

Investigating the Effect of Lesson Study Method in Science Lesson on Creativity of Secondary School Students

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Abstract: This study was conducted with the total aim of investigating the effect of lesson study in science lesson on creativity of female students in the first grade of secondary school. The study method was quasi-experimental and objectively was applied. The population were the entire female students in the first grade of secondary school (female public school of Shohadaye Khabir, region 2 Urmia) in number of 90 people that among the sample with the size of 58 people were selected as available sampling method and assigned in two groups of experimental and control (each group 29 people). In this study, the questionnaire instrument of Torrance creativity measurement was used with confirmed content validity and reliability coefficient of 0.87 for data collection, collected data were analyzed using the descriptive statistics (indices of central tendency and dispersion) and inferential statistics (t-test two independent groups, Kolmogorof-Smirnov and analysis of covariance). The research results showed that there is a significant difference in the error level of 5% among the student's creativity scores of experimental and control groups for all four variables (fluency, flexibility, development and innovation) and the difference is in favor of the trained students in the lesson study method.

Key words: Lesson study, creativity, secondary school, Urmia city, science lesson

INTRODUCTION

Creativity is one of the fine stand most complex activities of the human mind that education must pay attention to it. Creativity not only is related to intelligence and thought but also related to personality structures and hence, the issue of children talent should be taken into consideration by teachers should provide the expression of creative idea in schools and can be activated with effective participation in the area of teaching as multi-lateral in research arena in the first dimension, teacher as the research teacher plays a role to students. In this role, the teacher leads his teaching towards achievement of researcher student with effective organization of teaching-learning process. Using lesson study that is a Japanese model for professional development of teachers in the school and in practice helps to spread the culture of learning in school, provides an environment to teachers learn from each other improve their professional knowledge, review, rethink their educational, training behavior and pay attention more than ever to needs and how to engage students (Matoba *et al.*, 2006; Fernandez and Yoshida, 2009;

Perry and Lewis, 2009). Using the implementation stages of the lesson study includes problem diagnosis (checking the position of lesson study) the purpose determination (selection, checking the content and accuracy in the title) course design (planning, instructional design (Bakhtiari and Kobra, 2013).

To be able to help to achieve higher education goals by promoting the lesson study approach and accept that the greatest asset of a nation is thoughtful and creative forces of the country, any cost in the student's creativity foster is a great and lasting investment that will make our current world and future generations will benefit from its valuable results (Roshan *et al.*, 2008). In this research, we want to investigate the creativity from the perspective of Guildford that divergent thinking sits most important feature currently in most of our schools emphasize to convergent think in grand divergent think in GIS neglected. Creativity from Guildford (1987) and Abadi and Azadollah (1993) view is a "collection of capabilities and attributes which leads to the unique works production, the most important of these features is divergent thinking. He considered synonyms the creativity with divergent thinking to convergent thinking (Talebi, 2004).

Guilford (1987) view on the creativity of divergent thinking is formed of several features that the most important are fluid (fluency) produce a number of ideas at a time Flexibility (flexibility) the production of various and non-conventional ideas and different solutions for a problem. Recently (originality or initiative) using unique and new solutions extension (extension) production of details (Howard, 1996; Hurizad, 2010) in a study with the title of investigating the impact of lesson study of creativity axis on developing professional abilities of teachers and learning creative behavior of teachers and students” using creativity test concluded that there was observed significant positive correlation between creativity scores of teachers and creativity scores average of their class students. In fact, the results suggest that lesson study to learn the creative behavior can provide in effect, enriching the culture of teaching and school curriculum to foster creativity of teachers and students. In another study, he concluded that there is a significant correlation between teacher’s creativity scores and creativity scores average of their classroom students and in this research, lesson study causes the growth of skill and professional ability of teachers in the use of creativity to enrich the training culture. These findings are consistent with research of LisPel that has shown that, if school staff have training (lesson study) while effective duty, their abilities will have a significant growth and on the other hand the findings of this research is consistent with research findings of Manteghi (2001) which has investigated the impact of creative training in primary school with presenting a model for creative training in teaching has shown the effect of the trainings and is raised how to intervene the methods in textbooks and how to teach them.

Abadi and Azadollah (2012) showed among the creative components, fluency components, development and innovation are significant predictors for critical thinking and are consistent and also with the findings of Stigler and Hiebert (1999) some of the TIMSS data in 1999 concluded that the main factor in the success of Japanese is using lesson study in the professional development of teachers. Rock and Wilson (2005) found in a research that lesson study with the effect on some fields causes the professional development of teachers in the fields of training and continuous and focus learning, increase professionals confidence, collaborative thinking and consultation with colleagues and experts improve the teaching and learning process. Race in a study entitled “The effect of teacher on student’s intellectual prosperity” concluded that help of teacher to students and providing the conditions to getting help of students from teacher has a positive relationship with educational status and intellectual prosperity of students (Talebi,

2005; Seyyed, 2005) who found similar results in their study noted there is a significant effect and consistent between teaching method of teacher and student creativity prosperity, also with the findings of Ranzuli (2009) which shows there is a positive relationship between the teacher role and student creativity prosperity (Kamali *et al.*, 2009).

Results of previous studies show that teaching and training with the help of lesson study have an important role in the learning of students because science lesson by itself because of the increasing development of science and human knowledge every day is more new and large but this change is not only in terms of content and teaching methods but also should being familiar with new models such as the lesson study model, participation and consultation of teachers that is the most effective and least expensive method for the education system to be able to with minimal cost and maximum efficiency with creativity and innovation the challenges facing the managers and policy makers of education system. According to the present research objective, the main research question is whether the method of lesson study causes student’s creativity in science lesson in the first grade of secondary school?

Research hypotheses

Hypotheses:

- The lesson study method (science lesson) is effective in the fluency creativity growth of the secondary school female students in the first grade
- The lesson study method (science lesson) is effective in the innovation creativity growth of the secondary school female students in the first grade
- The lesson study method (science lesson) is effective in the flexibility creativity growth of the secondary school female students in the first grade
- The lesson study method (science lesson) is effective in the development creativity growth of the secondary school female students in the first grade
- The lesson study method (science lesson) is effective in the creativity growth of the secondary school female students in the first grade

MATERIALS AND METHODS

The present study is applied objectively and in terms of data collection method is the quasi-experimental that the experimental and control groups design with pre-test and post-testis used. The population in this study is all the female students of first grade the public secondary school of Shohadaye Khabir, region 2 in Orumiyeh to 90 students that in the academic year of 2014-2015 are educating in these schools. In this study, due to the

quasi-experimental of study 58 people, 29 people for experimental group and 29 people for control group were considered that for the procedure of available sampling were selected from the population. In this study, to measure the creativity of students and its components, the questionnaire of torrance creativity measurement is used that measures the formation factor of creativity the fluency, innovation, flexibility and development, it means that it measures the questions of 1-22 fluency factor, 23-33 of development factor, 34-49 of innovation factor and 50-60 flexibility factor.

Content method was used to measure the validity of the questionnaire and control methods of interfere with age, gender, number of classes and the type of lesson (science) is the same for both classes. Results of conducted research by Abedi the reliability of the creativity test in the four-parts of test is as follows: the reliability coefficient of the fluency part 85%, innovation part 82%, flexibility part 85% and development part has been 80%, respectively and reliability coefficient using Cronbach's alpha for fluency component 0.71, innovation component 0.74, flexibility component 0.78 and development component 0.76 and all the tools was determined 0.84. To analyze the data, descriptive and inferential statistical methods and SPSS Software is used.

RESULTS AND DISCUSSION

First and before applying the considered independent variable (teaching science lesson by way of lesson study) common test was conducted for both experimental and control groups of students to inform them of previous knowledge and ensure of their uniqueness that the obtained results is registered in Table 1 including the statistical indicators values, mean and standard deviation. As you can see, the mean of scores related to the students in the experimental group the number 12.79 is determined and mean of scores related to the students in the control group is determined the number 13.37 that there is a difference between them as 0.58 and not noticeable. It seems that the subjects were randomly assigned to 2 experimental and control groups and can trust to the homogeneity of the groups or peer of them. In the inferential analysis in order to understand this subject that a slight difference between the mean of scores in the two groups of students statistically significant or not? t-test of 2 independent groups is used.

Data in Table 2 show the test results in the error level of 5%. As F-value for levene test for homogeneity of variances is not meaningful ($p = 0.79 > 0.05$) then the values related to assumption of variances homogeneity should be used. In this case, the estimated t-value is not significant ($p = 0.51 > 0.05$) so at confidence level of 0.95%

Table 1: Mean and standard deviation of students score in science test

Index/group	Number	Mean	SD
Test	29	12.79	2.40
Control	29	13.37	2.28

can be said that the students were randomly assigned to experimental and control groups and almost are homogenous or peer:

- H_1 : The lesson study method (science lesson) is effective in the fluency creativity growth of the secondary school female students in the first grade

To determine the effect of the independent variable, the way of teaching lesson study on creativity by removing the pre-test should be used the analysis of covariance. However, using this test requires the attention to wrope-conditions (normal of data distribution or equality of variances). Investigating the normality of the considered distributions for this purpose, Kolmogorof-Smirnof test was used. Data in Table 3 show the results. According to the data in Table 3 as the significant level values for each four components and main variable of creativity is numbers >0.050 so by confirming the null hypothesis can be said that all distributions have normal features.

Investigating the equality or uniformity of variances: The second condition using analysis test of covariance is the ensuring to uniformity or homogeneity of subjects scores variance. Levene test was used for this work that the data in Table 4 show the results of the test. Data in Table 4 show that the significant level values for the variable is the numbers >0.050 . The null hypothesis is confirmed and variance of 2 test groups about all the variables has the homogeneous characteristics. After the assuming tests of covariance analysis data of Tables 5 show the obtained results for hypotheses of research.

Results of covariance analysis in Table 5 show that the significance level for correction pattern is significant at error level of 5%. So, the model is appropriate to identify factors. Estimated F-value is significant at the error level of 5% therefore, probably 0.95% training by using lesson study is effective on intellectual fluency of female student's in the first grade of secondary school. Based on the impact factor (ETA) can be said in the case of applying lesson study method, student's scores in the intellectual fluency property has increased at a rate of 0.68%:

- H_2 : The lesson study method (science lesson) is effective in the innovation creativity growth of the secondary school female students in the first grade

Table 2: Results of t-test 2 independent groups to compare the mean of student's scores in science lesson

Index/variable	Levine test for equality of variances		t-test for equality of means				
	F-value	Sig.	t-values	df	Significant level	Mean difference	Difference of SD error
Science concepts							
Assuming equal variances	0.068	0.796	0.669	27.00	0.509	0.58	0.87
Assuming unequal variances	-	-	0.667	26.60	0.510	0.58	0.87

Table 3: Results of Kolmogorof-Smirnof test for normality study of research variables

Index/variables	Type of test	Number	Mean	SD	k-s	Significant level
Fluency	Pretest	57	1.75	0.16	0.671	0.758
	Posttest	58	1.81	0.26	0.658	0.779
Innovation	Pretest	56	2.10	0.23	0.778	0.580
	Posttest	58	2.21	0.28	0.769	0.595
Flexibility	Pretest	59	1.80	0.29	1.390	0.052
	Posttest	58	1.99	0.30	0.960	0.316
Development	Pretest	59	2.04	0.30	1.240	0.090
	Posttest	60	2.14	0.34	0.967	0.308
Creativity	Pretest	57	1.92	0.13	0.656	0.783
	Posttest	58	2.01	0.23	0.683	0.740

Table 4: Results of levene test for homogeneity study of subject's variance

Index/variable	Type of test	Levene statistic	df 1	df 2	Significant level
Fluency	Pretest	0.145	1	56	0.705
	Posttest	0.280	1	57	0.599
Innovation	Pretest	0.016	1	55	0.900
	Posttest	1.866	1	57	0.177
Flexibility	Pretest	1.004	1	57	0.953
	Posttest	1.021	1	57	0.317
Development	Pretest	0.020	1	58	0.983
	Posttest	0.024	1	59	0.989
Creativity	Pretest	0.018	1	56	0.894
	Posttest	0.550	1	57	0.462

Table 5: Analysis results of covariance 2 test groups of fluency component

Variance sources	Sum of squares (order 3)	df	Mean of squares	F-value	Significant level	Impact factor ETA
Corrected pattern	2.51900	2	1.256	58.0680	0.00	0.679
Intercept (constant)	0.32100	1	0.321	14.8250	0.00	0.212
Pretest	0.81000	1	0.810	37.3370	0.00	0.404
The effect of intervention (group)	2.21400	1	2.214	102.106	0.01	0.650
Error	1.19300	55	0.022	-	-	-
Total	194.295	58	-	-	-	-

To determine the effect of the independent variable, the way of teaching lesson study on the power of "intellectual innovation" of students with limitation of the pre-test effect the analysis of covariance is used. Data of Table 6 show the results of research. Results of covariance analysis in Table 6 show that the significance level is significant at error level of 5%. So, the model is appropriate to identify the effect of independent variable.

F-value is significant. Therefore, probably 0.95% training by using lesson study is effective on intellectual innovation of female students in the first grade of secondary school. Based on the impact factor (ETA) can be said in the case of applying lesson study method, student's scores in the intellectual fluency property has increased at a rate of 0.53%:

- H₃: The lesson study method (science lesson) is effective in the flexibility creativity growth of the secondary school female students in the first grade

Data in Table 7 show that the estimated F-value is significant at error level of 5%. So, it can be said that probably 0.95% training of science concept by using lesson study method is superior on the usual training and increases the intellectual flexibility property of students. Based on the impact factor (ETA) can beside that after adjustment of prior knowledge about 0.38% of variance in the dependent variable explained by the independent variable:

- H₄: The lesson study method (science lesson) is effective in the development creativity growth of the secondary school female students in the first grade

Data in Table 8 show that the estimated F-value is significant at error level of 5%. So, it can be said that probably 0.95% training of science lesson by using lesson study method is more effective than the usual training. On

Table 6: Results of covariance analysis 2 test groups of intellectual innovation component

Variance sources	Sum of squares (order 3)	df	Mean of squares	F-value	Significant level	Impact factor ETA
Corrected pattern	2.519	2	1.256	58.0680	0.00	0.679
Intercept(constant)	0.321	1	0.321	14.8250	0.00	0.212
Pretest	0.810	1	0.810	37.3370	0.00	0.404
The effect of intervention (group)	2.214	1	2.214	102.106	0.01	0.650
Error	1.193	55	0.022	-	-	-
Total	194.295	58	-	-	-	-

Table 7: Analysis results of covariance 2 test groups of flexibility component

Variance sources	Sum of squares (order 3)	df	Mean of squares	F-value	Significant level	Impact factor ETA
Corrected pattern	2.029	2	1.015	16.817	0.000	0.379
Intercept (constant)	1.990	1	1.990	32.986	0.000	0.375
Pretest	1.227	1	1.227	20.332	0.000	0.270
The effect of intervention (group)	0.731	1	0.731	12.117	0.001	0.281
Error	3.319	55	0.060	-	-	-
Total	234.105	58	-	-	-	-

Table 8: Analysis results of covariance 2 test groups of development component

Variance sources	Sum of squares (order 3)	df	Mean of squares	F-value	Significant level	Impact factor ETA
Corrected pattern	2.895	2	1.448	22.716	0.000	0.452
Intercept (constant)	3.568	1	3.568	55.983	0.000	0.504
Pretest	0.221	1	0.221	03.466	0.068	0.059
The effect of intervention (group)	2.549	1	2.549	39.992	0.000	0.421
Error	3.505	55	0.064	-	-	-
Total	271.893	58	-	-	-	-

Table 9: Analysis results of covariance 2 test groups about learning "Recognition byten"

Variance sources	Sum of squares (order 3)	df	Mean of squares	F-value	Significant level	Impact factor ETA
Corrected pattern	2.097	2	1.049	082.738	0.00	0.751
Intercept (constant)	1.184	1	0.184	014.536	0.00	0.206
Pretest	0.379	1	0.379	029.877	0.00	0.352
The effect of intervention (group)	1.524	1	1.524	120.256	0.00	0.686
Error	0.697	55	0.013	-	-	-
Total	236.597	58	-	-	-	-

the other hand, the lesson study method has significant effect on the development creativity property of the high school female students in the first grade. Based on the impact factor (ETA), it can be said that after adjustment of prior knowledge about 0.45% of variance in the dependent variable explained by the independent variable:

- H_5 : The lesson study method (science lesson) is effective in the creativity growth of the secondary school female students in the first grade

Results of covariance analysis in Table 9 show that estimated F-values significant. It can be said probably 0.95% training of science concepts by lesson study to usual training has positive effect on creativity power and the impact factor (ETA) explained about 0.75% of variance in the dependent variable by the independent variable.

Based on the results of this study, it was found that totally using the pattern of lesson study training by teachers in secondary schools first grade provides growth areas and the promotion of teachers and increasing student's creativity. The results related to the first hypothesis base on the effect of lesson study method (science lesson). In fluency creativity growth of student's

with analysis of covariance showed that the trained students in lesson study method in compare to untrained students have the higher intellectual fluency property. The obtained result is consistent with the findings of many other studies that including Ali and Karami's findings showed the creative components, fluency components, development and innovation is significant predictors for critical thinking and is consistent and also is consistent with the findings of Stigler and Hiebert in a research on some of the TIMSS data concluded that the main factor in the success of the Japanese is the using lesson study in the professional development of teachers and in race research found that helping of teacher to students and providing conditions for getting help of students from teacher has a positive relationship with educational status and intellectual prosperity of students. In explaining the findings of the study can be said that in the lesson study method new ideas are evaluated and examined and lead to the emergence of new ideas and explore new concepts and help to broad-mindedness (open mind) to attitudes and values taking advantage of this teaching method allows students to answer and have a lot of ideas in connection with the new issue that perhaps might not have been dealt with in their work.

From the investigating, the results related to the second hypothesis was specified that the mean of student's scores in 2 groups of control and experimental has a significant differences with each other.

This difference is in favor of the trained students in way of lesson study and the finding is consistent with results of many researches Vakili and Ali (2012), Talebi (2005), Seyyed (2005), Abadi and Azadollah (2010) in explaining the finding, it can be said that since in then teaching methods, teacher introduces some resources to students study and collect information, giving students the opportunity to think over the issues and this leading to interest and motivate of them to the content and finally provides the context for the development of innovative ideas of students, provide unique and innovative solutions. The results related to the third hypothesis showed that the mean of student's scores in 2 groups of control and experimental in posttest have significant differences with each other that the difference is in favor of the trained students in lesson study method. The result of third hypothesis is consistent with many of the same findings including: Hurizad (2010), Manteghi (2001) and Talebi (2005). The mentioned researchers in their research findings have emphasized the positive effect of lesson study teaching method on creativity of students and teachers.

CONCLUSION

In explaining this finding can be said that in the lesson study method that are engaged in collaborative teamwork and in the classroom argue about an issue that this causes the production of diverse ideas and offer different solutions for one issue. Results related to the fourth hypothesis indicated that the mean of student's scores in 2 groups of experimental and control in post test related to "development component" have significant difference with each other that is in favor of students who have been trained in lesson study method. The obtained result is consistent with the same research findings (Abadi and Azadollah, 2012).

In fact, it can be said that in the lesson study method since teachers implement teaching work in partnership and each one by taking responsibility by attending in each other class, pay their attention to detail and involve students more with details to be able to provide the ability to generate new ideas. From the survey of results related to fifth hypothesis was specified that the mean of student's scores of 2 groups of control and experimental in post test are different that is in favor of trained student in the way of lesson study.

Therefore, trained students in the way of lesson study in compare to the control group have higher creativity in science lesson. These findings are consistent with the results of many other studies including other researchers, the results of Vakili and Ali (2010), Talebi (2005), Seyyed (2005), Hurizad (2010) and Manteghi (2001). In fact, lesson study causes to provide a context and environment till teachers can use the ideas and knowledge of each other and teachers with this teaching method change the old methods of training and teaching and above all teachers can solve the learning difficulties of students on different topics by identifying issues and prioritize them and provide a flexible environment and using there salts in practice. The teaching method among all teaching methods is the only method that in addition to the teacher, the two other teacher in the same major school administrator and even parents can be presented in teaching that this action causes to increase the motivation and creativity of the students.

Recent research has found that the main factor in the progress of nations in the international test TIMSS and PIRLS is using them from collaborative patterns of lesson study. It is recommended that the necessary measures are provided by holding training courses while familiarizing teachers with lesson study pattern from the authorities and those involved in education.

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