Possibilities and Challenges of Applying Lesson Study in Uzbekistan

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Abstract

Lesson Study – this is an increasingly popular professional development method that involves a group of teachers working collaboratively on a jointly planned and prepared research lesson but has received little attention in Uzbekistan. Therefore, in this article, an attempt is made to identify the possibilities of using the Lesson Study program and the local problems in its organization, to clarify the importance of LS, even if it is in the initial form. The participants of the study are three mathematics teachers and two 5th graders, totalling 38 students. The teachers prepare the research lesson and one of the teachers leads the lesson while other teachers observe the behaviour of the students and the lesson. After the first lesson, there will be a discussion between the teachers about the lesson and the students will be asked for their thoughts on the lesson. After the necessary changes and additions based on the suggestions of the participants, the lesson is presented to another group of students at the same level, and the opinions of the students and teachers about the revised lesson are collected again. The results show that the organization of the lesson in the form of LS and conducting the mathematics lesson based on real life examples aroused great interest in the students and had a positive effect on the improvement of the students' mathematics knowledge. Also, it had a more positive effect on the professional development of teachers and meaningful teaching.

Keywords: Lesson Study (LS), professional development, mathematics education.

1. Introduction

The quality and effectiveness of education largely depend on the knowledge and skills of teachers. No country's educational performance can exceed the knowledge and skills of its teachers.[1] Therefore, as the importance of continuous professional development of teachers is increasing, the teaching career is also related to professional development. There are many traditional

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ways to provide professional development for teachers. In particular, the most common methods in Uzbekistan are courses aimed at improving the qualifications of teachers, organization of seminars, introduction to the work of an experienced school or teacher, etc. However, these methods are costly and ineffective. Training and retraining in vocational training institutes are expensive and even then not accessible to everyone. Also, conducting it in isolation from practice and situation (situation) reduces the clarification of the characteristics of problems and deficiencies in education. Therefore, it is necessary to study modern methods and methods and world experiences in the organization and development of education related to practice. One such educational method is Lesson Study.

Lesson Study (abbreviated LS) is a research-based approach that originated in Japanese education in the late 19th century, inspired by ideas such as reflection, collaboration, and classroom practice.[2] Using available evidence, participants collaboratively research, plan, teach, and observe a series of lessons using ongoing discussion, reflection, and expert input to monitor and refine their interventions.

Lesson Study, derived from the Japanese words jugyou for lesson or lecture, kenkyuu for research or study, is a comprehensive concept that includes strategies for improving teaching activities. Jugyou kenkyuu (Lesson Study) involves activities such as observation, data collection, and collaborative analysis of learning and teaching activities in a live classroom environment of a group of teachers.[3]

In teaching and organizing school activities, jugyou kenkyuu is defined as a method of teacher development and cooperation based on observation and criticism of lesson processes. According to reports, the first introduction of this method into Japanese education dates back to the 1890s, when Japanese scholars and educators travelled to the west and were influenced by the teaching methods there, and then created their own teaching methods.[4] Over time, this method was widely studied by Western scientists. In particular, after Stigler and Hiebert's research, LS spread to Europe and the United States. In this study, we will analyze the importance and effectiveness of this method for mathematics, which is widely used.

2. The essence of the Lesson Study method

We can translate Lesson Study into Uzbek as "lesson study". Because of this, teachers who have participated in and observed several lessons in the same subject come together to strategize what the next lessons should be. With this practice, teachers see, discuss and learn from each other how to do lesson activities. Thus, teachers will have the opportunity to analyze in detail all the stages related to teaching the lesson.[5]

Through the lesson research method, teachers' relationships with other colleagues and students have acquired a new dimension. Initially, this practice, without pedagogical or theoretical knowledge, had more of a framework in which teachers observed each other's activities and were aware of different practices. Later and today, the practice of Lesson Study is moving away from the traditional method and becoming more sophisticated. As noted by researcher Dudley, Lesson Study is a program that involves improving learning and teaching activities and synthesizing multiple learnings in a professional sense.[6]

Lesson Study has been used as an in-service training program in schools in Japan for many years. It is a bottom-up professional development approach in which participating teachers plan (research), teach, and reflect on and improve the lesson together. This cycle of improvement of the lesson can be continued until the teachers are satisfied with its quality[7]. Lesson Study is not simply a work that teachers prepare and plan together, but a system or program that integrates teaching and research, theory and practice.[8] This is a scientific activity aimed at improving the quality of education in the classroom, which allows teachers to study the lesson process together and develop professionally together. Another aspect of this is that the participating teachers do not criticize each other, but rather share ideas about what can be done to make the lesson better, more interesting and more effective, and the research continues until the lesson reaches a high, satisfactory level. Therefore, LS is also known as the “problem-solving approach”.[9]

In his Handbook of Lesson Study, researcher Peter Dudley develops the following outline of the Lesson Study process:[10]

One of the most important differences between LS and other professional development methods is that LS focuses on student learning rather than teacher evaluation.[11] Given that each process is co-constructed, LS is similar to action research which leads teachers to seek and learn through collective lesson planning, observation, and reflection.[12] It is an important educational technology that does not have one template and requires local approaches.

3. Importance of Lesson Study in teaching mathematics

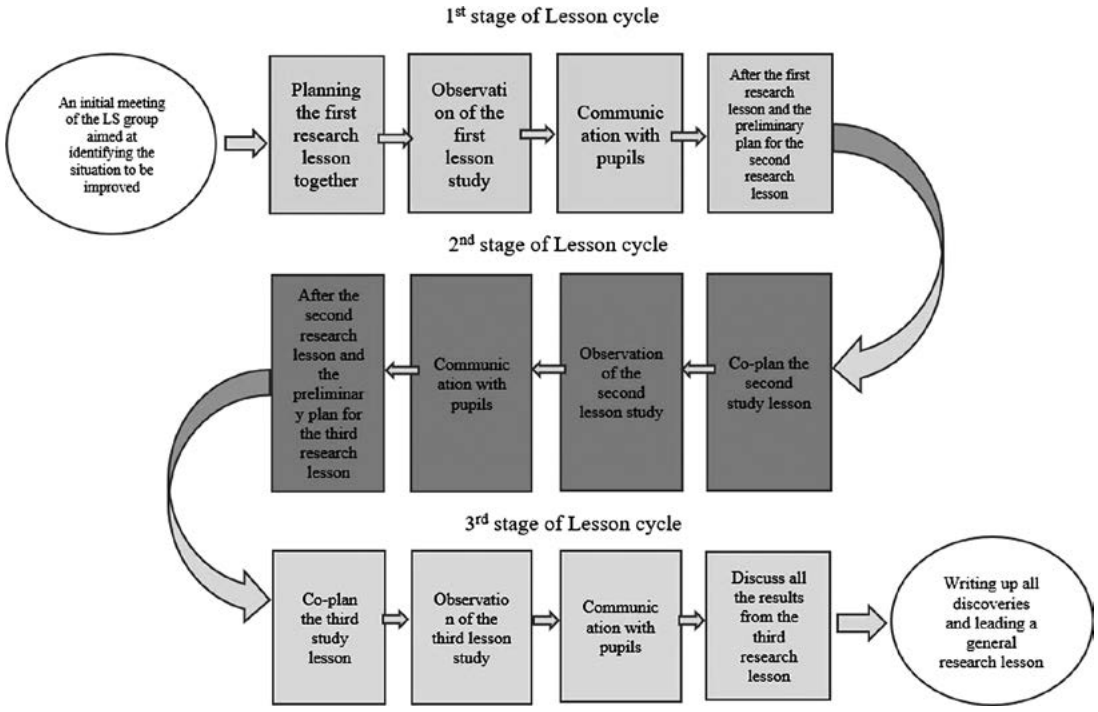
It is known that the science of mathematics is not only a determinant of a person's literacy but also a driver of the development of all fields. Therefore, learning and teaching mathematics is at the center of educational policies, programs and reforms in all societies. Of course, this is not for nothing, because mathematics is the basis of all modern technologies and scientific achievements. Mathematical literacy is an integral element of modern human culture and social and professional competence.[13]

In modern times, many educational technologies for teaching mathematics have been developed and are being improved. LS, which we are studying, is one of the most attractive and effective methods in this regard. After all, since 1999, the interest of educational scientists in LS was directly related to the fact that Japan achieved the highest scores in mathematics in the results of the TIMSS international test.[14] The high indicators associated with the international test results (PISA and TIMSS) later observed in the Far East Asian countries led to the increasing importance of LS in the world today.

According to researcher Masami Isoda, LS is a general theory for developing children who learn mathematics independently in Japan. It involves teaching how to learn, which means developing mathematics on its own. It is the result of over a hundred years of lesson research.[15]

Mathematical calculations in LS focus on problem-solving and provide students with independent work and thinking. This requires teachers to learn and achieve the outcome if the aim is to ensure that students learn/understand/be able to do B through A. Teachers

Figure 1. Lesson Study process



Source: Dudley P. 2014, p. 5.

are encouraged to be teachers who suggest classroom improvements and researchers who analyze children's perceptions. Therefore, the lesson plans are not in a fixed format but instead are developed according to the topic. Because the lessons change from generation to generation, newcomers learn the methods of the old and offer their own approaches, and this cycle continues. Researcher Luce describes it as follows:[16]

In the lesson, there are many opportunities to go through mathematical problems depending on the problems and situations. The important thing is to choose a topic that is appropriate for the problem and the situation. According to researcher Isoda, properly organized LS has 100 percent positive results in increasing students' mathematical knowledge and teachers' professional development.[17]

Other researchers Anake Sudedjamnong, Kittipot Robsuk and others in their research report that LS is a situation- and problem-based approach to conceptually and procedurally influencing students and teachers in mathematics.[18] In addition, Chang and Yee (2013) research showed that teacher collaboration can improve students' mathematical knowledge and teachers' professional development [19] Noparit and Saengpun find that LS is useful in learning fractional numbers.[20] In general, we can see that many studies have shown that LS is more effective in learning and teaching mathematics.

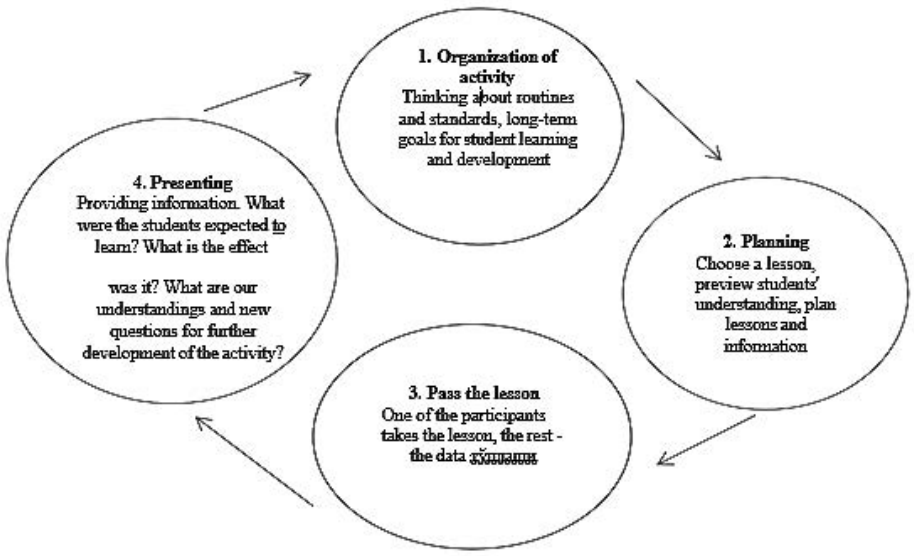
4. Research Methodology

In one of the schools in the city of Tashkent, it was aimed to improve the mathematical knowledge of 5th-grade students using the Lesson Study method and achieve efficiency.

First, a group of teachers consisting of 3 people was selected. In order to teach the first lesson to 20 students in the first group selected, the teachers consulted each other and decided on a topic and agreed on the methods of conducting it. One teacher led the lesson and two teachers participated through video-audio tools and marking (note-taking). After the lesson, there was a discussion among the teachers and after studying the opinions of the students, it was agreed to conduct the second lesson. Methods for conducting the second lesson were agreed upon, taking into account the shortcomings and achievements of the first lesson. In the second lesson, one teacher led the lesson and two teachers observed the process using video-audio tools and marking (note-taking).

The second lesson was organized in another group of 18 people, but the topic was repeated from the first lesson. Students' opinions were heard in the second lesson, and the third lesson was agreed upon after a mutual

Picture 2. The cycle of Lesson Study



Source: Lewis, 2009.

discussion between the teachers. The topic of the third lesson is close to the topic of the first lesson, but a different topic was chosen and conducted in two separate groups. A conclusion was drawn based on the results of the third lesson.

5. Research conduct and results

5.1. First lesson

The number and appearance of the first group of participants: 20 students of the 5th grade of the general secondary school.

Topic: to determine the average height of students in the class: X÷20=X

In the first lesson, the teacher first told the students that mathematics is related to our lives and the importance of mathematical calculations in solving problems in our daily life. After that, the students were given the task of determining the average height of the class by measuring their own height.

Students began to measure themselves with a ruler of 20 and 40 sm to complete this task. Each student recorded their height in meters, then all students wrote their height in meters on the board and then added them all up. He tried to determine the average class size by dividing the total number by the number of students. However, readers had difficulty figuring it out. First, when measuring their height, 4 students in the class made an arithmetic error (ie, made an addition error) and corrected their error with the help of their classmates. Second, they had trouble dividing the total number (that is when all the students in the class added their heights) 2915 by 20. That is, when calculating 2915÷20=145.75, students divided 2915 by 20 and calculated 145 and failed to calculate the whole 75. After the teacher's explanation and instruction to add 0 to the remainder to produce this whole 75, the students found the correct number.

Lesson process (45 minutes)

01	Teacher	Dear readers, we can apply mathematics in every situation of our life and being able to apply it helps us to solve problems correctly, quickly and easily. Let me give you an example and solve it. Akmal (name of student 1), do you know how tall you are?
02	Pupil 1	My teacher should be about 1.47 tall.
03	Teacher	Ok, now imagine what is the average height of the class and how do we find it? For this, we need to reduce this formula to X÷20=X, that is, X is the sum of the height of all students, and by dividing it by 20, we need to get the average height of the class. Let everyone measure their height and write it on the board in centimetres.
04	Pupils	Helping each other, the students began to measure their height with 20 and 40 cm rulers.
05	Teacher	Whoever is ready, write it on the board.
06	Pupils	Ready students began to write
07	pupil 9	The student wrote down his height as 124 cm, which made the observing teacher suspicious.
08	Teacher	After the student made a mistake on 9, he began to check that he counted all. As a result, it was found that students 4, student 11, student 16 also made arithmetical mistakes.
09	Pupils	After writing all their heights on the board in centimetres
10	Teacher	He asked to add numbers
11	Pupils	Among them, 2 students started to add up all the numbers, and the rest watched them and wrote that the total was 2915 cm.
12	Teacher	Andy pointed out that this number should be divided by 20 to get the average height of the class, and the student asked for 10. Why do we have to divide by 20?
13	Pupil 10	Because there are 20 students in the class
14	Teacher	Well, that's right, so we'll divide by 20
15	Pupils	2 other students came to the board to divide the total by 20. However, students divided 2915 by 20 by 145 and failed to produce 75 integers. Other students also came to help but could not get all 75 numbers.
16	Teacher	Reminded and explained that you need to add 0 to the remainder to get a whole
17	Pupils	After that, the students came up with the correct number 145.75
18	Teacher	He expressed his thoughts at the end of the lesson

After the lesson, the students were asked about their

satisfaction with the form and content of the lesson. Most of the students (12) stated that devoting the mathematics lesson to such life examples increased their interest in mathematics and that the lesson was easy and fast, while 5 students said that the lesson was a little boring, and the remaining 3 students said that they were hesitant about the form and content of the lesson.

After the lesson, there was a discussion between the teachers. During the interview, the recorded video audio and notes were reviewed and they reviewed the lesson process again and shared their thoughts.

Observing teachers of the first lesson reported the following shortcomings and results:

1st observing teacher: although the lesson was interesting, the students participated more passively. First, it took a long time for one topic, and second, it was not possible to create additional questions during the lesson. This prevented students from expanding their mathematical outlook and thinking. Moreover, all the children were left alone and the teacher could not control them. This created too much noise and inconvenience.

2nd observing teacher: students should be divided into groups of 4-5 students so that they can work with each other in a debate form. Having 20 students work in small groups, rather than working individually or collectively, will also increase student engagement and improve the arithmetic process.

5.2. Second lesson

Based on the behaviour and feedback of the students on the status and results of the first lesson, as well as the discussion of the teachers after the lesson, changes were made to the form of the lesson. The teachers agreed that the revised lesson would be taught again to another group of students (N=18) at the same level.

In the second lesson, the teacher first thought about the role of mathematics in solving problems and issues in our daily life and the importance of being able to apply mathematical knowledge to solve these problems and issues, and gave the students the task of determining the middle height of the class, only this time they were divided into 6 small groups of 3 people: (A+B+C+D+E+F)÷6=X

Students first identified themselves and then the average height of their subgroup. All 6 groups then wrote their average height on the board and added them up. The average height of the class was determined by dividing the added number by 6 (Look at table 1).

(147,3+147+138,3+140,6+143+146,6) ÷6=144,3

After the lesson, the students were asked about the lesson, content and knowledge gained. 15 of the students reported that the lesson was very interesting, they understood the content of the lesson well, and that the lessons in this form served to further improve their mathematical knowledge. 3 students did not hide that the lesson was meaningful and understandable, but they were a little bored.

After the lesson, the observing teachers expressed their opinions on the lesson process and content.

Teacher 1: The second lesson was better. After seeing the weaknesses of the first lesson and changing the content of the lesson, the students became a little more active. According to the first lesson, he worked more on himself and performed arithmetic operations (addition, subtraction, multiplication, and division).

Teacher 2: At first, we had a lesson that took more time than we expected. We estimated that it would take more than 45 minutes for all participants to divide into groups, average their heights, and then sum them up to find a single average height. However, the students were active in this matter and quickly resolved the issue. Therefore, it is necessary to make such issues, that is, the content of the lesson, more complicated. It should be complicated in the next lessons.

5.3. Data analysis and results

In order to analyze the data, both the teachers and the teachers participated in the lessons and observed the behaviour and participation of the students. After the lesson, the satisfaction of the students was asked.

Table 1. The average height of students in groups

Groups	A	B	C	D	E	F	
Average height	442	441	415	422	429	440	
	/3	/3	/3	/3	/3	/3	
	147,3	147	138,3	140,6	143	146,6	

and knowledge was studied, students' interests in the lesson and mathematics were asked. The survey was administered after each lesson and answered the following questions:

1) Was the form and content of the lesson interesting to you?
2) Did the lesson have a good effect on your math knowledge?
3) Do you want the lessons to be conducted again in this form, that is, in the form of life examples?

Answer results

Questions	Number of participants N=38	Answers		
		Yes	No	I don't know exactly
Did you like the form and content of the lesson?	38	31	3	4
Was the lesson good for your math skills?	38	30	4	4
Do you want the lessons to be conducted again in this form, that is, in the form of life examples?	38	33	2	3

From the above answers, we can see that most of the students expressed their interest in the form and content of the lesson, improving and strengthening their mathematical knowledge, and teaching the next lessons in the same way, in a form related to life factors.

After the lessons, the teachers were asked for their opinions on the organization and content of the lesson and their suggestions for the next lessons:

Main teacher:

I had no difficulty in passing the lesson. However, having co-teachers can sometimes make one feel under pressure. At the same time, their help was great in making the lesson meaningful, and I liked the way the lesson was conducted.

The first observing teacher:

The lesson is well organized, but the content is simple. Although determining the average height of the students in the class was suitable for the Lesson Study, it appeared that the students were less mathematically puzzled. It is desirable for students to be more puzzled when solving the problem. Of course, the second lesson was better and more meaningful than the first lesson. However, in the next lessons, it is necessary to add other examples of calculating averages and calculating percentages in a 45-minute lesson. For example, it is necessary to add tasks such as taking the square meters of classrooms, the dimensions of walls or desks, and what percentage of students achieved high scores in some competitions (competitions should be invented). These encourage students to think quickly and make quick decisions and apply their mathematical knowledge more quickly.

The second observing teacher:

I think that the form and content of the lesson were good. After all, it served to enrich the student's ability to apply mathematics in matters related to themselves and their lives. Of course, there will be gaps, but compared to the first lesson, we saw that the second lesson was more meaningful, and had more mathematical developments. So, we can improve the lessons in this form.

After the lessons, teachers were asked about the effectiveness and importance of Lesson Study:

Main teacher:

I think Lesson Study is good and effective. Because, in the preparation of the lesson, there will be an opportunity to receive opinions and suggestions from the partner teachers. In addition, observing teachers can see the shortcomings of the lesson, and in the next lessons, these shortcomings are avoided and the lesson is organized interestingly.

The first observing teacher:

Obviously, Lesson Study is a very good method. First, the teacher comes to the lesson thoroughly prepared. Second, the presence of co-teachers leads students to focus more on the learning process. Thirdly, it encourages the development of communication between the teacher and the students and meaningful lessons. Through lesson study, teachers need to think not only about planning a lesson, but also about researching (Kyozai kenkyu) and creating teaching materials necessary for the planned lesson, effective questioning methods and contents, and imagining children's appearance in the lesson.

The second observing teacher:

Lesson Study serves to enrich the theoretical and procedural aspects of the lesson along with the cooperative organization of lessons. This will lead to the improvement of lessons, students will get better knowledge. Most importantly, it provides professional development. Sometimes we learn what we don't know through our partners and improve the learning process. This serves the development of our activity.

Although the teachers emphasized the high effectiveness and importance of Lesson Study, they discussed the problems and shortcomings in organizing lessons through this method, especially the problems and shortcomings arising from local conditions. The teachers highlighted the following problems and shortcomings in this regard.

Main teacher:

I think there is a lack of teachers who collaborate to teach lessons in the form of Lesson Study. Firstly, there are only 2-3 mathematics teachers in the school. Second, teachers don't have time. Sometimes we can't attract them even for an open class. So, in Uzbekistan, where there are not enough teachers assigned to a sufficient number of subjects, it will be necessary for teachers to form whole school teams and work on lesson studies to improve their teaching, regardless of subject matter, rather than forming teams for each subject. If classes are filmed with video cameras and discussions are based on the filmed lessons, discussions can be held after the class and the children can be checked and discussed.

The first observing teacher:

Lesson Study is a process that requires hard work and patience. Since this is a research lesson, sometimes you have to wait a long time for the results of the research. Unfortunately, not enough work has been done in this regard in Uzbekistan. That's the biggest problem. Because we don't have enough LS methods for every topic. From lesson study of this time, we have learned that the challenges of teaching in Uzbekistan lie not only in the teaching method but also in the curriculum. This is a very important point. In the future, I think it is necessary to link class research to curriculum development in Uzbekistan. Other countries, for example, Japan, China, Thailand, etc. developed methods of teaching fractions, denominators, and arithmetical operations in the form of LS for each subject.

The second observing teacher:

Actually, I recently got acquainted with LS. We have similar open classes but open class is different from LS. As far as I know, in LS unlike an open class, all the co-teachers are actively involved in the organization of the lesson content. In the open lesson, we observed the teaching methodology of one teacher by participating in the lesson and made our own conclusions. While some schools conduct Lesson Study in advance in order to make their classes look better, LS is an activity to pursue the potential of children, classes, and teachers by taking cues from the children and teachers as they are. I mean, LS is still new for us and I think we need to develop it.

6. Discussion and conclusion

In conclusion, Lesson Study has been shown to be effective in numerous research studies. Because this educational technology is aimed at organizing education in a problem- and situation-dependent manner and finding solutions to problems and situations give pleasure to students and teachers. They are active in the lesson and develop their knowledge and skills from lesson to lesson. In particular, the professional development of teachers depends on local conditions. Unfortunately, this educational technology is rarely used in Uzbekistan. Teachers conduct the lesson more theoretically, as a result, students are less able to apply their mathematical knowledge in life. While students enrich their mathematical knowledge through extra lessons and tutoring, teachers develop their professional knowledge and skills through seminars, courses or special training. But improving both students' and teachers' knowledge and skills in this way requires additional time and money, and not everyone can do it.

Therefore, it would be desirable to introduce Lesson Study teaching widely, at least initially, to make it widely used in mathematics education. Of course, it is necessary to conduct more scientific research on this. In particular, it is necessary to research and discover local approaches to the technologies and methods of teaching complex mathematical knowledge such as fractions, equations, denominators, and remainders through LS.

In general, Lesson Study is an important educational technology that always needs to be researched, but it does not lose its importance. Studying and implement-

ing it is especially important in the further development of mathematics, in improving mathematical knowledge and skills, in a word, in professional development.

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Possibilities and Challenges of Applying Lesson Study in Uzbekistan

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Lesson Study, an increasingly popular professional development method that involves a group of teachers working collaboratively on a jointly- prepared research lesson, has received little attention in Uzbekistan. This research hopes to identify the potential for using the Lesson Study program while taking into consideration local problems in its execution; this should clarify the importance of LS, even at an initial application. The participants of the study are three mathematics teachers and two 5th graders, totalling 38 students. In the LS exercise, one teacher leads the lesson while the other teachers make observations of student behavior and lesson methodology. After the first lesson, the teachers discuss the lesson and students are asked for their opinions regarding it. Changes are made based on the discussion and suggestions, and a new lesson is presented to the next group of students at the same level with the same follow-up discussion and opinion gathering afterwards. This research shows that utilizing LS for a mathematics lesson with real life examples arouses great interest in the students and renders a positive effect towards the improvement of the students' mathematics knowledge. Additionally, LS experience proves a positive tool for professional development; most teachers found the exercise meaningful.

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