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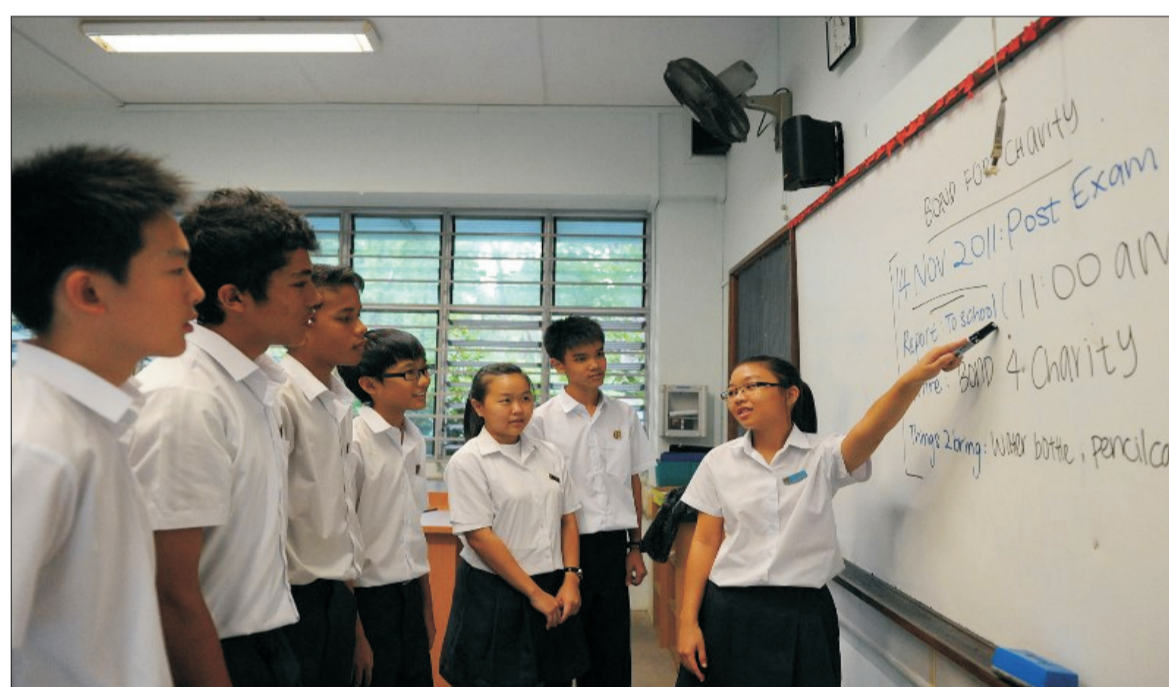
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EFFECTIVENESS OF CONCEPT MAPPING STRATEGY OF TEACHING SCIENCE ON PROBLEM SOLVING ABILITY OF SECONDARY SCHOOL STUDENTS



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ABSTRACT :

The aim of this study was to investigate how the Concept Mapping Strategy of teaching affects on problem solving ability skills in biology of secondary school students. Participants in this study were 60 grade IX biology students from co-educational state secondary school from two classes of general science course taught by the same teacher. For the purposes of the study, concept mapping instructional strategy was randomly assigned to the subjects. This study is a comparative research that employed an experimental group and a second group that was taught in a more conventional teacher-centered manner (called the control group). The subjects were 60 students. One class (n = 30, 16 boys and 14 girls) was assigned as a concept mapping group and the other (n = 30, 16 boys and 14 girls) as the control group. Problem Solving Ability Test developed by the researcher was employed in this study. The data obtained was analyzed descriptively and inferentially by calculating 't' value. The

results concludes that Concept Mapping Instructional Strategy was more effective than lecture based instructional strategy in improving problem solving ability skills in biology of IX grade students and also found that both boys and girls had similar improvement in problem solving ability skills by concept mapping strategy. Since the concept mapping strategy had shown improvement in increasing problem solving ability skills. Teaching biology teachers need to incorporate concept mapping strategies wherever it is applicable so that the secondary school students imbibe problem solving ability in them.

KEYWORDS: Effectiveness, Concept Mapping, Strategy, Problem Solving Ability, Biology

1. INTRODUCTION:

Modern science has acted as a spring board for the progress of mankind and enabled us to conquer time, distance and many more things. It has improved the conditions of quality of life. Therefore, in the present age of rapid scientific advancement, it is a must that each individual has sufficient knowledge about science to make his own life comfortable and meaningful. For the development of any nation, there is need of efficient scientists, engineers and doctors and this creates the necessity of providing strong basic knowledge about science and develop scientific temper among future citizens i.e., students. The basic knowledge of science also would help some of them to choose their career related to science competencies according to the expectation of the nation. Keeping in mind the above facts, science is taught as a compulsory subject right from the elementary stage.

Science deals with abstraction, conceptual thinking and generalization of facts etc, all of which require the use of cognitive process. Concept maps are spatial representations of concepts and their interrelationships that are intended to represent the knowledge structures that humans store in their minds (Jonassen, Beissner, & Yacci, 1993).

Concept mapping is a method to visualize the structure of knowledge. Since the knowledge expressed in the maps is mostly semantic, concept maps are sometimes called semantic networks. Often it is claimed that concept mapping bears a similarity to the structure of long-term memory. Instead of describing all concepts and their relations in text, one may choose to draw a map indicating concepts and relations in a graph or network. Visual representation has several advantages.

Problem-solving skills are important factor of achievement, particularly in science and mathematics. More generally, problem solving is one of the focus area of 21st century learning and teaching process. A good biology teacher is expected to possess good teaching quality, expertise, proper management ability and good interactive skills. The students' learning styles on their academic achievement in biology is not supposed to be neglected. The students' learning styles refers to the independent forms or ways students receive and process information. Lack of problem solving skills among students has been a major concern in science education. Broad research in this field has been done over the past few decades.

Lester (1982) defines problem solving as a process of coordinating previous experience, knowledge and intuition in an effort to determine an outcome of a situation for which a procedure for determining the outcome is unknown. Hoovinabhavi et al. (2004) studied on problem solving ability of college students and found that the girls are better in their problem solving ability than college boys. Ganandevan (2006) found out that the problem solving ability of higher secondary students is low. The male and female students differ significantly in their problem solving ability. Sharma (2007) studied on problem solving ability and as determinant of academic achievement of higher secondary students and found out higher secondary students have shown average problem solving ability. Nataraj and Manjula (2012) found the problem solving ability of students is low. The male and female students are differ

significantly in their problem solving ability skills.

From the above studies it has shown that learners are qualitatively different in their problem solving ability skills, hence, the difference in the performances of the learners. Therefore, the development of students' abilities should be of great importance as it shows a high and positive significance in problem solving which also relates to the effective learning which will return result in higher level of achievement to the individual, society and the nation at large.

2. SIGNIFICANCE OF THE STUDY:

The success of any educational problem depends on the calibre of teachers. Ajevalmi (1990) opined that the students' poor performance and lack of interest in science (biology) is as a result of lack of qualified teachers and facilities in science education. If teachers from any other field mandated to teach biology in those schools, in such cases due to the abstract nature of biology the learners will not be able to benefit maximally from the lesson because the teacher is not a professionally trained in the mandated field of study and also the students' learning styles are not taken into consideration. Thus, this justify the relevance and timeless of the study.

Science related problem solving has occupied very important place in the teaching of science especially biology. The primary goal of science teaching and learning is to develop the ability to solve a wide variety of complex biological problems. A thorough understanding of biological concepts is essential for solving problems. A student having good problem solving ability, will have knowledge and understanding of the subject followed by its application in day to day life. With this there will be better adjustment in both school and at home. Hence the problem of the study is to examine the effectiveness of the use of concept mapping instructional strategy in improving secondary students' problem solving ability in biology.

3. STATEMENT OF THE PROBLEM

The study sought to investigate the Effectiveness of Concept Mapping Strategy of Teaching Science on Problem Solving Ability of Secondary School Students.

4. OBJECTIVES OF THE STUDY

In order to achieve the purpose of the study, the following objectives were stated:

1. To compare the problem solving ability skills in biology of students who are taught through Concept Mapping Strategy (CMS) with that of those who are taught through Conventional Teaching Method (CTM).
2. To determine whether students' problem solving ability skills in biology is affected by sex, when they are taught through Concept Mapping Strategy.

5. STATEMENT OF HYPOTHESES

1. There is no significant difference between the pre test and post test mean scores of Problem Solving Ability skills in Biology of control group by Conventional Teaching Method.
2. There is no significant difference between the pre test and post test mean scores of Problem Solving Ability skills in Biology of experimental group after intervention of Concept Mapping Teaching Strategy
3. There is no significant difference between secondary school boys and girls mean scores of Problem Solving Ability skills in Biology of experimental group by Concept Mapping Strategy).

6. METHODOLOGY

Participants in this study were 60 grade IX students from co-educational state secondary school from two classes taught by the same teacher. For the purpose of the study, concept mapping instructional method was randomly assigned. This study is a comparative research that employed an experimental group and a second group that was taught in a more conventional teacher-centered manner (called the control group). The subjects were 60 students. One class (n = 30, 16 boys and 14 girls) was assigned as a concept mapping group and the other (n = 30, 16 boys and 14 girls) as the control group. In the present study, the problem solving ability test employed for the collection of data was Problem Solving Ability Test developed and standardized by the researchers (2014). This test contains 40 multiple choice questions. Every question has four responses out of which only one answer is correct. If the pupil ticks the correct answer then he/she given one mark and if he/she ticks a wrong answer, zero mark is given. At the end, the marks are added. The maximum marks are 40. The data obtained was analyzed descriptively and inferentially by calculating percentages, mean, Standard Deviation and 't' values.

7. ANALYSIS AND INTERPRETATION OF DATA

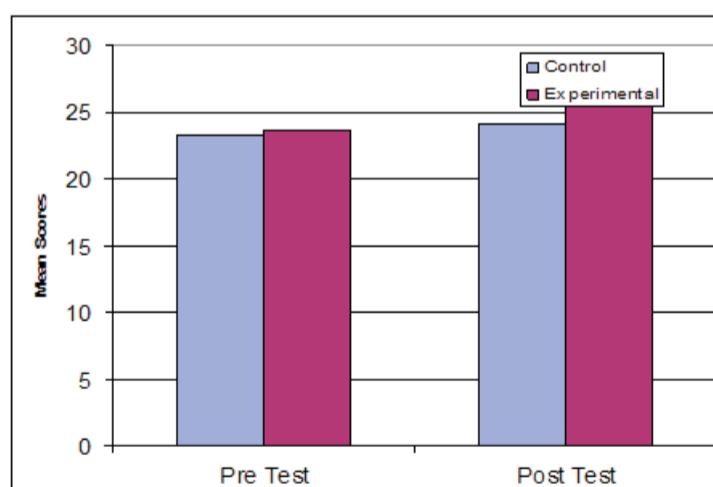
Effect of Concept Mapping on Problem Solving Ability in Biological Science

Table-1: Table showing effect of concept mapping on Problem Solving Ability in Biology between pre test and post test scores of Control and Experimental groups.

Group	N	Pre Test		Post Test			
Experimental	30	23.300	2.628	0.73 ^{NS}	24.133	2.825	5.80**
Control	30	23.700	1.441		28.166	2.547	

^{NS} Not Significant * Significant at 0.01 level;

The analysis of data revealed that the experimental group students had performed better when compared to the control group on the Problem Solving Ability in Biology on the post test scores. This was evidenced through the 't' values obtained for Problem Solving Ability in Biology ('t'=5.80) which is significant at 0.01 level.



Graph shows comparison of pre test and post test mean scores in Problem Solving Ability in

Biology of Controlled and Experimental Groups.

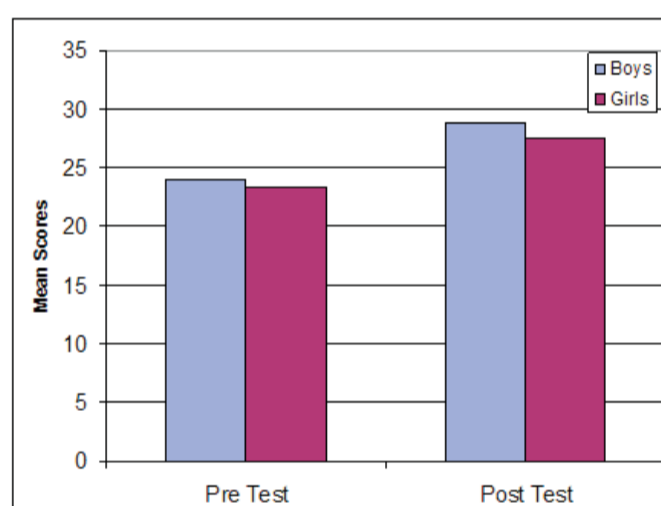
Effect of Concept Mapping on Problem Solving Ability in Biology between Boys and Girls

Table-2: Table shows Mean scores and Standard Deviations of Problem Solving Ability in Biology of boys and girls for the results of the Concept Mapping Strategy after the treatment.

Sex	N	Pre Test		Post Test			
Boys	30	23.937	1.691	1.91 ^{NS}	28.812	2.762	1.54 ^{NS}
Girls	30	23.428	1.089		27.428	2.138	

^{NS}Not Significant

The analysis of data revealed that the both boys and girls had performed better when compared to the control group on the problem solving ability in biology on the post test scores. This was evidenced through the 't' value obtained for problem solving ability in biology ($t=1.54$) which is not significant at 0.05 level.



Graph shows comparison of pre test and post test mean scores of problem solving ability in Biology of experimental group after intervention of concept mapping strategy.

8. FINDINGS OF THE STUDY:

By the analysis of data, the following findings emerged. The details are as under :

1. There is no significant difference between the pre test and post test mean scores of Problem Solving Ability in Biology of control group ($t=0.73$; $P>0.05$).
2. There is a significant difference between the pre test and post test mean scores of Problem Solving Ability in Biology of experimental group ($t=5.80$; $P<0.01$) after intervention of Concept Mapping Strategy.

9. DISCUSSION OF RESULTS

This empirical study showed that concept mapping is more effective teaching learning strategy than the conventional method, to improve problem solving ability skills in biology science of IX

standard students. The results of the study supported by Hoovinabhavi et al. (2004), Ganandevan (2006) and Sharma (2007) and they found that higher secondary students have shown average problem solving ability and found that the girls are better in their problem solving ability than college boys. The present results have implications for biology teacher preparation, especially in the area of identifying slow learners and adopting effective methods of tackling their problems. Biology educators would need to be aware of the utility value of the concept mapping approach to teaching and learning. A schedule for learning about and using the concept mapping strategy for instructional purposes should be built into the training programmes for pre-service biology teachers and in-service teachers as well as.

10. CONCLUSION

Problem solving ability is highly correlated with achievement in biology. Therefore, it is necessary that we should develop the problem solving ability through proper pedagogy which is effective in solving day to day problems with the knowledge acquired. Innovative or creativity based education enhances problem-solving abilities and promotes creativity and reasoning ability of students.

11. IMPLICATIONS AND SUGGESTIONS

In the light of the findings and conclusion of the study, following implications and suggestions made by the researcher :

1. Biology teachers need to undergo periodic training to update their skills in effective teaching. The importance of building up of student's problem solving abilities should be emphasized during training.
2. School administrators should see that workshops and orientation programmes to be conducted for the teachers to acquire the necessary skill for effective teaching in classrooms to improve students' interest in biology, so that their problem solving abilities are enhanced.
3. A teacher with good problem solving ability will be able to modify his teaching style to suit his students' learning style thus enhancing their interest and academic achievement in biology.

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