 201 students (124 boys and 77 girls) of class IX. Cluster method was used for sampling.

Experimentation:

Firstly achievement test (i.e. pretest) was administered on students. Then students of one group were exposed to concept mapping strategy of teaching. The second group was exposed to traditional teaching (i.e. lecture). At the end posttest was administered.

Following nine chapters were taught:

1. BIODIVERSITY AND CLASSIFICATION –I
2. BIODIVERSITY AND CLASSIFICATIO N–II
3. CELL: THE UNIT OF LIFE
4. ANIMAL AND PLANT TISSUE
5. HEALTH AND DISEASE -I (VIRUS)
6. HEALTH AND DISEASE –II(BACTERIA)
7. HEALTH AND DISEASE –III(INFECTIOUS DISEASE)
8. CO-ORDINATION OF HUMAN BEINGS WITH ECOSYSTEM
9. POLLUTION

Students of the two experimental groups (for male & female) were taught for 38 periods by the researcher using concept mapping strategy. Students of the two control groups (CG1 for male & CG2 for female) were taught similar topics for 28(CG1) and 31(CG2) periods by the researcher.

Based on the views of Novak (2008), the researcher followed the following steps for construction of concept maps-

(I) Identification of a text: To begin with researcher went through information related to a concept and identify segments of relevant text. This helps in creating a context that can contribute to determination of the hierarchical structure of the concept map.

(II) Identification of key nodes: The researcher listed the key ideas that can be used as nodes and then established the sequence from the most general to the most specific.

(III) Formulating connecting linkages: The researcher then explored the linkages between segments of information denoted in the form of nodes. Then all nodes and internodes are written in the form of a composite whole. This organized set of information appears as a ' concept map '.

Tools used:

Biology Achievement Test developed by the researcher was used for the study.

Statistics used:

t- ratios were calculated to analyze the data.

Results:

Table 01

Difference between means for pretest and posttest scores of male students exposed to concept mapping strategy of teaching

	N	Mean	S.D.	Std. Error of Mean	Correlation	SE_D	t-ratio
Pretest	55	16.53	5.42	0.732	0.678	0.6955	16.23^{***}
Posttest	55	27.82	6.94	0.937			

***Significant at 0.001 level

It was hypothesized that there is no significant difference between mean pretest and posttest scores of male students exposed to concept mapping teaching strategy. Table 01 shows that the valueof 't ratio calculated for finding out the significance of difference between pretest mean score and posttest mean score is 16.23 . This value is significant at 0.001 level because this value is greater than the required critical value (i.e. = 3.48 for df= 54). Thus, the null hypothesis is rejected at .001 level. It shows that there is significant difference between the posttest mean score and pretest mean score on achievement of male students exposed to concept mapping strategy of teaching. The posttest mean (=27.82) is greater than the pretest mean (=16.53). It means that there is a significant difference in favour of posttest score. Therefore, it can be concluded that concept mapping strategy of teaching is effective for teaching biology to male students.

Table 02

Difference between means for pretest and posttest scores of female students exposed to concept mapping strategy of teaching

	N	Mean	S.D.	Std. Error of Mean	Correlation	SE_D	t-ratio
Pretest	39	10.59	4.29	0.687	0.454	0.7797	14.86^{**} *
Posttest	39	22.18	4.96	0.795			

***Significant at 0.001 level

Further, it was also hypothesized that there is no significant difference between mean pretest and post-test scores of female students exposed to concept mapping teaching strategy. Table 02 shows that the value of 't' ratio calculated for finding out significance of difference between pretest mean score and posttest mean score is 14.86. This value is significant at 0.001 level because this value is greater than the required critical value (i.e. = 3.56 for df= 38). Thus, the null hypothesis is rejected at .001 level. It shows that there is significant difference between the posttest mean score and pretest mean score on achievement of female students exposed to concept mapping strategy of teaching. The posttest mean (=22.18) is greater

than the pretest mean (=10.59). It means that there is a significant difference in favour of posttest score. Therefore, it can be concluded that concept mapping strategy of teaching is effective for teaching biology to female students.

Forgoing discussion revealed that concept mapping teaching strategy is effective for boys and girls. Efforts were also made to compare the effectiveness of the concept mapping teaching strategy and traditional teaching. To begin with pretest scores of experimental and control group were compared by computing t- ratios for male as well as female students.

Table 03

Comparison of pretest scores for female students belonging to experimental and control group

Group	N	Mean	Std. Deviation	t-ratio
Experimental	39	10.59	4.290	0.472
Controlled	38	11.13	5.705	

Table 03 shows that mean pre-test score for experimental group is 10.59 and mean pre-test score for controlled group is 11.13. The value of t ratio is 0.472 which is not significant at 0.05 level. It shows that pretest scores of female students exposed to concept mapping teaching strategy and traditional method of teaching are equal.

Table 04

Comparison of pretest scores for male students belonging to experimental and control group

Group	N	Mean	Std. Deviation	t- ratio
Experimental	55	16.53	5.426	1.793
Controlled	69	14.83	5.105	

Table 04 shows that mean pre-test score for experimental group is 16.53 and mean pre-test score for controlled group is 14.83. The value of t ratio is 1.793 which is not significant at 0.05 level. It shows that pretest scores of male students exposed to concept mapping teaching strategy and traditional method of teaching are equal.

On the basis of table 03 and 04 it can be inferred that experimental and control groups are equivalent with regards to pretest scores. Then, attempts were made to find out whether students belonging to the experimental group and controlled group differ on post-test scores. Results have been shown in table 05 and 06.

Table 05

Mean, S.D. and t ratio showing differences between mean posttest scores of female students of experimental and control group

Group	N	Mean	Std. Deviation	t- ratio
Experimental	39	22.18	4.968	0.237
Controlled	38	21.84	7.314	

It was hypothesized that there is no significant difference between mean post-test scores of female students exposed to concept mapping teaching strategy and traditional method of teaching. Table 05 shows that the values of mean and S.D. for post-test scores for experimental group are 22.18 and 4.968 respectively. Mean and S.D. for control group are 21.84 and 7.314 respectively. The value of t- ratio is .237. It is not significant at 0.05 level. So, the null hypothesis can be accepted and it can be inferred that mean for experimental group does not differ from that for the control group. It means that concept mapping strategy of teaching and traditional method of teaching are equally effective for teaching biology to female students.

Table 06
Mean, S.D. and t ratio showing differences between mean posttest scores of male students of experimental and control group

Group	N	Mean	Std. Deviation	t ratio
Experimental	55	27.82	6.947	2.811**
Controlled	69	24.54	6.045	

**Significant at 0.01 level

It was hypothesized that there is no significant difference between mean post-test scores of male students exposed to concept mapping teaching strategy and traditional method of teaching.Table 06 shows that the value of mean and S.D.for post-test scores of male students of experimental group are 27.82 and 6.947 respectively. Mean and S.D. for control group are 24.54 and 6.045 respectively. The value of t- ratio is 2.811. It is significant at 0.01 level. So, the null hypothesis can be rejected. Mean for experimental group is greater than that for the control group. It means that concept mapping strategy of teaching is more effective than traditional method of teaching for teaching biology to male students.

DISCUSSION

The present study shows that concept mapping strategy of teaching is effective for teaching biology to male as well as female students. This finding is not in agreement with the findings of Snead & Young (2003) and Attieh&BouJaoude (2008). They found that students who used concept mapping did not differ significantly on the posttest than the students not using the concept mapping. However, results ofthe studies of Awofala (2011), Qarareh (2010), Asan (2007) and Rao(2004) lend indirect support to these findings of the present study.Awofala(2011) found that concept mapping is an effective strategy for teaching and learning mathematics.Qarareh(2010)found that use of the concept map shows greater effect on academic achievement in science.Asan (2007) found that concept mapping has a noticeable impact on student achievement in science classes. Rao (2004) found that concept mapping strategy is effective for teaching science.

It has been also found in the present study that as compared to traditional method concept mapping strategy of teaching is more effective for teaching biology to male students. But for female students' concept mapping strategy of teaching and traditional method of teaching are equally effective for teaching biology. This finding is contradictory with the studies of Qarareh(2010) and Boujaoude&Attieh(2008). Qarareh (2010) found that there was no statistically significant difference observed between male and female students based on the post-test results in science.Boujaoude&Attieh(2008) found that mean of the females in the experimental group was 18% higher than that of the females in the control group, while the mean of the males did not differ significantly between groups. Less academic motivation and scientific interest among girls may be responsible for such a result.Tamir (1988) found that boys have more positive attitudes and interest toward science and better understanding of the nature of science than girls. Steinkamp&Maehr (1984) also found that boys have a better motivational orientation toward science learning and this leads to better learning and concept buildup in boys as compared to girls students.

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Deepika Pandey
Research scholar, Department of Education, University of Allahabad, Prayagraj.