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THE IMPACT OF LESSON STUDY ON PRIMARY MATHEMATICS TEACHERS' INSTRUCTIONS IN BRUNEI DARUSSALAM

Hj Ade Shahrin HJ SUHAILI
Sultan Hassanal Bolkiah Institute of Education, Universiti Brunei Darussalam
hjade501@gmail.com

Masitah SHAHRILL
Sultan Hassanal Bolkiah Institute of Education, Universiti Brunei Darussalam
masitah.shahrill@ubd.edu.bn

Madihah KHALID
Institute of Education, International Islamic University Malaysia
madihahkhalid@iium.edu.my

ABSTRACT: This paper reports a study on the impact of "Lesson Study" on primary mathematics teachers' instructions in Brunei Darussalam. The purpose was to determine whether Lesson Study had a positive impact on teachers' instructions. Quantitative data were collected from; checklists from four research lesson classroom observations, and teachers' questionnaire that was distributed to 28 practitioners and qualitative data were collected from interviews, reflective journals and the study of lesson plans. From the results, four pathways were identified in which teachers' instructions had indeed improved, 1) Lesson plan development had broadened teachers' content and pedagogical knowledge; 2) Observation of students' learning helped teachers to be more conscious and sensitive towards students' learning needs and difficulties; 3) The development of teachers' self-confidence, teaching skills, questioning skills and classroom management skills; and 4) Feedbacks from peers and 'knowledgeable others' had made them more aware of the weaknesses and strengths on their own teaching.

Key words: Lesson Study; Primary Mathematics Teachers, Professional Development Program, Teachers' Instruction, Brunei Darussalam

INTRODUCTION

The New Education System (known as *Sistem Pendidikan Negara Abad ke-21* or SPN21) provided the much needed changes and improvement towards the standard of education in Brunei Darussalam. One of the aims of the system is to equip Bruneian students with essential 21st century skills in order to meet the social and economic challenges, and compete intellectually and academically with other students internationally (Ministry of Education, 2009). Therefore there was an immediate need for the implementation of a teachers' professional development program that can provide Bruneian teachers with sufficient content knowledge and pedagogy skills that can help them to implement the SPN21 curriculum efficiently. A teachers' professional development program known as the Lesson Study was selected to be one of the 'tool' to facilitate and support the implementation process of SPN21 in Brunei Darussalam. Despite a growing body of literature on the roles of Lesson Study in facilitating educational reforms, there have been only few research publications on Lesson Study conducted in Brunei Darussalam although interest in Lesson Study in Brunei Darussalam has gained momentum since its introduction in 2009.

There has been a proliferation of research, aims to impart descriptive knowledge base of lesson study in enhancing teachers' mathematical instructional practices. And we have since realised the importance to conduct researches on Lesson Study in schools in Brunei Darussalam and its effect towards teachers' instructional practices. Takahashi, Watanabe and Yoshida (2006) stated that lesson study has the features to potentially influence the quality of mathematics teaching practices in the United States, and elsewhere. It offers opportunities for teachers to critically evaluate their teaching practices. The critical evaluations may take place

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*Corresponding author: Hj Ade Shahrin HJ SUHAILI- hjade501@gmail.com

during the planning period or post lesson discussion, in which through these evaluations, lesson study provides a concrete image of effective instructional practices. It is because of this, lesson study is seen not only as a useful tool to disseminate effective teaching practices but also a powerful mechanism to develop such practices (Takahashi, Watanabe & Yoshida, 2006). Lewis (2002) explored and identified the 'key pathways' that connect lesson study to the improvement of teachers' instructional practices in the United States. These 'pathways' are essential to be understood if schools are to give lesson study a reasonable try in the United States (Lewis, 2002).

Given the proven success and phenomenal spread of Lesson Study in other countries over such a short period, it is important to provide a descriptive knowledge of the process of Lesson Study and its effect on Brunei teachers and students. It is hoped that the findings of this research will give valuable information regarding the effectiveness of lesson study in changing and improving teachers' instructional practices and as a 'catalyst' in changing the 'teaching culture' in Brunei primary schools The aim of the study is to investigate the impact of Lesson Study on Brunei primary mathematics teachers' instructions. It also explored the relationships of Lesson Study and Brunei primary mathematics teachers in developing their teaching proficiency in implementing the educational reforms efficiently. The key research question is, "What is the impact of lesson study towards teachers' instructions?"

METHODS

This study has adapted a combination of both quantitative and qualitative approaches. The quantitative data were collected from two sources; the 4 research lesson classroom observations acquired from the classroom observation checklist, and teachers' questionnaire. Qualitative data were collected from the observations of planning meetings, reflective stage session, teachers' reflective journal, teachers' interview session and the study of lesson plans of the teachers.

For this study, the researchers had selected a purposive sample of teachers from 14 government schools which were involved in the Lesson Study project in 2010; a collaboration between Universiti Brunei Darussalam and the Department of Schools at the Ministry of Education, Brunei Darussalam. Four teachers from 4 schools were observed during the teaching of the research lesson using the classroom observation checklist. The purpose of using the observation checklist is to provide the necessary guidelines in observing a particular mathematics lesson. The checklist was designed to focus the researchers' and other observers' attention towards numerous teaching criteria and students' behavior that are related to the objective of Lesson Study. The lesson organization, the teachers' presentation, the teaching strategy used, the nature of teacher and students communication, assessment and students' behavior are the six areas that were observed during each research lesson. These 4 teachers were also interviewed and were required to complete a reflective journal after they have completed the Lesson Study project. The main aim of using the teachers' reflective journal was to have a clearer picture of the teacher-participants' experiences when conducting the Lesson Study processes, which include teachers' ideas, fears, mistakes, confusions and the reactions towards the experience that they have during the Lesson Study processes. Table 1 shows the demographic data of the 4 teachers from the 4 schools.

Table 1. Demographics of the 4 Teachers Involved in the Lesson Study Project

	Teacher A	Teacher B	Teacher C	Teacher D
School	SRS	SRJ	SRK	SRKT
Gender	Female	Female	Female	Female
Age-group	30-39	30-39	30-39	40-49
Highest level of education	Bachelor Degree	Bachelor Degree	Certificate of Education	Certificate of Education
No. of years as a Mathematics teacher	11-15 years	11-15 years	11-15 years	16-20 years

All 28 teachers from the 14 schools who were involved in the Lesson Study project were surveyed. The teachers' questionnaire was adapted and modified from three previous researches on Lesson Study and Learning Study, namely; the teachers' perceptions of the impact of the lesson study project upon their knowledge and their learning by White and Southwell (2003), 'The Learning Study – A Framework for Enhancing School-University Collaboration that Focuses Upon Individual Lessons' by Ling (2008), and by Fernandez (2005) entitled Exploring 'Lesson Study' in Teacher Preparation. The demographic information of the 28 teachers is presented in Table 2.

Table 2. Teachers Demographics

Description		Group 1 (N=8)	Group 2 (n=10)	Group 3 (N=10)
Gender	Male	0	1	4
	Female	8	9	6
Age	18-25	1	3	1
	26-35	2	7	8
	36-45	5	0	1
	46 and above	0	0	0
Highest Qualification	Certificate or Diploma	4	5	6
	Bachelor Degree	4	5	4
	Masters' Degree	0	0	0
Number of years as a Mathematics teacher	0-5 years	1	7	4
	6-10 years	4	2	5
	11-15 years	3	1	1
	16 years and above	0	0	0

RESULTS

Classroom Observation Checklist Analysis

To investigate whether the teachers' instructions were improving between the four 'cycles' of lesson study, a one-way ANOVA was used to analyze the differences of the four teachers' 'performance' and teaching based on the 'evaluation' and 'measurement' by observers using the classroom observation checklist. Table 3 shows the 4 teachers performance based on the mean scores of the observation checklist. It shows that there were substantial improvements in the mean score of instructions as the lesson cycles were progressing from Teacher A to Teacher B and to Teacher C. However, there was a decline of mean score of the instructions between Teacher C (M=108.56, SD=8.017) and Teacher D (M=101.08, SD=19.280).

Table 3. Descriptive One-way ANOVA for the 4 Teachers

					95% Confidence Interval for Mean			
	N	Mean	SD	Std. Error	Lower Bound	Upper Bound	Min	Max
Teacher A	15	94.80	11.602	2.996	88.38	101.22	74	116
Teacher B	8	105.00	11.084	3.919	95.73	114.27	93	122
Teacher C	9	108.56	8.017	2.672	102.39	114.72	100	126
Teacher D	12	101.08	19.280	5.566	88.83	113.33	72	126
Total	44	101.18	14.113	2.128	96.89	105.47	72	126

Questionnaire Analysis

A descriptive statistical data on teachers' perception of the impact of lesson study on 8 aspects of their development, as represented in section 4 of the teachers' questionnaire, was used to give a holistic and broad view of the impact of lesson study on the teachers' instructions. On the teachers' questionnaire, the teachers were asked to provide a rating for each item. The ratings were (1) no impact, (2) little impact, (3) moderate impact and (4) large impact. Table 4 shows the teachers' mean scores on every item in section 4 of the questionnaire.

Table 4. Descriptive Statistical Data of Teachers' Perception on the Impact of Lesson Study

Descriptive Statistics	N	Minimum	Maximum	Mean	Std. Deviation
Your professional development	28	2	4	3.43	.690
Your teaching skills	28	2	4	3.46	.693
Your self-confidence/self esteem	28	1	4	3.25	.844
Classroom management skills and techniques	28	1	4	3.21	.738
Students' assessment practices	28	1	4	3.32	.772
Questioning skills and techniques	28	2	4	3.57	.573
Content knowledge and understanding	28	1	4	3.29	.763
Knowledge and understanding of instructional practices	28	1	4	3.39	.737

Note: Valid N (list wise) = 28

Results from Table 4 suggests that the largest impact of lesson study was on the teachers' questioning skills and techniques (M=3.57, SD=0.573). The differences of the means of each items was not much and all items have the mean score of above 3 which indicates that lesson study have better than moderate impact on all 8 aspects of teachers' development. Positive impact on each of the 8 aspects of teachers' development can and may have positive impact on teachers' instructional practices. It can be concluded, from the entries above, that teachers' instructional practices may have been improved as a results of positive development of the 8 items above.

Qualitative Insights into the Impact of Lesson Study on Teachers' Instruction

Based on teachers' responses from the interviews and their journals, evidences suggest lesson study did have an impact on teachers' instructions and these are presented in the following areas.

The Development of Knowledge of Instructions

It was found that meaningful discussion about instructions between teachers and knowledgeable others has a positive impact on teachers' learning and hence to the improvement of their instructional practices. The following interview excerpt is consistent with the 'themes' of discussion above:

They (other group members) asked me how would I explain to students…what would I use to compare between example 3/4 and 3/8. Same numerator but different denominator... I mentioned that I'm going to use fraction chart to show which fraction is bigger. (Teacher A)

The Development of Capacity to Observe Students

In lesson study, ability to collect related data from observation of students' responses towards any components of the teaching of the research lesson i.e. the activities, is vital for teachers not only to assess and evaluate the lesson holistically, but also it's a prerequisite for teachers to revise their lesson plan for the next research lesson. In one of the interview session, Teacher A identified and explained the benefits of observing students' learning in the research lesson:

For me, it is beneficial for teachers, in the first and second research lessons, we can already spot the pupils' problems and weaknesses in learning the topic. We can spot who are high achiever, talk well and do well. It teaches us to observe students…now it's very easy to observe them. (Teacher A)

The Development of Teachers' Belief of Efficacy

It was found most teachers had developed a sense of efficacy; the beliefs that have changed in instructions can affect students' learning. The following responses illustrate that the sense of efficacy amongst teachers and students' learning had changed as a result of alterations in teaching methods:

- *Pupils' learning did change. It allowed them to think by themselves and they expressed their opinions and feelings of their work. (Teacher A's journal)*
- *I changed my teaching methods and affected my pupils' way of learning. They are more responsive, actively involved, communicate and think. (Teachers' D journal)*

CONCLUSION

From the analyses of all the research instruments, four pathways were identified that may lead to the improvement of teachers' instructions during the Lesson Study project.

1. Lesson plan development had broadened teachers' content and pedagogical knowledge.
2. Observing students' learning during the teaching of the research lessons helped the teachers' to be more conscious and sensitive towards students' learning needs and difficulties, and made them more critical in choosing the appropriate and most suitable activities in the lessons.
3. The development of teachers' self-confidence, teaching skills, questioning skills and classroom management skills during the process of teaching research lessons.
4. Comments and feedbacks from peers and the 'knowledgeable others' made them more aware of their weaknesses and strengths of their own teaching.

From this study, the teachers stated that they have gained a lot by observing students' learning during the teaching of the research lesson. Teachers indicated that by observing students' learning during the teaching of research lessons, they have developed a sense of consciousness and sensitivities towards students' learning needs and difficulties. It was also observed that the teachers' self confidence, teaching skills, questioning skills and classroom management skills were largely impacted during the process of teaching the research lesson. Furthermore, the teachers have built their courage to be able to 'perform' in front of peers and 'knowledgeable others'. From the experience of being observed, these teachers have developed a sense of confidence and may lead to positive effects in their subsequent teachings, classroom management and questioning skills.

Finally, the unique features of the reflective stages of Lesson Study helped teachers to assess their general weaknesses and strengths of their own teaching. These comments and feedbacks on students' learning and on their teaching in general were the key ingredient for teachers to realise their weaknesses and strengths in teaching the lessons.

RECOMMENDATIONS

The findings of this study suggested some useful implications for the use of a collaborative learning structure such as Lesson Study specifically in the Bruneian context. However, the qualitative data of the present study only involved the 4 schools. Other groups of the Lesson Study project that focused on different mathematics topics and different level of students were not explored qualitatively. Further researches are necessary to consider the impact of Lesson Study on Mathematics teachers concentrating on different Mathematics topics and different levels of students.

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