

Implementation of the lesson study approach to develop teacher professionalism

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Abstract

The education system should be designed to help in the preparation of individuals for life in the 21st Century. The purpose of this study is to use the Lesson Study approach in studying the geography of the updated content, to improve the professional competencies of teachers based on the results of students' perception levels. The research methods used included observation, experiment, interview, statistical analysis, comparison, and synthesis. The results exhibited that the Lesson Study approach can be used in improving the professional competencies of teachers and increasing the quality of teaching. The main provisions and conclusions obtained in the scientific article can be used to improve teachers' pedagogical skills in the context of the updated education content.

Keywords: content update; educational process; Lesson-Study; pedagogical approach.

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1. Introduction

In the 21st century, when scientific and technical processes are moving forward, there is a need for artistic and creative individuals who can think outside the box and make drastic decisions (Sawyer, 2019; Gibson & Ewing, 2020; Chae, 2021). This should be facilitated by an education system designed to help in the preparation of such individuals. This aspect is typical for the modern school system of Kazakhstan, which has already completely switched to the updated content of education, to innovative forms and methods of teaching and upbringing, searching for modern management models in the management of the educational process.

There is no doubt that in this situation the key figure in the reform of education is the teacher (Chen, 2019; Riga, Ioannidi & Papayiannis, 2020). Responsibility for projecting and organization of educational process that meets the requirements of modern educational standards, the tasks of typical curricula, and the goals of learning in each subject area falls on his shoulders. Implementation of the idea and the philosophy of the updated content of education requires to change the forms, methods, and standards of training, re-education, and proficiency enhancement of teachers in higher education and institutions for advanced training and personnel development. One of the solutions in this direction, in our opinion, is using the Lesson-Study innovative technology as a means of developing the professional competencies of teachers (Akhmetova, 2000; Galiakhmetova, 2016; Taubaeva, 2016; Mukhitdinova et al., 2020).

The Lesson Study pedagogical approach originated in the 1870s in Japan to improve school practice. In 2007, Lesson-Study gained its fame and popularity when the Japanese scientist Makoto Yoshida presented it in the United States of America (USA) and Great Britain. Today, this approach is used very successfully in Singapore, Hong Kong, Sweden, Canada, the USA, the UK, and other countries. The "Lesson Study" method is being gradually introduced into the system of modern education in Kazakhstan (Groves & Doig, 2010; Dudley, 2011a;2011b;2013).

One of the characteristic features of the Lesson Study method is reflection, which makes it possible to improve professional competence, the desire to make the process more prominent, systemic, and realizable in cooperation with colleagues. As world experience shows, the use of Lesson-Study technology is very effective when used to improve teaching methods and increase the level of student's knowledge in the key subjects in primary and secondary schools, as well as to develop conceptual pedagogical approaches, including assessment for learning.

Using the Lesson-Study technology to increase the professionalism of teachers contributes to some key competencies:

- mastering modern teaching methods and technologies in the educational process;
- developing the ability to work in a team;
- developing the ability to predict and diagnose learning outcomes;
- understanding the difference between what, in their opinion, should happen during learning in the lesson, and what happens in reality (Guskey, 2002; Hollingsworth & Oliver, 2005; Doig, 2009; Garbin et al., 2021).

Significantly, Lesson Study is also aimed at improving knowledge in the field of pedagogical practice, which is a special object of activities research at the lessons. This cycle includes at least three sessions: planned, taught, controlled, and analyzed. Using Lesson Study it is possible to organize pedagogical research and measurements, conduct classes on a democratic basis, thereby influencing the quality of teaching. By the Lesson Study approach, you can see the mistakes of students and teachers, understand how to avoid them, and improve the quality of teaching (Doig et al., 2011; Petkova et al., 2020; Elmira et al., 2021; Stambekova et al., 2021).

At the first stage of implementation, the LessonStudy technology is made up of a group of teachers (preferably of three people), who are interested in introducing a new modern teaching methodology/technology, with at least one representative of the group having a significant pedagogical experience.

At the second stage, a meeting of the group members is held to determine jointly the expected results of introducing a new modern teaching method/technology and establishing a positive psychological attitude of the group members.

The third stage is the direct activity of the group members. It is aimed at mastering a new modern teaching method/technology.

At each stage, the group members must:

- jointly to plan a lesson using a new modern teaching method/technology;
- to conduct a planned lesson and observe during it the activities of three “researched students”, each of whom is a typical representative of a certain group of students in the class. For example, to observe the activities of a weak, medium, and strong student at the lesson (observation of this category of students should be as complete as possible, with fixation of the results of observation throughout the lesson). Teachers-participants of the group should distribute responsibilities among themselves before the lesson (who will conduct the lesson and who will only watch);
- jointly to analyze the lesson, to discuss what was successful and what was not, to think about the successes and failures of the observed (weak, medium, and strong) students.

At the fourth stage, there is a process of joint planning, conducting/observing, and analyzing the second lesson, but taking into account their personal experience of the first lesson.

At the fifth stage there is a process of joint planning, conducting/observing, and analyzing the third lesson also using a new modern teaching method/technology, but already taking into account his/her personal experience of the first two lessons.

At the sixth stage, the group members present their results on using a new modern teaching methodology/ technology to their colleagues to introduce it into pedagogical practice.

The form of presentation can be different, conducting an open lesson or presenting the results on the work done.

Essentially, LessonStudy is a collaborative approach to educating teachers and developing their teaching practices. Collaborative teaching is a philosophy of interaction based on mutual respect, revealing the ability of the participants and determining the personal contribution of each of the group members. The basic premise of collaborative teaching is based on consensus building through collaboration among group members (Doig et al., 2011; Elmira et al., 2021; Stambekova et al., 2021).

1.1. Purpose of study

The purpose of the study was to determine the problem of research at the lesson as an innovative technology for the development of professionalism of Lesson-Study teachers at the end of the work. Tracking the data of the three academic terms, it could be noted that the result was achieved, although insignificant.

2. Materials and Methods

2.1. Data collection instrument

This study collected data using an experiment, Observation, and interview. The participants were surveyed with the interview, made together with the school psychologist.

2.2. Participants

The research was carried out in the secondary school-gymnasiums №2 and №9 of Taldykorgan city (the Republic of Kazakhstan). The project involved 29 students at the age of thirteen, of which 15 were boys and 14 were girls.

2.3. Procedure

Let us consider the implementation of the Lesson Study approach, which we introduced in the academic years 2019-2020 (from September 1, 2020, to March 15, 2020) on the topic: "How creative and problematic level tasks of a high and low order contribute to the development of functional literacy of students at studying geography in grade 8".

At the beginning of the experiment, the majority of students had low motivation to achieve learning goals, insufficient preparation of students for lessons. The quality of education was 58.6%. A group of teachers consisting of creatively working geography teachers (Aidarkhanov Ayan - moderator, Aidarkhanov Tileubek - menti, Yerkenova Tolkyun - menti, Abukhanova Azhar), having studied literary sources started planning a series of consecutive lessons.

They jointly developed methods and forms of feedback with students, selected three "study" groups of students who were typical representatives of a certain group of students, i.e. *strong* - A, *medium* - B, *weak* - C. Students with good grades in school, who can improve academic performance to the level of an excellent student, students with average ability and students with low motivation in all subjects. In the future, attention was paid to the training and development of these three students. Continuing the study with these three categories of students, to determine the individual qualities of each student, attention was paid to personal qualities associated with such behavioral qualities as attention to classes, activity, and temperament. These students were surveyed with the interview questions, made together with the school psychologist.

3. Results

The results of the survey are presented in Table 1.

Table 1

The results of the survey to identify the personal qualities of students of categories A, B, C.

Level	Interest (20)	Ability to complete tasks (20)	Assurance (20)	Intelligence (30)	Overall score (100)
A	19	19	17	27	82
B	17	15	11	22	65
C	11	11	7	15	44

Summing up the results of this survey, we determined that "A" level students, when answering the interview, are recognized as a leader who has high motivation for learning, are confident in completing the assignment, and are self-confident. The interest of "B" level students makes it a little difficult to learn and accomplish the assigned task and requires improving leadership skills. Students of "C" level have low interest, resort to the help of other classmates in completing the task, i.e. need help and support from adults in completing the task indicated in the textbook.

The experiment summarized evidence that students' interest in geography subjects increased during the learning process. This was facilitated by assignments for critical and creative thinking. The educational process was accompanied by photo and video filming, interview, formative assessment. Defining the problem of the research at the lesson as an innovative technology for developing the

professionalism of Lesson-Study teachers, that is, critical thinking, we observed that they achieve the desired results only in cooperation.

The group was monitored by a level 3 teacher, who in turn is a Level 1 Mentor Leader. We observed teachers' collected data on the students assigned to them. After each practical lesson, they discussed the conducted lesson, made changes to the course of the next one, taking into account the point of view of the observed students.

In the course of the study, the teachers saw what obstacles arise for students, and that not all students understand what the teacher requires, specific goals are not set, goals are not set at each stage of the lesson, it is necessary to distribute roles in a group, to voice the time for completing each task so that work in the group was well-coordinated.

Previously, permission from students' parents was taken to participate in the research, such as interviews, videos, and photography. During the pedagogical experiment, 12 consecutive lessons in geography with built-in elements in 6 modules of the geography of the 8th grade according to the updated content were conducted.

The topic "Processing and analysis of geographic data" was discussed in the first lesson. Multilevel tasks for understanding, application and analysis were given following Bloom's taxonomy for students of levels A, B, C.

Task 1. Explain the meaning of geographic models in the study of natural and economic objects based on the knowledge gained. Find the difference between the main types of information and natural models.

Task 2. Describe the meaning of geographic models and space images in the study of natural and socio-economic phenomena and processes. Substantiate the proposed answer to the task on the example of the analysis of the map of the Aral Sea (1973) and satellite images of 1999 and 2012 (Figure 1).

Figure 1

Map and satellite images of the Aral Sea



Task 3. Prove the meaning of models of natural and special systems for studying the patterns of formation of natural processes and phenomena. Give examples.

A summative assessment of knowledge of the subsection "Atmosphere" for students of A, B, C levels, high-level control test tasks with one and several correct answers was proposed, which make it possible to determine the level of formation of solving geographical problems to reveal the patterns of atmospheric pressure distribution at different heights above the sea level and requiring calculation of the moisture coefficient at different latitudes.

Task 1. The amount of annual precipitation entering Balkhash is 150 mm, with a moisture coefficient of 0.15. Determine the vaporability of the given city

- A. 1000 mm
- B. 960 mm
- C. 970 mm
- D. 1100 mm
- E. 1050 mm

Task 2. If the atmospheric pressure at the sea level is 760 mm Hg then in Aktau city at the bottom of the Karakiya bowl, near the coast of the Dead Sea will be mm Hg.

- A. in Aktau city 762,8 mm Hg
- B. in Aktau city 772,8 mm Hg
- C. in Aktau city 767,2 mm Hg
- D. near the coast of the Dead Sea 790,3 mm Hg
- E. near the coast of the Dead Sea 800,3 mm Hg
- F. at the bottom of the Karakiya bowl 763,2 mm Hg
- G. at the bottom of the Karakiya bowl 783,2 mm Hg
- H. at the bottom of the Karakiya bowl 773,2 mm Hg

The students of the "A" level answered correctly when completing the test tasks. The students of "B" level completed the first control test correctly, but in the second of the three correct ones, they made one mistake. The students of the "C" level were unable to complete the high-level tasks. As a result of observation of the students participating in the experiment, certain conclusions can be drawn. So, "A" student copes with the tasks of the lesson, independently performs tasks of a high order, but does not have time to complete them, because he sometimes looks for complicated ways of solving, knowing simple ways. He is interested in the process of solving problems, and not in the evaluation itself. As a speaker, he is worried, confused about the answer, although he is well aware of the educational material. He sees his problem in his inability to express thoughts out loud.

Therefore, the teachers decided to change conditions for him and offered to try himself as a teacher. All observed students sat in one group in the last two lessons of the series. The "A" group students were given the following task: to explain the patterns of formation of lessons on the example of the tornado and tropical cyclone to students of "B" and "C" groups. He completed this task in full. During the interview, he said: "I need to work on my speech, vocabulary." This study showed how the cognitive and social self-regulation of the observed students develops. Collaborating in a group on solving the problems of the lesson, performing partner roles in the group (he was both a leader and a speaker), students with classmates analyze their actions and draw conclusions, and immediately note that they want to change.

The observed students of "B" level, listened attentively to teachers and classmates at the lesson, actively responded during the frontal survey, and also participated in the discussion of educational problems. They willingly took on the role of a leader, a speaker, they know how to organize the work of the group, but they take on tasks of low, medium levels, they successfully cope with them. They reduce their activity when performing complex problematic and creative tasks requiring analysis, synthesis, generalization, and evaluation because they know that the fulfillment of these levels guarantees them a grade of "4". This experiment showed that students trust their classmates, who are more erudite in geography than them. Level B students had some difficulty in the subject, accepted and understood the instructional information that level A students explained to them. The control test brought them a successful grade.

Level C students from the category of "weak students" performed tasks with difficulty. Performing tasks in the lesson, they constantly look back at their classmates searching for an object for cheating, they cope with reproductive tasks with support. For example, they used the reference book

and the glossary of the textbook to explain the concepts of "atmospheric front", "cyclone", "anticyclone". At the same time, they searched for information, wrote it down, arranged it in the form of a scheme under the dictation of the group members, listened, but did not take on the role of a leader or speaker. Students of "A" level participating in the experiment felt comfortable working in a joint group with "B" and "C" level students, as they know geography better, are interested in this subject, perform high-level problematic and creative tasks and reveal the patterns of hurricane formation using the example of a tornado and Katrina in North America.

During the study, the group mentor identified the number of questions, tasks of high and low order, based on Bloom's taxonomy. The calculation data are presented in Table 2 and Figure 2. The observer decided to look at the "C" level students in other subjects. The students were active at the lessons of the humanitarian direction, where they answered the teacher's questions. In interviews, the "C" level students said that they have difficulty in geography subject. For these participants, individual problematic and creative multilevel tasks of a cognitive nature were compiled to adapt to the subject that caused them complete denial.

Table 2

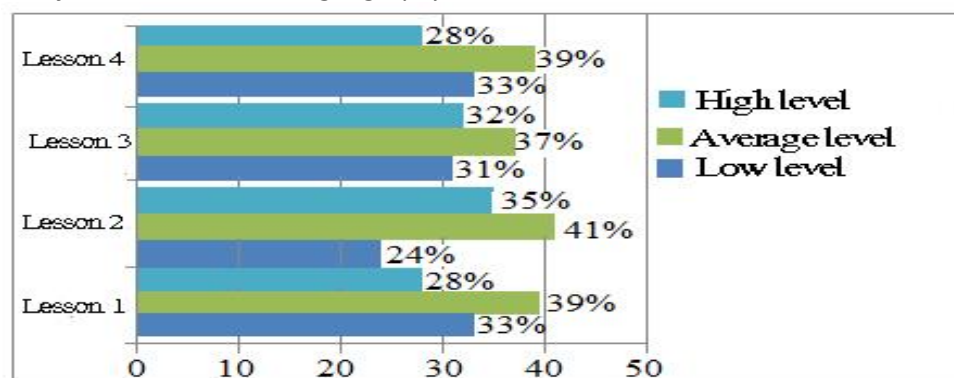
The number of tasks on Bloom's Taxonomy in the 8th grade at geography lessons

№ lesson	Total questions / tasks	Low level of knowledge	Average level		High level		
			Under-standing	Application	Analysis	Synthesis	Assessment
1	18	7	3	3	2	1	1
2	17	4	3	4	3	1	2
3	19	6	4	3	2	3	1
4	18	6	3	9	3	1	2

As you can see from the data, the distribution of high and low-order tasks is uneven. The teacher fills the lesson with tasks of a high order by reducing the number of knowledge tasks (at the 2nd lesson - 2 tasks), understanding (at the 3 lesson - one task). Low-order questions (knowledge, partly understanding) provide students with basic knowledge to solve higher-level questions. Students are shallowly wrapped up in the topic to "master" the material.

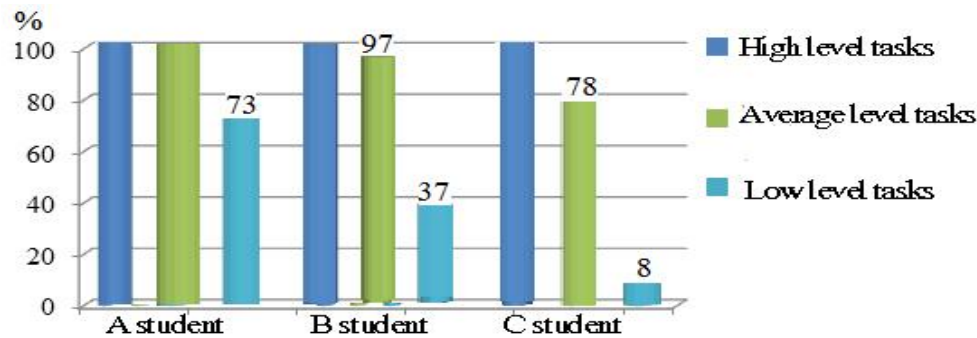
Figure 2

The share of multilevel tasks at a geography lesson



A quantitative and qualitative analysis of the performance of all tasks by the observed students during a series of lessons, performed by the group teachers together with a mentor, determined the quality of the performance of multilevel tasks (Figure 3).

Figure 3
The quality of level tasks



By strengthening the students' ability to understand deeply the meaning of a topic, you can teach how to observe and compare, interpret and analyze, assess the situation, and make a decision. In such conditions, students' critical thinking develops. All three observed groups coped with the low-order tasks, the students "A", "B" completely coped with the tasks of the middle order, the students of the "C" level partially coped, the students of the "A" level coped with the majority of the higher-order tasks, the "B" level students tried to fulfill them, students of "C" level did not even take them.

When Logging in and Out of Lesson Study, the students received the following task: "Imagine the situation: your classmate is preparing for the test, think of 5 questions on the topic of the lesson to test his knowledge." The students worked individually. The results of the work are summarized in Table 3.

Table 3
Logging in and Out of Lesson Study

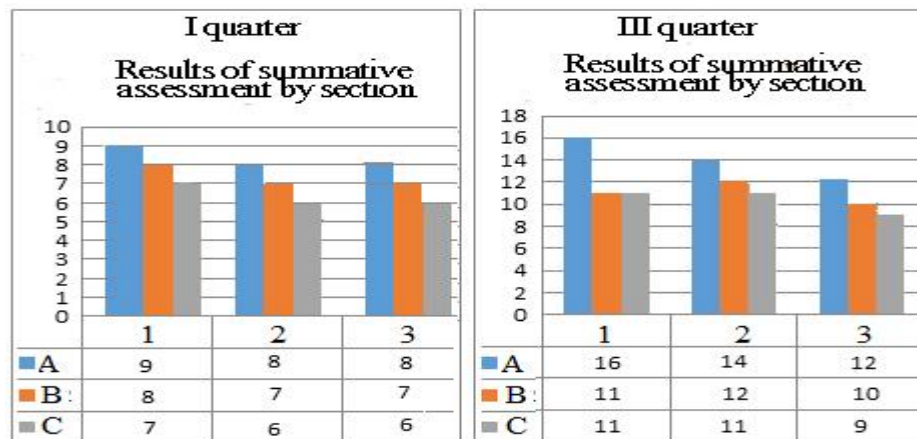
Levels	Logging in Lesson Study				Out of Lesson Study		
	Total Questions	High level	Middle level	Low level	Total Questions	High level	Middle level
A	6	2	3	-	4	2	-
B	6	1	3	1	2	3	-
C	5	-	2	3	1	3	1

According to the results of summative assessment in 3 sections of the first and third terms, you can see a noticeable increase in learning outcomes. The analysis of the results showed that the quality of education at level A increased by 39%, at level B by 28.5%, level C by 37% in the third term in comparison with the results of the summative assessment of the three sections for the first term.

So, teachers gained invaluable experience in projecting lessons for the development of critical thinking for students, came up with a new problem - teaching students to ask and answer questions of a high and low order, to model such tasks and questions first by themselves, and then to teach this skill to students. (Figure 4).

Figure 4

Indicators of the results of summative assessment in the section for 1 and 3 terms of students of levels A, B, C

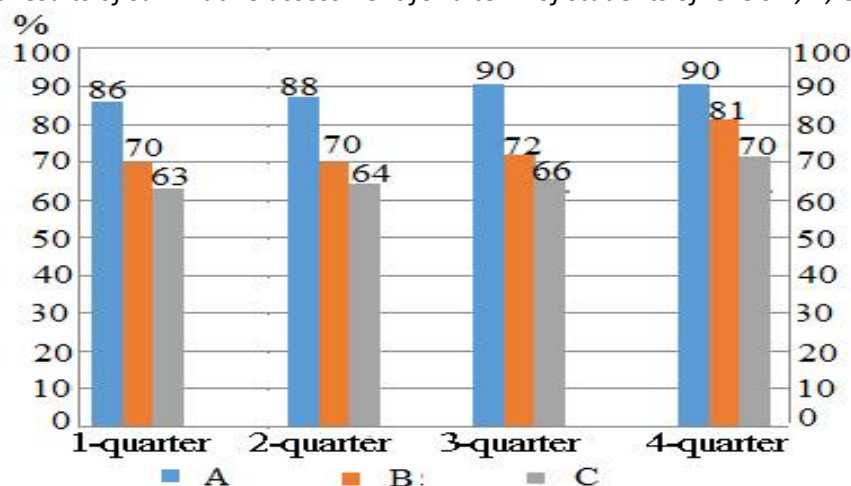


The participants prepared for classes at home took preliminary tasks from the teacher; it was evident how responsible they were in the activities that the teachers of the group suggested to them. According to the results of summative assessment in 3 sections of the 1st and 3rd terms, you can see a noticeable increase in learning outcomes (Figure 4). The analysis of the results of Figure 3 showed that the quality of education for a student of level “A” increased by 39%, “B” by 28.5%, “C” by 37% in the fourth quarter in comparison with the results of the summative assessment of the three sections for the first term.

The analysis of the summative assessment for the terms shows improvement in the quality of education of the 8th-grade pupils participating in the experiment (Figure 5). According to Figure 5, the quality of education at level A increased by 4% and amounted to 90%, level B by 11%, level C by 7% in 3 terms in comparison with the results of the summative assessment for the first term.

Figure 5

Indicators of the results of summative assessment for a term of students of levels A, B, C



4. Discussion

At the end of the lesson study, the group members decided to continue studying the lesson on the identified problem “How do high and low-level questions and tasks contribute to functional literacy and critical thinking?”. Teachers revised their methodological arsenal, supplementing it with

techniques and strategies of critical thinking, understood the meaning, the role of high and low order questions for the development of students' critical thinking at the lessons. This study, therefore, helped in developing the lesson study approach of teachers for professionalism. This result corroborates with that of Copriady (2013) and also that of Gunawan (2018).

The school staff team took interest in and supported the Lesson Study approach. The collaborative environment created in the creative group showed teachers the ability of the teacher community to take concrete actions to a practical understanding of new approaches to projecting a modern lesson in the «teaching-how-to-learn» paradigm. When implementing Lesson Study in practice, the level of formation of students' critical thinking skills was noted in the following actions:

- students have formed different points of view, they have learned to defend their opinion fully; learned to be critical of everyone (Ilyashenko et al., 2019; Dagnev & Mekonnen, 2020);
- learned to respect each other, make suggestions, listen; students learned to discuss jointly the problem encountered and come to a common decision; learned to appreciate each other and respect the opinions of group members.

5. Conclusions

The described stages of realization of the Lesson-Study technology are classic, they can be carried out with some changes depending on the specific school. Subject teachers working on the Lesson-Study technology adapt new scientific ideas, principles, and pedagogical technologies, to the conditions of a specific educational institution, which is engaged in innovation and implementation activities.

In this way, Lesson Study helps teachers improve: by jointly planning, jointly observing, making changes in lesson planning in the mid-term planning cycle, they form a joint view of learning. Teachers were able to see a specific student, his difficulties, opportunities, and not just the general overview of the class. Lesson Study experience helped build a professional teaching community.

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