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Research Article

PROMOTING CRITICAL THINKING USING ACTIVE LEARNING STRATEGIES: A STUDY AMONG SECONDARY SCHOOL STUDENTS

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ABSTRACT

Critical Thinking is ability or set of skills that is highly valued in students, especially in contemporary world and development of Critical Thinking has become a promising strategy helping to increase learning effectiveness while teaching any subject matter. Improving Critical Thinking is accepted as a crucial goal of education and schools are considered one of the best places where Critical Thinking can be developed efficiently. In the present study, the effect of active learning strategies on the critical thinking dispositions of secondary school students have been investigated. The study adopted quasi experimental pre-test post-test two group design. The pretest and post-test were administered to the two non-equivalent samples in the form of intact groups of class IX of two different schools. Findings of the study indicated that the Active Learning Strategies were effective in improving the Critical Thinking of the secondary school students. It was also found that the Active Learning Strategies were effective in enhancing most of the dimensions of Critical Thinking dispositions among the secondary school students.

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INTRODUCTION

Learning is not a passive pursuit. It is not merely the process of absorbing information from external sources; on the contrary it is the act of processing of information in the ways that are meaningful to the learners. Students do not learn just by sitting passively in the classroom listening to teachers, taking notes, memorizing the answers or recalling facts. They must be actively involved in the process of learning by talking about what they are learning, writing about it, by relating it to past experiences and applying it to their everyday lives. (Bonwell & Eison, 1991; Chickering & Gamson, 1987) Students learn best when they are embedded in the Active learning process. Active learning is a term generally used to denote teaching learning strategies that engage and involve students in their learning process. It is anything course-related that all students in a class session are called upon to do other than simply watching, listening and taking notes. In this mode of learning, students are engaged in activities including discovering, processing, and applying information (Felder and Brent, 2009).

Current researches and anecdotal evidences on instructional practices worldwide indicate that the active learning approaches can increase student understanding of science concepts because they facilitate student learning processes

resulting in improved student attitudes and retention of knowledge and promote a learning environment more amenable to the metacognitive development necessary for students to become independent and critical thinkers and self managed learners.

By considering all the benefit of Active learning, and more, many International agencies like UNESCO and the United Nations have made several attempts to sensitize and popularize the need for promoting the Active learning pedagogies worldwide. Following these worldwide efforts to respect the Rights of child and the call for participatory pedagogic practices, the educational system in India also witnessed several drastic revolutions in field of pedagogic principles and practices. NCF (2005) has proposed a shift in rote learning approaches in teaching and learning and outlined the need to institute Active learning pedagogies in the classroom. These transitions in the pedagogic practices were also reflected in the Kerala Curriculum Framework (KCF, 2007). Hence it is imperative to employ participatory pedagogic practices in the classrooms that will promote the active learning in the learners and the number of active learning tasks is limitless. However it is often observed that passive learning environment of teacher centered lectures remains the predominant environment encountered by students in classrooms and effective teaching

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method based on how people learn are often rarely applied in regular classroom.

Critical Thinking is ability or set of skills that is highly valued in students especially in contemporary world and development of Critical Thinking has become a promising strategy helping to increase learning effectiveness while teaching any subject matter. Improving Critical Thinking is accepted as a crucial goal of education and schools are considered one of the best places where Critical Thinking can be developed efficiently. However as a result of the current classroom practices, it is often noticed that learners are not encouraged to improve themselves as thinkers and overemphasis is placed on information transmission, memory, practice, rote learning etc., paying little focus on higher order thinking. Consequently, majority of school leavers are not able to think effectively and deal efficiently with many of the practical situations. Hence teachers need to realise that it is their prime duty to develop Critical Thinking in the students by modifying the curriculum to integrate active, authentic and evidence based practices that will develop our students' Critical Thinking to the optimum level.

Therefore there is an urgent need for an overall revisiting of the pedagogic practices being followed presently in the class rooms and deliberate efforts should be taken to adopt Active Learning Strategies appropriate to develop the thinking faculties of the students at an earlier stage itself-so that they can make the fullest possible use of their thinking abilities to realize the best ways to invest their true potentials. On looking into the researches conducted in the past, it was found that Active Learning Strategies had proved to be one of the best methods appropriate to develop the thinking abilities. So, in the present study, the investigator intended to study the influence of certain Active Learning Strategies on Critical Thinking of secondary school students of Kerala.

Objectives of the study

To study the influence of Active Learning Strategies on the Critical Thinking Dispositions of secondary school students.

Design of the study

The present study adopted quasi experimental pre-test post-test two group design. A non-equivalent control group design was used. The pretest and post-test were administered to the two non-equivalent samples in the form of intact groups of class IX of two different schools.

The sample for the study consisted of 82 students, 41 each in experimental group and control groups. Purposive sampling technique was used where in samples were drawn from two intact divisions of standard IX of SNMHS, Moothakunnam and HMYSHS, Kottuvalikkad as experimental and control groups respectively.

Instruments used

The tools used in the study were Raven's Progressive Matrices Test (Raven, 1976) and Critical Thinking Dispositions Scale. The Likert Type Critical Thinking Dispositions Scale was constructed by the investigator by including the dimensions Open minded, Inquisitive, Truth seeking, Analytic, systematic and self confidence. The final form of the test comprised of 60 items including both positive and negative statements. Each

item contained five alternative responses such as Strongly Agree (SA), Agree (A), Agree or Disagree (A/S), Disagree (D) and Strongly Disagree (SD). The scoring based on a five point Likert Type Scale designed for positive items weighed a score of 5 for (SA), 4 for (A), 3 for (A/D), 2 for (D) and 1 for (SD). The summative score of all the items provided total Critical Thinking Disposition score. The maximum score possible was 300 and minimum was 60.

Procedural Details of the study

The study was carried out in two phases, the Developmental Phase and the Experimental phase. The developmental phase included the preparation of instructional material integrating Active Learning Strategies to teach selected topics in Physics of class IX.

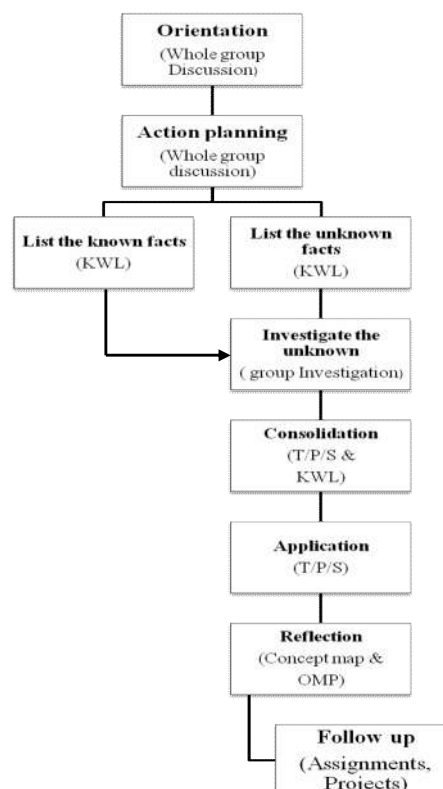
The instructional materials were prepared on 2 units in Physics of class IX. The units selected for the study were Fluids and Periodic Motion and Sound

The investigator selected the Active Learning Strategies after an intensive review of the related literature, considering the opinions and suggestions of the experts and the experienced in the field. The major Active Learning Strategies used in the present study were

1. Group Investigation (GI)
2. Think-Pair-Share (T/P/S)
3. K-W-L
4. Concept Mapping (CM)
5. One Minute Papers (OMP)

These strategies were incorporated in the various stages of lesson development in a sequential order as indicated by the chart.

Integration of Active Learning Strategies in the Lesson Plan



During the experimental phase, the students of experimental group were taught using Active Learning Strategies like Group Investigation, T/P/S, K-W-L, Concept mapping and One minute paper, which were not familiar to them. Hence the investigator gave them necessary information about the new instructional practices and the transformed roles the students have to play in this mode of learning. The students of control group were taught by their regular teacher using strategies like lecture, demonstration, group discussion and at times note dictation. After the implementation of the treatment for over a period of 2 months, the post-tests were administered to both experimental and control groups. The scores of experimental and control groups obtained in the test were tabulated and consolidated separately.

Statistical Techniques employed

t-test and ANCOVA were employed to test the various hypotheses.

Analysis and Interpretation

The mean score of Critical Thinking skills of the experimental and control groups in pre-test and post-test along with the gain scores are shown in the Table 1

Table 1 Mean scores of experimental and control groups on Critical Thinking Disposition

Group	N	Mean score		
		Pre-test	Post-test	Gain
Experimental group	41	189.63	231.122	41.49
Control Group	41	187.50	218.23	30.73

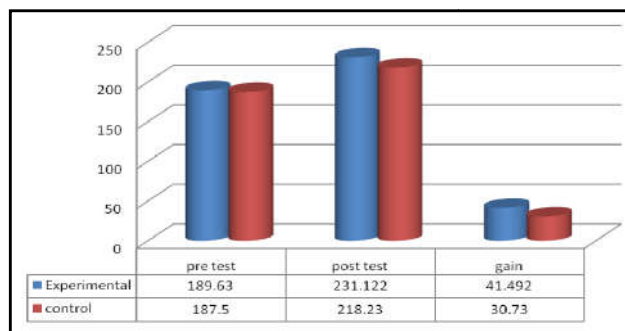


Figure 1 Mean scores in Critical thinking disposition of Experimental and control groups

The following hypothesis was formulated to find out the influence of Active Learning Strategies on Critical Thinking of the students.

H₀1 There is no significant difference in Critical Thinking dispositions of experimental and control group when the pretest on Critical Thinking disposition and intelligence were taken as covariates.

To test the statistical significance of difference of mean scores in Critical Thinking disposition, the ANCOVA was performed on the post-test scores taking the pre-test scores on Critical Thinking disposition and intelligence as covariate. The result of the analysis is presented in Table 2.

Table 2 Analysis of Covariance associated with Critical Thinking Dispositions of Experimental and control groups with pre-test on Critical Thinking dispositions and intelligence as covariate

Source of Variation	Sum of Squares	df	Mean Square	F	Sig.
Intelligence	76.375	1	76.375	1.147	.288
Pretest score of CTD	1.497	1	1.497	.022	.881
Group	3083.129	1	3083.129	46.287	.000
Error	5195.488	78	66.609		
Total	4156978.000	82			
Corrected Total	8427.561	81			

Table 3 Adjusted mean scores in Critical Thinking disposition of experimental and control when pre-test score and intelligence were taken as covariate

Group of students	Mean	Std. Error	95% Confidence Interval	
			Lower Bound	Upper Bound
Experimental group	231.091	1.278	228.547	233.636
Control group	218.762	1.278	216.218	221.307

Table 2 reveals that the difference in the mean post scores in Critical Thinking Dispositions of the experimental and control group is significant with F=46.287, p<.000. Hence the null hypothesis (H₀1) stating that there is no significant difference in the Critical Thinking Dispositions of the experimental and control group when the pre-test score on Critical Thinking Dispositions and intelligence were taken as covariate was rejected and the alternate hypothesis i.e. there is a significant difference in the Critical Thinking Disposition of the experimental and control group when the pre-test score on Critical Thinking Dispositions and intelligence were taken as covariate was accepted. It was also found from the Table 3 that the adjusted mean score of Critical Thinking Dispositions of experimental group (mean=231.091) was higher than that of control group (mean=218.762). This significant change in scores of the experimental group can be attributed to the treatment given by the investigator. This indicates that Active Learning Strategies were effective in improving the Critical Thinking Dispositions of secondary school students.

After having found that the overall development of Critical Thinking Disposition was better in experimental group when compared to control group, it was attempted to study the differences in the gain scores of dimensions of Critical Thinking dispositions of experimental and control groups. For this independent t-test was employed on the gain score of dimensions of Critical Thinking Dispositions between experimental and control groups and the results are given in the Table 4.

Table 4 Summary of independent t-test on gain scores of dimensions of Critical Thinking Dispositions

Dimension of Critical Thinking Dispositions	Group	Gain Score Mean	SD	t-value
1. Inquisitiveness	Experimental	5.39	6.11	.244 ^{ns}
	Control	5.02	7.38	
2. Objectivity	Experimental	6.87	5.45	2.037*
	Control	4.26	6.12	
3. Analytic	Experimental	8.87	5.45	2.285*
	Control	5.78	5.27	
4. Systematic	Experimental	7.36	5.43	2.501*
	Control	4.24	5.86	
5. Truth Seeking	Experimental	7.31	5.30	2.605*
	Control	4.02	6.11	
6. Self-Confidence	Experimental	5.85	6.07	.888 ^{ns}
	Control	6.97	5.34	

ns – Not significant at 0.05 level, * Significant at 0.01 level

Table 4 indicates that the t-value for the gain scores of the objectivity, Analytic, systematic and Truth seeking dimensions of Critical Thinking dispositions were significant at 0.05 level. This indicates that there is a significant difference in the gain scores of these dimensions of Critical Thinking dimensions between experimental and control groups. However the t-value of gain scores of the dimensions Inquisitiveness and self confidence were not significant at 0.05 level indicating that there was no significant difference in the gain scores of these dimensions between experimental and control groups.

Thus the students in the experimental group were found to have more gain in scores of the dimensions of Critical Thinking Dispositions except inquisitiveness and self confidence when compared to the control group. This gain in the scores of dimensions of Critical Thinking dispositions can be attributed to the practice of Active Learning Strategies.

Findings of the study

The Active Learning Strategies were found to be effective in improving the Critical Thinking of the secondary school students.

It was statistically found that the Active Learning Strategies were effective in enhancing most of the dimensions of Critical Thinking dispositions among the secondary school students.

CONCLUSION

The study has examined the means to revive the system of science education by giving emphasis on the promotion of thinking abilities of the students as well improving the achievement in the content. It was found that the utilisation of Active Learning Strategies was effective in influencing the Critical Thinking dispositions of secondary school students. A study of this nature can popularize the use of similar pedagogical practices that aim at developing thinking faculties of the students in addition to improved achievement in the content.

These Active Learning strategies can be made an integral part of science curriculum in secondary schools and teachers should be encouraged to employ these strategies predominantly in their classes. Active Learning Strategies can be integrated successfully in all subjects of secondary school curriculum so as to make learning a satisfying and enjoyable activity.

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