



COMPUTER BASED CONCEPT MAPPING: ITS EFFECT ON REASONING ABILITY OF STUDENTS.

Rosy Fernandes

Assistant professor

K B College of Education, Kumta, Karnataka.

ABSTRACT

The study was aimed at evaluating the Effect of Computer-Based Concept Mapping Instructional Strategy in Improving Reasoning Ability of Secondary School Students. The pre-test, post-test, parallel group, 2×3 factorial design was used. A standardized Reasoning Ability test developed by Dr. Sadhana Bhatnagar (1985) was used to collect the data from the sample consisting of 72 students studying in standard Nine. Findings of this research discovered that: i) Computer-Based Concept Mapping Instructional Strategy is more effective than the conventional strategy in improving the Reasoning Ability of Secondary School Students. ii) Intellectually above-average students of experimental group performed better than the above-average students of control group in Reasoning Ability. iii) Intellectually below-average students of experimental group performed better than the below-average students of control group in Reasoning Ability. This paper also includes challenges of student-centric education.

Keywords: Computer Based Concept Mapping Instructional Strategy, Reasoning Ability.

INTRODUCTION

Science is a systematic content of knowledge. The learning of concepts in science depends on learning experiences. True learning is not simply gaining of certain traits or skills; it is a change in behaviour brought about by training or experiences. Reasoning Ability is a component of Intelligence. It is associated with problem solving ability and intelligence of the individual. This capability is very essential for students to face the modern technical world. This study attempts to provide an exclusive learning experience to students, to develop Concept Maps using technology for improving their Reasoning Ability and enhance their learning outcomes in Science.

Concept maps were first constructed by Joseph D. Novak's research program at Cornell University in 1972. Concept maps are graphical tools for organize knowledge. They include concepts (enclosed in circles or boxes), linking line (indicates relationship between concepts), linking words (specify the relationship

between the two concepts), Cross-links (refers relationships between concepts of different segments of the concept map).

Concept Mapping is a creative learning activity. It is effective method to get a meaningful understanding of new concepts and to integrate these new concepts with prior knowledge retained in long-term memory. Concept Mapping is an learning tool that helps in Concept Attainment to organize knowledge and to structure it.

Modern technology has given as an chance to modify traditional Concept Mapping with the help of Computer. Computer-Based Concept Mapping Instructional Strategy helps the learners to arrange information meaningfully through visual aids. This practice stimulates meta-cognitive awareness, improves Reasoning Ability, leads the learners to organize concepts effectively and achieve meaningful learning. There is a number of Concept Mapping Software's available today. 'INSPIRATION' is one such Computer-assisted Concept Mapping Software used in the present study.

REVIEW OF RELATED LITERATURE

Computer Based Concept Mapping has been widely used as teaching, learning and evaluating tool in different subject areas.

In Science Kwon, S. Y. (2007) conducted a study on "Using Computers to Individually-generate vs. Collaboratively-generate Concept Maps." The findings revealed that, the Students who individually generated concept maps scored more. Asan, A. (2007) Conducted a research on "Concept Mapping in Science Class: A Case Study of fifth grade students." experimental group was treated through Inspiration, which is computer based concept mapping tool. The findings revealed that, Concept Mapping has a noticeable impact on student achievement in science classes. Rao, M. P. (2004) conducted a study on "Effect of Concept Mapping in Science on Science Achievement, Cognitive Skills and Attitude of Students". The study discovered that, the experimental group had performed better when compared to the control group on the achievement, process skills and concept attainment test.

In Biology Royer, R. & Royer, J. (2004) conducted a study on "Comparing Hand Drawn and Computer Generated Concept Mapping." The results revealed that, There is significant difference in the group using the computer, created more complex maps than the group that used paper/pencil. Chang, K.E., Sung, Y.T., & Chen, S.F. (2001) conducted a research on "Learning through computer-based Concept Mapping with scaffolding aid." The study revealed that, the 'construct-on-scaffold' had better effect for learning on biology. From the synthesis of the reviewed studies it is observed that, Computer-Based Concept Mapping is absolutely an effective practice for Reasoning Ability. But very little effort has been done to use Computer-Based Concept Mapping in teaching Science Content, although the teachers were aware and provide training of the present developments in the teaching of Science.

OBJECTIVES

1. To study the effect of Computer-Based Concept Mapping Instructional Strategy and Conventional Strategy in improving Reasoning Ability of Students.

2. To study the effect of Computer-Based Concept Mapping Instructional Strategy and Conventional Strategy in improving Reasoning Ability of Students in terms of Above- Average and Below- Average Intelligence levels.

HYPOTHESES

H₁: Computer-Based Concept Mapping Instructional Strategy is more effective than the Conventional Strategy of teaching in improving the Reasoning Ability of Students.

H₂: Intellectually the performance of above-average students of experimental group is more than the above-average students of control group in Reasoning Ability.

H₃: Intellectually the performance of below-average students of experimental group is more than the below-average students of control group in Reasoning Ability.

RESEARCH DESIGN

The pre-test, post-test, parallel group, 2×3 factorial design was used in the study. This is diagrammatically represented in the Table 1.

Table1.Schematic Representation of Treatments and Levels

Treatments ↓ Levels →	Above Average (L ₁)	Below Average (L ₂)
Computer-Based Concept Mapping Instructional Strategy. (T ₁)	n(18) T ₁ L ₁	n(18) T ₁ L ₂
Conventional Strategy. (T ₂)	n(18) T ₂ L ₁	n(18) T ₂ L ₂

SAMPLE

The sample consisted of 72 students studying in Standard Nine. Based on their Intelligence Scores, matched pairs were identified and divided into two groups as Experimental and Control group with 36 cases in each group. On the basis of their intelligence 'T' Scores, each group was further divided into 2 levels as Above-Average and Below- Average consisting of 18 cases in each group.

TOOLS USED

Standardized Intelligence test developed by J C Raven, was used for the classification of levels of students (Above-Average and Below-Average). The data for the present study was collected by using the standardized Reasoning Ability test developed by Dr. Sadhana Bhatnagar (1985).

PROCEDURE OF THE STUDY

In order to avoid the inter-personal and intra personal variation of two different teachers for the student groups based on Computer-Based Concept Mapping instructional strategy and Conventional strategy, it was decided to conduct both the classes by a single teacher having competence in both the strategies on the same dates. The two groups were pretested on Reasoning Ability. The experimental treatment involved in the teaching of a selected unit in Biological Science namely, "Classification of living organisms" of standard

nine. Each lesson was of one and half hour duration. The total fifteen lessons were taught by using Computer-Based Concept Mapping instructional strategy to the experimental group of students. Meanwhile, the students of Control group were taught the same lessons by using Conventional Strategy. Immediately after the completion of the treatment both the groups were Post- tested on Reasoning Ability.

DELIMITATIONS

- Computer-Based Concept Mapping Instructional Strategy can be applied to any discipline, at any level. In the present study, the background of the Researcher has enabled its application to Science at Secondary School level.
- Computer-Based Concept Mapping Instructional Strategy can be applied for different types of instruction. In the present study, it is applied to Group instruction as it is suitable to the Indian context.
- The study was confined to the teaching of Science for students of English medium of standard nine only.
- Computer Based Concept Mapping Instructional Strategy involved the use of software namely 'INSPIRATION'.

RESULTS

The objectives and related hypotheses were analysed by applying 't' test. The results of the study are given below:

⇒ *Instructional Strategy (Treatment)*

Table 2: Sum of Post-test scores of Experimental group and Post-test scores of Control group and 't' value with its significance on Reasoning Ability

(n=36)

Dependent Variable	$\sum D$	$\sum D^2$	Obtained 't' Value	Theoretical Value	Significance P<0.01
Reasoning Ability	394	5052	14.3	2.72	Significant

Since the obtained 't' value (14.3) is more than the Theoretical 't' value (2.72) with df (35) at 0.01 level of significance the difference is significant.

From the results of the above table it can be concluded that; The Computer Based Concept Mapping Instructional Strategy when compared to that of Conventional Strategy of teaching Science is significantly more effective in improving the Reasoning Ability of students.

⇒ *Students' Level (Above-Average and Below-Average)*

Table 3: Mean and Sum of Post-test scores of Above-Average and Below-Average students of Experimental group and Control group and 't' value with its significance on Reasoning Ability (n=18)

Students Level	Mean		ΣD	ΣD^2	Obtained 't' Value	Theoretical Value	Significance P<0.01
	Experimental group	Control group					
Above Average	11.86	6.36	198	2632	9.03	2.90	Significant
Below Average	10.92	5.47	196	2420	11.27	2.90	Significant

➤ *Above-Average level*

Since the obtained 't' value (4.54) is more than the Theoretical 't' value (2.90) with df (17) at 0.01 level of significance the difference is significant. The Above Average level of Experimental group has a mean score difference of (11.86-6.36=5.5) 5.5 units higher in comparison with the Control group. This indicates that the treatment given to the Experimental group led to better test scores on Reasoning Ability.

Hence, the experimental treatment proved to be significantly more effective. Thus it can be concluded that: Intellectually above-average students of experimental group performed better than the above-average students of control group in Reasoning Ability.

➤ *Below-Average level*

Since the obtained 't' value (5.56) is more than the Theoretical 't' value (2.90) with df (17) at 0.01 level of significance the difference is significant. The Below Average level of Experimental group has a mean score difference of (10.92-5.47=5.45) 5.45 units higher in comparison with the Control group. This indicates that the treatment given to the Experimental group led to better test scores on Reasoning Ability.

Hence, the experimental treatment proved to be significantly more effective. Thus it can be concluded that: Intellectually below-average students of experimental group performed better than the below-average students of control group in Reasoning Ability.

MAJOR FINDINGS

The major findings of the present study are as follows:

1. Computer-Based Concept Mapping Instructional Strategy is more effective than the conventional strategy in improving the Reasoning Ability of students.
2. Intellectually above-average students of experimental group performed better than the above-average students of control group in Reasoning Ability.
3. Intellectually below-average students of experimental group performed better than the below-average students of control group in Reasoning Ability.

CHALLENGES IN STUDENT CENTRIC LEARNING

- The “digital divide,” caused by low computer literacy rates and lack of access to technology among some learner populations.
- This is technology dependent and can create unique challenges for training that include: inadequate computers and related technology; and the need for students to have technical skills that may not otherwise be needed for this type of learning.
- Students with low motivation, limited technical skills or bad study habits may fall behind or become frustrated.
- Students who need more training support might find it confusing.

CONCLUSION

Education is a process of acquire knowledge. The innovative methods like Computer-Based Concept Mapping instructional strategy that helps the learners to organize information through visual aids, stimulates learner’s meta-cognitive awareness and also increases the use of retrieving and memorizing knowledge. Present study has proved that Computer-Based Concept Mapping Instructional Strategy is more effective than Conventional Strategy in improving Reasoning Ability. This study has implications for student centric learning. It has been found to be a systematic strategy to improve classroom teaching across various disciplines and hence its involvement in the curriculum of teacher education will be a major step in making its application possible at the grass root level. The teachers of all levels need appropriate training to use Computer-Based Concept Mapping software’s like ‘Inspiration’ to enhance Reasoning Ability in their students. Efforts in this direction will definitely bring improvement in student performance.

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