

Effectiveness of Concept Mapping Strategy for Teaching Science

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Abstract: The study aimed to evaluate the effectiveness of Concept Mapping Strategy for teaching Science to class VII students in terms of achievement, interest in science and reaction. It adopted a Non-equivalent Control Group Design. The intact group as existed in the school were taken for experimentation. One of the group was taught Science Concepts through Concept Mapping Strategy and the other group was taught the same concepts using Traditional Method Strategy. Tool used for study were Achievement test and Interest in Science. A total of 78 students were selected through random sampling. The experimental group received instruction using the Concept Mapping strategy, while the control group was taught the same concepts through traditional teaching methods. achievement and interest in science test were used as tools to measure outcomes. Data analysis was conducted using one-way ANCOVA, with pre-achievement scores treated as a covariate. The adjusted F-value was found to be 5.156, which is statistically significant at the 0.5 level ($df = 1/78$). These results indicate that the Concept Mapping strategy was significantly more effective than traditional methods in improving students' achievement in Science Subject.

Keywords: concept mapping, science achievement, teaching strategy, student interest, classroom experiment

1. Introduction

Since ancient times, humans have relied on everyday tools to manage life efficiently whether it was learning to create fire by rubbing stones or using bark to cover the body. To fulfil daily needs, one has to inevitably depend on science. Consciously or unconsciously, everything we learn is rooted in science, which helps to organize and improve our lives. Science is such subject, that includes many complex concepts. Many time it becomes very difficult to understand the complexity of science. In the classrooms, usually teachers provide knowledge-level instruction while teaching the subject science. However, this often fails to develop students' responsive or application-level skills. Every subject has its own discipline and method. Commonly used methods include lecture-demonstration, laboratory method, inductive and deductive approaches, and concept mapping matrices. By selecting the right method, teachers can make their subject more engaging and effective.

Science is fundamentally based on the principle of learning by doing. Yet in today's changing environment, students tend to remember concepts only as long as they are needed. They often memorize them temporarily and then forget. To address this issue, the Concept Mapping Strategy has been introduced in science education.

This technique presents concepts in a graphical form which includes **nodes and links** that connect one concept to another.

It helps students visualize relationships and even create their own concept maps for a given topic. Hence Concept Mapping techniques considered as a powerful tool for developing deeper understanding of scientific concepts.

Objective:

To compare the adjusted mean scores of the achievement in science of the students taught through Concept Mapping Strategy and Conventional Method by considering pre-achievement in science as a covariate.

Hypothesis:

There is no significant difference in the adjusted mean scores of the achievement in science of the students taught through Concept Mapping Strategy and Conventional Method by considering pre- achievement in science as a covariate.

Sample

This study on Concept Mapping Strategy was done on students enrolled in Class VII in Devi Ahilya Shishu Vihar School and Little Flower H S School. The random sampling technique was used. The above schools were then randomly assigned to the treatment. Devi Ahilya Shishu Vihar School was treated as the Experimental Group and students were imparted instruction through the Concept Mapping Strategy. The other school, Little Flower Higher Secondary School was treated as the Control Group. These students were taught using the Conventional Method. Treatment -wise, Gender-wise, and School-wise distribution of sample of students belonging to class VII is given in Table 1.1

Table 1: Genderise, Treatment wise sample

S. No.	Schools	Group	Treatment	Males	Females	Total
1.	Shri Devi Ahilya Shishu Vihar	Experimental	Concept Mapping Strategy	22	20	42
2.	Little Flower H.S. School	Control	Conventional Method	23	13	36
Total				45	33	78

From the above Table 1.1, it is observed that the sample consist of 78 students. There were 33 females and 45 males

with the age of students ranging between 12 to 14 years. Both, Devi Ahilya Shishu Vihar School and Little Flower H S

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School were affiliated to Central Board of Secondary Education, with the medium of instruction being English. The schools are located in the urban area. Both the schools had equivalent infrastructure. Sample represented average level of Socio-Economic Status with the mother tongue of these students was other than English.

Experimental design

The Present study was Experimental in nature. It employed Non-Equivalent Control Group Design. According to Campbell and Stenley (1963), the layout of this design is given under: given below:



Tools

In the present study the data were collected in respect of Achievement. The Achievement of the students in science subject was assessed with the help of Achievement test developed by the researcher. The researcher selected six topics from class VII CBSE board. The topics selected for the study were Nutrition in plant, Nutrition in Animal, Fibre to Fabric, Acid, bases and salt , Heat, and soil.

Procedure of Data Collection

The permission for research was taken from the Principals of the Selected Schools. The rapport was established with the students. The present study was experimental in nature, employed two groups. Two levels of Treatment were assigned randomly to the randomly selected two Intact Groups. To start with, Achievement Test of Science (ATS) were administered on both the Groups by following the same procedure for both the groups. After Administering the ATS, orientation for Concept Mapping Strategy was given in the experimental group. The treatment was continued for four months including sixty- eight periods each comprised of forty-five minutes. All the selected topics were taught to experimental group by Concept Mapping strategy. While control group was taught by Conventional Method. After the treatment, achievement test in science was administered as the post test for data collection.

2. Result

One-way ANCOVA was used for comparing the adjusted mean scores of achievements in science of students taught through Concept Mapping Strategy and Conventional method by considering Pre - achievement in science as covariate.

Table 2: Summary of One Way ANCOVA of achievement in science of students taught through Concept Mapping Strategy and Conventional Method by considering Pre Achievement in science as a covariate.

Sources of Variance	Df	SSy.x	MSSy.x	Fy.x	Sig
Treatment	1	229.52	229.52	5.156	0.02
Error	75	3338.59	44.51		
Total	78				

From the table 1 it is clear that the observed value of adjusted F is 5.156 with df (1,78) its two-tailed significance value is

0.02 which is less than 0.05, hence, it is significant at 0.05 level of significance.

Therefore, the null hypothesis that “there is no significant difference in the adjusted mean scores of achievement in Science of students belonging to Concept Mapping, and Conventional Method groups by considering pre-achievement in Science as covariate” is rejected.

Table 3: Adjusted mean scores of Achievement in Science

Treatment	Adjusted Mean
Concept Mapping Strategy	27.42
Conventional Method	24.30

Further by observation of the table 2, the adjusted mean scores for achievement in the subject science of the Concept Mapping Strategy group is 27.42, which is significantly higher than the adjusted mean scores of Conventional Method group which is 24.30. It may, therefore, be stated that Concept Mapping Strategy was found to be significantly more effective in terms of achievement in Science than Conventional method when pre-achievement in Science was considered as a covariate.

3. Discussion

Concept Mapping Strategy (CMS) was found to be significantly effective to Traditional method. This aligns with the findings of Spaulding (1989), Daniel (1989), Franklin (1991), Martin (1991), Shopper (1993), Jay (1994), Okebukola & Jegede (1998), Odom & Kelly (2001), Basso and Margarita (2004), Rao (2004), Berionni & Baldon (2006), Akkingolu, Orhan; Yasar, Zeynep (2007), Asan (2007), Ahmad (2010), Kharatmal & Nagarjuna (2010), Yunus (2010), Olarewaju and Awofala (2011), Ahmad, R. (2011), Bahago (2011), Jibrin and Danladi (2012), Udeani, Uchenna; Okafor, Philomena (2012), Rajshree and Vaishnav (2012), Ahmad and Munawar (2013), Chawla (2013), Ali and Toriman (2014), Chawla and Singh. (2015), Oyovwi (2015), Indra Sen. (2015), Sakiyo and Waziri (2015), Arif Comek, Orhan Akinoglu, Ersin Elmac, Tugba Gundogd (2016), Ukpai, Ogonnaya, Okafor, and Okechukwu (2016), Abdulrahman (2016), Adeoyek, et al (2016), Ogonnaya & Okafor et al. (2016), Wang & Sundararajan et al. (2020). The possible reason behind this result may be that in the Concept Mapping strategy, the learning material is organized in a way that actively connects students’ prior knowledge, thinking ability, and analytical skills. In this method, students link various aspects of the subject matter, which helps develop deeper understanding. Concept Mapping respects individual differences by allowing students the freedom to think, connect, and restructure at their own pace. This process turns them into active learners who don’t just receive information but also structure and analyze it. On the other hand, in the Conventional method, students remain passive listeners, where the content is based on rote learning and repetition, and the freedom to think is limited.

4. Conclusion

Concept Mapping Strategy was found to be significantly more effective in terms of achievement in Science than Conventional method.

5. Implications

- Students can collaboratively create concept maps in groups, which facilitating the exchange of idea.
- Teachers must design tasks that require students to construct, compare, and revise their maps.
- Researchers can track learning progress by analyzing changes in students' maps over time.
- Textbook writers can embed concept mapping tasks as formative or summative assessments.
- Planners can develop a course with a logical flow, ensuring that prerequisite knowledge is established before introducing more idea.

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