RELATIVE EFFECTIVENESS OF LEARNER CENTRED STRATEGIES AND CONVENTIONAL METHOD IN TEACHING SCIENCE AT ELEMENTARY STAGE

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ABSTRACT

The present study was conducted to compare the effectiveness of learner centred strategies and conventional method of teaching on academic achievement of students in science in order to find out which one of them is more effective learning strategy. The sample of the study was 675 elementary school students made up of 341 boys and 334 girls randomly selected from two districts of Manipur state of India. Pre-test and post test design was adopted for the study. Two instruments namely science pre –test and post test were used for collection of the data. The collected data was subjected to t-test analysis at $p=0.05$ level of significance. The finding revealed that the learner centred strategies was significantly effective than the conventional method in terms of the academic achievement as well as the retention of the concepts. The study recommends the learner centred strategies for teaching for the elementary stage of education in Manipur, India.

Keywords:

Activity base learning, Learner centred approach, pre and post –test, Achievement, Retention

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Introduction

Science learning is not merely memorizing but to understand the facts and its main objectives are that the child must understand the content they have learnt and not merely remember for sometime or for longer duration. Psychologist considered the students at Upper Primary Level (Classes VI to VIII) which are in the age group of 10 to 12 years are at concrete operational stage. Students at this state should be engaged in learning the principles of science through familiar experiences, working with hands to design simple technological units and modules and continuing to learn more about environment and health through activities and surveys. Scientific concepts are to be arrived at mainly from activities and experiments. Group activities, discussions with peers and teachers, surveys, organization of data and their display through exhibitions etc. in schools and the neighbourhood should be important components of pedagogy. In India, the National Curriculum Framework (NCF) 2005 developed by the National Council of Educational Research and Training (NCERT) also emphasizes "Learner Centred approaches" to achieve the objectives of the curriculum. Syllabus for classes at the elementary level formulated by the syllabus committees which involve schools, subject experts, teachers and the NCERT faculty is also on the ideas reflected in the NCF. As recommended by the NCF, in the area of science teaching, the new syllabi emphasizes on a learner friendly approach in the development of instructional materials. The shift from knowledge transmission to active participation of learner in the construction of knowledge is strikingly visible.

As per Right to education (RTE) Act 2009 of India, Pedagogy for teaching learning should be through activities, discovery and explanation in a child friendly and child-centred manner.

The recommendations of the Jomtien Conference(1990) addressed the issues of 'access', 'quality', 'relevance', 'equality', 'gender' and 'efficiency' of education. It suggested a change in approach to education from 'individual to collaborative' and recommended a pedagogical shift from 'teacher centre to learner centred' approaches. The Jacques Delors Commission Report (1996) on 'Education for The Twenty First Century' proposed that the Education System should be characterized by learning to, learning to learn, learning to do and learning to live together, learning to be. It recommends learner centred approaches to achieve these objectives of education.

After reviewing the research studies on learner centred approaches it is clear that the field has vast developmental potential for psychological and educational exploration. However research in this field in Northeastern state of India remained in the backyard and it is untouched and a virgin field of research in the state of Manipur. The present study aims to find the relative effectiveness of learner centred approach and conventional method in teaching science at elementary stage.

Operational key words

Learners Centred Strategy – The 'Learner Centred Strategy' means that the 'learner' or 'child' and not the 'teacher' is the main focus of the educational programme. These take into account learner's developmental stages, maturity, learning strategies, meta-cognitive and cognitive skills, prior knowledge and experiences, motivation and interests, personality, context and culture.

Among the learner centred strategies activity based learning is one of them which the researcher took interest to find out whether it effects the students achievement.

Activitiy based learning – Activity based learning is one of the child centred approach to education which involves teacher to bring students into contact with subject matter through activities and knowledge is the result of the purposeful activities.

Conventional method – Conventional method refers to the traditional method of teaching which is based on objectivist view of knowledge. In this method the teacher transmits knowledge to the learners who are considered as passive receiver of knowledge. The lecture and lecture demonstration methods will be used by the investigator in the present study.

Elementary stage – Elementary stage refers to the 5 years of primary education (Class 1 to V) plus 3 years of upper primary education (Class-VI to VIII). The investigator will study Class VI and VII.

Achievement- knowledge acquired and skills developed in school subjects, generally indicated marks obtained in tests

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Research hypotheses

1. Students taught through learner centred approach will gain higher score as compare to students taught by conventional methods.

2. Learner centred approach develops positive effect the durability of learning through retention of concepts learnt by the pupils in the classroom.

Research objectives

1. To find out the relative effectiveness of learner centred approach in teaching of science.

2. To compare the academic achievement of students taught by learner centred approach with the conventional method of teaching science at elementary stage.

3. To find the durability of learning (retention) of concepts by the pupils in the classroom taught through learner centred approach.

4. To compare the durability of learning of the pupils taught through learner centred strategy and conventional method.

Delimitation of the study

1. Learner centred strategies are confined to activity based method.

2. The selection of dependant variable has been limited to achievement of science

3. Conventional method will be confined to lecture and lecture demonstration method.

4. The study was conducted at six schools at Imphal West and Imphal East districts of Manipur

5. Study is confined to the students of Elementary stage studying in Class –VI and VII.

6. Only two topics of the science course of class VI and VII from their scheme of study were taken for the treatment.

Method adopted

Experimental method was employed for the present study.The design for the present study is pre-test and post-test design (T1-X-T2) also known as Pre-Post experimental design.

Table .1 Design of the study:

Groups	Pre-test	Treatment	Post-test	Retention Test
Control Group	Achievement Test	Conventional instruction	Achievement Test	Achievement Test
Experimental Group	Achievement Test	Learner centred instruction	Achievement Test	Achievement Test

Sample

A purposive sample was used for the present study. Altogether six schools were selected two from Imphal East and five from Imphal West districts randomly. Sample of the present study comprised of 675 students of which 341 are boys and 334 are girls. The students were studying in Class VI and VII in the randomly selected six schools each having two or more sections.

      Students studying in section A of each class were selected as control group and students in section B as experimental group.

Tools used in the present study

In order to get accurate data and information the following tools were employed.

1. Self made instructional tools in the form of unit wise lesson plan along with teaching aids of some selected topics of science for class VI and Class VII.

2. Measuring tools in the form of teacher made achievement test. The total score for the test was 20 marks. The instrument was subjected to expert judgement and was also revised based on the inputs received from the experts.

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Table : List of schools and number of participating students

Category of school	Name of School	No. of Students	Total
Private	(i) Savio Hr. Sec. School, Imphal West	160 (23.7%)	504
	(ii) Grace Academy, Imphal West	150 (22.2%)	
	(iii) Guru Nanak, Imphal West	110 (16.3%)	
	(iv) Kanan Devi Hr. Sec. School, Imphal East.	84 (12.4%)	
Government	(i) Bhairodan Maxwell High school, Imphal West.	82 (12.1%)	171
	(ii) Lamlong Hr. Sec. School Imphal East.	89 (13.3%)	
Total of No. Student		675 (100%)	675

Data collection procedure in the present study

The present study employed the pre-test and post-text design (T1-X-T2) also known as pre-post experimental design. One section of the class for each sample school was selected randomly as experimental group and the other section as the control group. Experimental group was taught using learner centred strategy (Activity based learning) and the control group was taught by conventional method (lecture and demonstration method). A teacher made achievement test of 20 marks was prepared from the already taught units from each class and was administered upon the experimental as well as control groups in the form of pre-test. 30 minutes was given for the test. The answer sheets were evaluated to collect the pre-test scores. Two units each for Class VI and VII from the science text book prescribed by the Board of Secondary Education Manipur (BSEM) were selected. For class VI the units 'changes around us' and 'Force and motion' were selected. Similarly, for class VII the units 'Light' and 'sound' were selected. The units were divided into a number of sub units and lesson plans and learning materials were developed following the two strategies. The control groups were taught through lecture and lecture cum demonstration method and the experimental groups were taught through activity based learning

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on the same topics. The treatment was conducted by the investigator in both groups so as to avoid teacher variable and maximum precision. Treatment was conducted in the normal school timings within their science periods in the time table without disturbing the schedule and program. After teaching the first selected units in both the groups, teacher made achievement test carrying 20 marks was administered to both the groups to obtain the first post-test scores. 30 min was given for the test.

Similarly, second post test score was collected after teaching the second selected unit in both groups. After one month time of post test similar test were conducted for testing the retention/durability of learning through retention of concepts by the students in the classroom of both teaching strategies.

Statistical technique

In the present study the investigator has used descriptive statistics like mean, median, mode, SD and significance of the difference between means and graphical representations were used for data analysis. t- test was used in the test of significance between means.

For all statistical calculations and hypotheses testing, IBM SPSS statistics version 22 of International Business Machines Corp. was used.

Analysis and interpretation of data

Analysis and interpretation were analyzed based on pre-test and post test data obtained from the experiment.

The Pre-test done to understand the baseline academic characteristics of the participant students used a question paper carrying a full mark of 20. The scores obtained by all the participating students had a mean of 10.79 ± 3.76. The median and mode were 10 each with the skewness of -0.07. Hence the pre-test score is normally distributed. The scores obtained by the control group had a mean of 10.79 ± 3.8 and for the experimental group the mean was 10.78 ± 3.72. The mean difference was 0.004. The Levene's test of equality of variance of the two groups showed no significance (F [673] =0.26, p=0.61). Hence assuming equal variances a two tailed t test was conducted to test the equality of the two mean scores at the confidence level of

95% which showed no difference (t=0.012, p=0.99), (Table 3). Hence the two groups (control and experimental) had no difference in their baseline academic characteristics. This finding made the two groups comparable for estimating statistical significance on the effects of experimental treatment.

Table 3. Independent Samples t-test comparing the Control and Experimental groups on the means of Pre-test scores

Levene's Test for Equality of Variances		t-test for Equality of Means					95% Confidence Interval of the Difference	
F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	Lower	Upper
.256	.613	.012	673	.990	.004	.290	-.565	.572

Analysis of Post Test 1

After a common lesson was taught to the students employing conventional method to the control group and the new method to the experimental group, the first post test was taken. The overall scores obtained in the post test had a mean of 12.97 (SD=3.5).

The control group scored marks ranging from 4 to 19 with the mean of 11.43 (SD=3.24) and the experimental group ranging from 4 to 20 with the mean of 14.52 (SD=3.14) as shown in the table.4a.

Table 4a Descriptive statistics of First Post test score of the control and experimental groups

Control			Experimental		
N	Valid	338	N	Valid	337
	Missing	0		Missing	0
Mean		11.43	Mean		14.52
Std. Error of Mean		.176	Std. Error of Mean		.171
Median		11.00	Median		15.00
Mode		12	Mode		15
Std. Deviation		3.239	Std. Deviation		3.137
Range		15	Range		16
Minimum		4	Minimum		4
Maximum		19	Maximum		20

Multiple linear regression was carried out to find out the adjusted t test value with first post test score as dependent and test group (control and experimental group) as the independent variable with gender and class groups as the covariates. It found the experimental group and the control group being significantly different (t=11.6, p<0.05) (Table 5). Thus we concluded that the mean score of 14.5 obtained by the experimental group was significantly higher than the mean score of 11.43 obtained by the control group and hence the experimental group taught with the new technique imparted knowledge significantly more than the control group taught with conventional technique.

Analysis of post test 2

To further reconfirm this finding another test (second post test) was conducted after teaching a new lesson in the same way as done for the first post test. The overall scores achieved by the students had a mean of 14.11(SD=3.5) with median and mode of 15 each (Table 4b). The control group had a mean score of 12.61 (SD=3.4) and the experimental group 15.61 (SD=3.0). On comparing the two groups with t test, adjusting for the covariates (Gender and Class groups) we found significant difference (t=11.2, p<0.05), (Table.5). This further reinforced our findings in the first post-test.

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Table 4b Descriptive statistics of second Post test score of the control and experimental groups

Control		Experimental	
N	338	N	337
Mean	12.61	Mean	15.61
Median	12.00	Median	16.00
Mode	15	Mode	15
Std. Deviation	3.377	Std. Deviation	3.008
Minimum	3	Minimum	7
Maximum	20	Maximum	20

Table 5. Comparison of control and experimental groups on interventions using t test

Interventions	Control			Experimental			Adjusted t test (95% CI)	
	n	mean	SD	n	mean	SD	t-value	P value
1st Post test (PT1)	338	11.43	3.2	337	14.52	3.1	11.6	<0.05
2nd Post test (PT2)	338	12.61	3.4	337	15.61	3.0	11.2	<0.05

Analysis of Retention test

The retention test conducted after a duration of 30 days from the first post test had a mean score of 11.8 (SD=3.8) with mode and median of 12 each. The marks ranged from 2 to 20. Out of the total 675 students attended in the previous first post test, 8 students (from the control group) could not turn up hence only a total of 667 students attended the retention test. The mean score obtained by the control group was 9.97 (SD=3.3) and that of experimental group was 13.57 (SD=3.5) as shown in the table.6a.

Table 6a. Descriptive statistics of retention test of the control and experimental groups

Control		Experimental	
Valid N	330	Valid N	337
Missing	8	Missing	0
Mean	9.97	Mean	13.57
Median	10.00	Median	15.00
Mode	12	Mode	15
Std. Deviation	3.291	Std. Deviation	3.495
Minimum	2	Minimum	5
Maximum	20	Maximum	20

When the two groups are compared using t test adjusted for the confounding variable class group we found significant difference (t=12.6, p<0.05). This indicated that in the retention test, the experimental group could retain more knowledge then the control group. We wanted to know by how much, the first post test score was reduced over the period of 30 days. It was found that among all students the reduction in score was on average 1.2 (SD=2.7) which is 8% reduction from the first post test score. When compared between the control and experimental group, the former had a mean reduction of 1.47 (SD=2.67) equivalent to 10.6% and the later 0.95 (SD=2.7) equivalent to 5.6%. This increased reduction in knowledge over time in control group was significant (t=-2.3, p=0.03), (Table. 6b). The above results support the hypothesis- Learner centred approach develops positive effects on the durability of learning through retention of concepts learnt by the pupils in the class room

Table 6b. Comparing control and experimental groups on interventions using t test

Interventions	Control			Experimental			Adjusted t test (95% CI)	
	n	mean	SD	n	mean	SD	t-value	P value
Retention test (RT)	330	9.97	3.3	337	13.57	3.5	12.6	<0.05
PT1 - RT	330	1.47	2.67	337	0.95	2.7	2.3	0.03

Major finding

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1. There was no significant difference between achievement score of students belonging to both groups (Control and experimental groups) taught by conventional methods of teaching. Hence the two groups (control and experimental) which were taught by conventional methods prior to the experimental treatment had no difference in their baseline academic characteristics.

2. Mean score of conventional group in post test1 was 11.43 ± 3.24 whereas Mean score of learner centred approach group in post test 1 was 14.52 ± 3.14. The t value was11.6, where $p<0.05$(significant at 0.05 level). Mean score of conventional group in post test 2 was 12.61 ± 3.4 against the 15.61 ± 3 of learner centred approach group. The 't'value at 0.05 level of significance of both post test were found to be significant. Thus, the students exposed to learner centred approach of teaching performed significantly better than the students taught through the conventional or the traditional method of teaching.

3. It was observed that students taught by learner centred instruction positively influenced retention of what was learnt. The achievement score of retention test of the experimental group which was exposed to activity based learning, a learner centred approach (Mean score=13.57 ± 3.5), was found to be significantly higher compare to the control group of students which was taught mainly by the conventional method (mean score=9.97 ± 3.3) of teaching. The t value 12.6, $p<0.05$ was highly significant.

4. The retention test among all students the reduction in score was on average (1.2 ± 2.7) which is 8% reduction from the first post test score.

5. It was found in the retention test that among the students taught by conventional method the reduction in score was on average (1.5 ± 2.7) which is equivalent to 10.6 % reduction from the first post test score

6. The students taught by learner centred approach have average reduction score of 0.95 ±2.7 which is 5.6% reduction from the first post test. The students taught by conventional method were found to be significantly reduce in knowledge overtime ($t=2.3$; $p=0.03$)

Suggestions for future research

The study may be replicated for various grade level as well as different content areas of science to generalize the finding of the study. The study areas also may be extended to hills and rural setting to ascertain its impact on different learning environment. The impact of the new strategy may also affect the teachers therefore; it is also suggested to focus on teachers to see the attitudes changes and other plausible problems faced by the teachers during the teaching through learner centred approaches.

Educational implications

Learner centred strategies may be introduced by the teacher in the teaching learning environment to motivate the learners to a greater extent and to bring about maximum learning outcome. This approach need to be introduced for teaching science as they have significant effect in bringing desirable development among student's attitude towards science. 'Science for All' and 'Scientific Literacy' are matters of great concern today for all nations especially the under developed and developing countries like India. These need systematic and comprehensive strategies for creating a congenial learning environment for teaching processes in science. Interaction, inquisitiveness, reasoning and creativity aspects fostered through science teaching become more important in such an environment4. Schools need to shift their emphasis from passive answer absorbing to active answer seeking, from rigid daily programmes to active flexible schedules, from teacher dominated classroom to child directed and group activities and from memorizing to problem awareness and problem solving. Complete orientation of teachers should be done to train the teachers to use learner centred strategies in the teaching learning process. Teachers also need to be trained in application of these strategies appropriately according to the need in their classroom. It is also required to include peer work/group work activities in the teacher training programme so that the teacher trainees can work with interactive teaching material and will help her to face the challenges of the modern classroom. Guidelines for formulation of activity based learning need to be incorporated in teacher training progress in service and pre-service training. Elementary education curriculum needs to be skill focused rather that focused in completing particular number of units as mentioned in the National Curriculum framework 2005. Further, the RTE

Act, 2009, also specifies that good quality elementary education must be provided by the central and local authorities. Instructional methods should be wholesome as to address different learning needs and optimum levels of challenge. Each method, lecture, activity based learning or any other method have their merits and limitations and they must be judiciously used to attain the final goal of high quality in education through successful educational experiences and outcomes. Subject relevant activities need to be implemented to a much greater extend to bring about cognitive development in each area. Collaborative activities such as conducting project and group work help the subjects to make connections with others whom they would not have otherwise, to want to participate in the activities, to share their knowledge and listen to others, to be excited about their class assignments, and to be eager to take responsibility, for their own learning and for others as well. Lecturer pairing with hands-on activities should be implemented as often as possible in the teaching learning process. A new shift is suggested to be experienced in science education to put learners in contexts where they can practice the motivated learning activities. In other words, science courses should shift from a teacher-centred approach to learner-centrered approach. Learners should be placed in experienced based contexts so that they have enough opportunities to question the dispositions they hold regarding learning science and build curiosity accordingly

Acknowledgment

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