

Effect of Concept Maps on Academic Achievement in the Subject Biology among the Higher Secondary Level School Students

^aGawade Archana Marutirao, ^bPatankar P. S

^aResearcher M. Sc. M. Ed. M. Phil

^bProfessor & Head-Department of Education Shivaji University, Kolhapur, MS, India

Abstract

The title of this research paper, Effect of concept maps on academic achievement in the subject biology among the higher secondary level school students. The objectives of this study is to study the effect of concept map strategy on academic achievement of XI Standard Biology students. For this study experimental research method is used. The sample selected from four Jr. Colleges from Gadhinglaj Taluka by random selection method. The conclusion is the concept map strategy used for teaching Biology was effective on higher secondary level school students.

KEYWORDS: Concepts Maps, Academic Achievement

Biology literally means, “The study of life”. Human is the part of this biotic and a biotic world on the planet earth. The biotic world is totally depending upon the remaining a biotic world. The study of this biotic world is biology. Biology is such a broad field, covers the study of minute structures in the cell to concept of large ecosystem and global climate changes. All biotic factors from amoeba to large whale and from fungi to large tree are depended on each other and also attached with each other with particular food chains. We got the knowledge and understandings of that food chain with the study of biology.

Human has always curiosity about the biotic world around him and their relation with a biotic world. His curiosity starts from his own bodily structure. Human got the key of healthy life through the study of bodily structures of his own and other organisms. Our day today life activities depend on our bodily organs. The personality of a person depends on how he uses his organs. The person should know all the information about it so to take care of it.

Today’s learners are tomorrow’s decision makers. The willingness of engaging oneself with contemporary science and its associated issues are now more prominent. For this the science teachers need opportunities to keep update and to developed engaging classroom approaches. The aim at today’s science education is to bring the real world in to the classroom. Today’s science teachers are searching the ways in which new knowledge can be brought is to the classroom. It is important that we teach students to make connections between what they learn in the classroom what they see in everyday life.

At the higher secondary level Biology is taught through lecture method, practical method, models and charts. A few experimental teachers follow self-study, group discussions or seminar methods. However, one can’t say surely that students learn everything about Biology by these methods. The present research is undertaken to find out a new method that will be easily available both for teachers and students and will prove the prevailing methods are inappropriate.

A few concept maps are included in the book of biology prescribed for higher secondary school. Both the teachers and students might be using these concept maps for the teaching-learning process but the method if concept map technique in studding is not practiced regularly.

The present research attempts to examine the output if the separate concept maps on each units of XI Standard XI Biology are used in the teaching-learning Process.

In fact, we are associated with the term concept map since our childhood. Along with its development the brain starts exploring the relationship between the persons, events and things around it. As the child's experience increases, the same is being saved in the brain for example-

- a) The correlation between the kinds
- b) The correlation between the various departments/sections of one's office
- c) The correlation among the things around

A few examples of the practical application of concept map are: a chain system of tiff in carriers of in Mumbai or the Railway Timetable. The term 'concept map' may be defined as: concept maps are multi-purpose tools to visualize connections in complex systems in a wide variety of fields.

Concept maps can be defined as a form of node-link diagram for organizing and representing, semantic relations among ideas.

Many ordinary students face difficulties while dealing with some units of Biology' at higher-secondary level, for example- Morphology of flowering plants. If the teacher teaches this unit with the help of the concept map, the students will get are the important points at a glance. The special feature of concept map is proper presentation of maximum information in minimum words. It helps to increase the understanding capacity of student's 'concept map' makes the teaching-learning process more easy, lucid and effective. The dissertation research explore the use at concept maps as knowledge integration tool to draw out exciting ideas & connections to form new ideas & sort out alternative ideas.

Statement of Research Problem

Effect of concept maps on academic achievement in the subject biology among the higher secondary level school students.

Operational Definition of the Key Concepts

Concepts Maps

For the purpose of this study concepts maps means diagrammatic & graphical representation of concepts in the XI Standard text book of Biology, to enhance knowledge integration. For the purpose of this study concept maps will be prepared on selected from XI Standard biology textbook.

Academic Achievement

For the purpose of this study Academic achievement means marks scored by XI standard Biology students in examination taken by researcher. The question paper used for this exam is on textbook which is published by Maharashtra state board of secondary and higher secondary education.

Objectives of the Study

1. To study the effect of concept map strategy on academic achievement of XI Standard Biology students.

Assumptions of the study

1. Content of XI Standard Biology syllabus includes concept which can be studied with concept map technique.
2. Content of XI Standard Biology syllabus includes concept which helps to prove that the concept maps can be used for knowledge integration among XI Standard in the subject Biology.

Hypotheses of the study

Research hypotheses

Concept mapping strategy can enhance academic achievement of the XI Standard student in the subject Biology.

Null hypotheses

1. There is no significant difference between the pre test scores of control group and experimental group for academic achievement test.
2. There is no significant difference between the pre test scores & post-test scores of control group for academic achievement test.
3. There is no significant difference between the pre-test score & post test scores of experimental group for academic achievement test.
4. There is no significant difference between the post test scores of control & experimental group for academic achievement test.

Importance of the study

1. Many students leave school with a very fragmented knowledge of biology that does not allow them to understand complex scientific systems and connections to their everyday lives. The research allows students to build strong understandings. Knowledge integration process can be enhanced with the help of concept mapping strategy & it is helpful for increasing the academic achievement of higher secondary level science students.
2. This study is important for constructive learning. The goal of this study is to explore concept maps as interactive tool implemented in a technology supported learning environment with interactive visualizations designed to support strong understandings of Biology that enables learners to explain real life phenomenon.

Scope of the study

1. The findings of this research are applicable for all the higher secondary schools.
2. The results & conclusions of this research are applicable for the subject Biology of higher secondary level.
3. The findings of this research are applicable in the field of concept mapping.

Delimitations of the study

1. The study is delimited to the Biological concepts from XI Standard textbooks which have linkage to previous knowledge.
2. The research is limited for the teaching strategy concept mapping.
3. This research is limited for Kolhapur District only.

Significance of the study

The results of the present study are useful to

1. Teachers teaching Biology subject at junior level can develop on emergent teaching method.
2. Students studying Biology subject and social science at high school level can use Concept map technique as study tool.
3. Teachers teaching science and social science at high school level can use concept map technique as teaching method.

4. M. Phil. and Ph. D. students will get essential direction for precise use of concept maps in education research.
5. The Bureau of text-book production and curriculum research can develop, revision tools, evaluation tools for knowledge integration at school and junior college level.
6. Research Guides will get a new direction for precise use of Concept maps for knowledge integration in educational research.

Research methodology

Research methodology consists of the research design, sampling design, development of tools and techniques and statistical technique used for the present study.

Research design

The experimental method is used in this research. Experimental research method is used for the study of effectiveness of concept mapping in learning XI science Biology. Pre test- post test, control group quasi experimental design is used.

Variables used in the present research method

The academic achievement of XI standard Students in the subject biology is dependent variables and concept mapping strategy is independent variable.

Pretest-posttest Non-Equivalent Group Design

The random alignment to experimental and control treatment has not been applied and also the equivalence of group was not assured before experimentation. Hence pretest-posttest non-equivalent group design was used.

In this design the pretest is administered on both control and experimental group. The experimental treatment is provided to only experimental group. And at the end the posttest is administered on both control and experimental group.

Sample selection methods used in the present research

For experimental research four Jr. Colleges are selected from Gadhinglaj Taluka by random selection method. Two colleges from rural area and two from urban area are selected by lottery method. 30 students from each college are randomly selected.

Academic achievement test

To study the effectiveness of concept map strategy it was necessary to find out the academic achievement of XI Standard students before implementation of concept map strategy, an Academic achievement test is developed for XI Standard Students. The achievement test was prepared as per learning objective knowledge, understanding and application.

Before using concept map technique it is necessary to know the subject knowledge level of the students studying XI Standard Biology. For this purpose the students has given multiple choice test of 100 marks. The question paper include 50 multiple choice question and each question has 4 choices. Every question has 2 marks. Achievement test was prepared according to blue print and it is attached in appendices.

Another achievement test is prepared by the researcher to test the students after implementation of concept map strategy. The student has given multiple choice tests of 100 marks. The question paper include 50 multiple choice questions and each question has four alternatives. Every question has 2 marks.

Null Hypothesis No. 1

There is no significant difference between the pre test scores of control group and experimental group for academic achievement test.

Table No. 01
Difference between the pre test scores of control group and experimental group for academic achievement test

Area	Group	Mean	S.D.	Calculate d t value	Table t value	Level of signification	Degrees of Freedom
Rural	Experimental	59.2	11.32	0.57	2.00	0.05	58
	Control	57.06	16.96		2.66	0.01	
Urban	Experimental	58.13	11.80	0.66	2.00	0.05	58
	Control	60.46	15.33		2.66	0.01	

Interpretation

It is revealed from the Table No. 01 that there is no significant difference in the pre test score of control group and experimental group for achievement test in both rural and urban area.

Hence both groups are identical in nature and hence the Null Hypothesis no.1 is accepted. The control and experimental group are equivalent in achievement test in both rural and urban area.

Null Hypothesis No. 2

There is no significant difference between the pre test scores & post-test scores of control group for academic achievement test.

Table No. 02
Difference between the pre test scores & post-test scores of control group for academic achievement test

Area	Group	Mean	S.D.	Calculate d t value	Table t value	Level of signification	Degrees of Freedom
Rural	Pre-test	57.06	16.96	1.9409	2.00	0.05	58
	Post-test	56.02	16.31		2.66	0.01	
Urban	Pre-test	60.46	15.33	0.3114	2.00	0.05	58
	Post-test	60.33	15.63		2.66	0.01	

Interpretation

It is revealed from the Table No. 02 that there is no significant difference in the pre test score and post test score of control group for achievement test in both rural and urban area.

Hence the treatment of concept map strategy is not given to control group so there is no change in the marks got by the students in pre test and post test and hence the Null Hypothesis no.3 is accepted.

Null Hypothesis No. 3

There is no significant difference between the pre-test score & post test scores of experimental group for academic achievement test.

Table No. 03

Difference between the pre-test scores & post test scores of experimental group for academic achievement test in rural area

Area	Group	Mean	S.D.	Calculated t value	Table t value	Level of signification	Degrees of Freedom
Rural	Pre-test	59.02	11.32	9.268	2.00	0.05	58
	Post-test	65.66	13.67		2.66	0.01	
Urban	Pre-test	58.13	11.80	9.893	2.00	0.05	58
	Post-test	72.06	8.66		2.66	0.01	

Interpretation

It is revealed from the Table No. 57 that there is significant difference in the pre test score and post test score of experimental group for achievement test in both rural and urban area.

Hence the orientation of concept map strategy is given to experimental group so there is increase in the marks scored by the students in post test then that of pre test. Hence the Null Hypothesis no.3 is rejected.

Hence it is concluded that, the concept map strategy is found to be effective for learning Biology for the students of for XI standard students in rural area.

Null Hypothesis No. 4

There is no significant difference between the post test scores of control & experimental group for academic achievement test.

Table No. 04

Difference between the post test scores of control & experimental group for academic achievement test in rural area

Area	Group	Mean	S.D.	Calculated t value	Table t value	Level of signification	Degrees of Freedom
Rural	Control	56.02	16.31	2.4359	2.00	0.05	58
	Experimental	65.66	13.67		2.66	0.01	
Urban	Control	60.33	15.63	3.57	2.00	0.05	58
	Experimental	72.06	8.66		2.66	0.01	

Interpretation

It is revealed from the Table No. 04 that there is significant difference in the pre test score and post test score of experimental group for achievement test in both rural and urban area.

Hence the orientation of concept map strategy is given to experimental group so there is increase in the marks scored by the students in post test then that of pre test. Hence the Null Hypothesis no.4 is rejected.

Hence it is concluded that, the concept map strategy is found to be effective for learning Biology for the students of for XI standard students in rural area.

Conclusion

The concept map strategy used for teaching Biology was effective on higher secondary level school students. Experimental group of higher secondary level school students achieved higher score in post test of achievement test due to the effect of concept map strategy for rural area.

The concept map strategy used for teaching Biology was effective on higher secondary level school students. Experimental group of higher secondary level school students achieved higher score in post test of achievement test due to the effect of concept map strategy for urban area.

References

- Ahmad B.C, Munawar, Mirza(2013),Mapping On Students' Academic Achievement.Journal of Research and Reflections in Education.Vol.7, (.2), pp 125 -132.
- Ausubel, D. P. and Novak, J. D. (1968), Educational psychology: a cognitive view.New York; hoit, rim chart and Winston. Vol. 32 (1) 66
- Chei-Chang, Chiou (2008),The effect of concept mapping on students' learning achievements and interests.University of Education, Changhua, Taiwan; Innovations in Education and Teaching .
- John W.Best& James V. Khan (2002),Research in education. (9thed.)New delhi ;Printice Hall of india(pvt.) Ltd.
- L. B. Renwick (1991), An investigation of the effectiveness of concept mapping. Aspects of educational and training technology series,25,55-58
- Mustafa, kilic and murset, kacmac (2004)Concept Maps As A Tool For EangagefulLearning and Teaching In Chemistry Education. Journal of comical Education.
- MeenaKharatmal and Nagarjuna, G. (2006),A Proposal To Refine Concept Mapping For Effective Science Learning. Concept Maps Theory, Methodology, Technology.
- Mathur, S. S. (2001). Educational Psychology :VinodPustakMandir, Agra.Novak, J. D. andGowin, D. B. (1984), Learning about learning. West Lafayette, Indiana;
- Otor,E. E. (2013), Paper Effects of concept mapping strategy on students'