

Effectiveness of Lesson Study Approach towards Science Learning in Pakistani Elementary School

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ABSTRACT

Lesson study is a kind of teacher training program extensively used for professional development of both pre-service and in-service teachers. Current study intended to explore the effect of lesson study approach on science learning by conducting a Quasi-Experimental research that followed a Non-equivalent pretest posttest control group design. As academic attainment of students is considered the basic parameter to evaluate the classroom learning, so effectiveness of lesson study approach was measured in association with the student's achievement at elementary level. The objective of this study was to examine the effectiveness of lesson study approach on the academic success of elementary science students. Six elementary science teachers of a public school were engaged and oriented to lesson study. Teachers were guided how to teach general science using lesson study approach. This research involved two sections of grade 7 students as sample, one as control group (taught by conventional method) and other as experimental group (taught following lesson study approach). The treatment of lesson study teaching was given for 08 weeks covering 03 lessons in a week. The success of the Lesson Study was determined by comparing performance of both groups on pre and post-test. Quantitative data consisting of achievement test scores were analyzed using SPSS Software. The result indicated that in posttest, performance of experimental group (36.90) turned better than control group (14.03) on achievement test. Hence, it is substantiated that lesson study approach has a noteworthy effect on science learning at elementary level. It is also revealed that science teaching through lesson study increases comprehension and application skills of elementary students significantly. The study recommends endorsement of lesson study approach in teaching of science by inculcating it in teacher training curriculum.

Keywords: Lesson Study Approach, Science learning.

INTRODUCTION

Constructivism is the underpinning of Lesson Study approach and it endorse importance of creating “Research Lessons” as teacher’s discipline-specific subject and pedagogical knowledge is growing that yield to better student achievement. “Lesson study is an inclusive and well-articulated process for investigating and analyzing teaching practice.” (Fernandaz, Cannon & Chokshi, 2003, p.17). Lesson Study concentrates on refining the lesson planning practice, upgrading teacher’s instructional techniques and tactics and delivery of the lesson, assessing the student learning outcomes, evaluating thinking skills of students and upsurge student’s capabilities.

Within the bounds and context of “No Child Left Behind”, Act of 2001, a reform-based teaching is desired. In this scenario, lesson study approach is a natural fit to assume particularly in developing countries like Pakistan due to its efficiency and cost-effectiveness. Wang-Iverson & Yoshida (2005, p.12), wrote: “If we truly wants to leave no child behind, we must re-think about acquainted practices that are considered as

unchallengeable currently”. Lesson Study can support us in wrapping our thoughts in diverse styles of working rationally and pragmatically. Adopting lesson study approach can help our students in achieving a supreme level of proficiency and competency.

Statement of Research Problem

The existing study is focused to scrutinize the competence of lesson study approach on science learning at elementary classes.

Delimitations

This study is restricted to six elementary science teachers and two sections of Grade 7 students studying in a government school of Islamabad. Current study is demarcated to discover the outcomes of lesson study approach on science learning of elementary students.

Objectives of the Research

To examine the effectiveness of lesson study approach on students learning attainment at elementary classes.

Research Hypothesis

- “There is a no significant difference in mean value of Control group and experimental group on posttest”. (H₀₁)
- “There is a significant difference in mean value of Experimental and Control group on posttest”. (H₁)
- “There is no significant difference in mean value of Experimental and Control group on Knowledge based test items on posttest”. (H₀₂)
- “There is a significant difference in mean value of Experimental and Control group on Knowledge based test items on posttest”. (H₂)
- “There is no significant difference in mean value of Experimental and Control group on Comprehension based test items on posttest”. (H₀₃)
- “There is a significant difference in mean value of Experimental and Control group on Comprehension based test items on posttest”. (H₃)
- “There is no significant difference in mean value of Experimental and Control group on Application based test items on posttest”. (H₀₄)
- “There is a significant difference in mean value of Experimental and Control group on Application based test items on posttest”. (H₄)

Significance of the Study

The outcomes of this study are deliberated to deliver beneficial awareness about the lesson study approach on student’s academic attainment. The study can be supportive in encouraging and stimulating teachers to work on what make students learn better and what kind of instructional strategies and activities can facilitate student’s learning and thinking. This can also motivate educational administrators, policy makers and curriculum developers to endorse the usage of lesson study in elementary school science teaching. It can provide a strong footing in organizing pre-service and in-service teacher’s training programs for their capacity building through lesson study approach. In Pakistan, as no significant researches have been carried out on lesson study approach so far, it can offer prospects for up-coming researchers to pair together the observations of this study and/or investigate further studies for the goal of cultivating academic achievements of elementary science.

Literature Review

The prominence of science teaching and learning always remains a segment of apprehension. Researchers are continuously trying to seek improvement in investigating how expertise in science learning can be attained. Baba (2007) articulated the connection that exists between learner's outcomes and the instructor teaching. Similarly, Makinae (2010) argued the identical notion of learning.

Tschannen (2001) argued the similar arguments for lesson study. For achieving the full potential and desirable results in either state or local schools, it is mandatory that these must be taught by subject experts who have the requisite qualification and professional aptitude towards the job assigned to them. Only such professionals can instigate, motivate, facilitate and encourage the learning in students which is the essence of accomplishing desirable goals and instructional objectives. Anaya et. al., (2016) explained that the written teaching planners and/or teacher training programs cannot be adequate to inspire teachers to improve the teaching level and classroom instruction. They suggested that the lesson study can be deployed as an efficient mean to enhance their teaching. They added that lesson study is a collaborative practice that includes instructors rehearsing and revising the concepts to improve classroom teaching. They further supplemented that, "When teachers feel as though they are more effective, they deliver better teaching and it promotes student learning. They also quoted that as teacher efficacy enhances, their teaching progresses and so does student learning".

"Lesson study" is an approach that allows a critical evaluation of the entire instructional mechanism. Richardson (2000) explained lesson study approach as a facility for the instructors to analyze their teaching practices "with new eyes". It has been asserted as an effective strategy (McDonald, 2009, p. 391). It is a process in which Japanese on regular basis engage in and evaluate their instructional techniques by means of a careful observation and planning their lessons (Cohan and Honigsfeld, 2007). Corcoran & Pepperell (2011) delineated, "it fosters the knowledge" (p. 229). This resounded the discoveries of Leavy (2010) as he observed lesson study beneficial to pre-service skills, knowledge and strategies. Cohan and Honigsfeld (2007) cropped up, "this approach is effective." (p. 81). Wright and David (2009) gauged the efficiency of lesson study as far as the contents of subject matter, instructional approach and potential achievement as a result were concerned. They summed up that all three areas are affected and imprinted by means of lesson.

Lesson study approach is meant to lead teacher to instruct based on the notion of learner centered for improving the skills and hence the outcomes of the students learning in a larger spectrum. In Japan, teachers mostly engaged the learners of the similar grade in an interactive process to find out the gap and to enrich their problem-solving abilities which has a paramount impact on students learning and achievement (Meyer, 2006). Lesson study approach enables teachers to get to know various forms of skills, exposure and expertise so in order to inculcate in their students to enhance their thinking and cognitive domain with respect to ideas, concepts and related issues (Lewis, 2009).

Inprasitha (2015) clarified that Lesson Study is a reproducible approach in teaching science. He revealed the effect of Lesson Study on "Problem Solving Approach" for replicating improved teaching practice along with explanations of "Pedagogical Concept Knowledge". Leavy & Sloane (2008) postulated the fact that "it has positively significant impact on teaching" (p. 168). Lott's (2006) summed up his findings by asserting that teachers who participated in her initiative about lesson study effectiveness improved and modified their teaching skills over time. He drew the conclusion that by

participating in lesson study approach, it is certain that mathematical concepts of the students and teachers are going to modify significantly. Moreover, it enhances the quality and temperament of the instructors in achieving better and improved results.

Hamzeh, F. (2014) investigated the utility of lesson study approach to gauge its effectiveness on pre-service teachers and concluded that it has better results as compared to inquiry-based approach, previously in practiced. It enhances the quality of instruction by inducting interest, logic, relevancy and motivation. Wake (2016) recommended lesson study as an efficient approach for professional development of teachers with particular reference to problem solving processes in teaching of mathematics. He adopted the cultural-historical activity theory and stated the importance of constructing artefacts instruments. He determined that the scheme of developing artefacts as borderline items help in improving teaching and learning and is vital for successful attainment of lesson study.

McDonald (2009) implied this model on the programs of Professional development in Australia. The results indicate that it improves the knowledge of subject and pedagogical skills of teachers. The vista and approach of the teacher was improved and modified positively which is demonstrated in their everyday teaching. Maitree (2015) narrated the successful and sustainable execution of lesson study in the Thailand Education System. He suggested the induction of a three-year lesson study teaching model (2006-2008) in some sample schools for piloting. Fadime (2018) scrutinized the influence of lesson study on the capacity building of pre-service teachers for learning English as a foreign language (EFL) in Turkey. It was found that lesson study is quite effective in contributing towards teacher learning and they improve themselves by continue practice. He further added that the improved class-room instruction indeed plays a vital role in improving student's learning outcomes.

Method and Procedure

The method and procedure adopted in this study is mentioned here in below:

Design

This experimental study adopted "Quasi-Experimental" design and more precisely "The Pre-test, Post-test non-equivalent control group Design" was followed.

Sample

Convenience sampling technique was adopted to select the sample of the study. 60 students from two sections of Grade 7; one as an experimental and other as control group, of Islamabad Model School for Girls (I-X), NHC, Islamabad constituted sample of the study.

Instrument

The data of this study was collected from achievement test scores by administering same test as Pre-test and Post-test. Beside basic cognition/knowledge area, the test also contains questions that assess comprehension and application skill of the students. The reliability of test was calculated as .76 and the test was validated by a group of specialists.

Procedure

The intervention of lesson study was applied for eight weeks covering three lessons in a week. Total 24 lessons were delivered following the "lesson-study" pattern. The success of the Lesson study was determined by comparing both groups on the basis of

their performance in pre-test and post-test. The data was obtained in quantitative form (test scores of students)

Data Analysis

T-test was executed for analysis of data through SPSS software. The data were analyzed in the following ways:

- Inclusive comparison of Science Learning on post-test
- Knowledge based test item's Comparison
- Comprehension based test item's Comparison
- Application based test item's Comparison

Table 1: Inclusive comparison of Science Learning on post-test

Group	Pretest Mean	SD(Pre - test)	Posttest Mean	SD(Post -Test)	Mean difference	df	t value	Sig(2-Tailed)
Experimental (n=30)	14.43	4.65	36.90	10.34	22.87	58	10.76	.000
Control (n=30)	13.70	6.19	14.03	5.34				

Level of significance = 0.05

Table 1 reflects that in pretest, the experimental group came with mean score of 14.43 and control group was 13.70. Mean score difference appeared .73 which is not significant. Therefore, the groups could be considered as alike at the pretest level, before the treatment. Furthermore, there is a visible difference in two mean scores i.e. experimental group (36.90) and control group (14.03) at posttest. Mean score difference of two groups was found to be 22.87. The t-value calculated was 10.76, significant with .000 significance level ($p < 0.05$) which agrees to discard the null hypothesis H_01 and accepts its alternative.

Table 2: Knowledge based test item's Comparison

Group	Pretest Mean	Pretest SD	Posttest Mean	Posttest SD	Df	t value	Sig(2-tailed)
Experimental	7.30	1.72	12.90	1.97	58	10.66	.000
Control	7.93	3.62	8.06	1.50			

Level of significance = 0.05

Table 2 depicts that on knowledge based test items, the mean score of experimental group was 12.90 and control group was 8.06. The difference in mean score was 4.84. The computed t-value was as 10.66 which was found to be significant at 0.000 significance level ($p < 0.05$) which agrees to discard the null hypothesis H_02 and accepts its alternative.

Table 3: Comprehension based test item's Comparison

Group	Pretest Mean	Pretest SD	Posttest Mean	Posttest SD	df	t-value	Sig(2-tailed)
Experimental	4.33	1.47	11.66	3.90	58	8.37	.000
Control	3.80	2.02	4.30	2.81			

Level of significance = 0.05

Table 3 describes that on comprehension based test items of posttest, mean score of experimental group was 11.66 and control group score was 4.30. Mean score difference of two groups was found to be 7.36. The computed t-value 8.37 found to be significant with 0.000 significance level ($p < 0.05$) which agrees to discard the null hypothesis H_{03} and accepts its alternative.

Table 4: Application based test item's Comparison

Group	Pretest Mean	Pretest SD	Posttest Mean	Posttest SD	df	t-value	Sig(2-tailed)
Experimental	2.80	2.68	12.33	5.49	58	9.63	.000
Control	1.96	2.31	2.10	1.90			

level of significance = 0.05

Table 4 illustrates that on application based test items, the mean score of experimental group was found at 12.33 and control group was at 2.10. Mean score difference of two groups turned 10.23 on post-test. The computed t-value was as 9.63 which was found to be significant with 0.000 significance level ($p < 0.05$) which agrees to discard the null hypothesis H_{04} and accepts its alternative.

Findings

These findings were observed from the analysis of the data:

1. The results of data analysis revealed that in pre-test, the two groups were at the same mean score so should be treated as equal before the lesson study exposure.
2. Overall attainment of the elementary science students taught with lesson study was significantly better than the students taught without lesson study. Consequently, null hypothesis H_{01} , "There is a no significant difference in mean value of control group and experimental group on posttest", was discarded.
3. On knowledge based test items, experimental group appeared on better mean score than control in posttest. Therefore, the null hypothesis H_{02} , "There is no significant difference in mean value of control group and experimental group on knowledge based test items on posttest" was discarded.
4. The performance of experimental group remained better on comprehension based test items than control group. So the null hypothesis H_{03} , "There is no significant difference in mean value of control group and experimental group on comprehension based test items on posttest" was discarded.
5. The data analysis revealed that the performance of experimental group remained better than control group on application based test items. So the null hypothesis H_{04} , "There is no significant difference in mean value of control group and experimental group on application based test items on posttest" was discarded.

Conclusions

It is concluded from data analysis that teaching of general science with the lesson study was more beneficiary than the conventional way of teaching general science to the elementary class learners. The enactment of experimental group appeared profoundly better than control group on posttest. On comprehension and application based questions, a note-worthy difference was also detected between the performance of two groups. Students of experimental group made better result on post-test while answering high order test items than the control group those who were taught by conventional method. Hence, use of lesson study approach increases high order cognition of student's and they perform better on high order thinking questions; beyond memorization. So, the attainment of general science students can be improved significantly through lesson study approach, studying in public sector schools under Federal Directorate of Education, Islamabad.

Recommendations

- A teacher's professional development program can be organized for in-service science teachers in order train and equip them with sufficient drill to practice lesson study in teaching science.
- Effectiveness of lesson study approach on mathematics both at primary elementary level can also be studied.
- Concepts related to teaching of science through lesson study approach can be amalgamated in the curriculum designed for prospective pre-service science teacher education so that they can apply it in the field after getting employed.
- Continued research in lesson study can also comprise recapping this practice with a relatively bigger sample of pre-service science teachers making their lessons and delivering in their teaching practices in various public and private schools.

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