

# Effect of concept mapping strategy on students' academic achievement in secondary school biological science

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**ABSTRACT** - This experimental study was conducted to study the effect of concept mapping strategy on academic achievement in the biological science of secondary school students. Two hundred students were selected for the study by adopting a disproportionate random sampling technique. The study adopted pre-test, post-test quasi- experimental design and data collected for the study were analysed using the t-test statistic. The main aim of the present study was to explore whether the students achieve better academic achievement in biological science while using concept mapping strategy. Results revealed that concept mapping is an effective strategy for teaching and learning biological sciences. The strategy is also capable of improving learners mastery of the content at the higher-order levels of cognition.

**Key words** -- Concept mapping, Academic achievement, Secondary school students.

## I. INTRODUCTION

At present, mostly behavioural practices are in vogue in schools where students are passive and the classroom environment is mostly teacher dominated [1]. The characteristic of learning is that it involves a complex interactive system including environmental, social, motivational, emotional and cognitive factors[3]. Biological science in its general view, is the subject with which man learns about his environment, its resources and problems and how to control and utilize them both productively and sustainably. But in schools, students' achievement in science is very poor. This is due to insufficient manpower, lack of equipment, a poor attitude of students and poor understanding of the concepts involved in science[2]. The methodology is very vital in any teaching-learning situation. The adoption of lecture methods by most teachers, in order to overcome the bulky syllabus hinder the academic achievement. The lecture method is also known to cause lack of interest and poor performance in science as opined by[3]. As Chhattisgarh is considered an educationally backward area, it is a major challenge to bring the best educational outcomes. Concept mapping strategy is one of the strategies which probably has the potential to offer opportunities to deal with the problems of effective teaching and learning of biological science. It is also the constructivist learning strategy which is more effective in attaining academic performance. So this study was proposed to examine the effectiveness of concept mapping strategy on students' academic achievement in secondary school biological science.

## Objectives of the study

- To study the effect of concept mapping strategy on academic achievement in biology subject in secondary school students.
- To study the effect of concept mapping strategy on academic achievement in biology subject in secondary school students on the basis of gender.
- To study the effect of concept mapping strategy on academic achievement in biology subject in secondary school students on the basis of the type of school.

## Hypotheses of the study

Considering the objectives mentioned, following hypotheses have been formulated.

- H1: There would be a significant difference in academic achievement of control and experimental group of secondary school students.
- H2: There would be a significant difference between the post-test mean scores of control group of academic achievement in biology with respect to gender.
- H3: There would be a significant difference between the post-test mean scores of experimental group of academic achievement in biology with respect to gender.
- H4: There would be a significant difference between the post-test mean scores of control group of academic achievement in biology with respect to the type of school.
- H5: There would be a significant difference between the post-test mean scores of experimental group of academic achievement in biology with respect to the type of school.

**Sample:**

For the present study, two hundred students of class ninth were selected by adopting a disproportionate random sampling technique. Two schools (one government and one Private) were selected from Durg district. One section was assigned as the control group and the other as the experimental group respectively having fifty students (twenty-five boys and twenty-five girls) in each group.

**Tools:**

A self-made achievement test in biology with seventy multiple choice questions was used for data collection. The reliability of the test, calculated by the test-retest method is 0.75 and was validated against the criteria of content validity. Concept maps of the topics of biological science were developed by the researcher. For this purpose ninth standard, NCERT and SCERT books were considered.

**II. RESULTS AND DISCUSSION**

The tables and interpretation given below present a detailed description of the analysis.

H<sub>1</sub>: There would be a significant effect of concept mapping strategy on academic achievement in biology subject in secondary school students.

Table No1. Difference in academic achievement of control and experimental group of secondary school students.

Condition	Group	N	M	SD	Df	t	Level of significance
Pre-test	Control Group	100	27.12	6.02	198	1.82	NS
	Experimental Group	100	28.76	6.72			
Post-test	Control Group	100	29.19	7.07	198	8.20	S**
	Experimental Group	100	37.41	8.45			

S\*\* Significant at 0.01

S\* Significant at 0.05

NS Non significant at 0.05

As shown in the above table, the significant difference was not observed in the pre-test between the control and experimental group. [t=(df,198) = 1.82, p>0.01]. Whereas there was a significant difference in the post-test which implies that the experimental group scored higher than the control group. [t=(df,198) = 8.20, p<0.01]. Hence the proposed hypothesis is accepted. Thus it can be concluded that there is a significant difference in the academic achievement of the control and the experimental group of post-test of the secondary school students.

Further, the mean scores of the control group and experimental group of pre-test are 27.12 and 31.76 respectively and the mean values of the control group and experimental group of post-test are 29.19 and 37.41. It can be inferred that the students of the experimental group scored better than that of the control group. The reasons may be that the learning through concept maps in difficult topics of biology is expected to stimulate the construction of integrated knowledge structures leading students to achieve higher in tests that measure high cognitive levels.

H<sub>2</sub> There would be a significant difference between the post-test mean scores of the control group of academic achievement in biology with respect to gender.

Table No.2 Difference between the post-test mean scores of the control group of academic achievement in biology with respect to gender.

Group	Gender	N	M	SD	df	t	Level of significance
Control Post-test	Male	50	30.27	7.36	98	0.40	NS
	Female	50	29.61	8.90			

S\*\* Significant at 0.01

S\* Significant at 0.05

NS Non significant at 0.05

It is clear from the table no 2. that the mean values of the male is 30.27 and that of the female is 29.61. The obtained value [t=(df,98) =0.40, p>0.01] which exhibits that there is no significant difference between the post-test mean scores of the control group of academic achievement in biology with respect to gender. Hence the proposed hypothesis is not accepted.

The above results may be due to the conventional or the traditional method adopted for the teaching-learning process, which has no differential impact on the academic achievement of male and female students in biological science.

H3: There would be a significant difference between the post-test mean scores of experimental group of academic achievement in biology with respect to gender.

Table No. 3 Difference between the post-test mean scores of experimental group of academic achievement in biology with respect to gender.

Group	Gender	N	M	SD	df	t	Level of significance
Experimental Post-test	Male	50	41.32	7.12	98	1.09	NS
	Female	50	42.76	6.10			

S\*\* Significant at 0.01

S\* Significant at 0.05

NS Non significant at 0.05

It is clear from the table no. 3 that the mean score of the male is 41.32 and that of the female is 42.76. The obtained value [t=(df,98) =1.09, p>0.01] which shows that there is no significant difference between the post-test mean scores of the experimental group of academic achievement in biology with respect to gender. Hence the proposed hypothesis is not accepted.

The concept mapping strategy seemed to have provided an environment free from stress and boredom in which the male and female students have achieved same level of equilibrium in learning biological science concepts.

H4: There would be a significant difference between the post-test mean scores of control group of academic achievement in biology with respect to the type of school.

Table.No:4 Difference between the post-test mean scores of control group of academic achievement in biology with respect to the type of school.

Group	Type of school	N	M	SD	df	t	Level of significance
Control Post-test	Private	50	37.91	8.51	98	0.08	NS
	Government	50	38.16	8.37			

S\*\* Significant at 0.01

S\* Significant at 0.05

NS Non significant at 0.05

It is clear from the table no. 4 that the mean score of private school students is 37.91 and that of government school students is 38.16. The obtained value [t (df,98) =0.08, p>0.01], which clearly exhibit that there is no significant difference between the post-test mean scores of the control group of academic achievement in biology with respect to the type of school. Hence the proposed hypothesis is not accepted.

Instead of using the traditional or conventional method, students should be provided with conducive or encouraging strategy, which will be helpful to widen their cognitive skills and at the same time help them to understand the difficult biology concepts.

H5: There would be a significant difference between the post-test mean scores of experimental group of academic achievement in biology with respect to the type of school.

Table No. 5 Difference between the post-test mean scores of experimental group of academic achievement in biology with respect to the type of school.

Group	Type of school	N	M	SD	df	t	Level of significance
Experimental Post-test	Private	50	48.44	10.61	98	0.22	NS
	Government	50	47.99	9.16			

S\*\* Significant at 0.01

S\* Significant at 0.05

NS Non significant at 0.05

From the table no.5 it is clear that the experimental post-test mean values of private and government school students are 48.44 and 47.99. It is also revealed from the above table that no significant difference exists between the post-test mean scores of experimental group of academic achievement in biology with respect to the type of school.  $[t(df 98) = 0.22, p > 0.01]$ .

It is clear from the above findings that the incorporation of concept mapping strategy is an effective way to foster the academic achievement for both private and government secondary school students. Since the treatment has the potential to improve better achievement, it brings out maximum learning output for the students.

### III. CONCLUSION

This study was aimed to find out the effect of concept mapping on secondary school students' academic achievement in biological science. The study discovered that students taught using concept mapping recorded better and significant post achievement than those taught using the conventional or traditional method. The study, however found that there is no significant difference between the academic achievement of male and female students in biology when concept mapping was used as strategy This implied that there is no gender inequality in employing concept mapping strategy. Similarly no significant difference was found in the academic achievement of government and private secondary school students. But the experimental group scored better than the control group. So it can be said that that concept mapping strategy was more effective in increasing students' academic achievement in biological science. Concept mapping assessment should be practically applied to classroom situations. In teaching biological science teachers should use concept mapping strategy to arouse the interest of their students and also encourage them to prepare concept maps.

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