



## A Study On Effectiveness Of Peer-led Concept Mapping Instruction On Scientific Attitude In Biological Science Among Secondary School Students

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### Abstract

The acquisition of the knowledge of scientific terms and concepts in biological science, a clear understanding of them, the ability to use such knowledge in different situations in the life and in the development of skills should be the outcomes of learning science. **Scientific attitude** is need of today's society for peaceful and meaningful living of every person The study aimed at the understanding of the effect of Peer-led concept mapping instruction on Scientific attitude in biological science of secondary school students. Sample of the study consisted of two hundred IX standard students ( 100 Experimental group and 100 Control group) from two secondary schools (one Government and one Private) from Durg district of Chhattisgarh. Experimental group was exposed to peer-led concept mapping instruction and the control group was taught by conventional method. Scientific attitude tool and concept maps were used in pre and post test administration to measure the effect of peer-led concept map instruction on Scientific attitude. Findings indicates that peer-led concept mapping instruction is significantly more effective than the traditional/conventional method of teaching in enhancing learning in biology. The experimental group scored significantly higher than the control group, which indicates that peer-led concept mapping instruction has noticeable impact in students' Scientific attitude in biological science of secondary school students.

**Keywords:** Peer-led concept mapping instruction(PLCMI), Scientific attitude, Biological science

### Introduction

Attitudes to science and learning science have always been a concern for educators and induce views of science. The **scientific attitude** investigates certain scientific acts or feelings. Scientific attitude is the ability to react consistently, rationally and objectively in certain ways to a novel or challenging situation. It is the capability or potential to do things in a way that rely on proven principles rather than unverified principles. The most important scientific attitudes are open-mindedness, critical mindedness, intellectual honesty, willingness to change opinion, search for truth, curiosity, rational thinking, etc. (Rao,et.al,2001). (Simpson,2003) scientific attitude is grouped into the categories such as the willingness of knowing and learning, enquiry and aspiration for everything, willingness to prove truthfulness and respect to logic. (Peter and Stout,2006) considered five groups presenting scientific attitude as curiosity, persistence, accepting uncertainty, inventiveness and critical thinking. It is desirable that students of science should be

encouraged to develop these attributes. A person with good scientific attitude is free from superstition, untested assumptions and many times from admired opinion that has no experiential basis (Olatoye and Aderogba, 2012). (Amjad and Muhammed,2012) revealed that the level of development of any country is largely based on the level of scientific knowledge. One of the most important factors in science teaching is the Scientific attitude which determines behaviour (Amjad & Muhammad, 2014). It has also been shown that one of the most important factors in science teaching is the attitude which determines behaviour. We also need to make them aware of the role that personal characteristics play in the acquisition of scientific knowledge. Needless to say, classroom teachers must play a major role in this enterprise and thus help students acquire a better understanding of science. As it is known that **Chhattisgarh**, have usually been regarded as educationally 'backward' states, with a lower educational index than the National average and the major challenges in teaching especially in this district is to create experiences that involve the student and support his own thinking. Hence, in secondary students of **Chhattisgarh**, scientific attitude have to be developed by the teachers and the initiation should start from the beginning of school education as the educational outcomes are most important indicators of student's future development. It is a well-known fact that the quality of education depends on the teachers and so the method they use in teaching matters a lot. So students are engaged actively in the learning process and in the contest allowing them to see patterns developing, and learning as a cumulative whole. So in terms of **pedagogy**, the development of education now requires teaching strategies that emphasize student involvement in their learning, where the focus is on knowledge construction rather than knowledge transformation. The instructional strategy with **constructivist ideas** assists a student towards a self conceptualization of the solution. The constructivist learning strategy can be developed to improve the scientific attitude. **Peer-led instructions** are widely understood as being key to effective forms of engagement through which students develop cognition and sense of confidence in what they themselves can achieve. Having a positive view towards the peer as credible sources of information and finding peer-led sessions fun, one can prefer peer-led session over teacher-led sessions. Peer-led learning is one of a pedagogical approach to providing instruction. Peer leaders work collaboratively with the course instructor to facilitate the development of scientific attitude and higher achievement after being trained in learning strategy, pedagogical methods and conceptual content of the course. The study was conducted in view of determining the method which is more effective in enhancing students' scientific attitude. This is one of the important reasons for the investigator to pursue the problem for the research. So the study was intended to investigate the **effectiveness of peer-led concept mapping instruction on scientific attitude in biological science among secondary school students.**

### **Objectives of the study**

The present study was taken up with the following objectives:-

- To investigate the effect of peer-led concept mapping instruction on scientific attitude in biology subject in secondary school students.
- To investigate the effect of peer-led concept mapping instruction on scientific attitude in biology subject in secondary school students on the basis of gender.

- To investigate the effect of peer-led concept mapping instruction on scientific attitude 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.

- H<sub>1</sub>: There would be the significant effect of peer-led concept mapping instruction on scientific attitude in biology subject in secondary school students.
- H<sub>2</sub>: There would be the significant effect of peer-led concept mapping instruction on scientific attitude in biology subject in secondary school students on the basis of gender.
- H<sub>3</sub>: There would be the significant effect of peer-led concept mapping instruction on scientific attitude in biology subject in secondary school students on the basis of the type of school.

### Sample

By adopting a **disproportionate random sampling technique**, schools and students were selected for the study. Two schools (one Government and one Private) are taken in which two sections in each school has been assigned as experimental and control group respectively, having twenty-five students in each group. Thus the researcher selected a total two hundred students as a sample for the present study. Further from both the experimental groups four peer leaders (two boys and two girls) were trained for the concept mapping instruction.

### Variables involved

Variables involved in the present study are shown below:

Independent Variable	Dependent Variable	Demographic Variable
Peer-led Concept Mapping Instruction [PLCMI]	Scientific Attitude	Gender [G]
		Type of School [TOS]

### Description of the research tool

- To measure the **Scientific attitude** of the students a tool developed by Dr. Sukhwant Bajwa and Monica Mahajan (2009) was administered. The reliability of the test was found to be 0.970. The content and concurrent validity was **0.92** and **0.475** respectively.
- **Concept maps** of all topics of biology from NCERT and SCERT textbooks of IX standard were developed by the researcher. Peer leaders were trained to construct concept maps.

### Statistical treatment of the data

For the analysis of data, t- test, and ANOVA were computed.

### Analysis and interpretation:

Data was collected from two secondary school students of class ninth, from Durg district of Chhattisgarh.

**Table No. 1 :** Summary of ANOVA for the effect of peer-led concept mapping instruction on Scientific Attitude.

Source of Variance	Sum of squares SS	Degree of freedom Df	Mean squares MS=SS ÷ df	f - Ratio =MS÷MS Within	Significance
PLCMI	225.68	1	225.68	7.028	<b>**S</b>
G	27.026	1	27.026	0.841	NS
TOS	165.142	1	165.142	5.138	<b>** S</b>
PLCMI×G	209.92	1	209.92	6.54	<b>** S</b>
PLCMI×TOS	152.00	1	152.00	4.73	<b>** S</b>
G× TOS	143.24	1	143.24	4.46	<b>** S</b>
PLCMI× G× TOS	208.85	1	208.85	6.51	<b>** S</b>
WITHIN	6199.16	193	32.11		
<b>TOTAL</b>	<b>7331.018</b>				

**\*\*** THE SIGNIFICANT AT 0.01

**\*** THE SIGNIFICANT AT 0.05

**Table No. 2:** Summary of main effects [ one way ANOVA] showing mean, standard deviation and F- value

MODEL	VARIABLE/FACTOR	N	MEAN	SD	F- RATIO	LEVEL OF SIGNIFICANCE
PLCMI	EXPERIMENTAL	100	9.61	2.83	<b>7.028</b>	<b>** S</b>
	CONTROL	100	6.20	1.64		
G	MALE	100	8.63	2.49	<b>0.841</b>	NS
	FEMALE	100	7.93	1.98		
TOS	GOVERNMENT	100	8.65	2.41	<b>5.138</b>	<b>** S</b>
	PRIVATE	100	6.18	2.03		

**\*\*** THE SIGNIFICANT AT 0.01

**\*** THE SIGNIFICANT AT 0.05

**Interpretation:**

Table No. 2 reveals the significant individual / main effect of PLCMI on Scientific Attitude in Biological Science of secondary school students. The mean values indicate that the experimental group is the significantly higher than that of control group. [**F(df 1,193) = 7.028, p< 0.01**].

The results of the study extend the findings of **Morhan;Yasar and zeynep (2007), Khan and Khan (2012), Akingolu (2016) and Adovek et al. (2016)** which depicted that PLCMI is more effective for teaching Biology for the development of Scientific Attitude as compared to the conventional method.

Table No.2 also depicts that mean values of male and female students are **8.63** and **7.93** respectively which can be interpreted that there exists no the significant effect of gender on Scientific Attitude in Biological Science of secondary school students. [**F(df1,193) = 0.841, p > 0.01**]. These results are in conformity with the studies if **Dhatrak and Wanjari(2013), Olaseinde et al (2013), Singh and Imam (2014) Najir Ajmal (2016)**. Further the studies of **George, Yogeshchandra (2013) and Huyuguzel (2013)** are in contradiction to the above findings.

It has been observed from the above table that the mean values of Government and Private schools are **8.65** and **6.18** respectively which can be concluded that there is the significant effect of type of school on Scientific Attitude in Biological Science of secondary school students. [**F (df1,193) = 5.138**].

The above findings are supported by the studies conducted by **Pillai (2012), Thakur and Singh (2015), Paneer Selvam and Muthamizhselvam (2015)** which established the fact that there is the significant effect in Scientific Attitude of Government and Private secondary school students. Whereas, studies of **George (2000) and Nazir HaZmal (2016)** found that Private schools have more positive Scientific Attitude towards biological science as compared to Government schools.

**TABLE NO. 3.** Summary of first order interaction effect [ two way ANOVA ] showing mean, standard deviation and f- value.

MODEL	VARIABLE/ FACTOR		N	MEAN	SD	F	LEVEL OF SIGNIFICANCE
		MALE	50	9.84	2.46	<b>6.54</b>	<b>** S</b>
	EXPERRIMENTAL						
		FEMALE	50	9.36	2.34		
PLCMI × G							
		MALE	50	6.28	1.25		
	CONTROL						
		FEMALE	50	7.80	1.56	<b>4.73</b>	<b>** S</b>
		GOVT.	50	4.40	1.20		
	EXPERIMENTAL						
PLCMI×TOS		PRIV.	50	5.42	1.35		
		GOVT	50	4.10	1.00		
	CONTROL						
		PRIV.	50	4.42	1.10	<b>4.46</b>	<b>** S</b>
		GOVT	50	1.70	0.40		
	MALE						
G × TOS		PRIV.	50	1.54	0.40		
		GOVT	50	0.54	0.14		
	FEMALE						
		PRIV		4.50	0.90		

**\*\* THE SIGNIFICANT AT 0.01**

**\* THE SIGNIFICANT AT 0.05**

**Two-way interaction effect of Peer-led Concept Mapping Instruction × Gender on Scientific attitude of secondary school students.**

The significant interaction effect PLCMI × G was observed on Scientific attitude of secondary school students. [ $F(df1,193) = 6.54, p < 0.01$ ]. Mean values for male and female of the experimental group are **9.84** and **9.36** respectively and the mean values for male and female of the control group are **6.28** and **7.80** respectively, which indicates that both male and female of experimental group scored higher than the control group.

The above findings are supported by the studies conducted by **Ekpete(2012), Hansel and Birol (2014) and Agbaje(2016)** which showed the significant effect of Scientific attitude to biology subject of secondary school students, but the study of **Olasehinde.etal.(2013)** is in contrary to the above findings.

**Two-way interaction effect of Peer-led Concept Mapping Instruction × Type of School on Scientific Attitude of secondary school students.**

Further table no 3 clearly reveals that Peer-led Concept Mapping Instruction × Type of School has the significant Interaction Effect on Scientific Attitude of secondary school students. [ $F(df1,193) = 4.73, p < 0.01$ ]. Mean values indicate that experimental group scored the significantly higher in both government and private schools than the control group.

**Two-way interaction effect of Gender × Type of School on Scientific Attitude of secondary school students.**

The significant interaction effect of Gender × Type of School was observed on Scientific Attitude of secondary school students. [ $F(df1,193) = 4.46, p < 0.01$ ]. Mean values indicate that male students scored higher than that of female students in government school, whereas female students scored higher than the male students in private school. This finding is supported by the studies conducted by **Keraro, Samuel and William (2007)**.

**Table No:4.** Summary of three way ANOVA showing mean, standard deviation and f-value.

MODEL	VARIABLE / FACTOR	GENDE R	TYPE OF SCHOOL	N	MEA N	SD	F	LEVEL OF SIGNIFICANCE
			GOVT.	25	12.28	4.56	<b>6.51</b>	<b>** S</b>
		MALE						
			PRIVATE	25	7.44	2.10		
	EXPERRI -MENTAL							
			GOVT.	25	7.80	1.95		
		FEMAL E						
			PRIVATE	25	10.92	2.73		
PLCMI× G × TOS								
			GOVT.	25	8.25	1.70		
		MALE						
			PRIVATE	25	6.52	1.63		
	CONTROL							
			GOVT	25	6.24	1.56		
		FEMAL E						
			PRIVATE	25	6.78	1.69		

\*\* THE SIGNIFICANT AT 0.01

\* THE SIGNIFICANT AT 0.05

**Interpretation:**

It is clear from the above table that the significant interaction effect of Peer-led concept mapping instruction× Gender × Type of School was observed on Scientific Attitude of secondary school students.[F(df1,193)= **6.51 .p<0.01**] Further from table no. 4.04 it is clear that the mean values of male students of Government and Private schools of the experimental group are **12.28** and **7.44** respectively and the mean values of female students of Government and Private schools of experimental group are **7.80** and **10.92** respectively. Similarly, the mean values of male students of Government and Private schools of the control group are **8.25** and **6.52** respectively and the mean values of female students of Government and Private schools of control group are **6.24** and **6.78** respectively. It can be concluded that in the experimental group, male students of government school scored higher than the female students whereas, female students of private school scored higher than the male students.

The above findings revealed that Peer-led Concept Mapping Instruction is a more effective teaching strategy than the traditional or conventional method to improve

Scientific Attitude of the students in the subject of biological science in secondary schools

The above results are in conformity with the studies conducted by **Akkingolu (2007)**, **Yunus(2010)**, **Anna Uitto and Pirkko Karna (2013)**, **Yogeshchandra (2013)**, **Christopher(2015)**, **Arif Comek et al. (2016)** and **Amita Ahuja (2017)**. In their studies, the researchers found that Peer-led Instruction, Student-centered, activating and participatory methods are very essential to enhance students' attitude to learn biology subject with clear concepts.

### **Conclusion:**

In science education the instructional strategies, to promote process nature of biological science, should focus not only on enabling students to score better but also on developing a **scientific attitude**, over the time, among them also. Classroom learning scenario with ample scope of creativity, innovation, involvement and problem solving catalyze the process of the development of scientific attitude among students. The learning of **biological science** should focus more on activities that support students' experiences in order to relate it to their day to day lives. For this to happen, teachers need to consider that learning science needs to have more emphasis on making a connection between subject and student's participation. The intent of this research was to present a significant understanding of peer-led concept mapping instruction that could potentially assist students with learning and development of higher level thinking skills. More detailed research with a larger portion of the population is needed to confirm peer-led Concept Mapping instruction as such a valuable tool for education.

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