Benefits, Difficulties and Conditions of Lesson Study Implementation in Basic Teacher Education: A Review

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Abstract

The purpose of this study is to review the effectiveness of the implementation of the lesson study in higher education through the review of 28 empirical researches conducted both in Greece and the world over the past decade (2008-2018). In particular, the benefits, the difficulties and the conditions of effective implementation of the lesson study are examined. The lesson study is a method of improving teaching and learning for students and teachers. The results of the research revealed that the development of co-operation, reflection and professional development of preservice teachers are seen as important advantages due to the implementation of the lesson study. The preparation time, the tensions and the stress resulting from the monitoring of the teaching of their fellow students are mentioned as main difficulties, while participation and cooperation of preservice teachers and their support by trainers are seen as necessary conditions for its successful implementation. There is also a need for further research on the implementation of the lesson study in higher education, mainly in Greece, compared to the international field.

Keywords: lesson study, teacher professional development, higher education

1. Introduction

The continuous professional development of teachers, starting with their university education, is a prerequisite for upgrading the educational project. In order to achieve this goal, students' theoretical study programs should be modernized and implemented practically and effectively in the classrooms (Rekalidou, Karadimitriou & Moumoulidou, 2014). Several researchers however, highlight the gap between curriculum theory and teaching (Juhler, 2018) and emphasize the importance of lifelong teacher education (Saito, 2012) to improve their theoretical and practical training.

Programs for a constructive approach can contribute to the effective professional development of future teachers, as constructivism is considered an appropriate framework for their education. Teachers find the positive impact on their pupils' perceptions and their own teaching skills, increasing their confidence and improving their teaching (Gordon & Debus, 2002; Dejene, Bishaw & Dagnew, 2018).

Several researchers also highlight the importance of co-operation between learners and between trainer and trainees, the value of interaction within the group, and the importance of reflection in their education (Rekalidou et al., 2014). With it, preservice teachers can collect information, process them within their group and use them appropriately in their teaching (Saito, 2012).

An effective program of professional development of future teachers, which is based on constructivism and can narrow the gap between theory and practice is a lesson study (Wessels, 2018; Rekalidou et al., 2014). The review of international and Greek literature shows that several studies have explored the contribution of the lesson study to improving student learning and professional development (McDowell, 2010; Levy & Hourigan, 2016; Dania, Voutsina & Moumouri, 2013) as well as to the formation of more positive attitudes and beliefs of participating preservice teachers (Carroll, 2013; Post & Varoz, 2008; Juhler, 2018). In addition, several studies have studied the advantages of the lesson study, while fewer have dealt with the difficulties in implementing it (Hamzeh, 2014; Lucas, 2014; Burroughs & Luebeck, 2010) and even fewer researches have explored the conditions for its effective implementation in higher education (Molina, 2012; McDowell, 2010).

The purpose of this study is to investigate the contribution of the lesson study to the preservice teachers by analyzing the relevant researches carried out during the last decade to draw useful conclusions, identify any gaps that may exist

and make suggestions for further research.

2. Lesson Study: Theoretical Approach

The lesson study which was first implemented in Japan is a teaching method in which teachers, in a climate of cooperative and constructive dialogue, plan, teach, observe and evaluate the results of a lesson in a classroom (Espinosa, Datukan, Butron & Tameta, 2018). With this teaching practice based on constructivism, dialogue between teachers is enhanced, participatory learning and educational reflection are supported. Improving teaching for the benefit of trainees and enhancing the professional development of teachers (Giannakidou, Gioftsali, Tzioras, 2013).

In order to carry out the lesson study, a team of teachers of the same specialty collaborates to design and teach a research lesson over a period of 10-15 hours in three to four weeks (Fernandez, 2002). It is distinguished in the following stages: a) setting goals, b) planning the research lesson, c) teaching, observing and data collecting of the research lesson, d) evaluation - feedback and re-teaching, and e) reflection, formulation and sharing final results (Stepanek, Appel, Leong, Mangan & Mitchell, 2007).
In particular, teachers who teach the same subject in a school unit by expressing their views freely and through a fruitful and creative dialogue all co-create a common understanding of teaching the research lesson that a member of the group will carry out in the classroom (Lewis & Hurd, 2011). For its planning, teachers analyze students' way of thinking and co-decide the most appropriate teaching methods and techniques. Also, at this stage, the teaching activities that students will perform are determined by the teachers, while estimating and commenting on their possible reactions and responses to each of them (Dania et al., 2013). The individual experiences and ideas of the participating teachers are tested in practice, are controlled and adopted, rejected or modified. This process motivates teachers to create a rich and well-structured lesson (Espinosa et al., 2018).

Teacher learning in the context of the lesson study results from the observation of the way the research lesson is taught by a group teacher, from the processing of data concerning the trainees' learning, which are collected during the course, as well as from the evaluation - feedback and reflection that contribute significantly to the improvement of the lesson itself as well as to the professional development of teachers (Stepanek et al., 2007). The results from the implementation of the research lesson are then communicated so that other teachers interested in the lesson study can get data and implement them (Murata & Pothen, 2011).

The lesson study combines theoretical and practical learning and promotes high quality learning through high quality teaching. Improving the professional knowledge and skills of teachers enables them to be distinguished as teachers by providing high quality teaching to learners, giving the latter opportunities for meaningful acquisition of knowledge (Nishimura 2016; Wessels, 2018). Also, the lesson study enhances the critical thinking of learners through team and cooperative teaching, which activates their various skills and competences and improves their learning (Darling-Hammond & Richardson, 2009).

The time required to complete all the stages of the lesson study and the lack of willingness to cooperate with teachers are the most important difficulties for its implementation (Lenski, Caskey & Anfara, 2009). Also, another difficulty mentioned in implementing the lesson study is the lack of familiarity of teachers with other colleagues attending their teaching, which creates additional stress (Rekalidou, Moumoulidou, Karadimitriou, Mavrommatis, & Salmont, 2013).

The prerequisites for the successful completion of the lesson study are the voluntary and equal participation of teachers and enhancement of collaborative culture among them, based on honest and two-way communication (Lewis, Perry & Hurd, 2004).

3. Purpose and Research Questions

The purpose of the present study is to investigate the effectiveness of the lesson study on the continuous improvement of the basic education of preservice teachers in higher education, through the analysis of 29 researches from Greece and internationally which took place during the last decade (2008-2018). In particular, this study investigates: a. the benefits, b. the difficulties and c. the conditions of effective implementation of the lesson study in basic education of preservice teacher in higher education.

Indicative questions put to the investigation and which the research will attempt to answer are the following:

1st: Are there benefits from implementing the lesson study in basic education of preservice teacher in higher education?

2nd: Are there difficulties in implementing the lesson study in basic education of preservice teacher so as to influence their intention to use it? If so, which?

3rd: What are the conditions and procedures for the effective implementation of the lesson study in basic education of preservice teacher?

4. Method

Research was conducted in accordance with the following criteria listed in Table 1.

Table 1. Selection criteria for investigations

Selection criteria for investigations	
Research questions	(a) Are there benefits from implementing the lesson study in basic education of preservice teacher? (b) Are there difficulties in implementing the lesson study in basic education of preservice teacher so as to influence their intention to use it? If so, which? (c) What are the conditions and procedures for the effective implementation of the lesson study in basic education of preservice teacher?
Geographical distribution	Universal
Year of publication	2008-2018
Language	Greek, English
Type of research	Empirical

Figure 1 shows the flow diagram of the methodology followed in this bibliographic review.

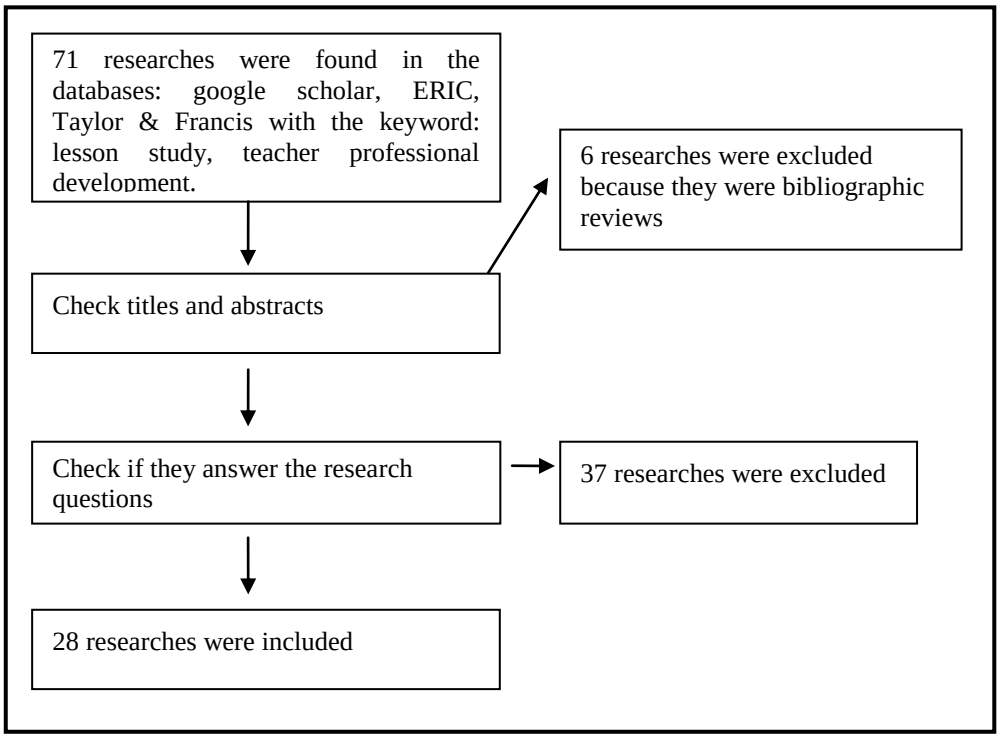

Figure 1. Flow diagram of the methodology

5. Results of the Research

The results of the research contain data on the number of studies researched per year, their country of origin, the type and the size of the sample of surveys. Also, the results of this research are presented in tables per research question.

Figure 2 shows the number of researches per year.

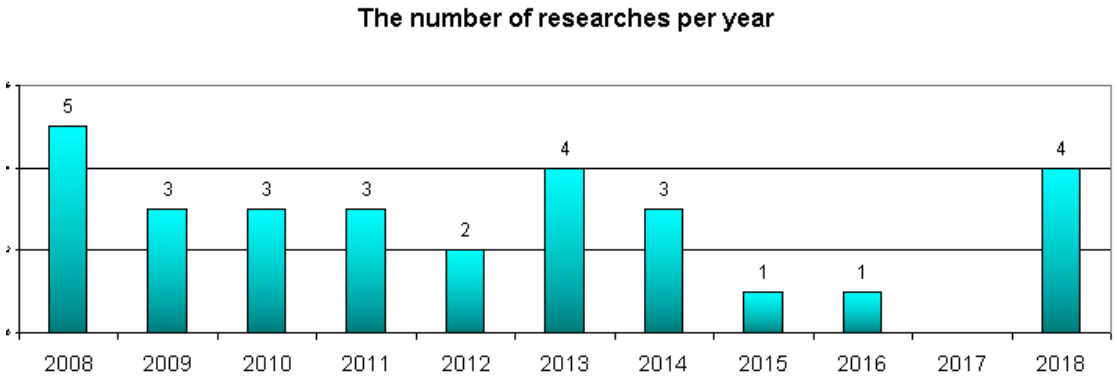

Figure 2. Number of researches per year

Figure 3 shows the number of researches in Greece and internationally.

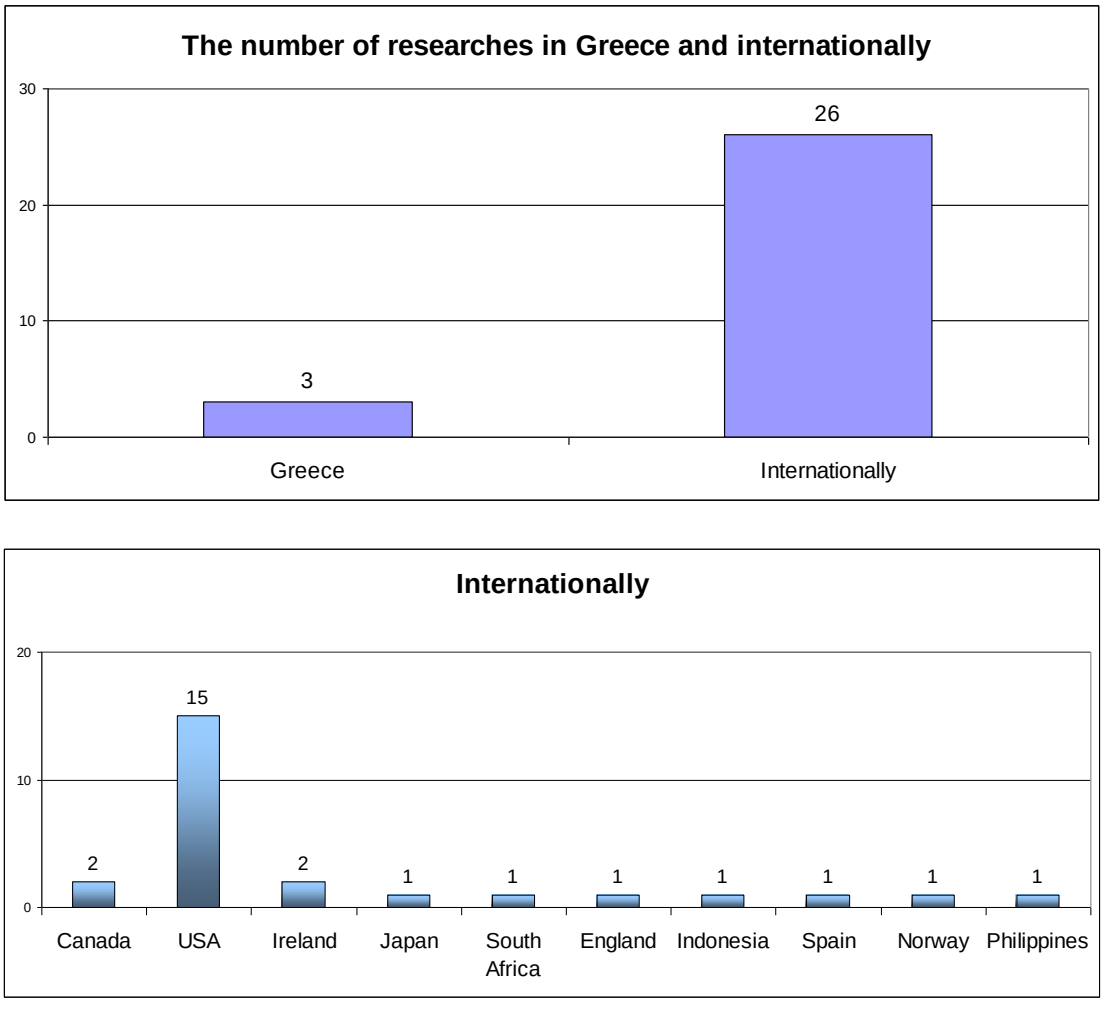

Figure 3. Number of researches in Greece and internationally

Figure 4 shows the number of researches per type.

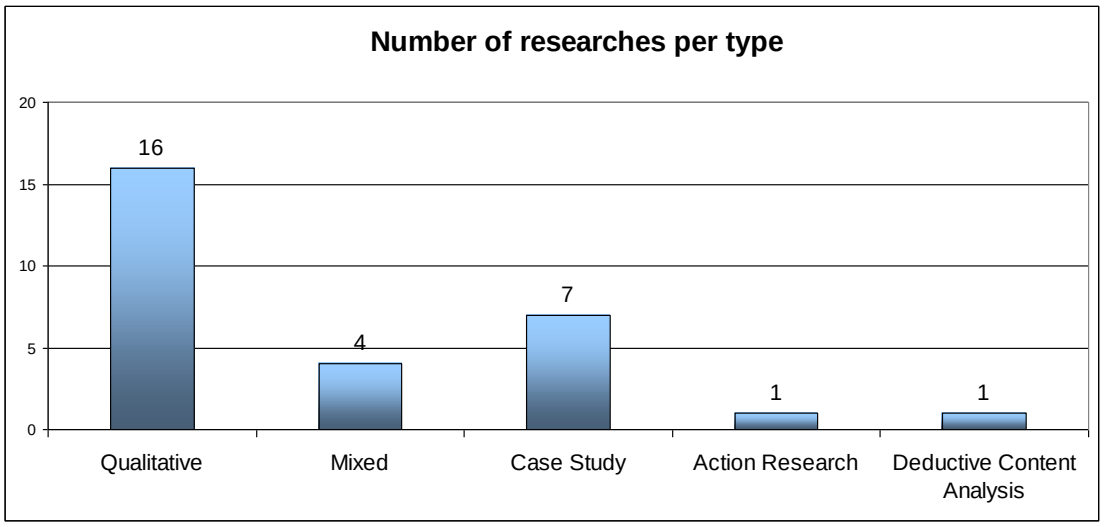

Figure 4. Number of researches per type

1st Research question: Are there benefits from implementing the lesson study in basic education of preservice teacher in higher education?

Table 2 summarizes the main findings of the researches examined regarding the benefits of implementing the lesson study in higher education.

Table 2. Benefits of implementing the lesson study in higher education

Researches in higher education regarding the benefits of implementing the lesson study			
Researchers Year Country	Purpose	Type of research Sample size Lesson	Research results
McMahon & Hines 2008 USA	To investigate how the lesson study could be used to encourage cooperative reflection among preservice teachers and how it could potentially be used to support the continued professional development of in-service teachers.	Case study 8 Mathematics preservice teachers, the class teacher, the director of the Mathematics department, and two teacher educators. Mathematics	The results of the research revealed that the lesson study can provide a supportive framework for the reflective cooperation of teachers as they try to improve teaching. Also, experienced teachers have developed professionally from their participation in the lesson study, as they have been given the opportunity to reflect on their own practices and to encourage the cooperation of teachers while providing support to preservice teachers.
Parks 2008 USA	To investigate some of the challenges presented in practice-based, cooperative learning by looking at the intended and unintended learning of preservice teachers in the implementation of the lesson	Qualitative 27 preservice teachers Mathematics	The results of the research showed that some preservice teachers through the lesson study had opportunities to develop mathematical methods and foster cooperative learning.

	study in Mathematics.		
Post & Varoz 2008 USA	To investigate the cooperation of preservice and inservice teachers in lesson study groups to learn about the teaching of Mathematics within the framework of classroom practice.	Qualitative 3 in-service teachers 6 pre-service teachers Mathematics	Collaboration in the group was beneficial.
Saito, Hawe, Hadiprawiroc & Empedhe 2008 Indonesia	To investigate a case of lesson study at the School of Mathematics and Science of the University of Yogyakarta in Indonesia. More specifically, it aims at identifying and analyzing existing issues and problems in order to promote the lesson study as a method of improving the quality of education of preservice teachers of faculties at the Universities of Indonesia.	Case study 8 students 8 members of Teaching Research Staff Mathematics, Physics, Chemistry, Biology	The most important point in the lesson study is the reflection on the learning of students.
Sims & Walsh 2008 USA	To investigate whether first year and second year preservice teachers can analyze their lessons based on lesson goals, conduct detailed discussions on educational strategies, such as question techniques, predicting student responses, and how lesson flow affects the students' understanding, and to judge the lesson plan and not the teacher by implementing the lesson study. Also, another goal added in the second year focused on developing the ability of preservice teachers to observe and collect real learning data.	Qualitative 1st year: 32 preservice teachers of preschool education 2nd year: 25 pre-school teachers preservice teachers of preschool education	The results of the research revealed that the second year's preservice teachers worked perfectly with their colleagues. The feedback session was a learning opportunity for second year preservice teachers.
Chassels & Melville 2009 Canada	To investigate the benefits and challenges of participating teacher candidates in the lesson study.	Qualitative 60 teacher candidates 20 field practicum asso ciate teachers the pre -	The findings show that the lesson study provides opportunities for teacher candidates to create professional learning communities, to deepen the understanding of the curriculum and pedagogy, and to develop critical observation, analysis and

		service instructor and first author Mathematics of elementary school	reflection habits. The lesson study contributes to the professional development of teachers.
Matthews, Hlas & Finken 2009 USA	To investigate the contribution of lesson study and lesson design to four columns with preservice teachers focusing on student-centered learning and the usefulness of colleagues' collaboration.	Qualitative 3 preservice teachers 1 supervisor professor Mathematics	As the results show, the lesson study helped teachers by encouraging and focusing on their collaborative efforts. The lesson study was considered as a valuable initial professional development experience for preservice teachers.
Parks 2009 USA	To examine carefully a collaboration in which the participants and the coordinator of the lesson study feel that the members actually and equally participated in the design, teaching and analysis of a lesson. The aim of this study is not to examine the ways in which cooperation failed but to look at the challenges faced by teacher educators after collaboration.	Action research 3 preservice teachers 1 supervisor Writing	Preservice teachers had the opportunity to collaborate, as a benefit of the process and worked to make all aspects of the process collective, even when it meant meeting for extra hours outside the classroom.
Burroughs & Luebeck 2010 USA	To investigate the results of the involvement of preservice and in-service teachers in a cooperative lesson study experience and how the results of this experience can inform future ways to include preservice teachers in the lesson study.	Qualitative 24 preservice teachers Mathematics	The results of the research show that preservice teachers can contribute to the process of lesson study as researchers.
Fernandez 2010 USA	To investigate how and what preservice teachers learn through their engagement in micro-teaching of the lesson study.	Case study 18 preservise Teachers Mathematics	Active learning including important discussion, planning and practice, support by an informed consultant, ongoing collaboration, and testing, analysis and review capabilities were aspects of lesson study micro-teaching.

McDowell 2010 USA	To investigate the experiences experienced by preservice teachers in a lesson study centered on teaching and learning the nature of Science.	Qualitative 6 preservice teachers Science	Students who worked at higher levels of reflection deepened more in the pedagogical content of knowledge.
Carrier 2011 USA	To examine the views of preservice teachers by implementing the lesson study in their initial efforts to design and teach a lesson of scientific research on their peers and to encourage teacher educators to review some of these long established, research-based teaching strategies with preservice teachers. An additional goal is to motivate school policy makers to look at the effectiveness of these change-promoting strategies and policies, including providing time for teachers to collaborate.	Qualitative 57 preservice teachers Science	Advantages: Cooperation, the value of observation and reflection in understanding their teaching and the benefits of revising their lessons. Preservice teachers have recognized that lessons are improved by observation and feedback, and these experiences can help them begin to accept and learn from constructive criticisms.
Elipane 2011 Japan	To investigate how some elements of the lesson study are used as a powerful intervention to facilitate the familiarization of future teachers of Mathematics with the actual teaching practice in schools during the student's teaching program.	Qualitative 7 preservice teachers 3 inservice teachers 2 University professors Mathematics	The results of the research revealed that four issues related to the skills, abilities and habits of the mind were more intense in research: first, the understanding of the resources needed for classroom teaching, secondly the use of school and class as venues research, thirdly the involvement in major reflections, and fourth the forging of the spirit of cooperation. Also, the lesson study can improve the training of preservice teachers.
Pongsason, Akerson, Rogers &Weiland 2011 USA	To investigate the use of a modified version of the Japanese lesson study acting as a tool of reflective practice to support preservice teachers of elementary education by developing pedagogical knowledge content to teach the nature of Science.	Case study 6 preservice teachers Science	The results of the research revealed that the lesson study may have some influence on the pedagogical content of preservice teachers to teach the nature of Science.
Cajkler, Wood,	To investigate how	Qualitative	The results of the research

Norton & Pedder 2013 England	participation in the lesson study contributed to collaborative learning for both trainees and mentors.	2 preservice teachers, 2 consultants, 1 newly appointed teacher 1 experienced teacher Geography, Modern Languages	revealed that the lesson study facilitated the rapid integration of the future teacher into departmental work practices, according to the mentors, while the preservice teachers claimed to have benefited from the group approach of the lesson study. With successful completion, the lesson study improves the professional development of teachers.
Giannakidou, Gioftsali & Tzioras 2013 Greece	To investigate and interpret the reflective act developed by the students of the Department of Education Sciences in Pre-school Age of Democritus University during their teaching practice, implementing an adapted version of the lesson study in conjunction with an open student-centered approach, such as the Project method.	Case study 2 groups of 8 students 1 supervisor Project creating a Greek-Turkish dictionary	The results of the research revealed that students also showed samples of technocratic and interpretative reflection before and after the act. At the same time, students' critical reflection was developed, only in individual exhibitions submitted after the completion of their classroom practice. One factor that favored the development of reflective thinking of sample students was the cooperative character of the model and the process of collective feedback.
Dania, Voutsina & Moumouri 2013 Greece	To present the model of the lesson study, as implemented to the practice of third-year students of the Department of Physical Education and Sport Science, National and Kapodistrian University of Athens. The main aim was to highlight the unseen aspects of physics lessons teaching and through it the identification of the elements that influence the identification of an effective lesson.	Qualitative 8 students Physical Education	The detailed analysis of the lesson and its multiple opportunities for collaboration, focused feedback and reflection contributed to linking theory to practice, creatively promoting both their personal and professional development.
Hamzeh 2014	To investigate whether the lesson study enables preservice teachers to improve their teaching through exploratory learning. Also, if teachers' beliefs	Mixed 48 participants Natural Sciences	Cooperation and professional development of teachers.

Canada	about their self-efficacy are related to their experience of lesson study, and if they are urged to cooperate with each other. Finally, their attitudes and perceptions about the lesson study in the field of Science are examined.	(Biology, Physics)	
Rekalidou, Karadimitriou & Moumoulidou, 2014 Greece	To investigate the processes of collaboration, reflection and feedback from the perspective of students and supervisors who have implemented the lesson study to students' teaching practice.	Mixed 127 students 5 supervisors Teaching Practice	Reflection and feedback enabled students to critically approach the practice, evaluate themselves and improve the program they implemented.
Lucas 2014 USA	To investigate the outcome of the lesson study in collaborative knowledge building and teacher reflection as well as thoughts, feelings and actions in relation to the practice of teaching.	Mixed 5 participants Language Mathematics	Increase the effectiveness of the participants' teaching. Increased collaboration and in-depth reflection. Positive changes in teaching practices and focus on learning from practice.
Thompson 2015 USA	To investigate the effect of lesson study on teachers effectiveness.	Qualitative 37 participants Science, Technology, Engineering Mathematics	The lesson study is a valuable tool for professional development and experienced and inexperienced teachers.
Leavy & Hourigan 2016 Ireland	To explore the development of pedagogical knowledge of the content of preservice teachers stemming from the involvement and reflection of teaching primary Mathematics in a lesson study structure.	Case study 25 preservice teachers primary education Mathematics	The results of the research revealed that the lesson study is considered effective in the initial training of the preservice teachers.
Angelini & Alvarez 2018 Spain	To examine the perceptions of preservice teachers who used the lesson study for a five-week teaching at school and to analyze their perceptions of how the lesson study influenced classroom teaching in preschool and primary education.	Qualitative 12 undergraduate preservice teachers English as a foreign language	Students' answers to the post-processing preservice teacher's questions have shown that toys and energetic techniques in the classroom have led to a high preservation of the teaching content.

Juhler 2018 Norway	The study investigates the problem of the difference between theory and practice by introducing the lesson study and the representation of content as an intervention in the practical training of teachers.	Deductive content analysis 7 students 7 preservice teachers 2 mentors Physics	During the intervention, the preservice teachers focused more on the goals of teaching, students and their learning, on the better representation of specific content and on the specific assessment compared to the current state of the practice.

2nd Research question: Are there difficulties in implementing the lesson study in basic education of preservice teachers so as to influence their intention to use it? If so, which?

Table 3 summarizes the main findings of the researches examined regarding the difficulties in implementing the lesson study in higher education.

Table 3. Difficulties in implementing the lesson study in higher education.

Researches in higher education about the difficulties in implementing the lesson study			
Researchers Year Country	Purpose	Type of research Sample size Lesson	Research results
Sims & Walsh 2008 USA	To investigate whether first year and second year preservice teachers can analyze their lessons based on lesson goals, conduct detailed discussions on educational strategies, such as question techniques, predicting student responses, and how lesson flow affects the students' understanding, and to judge the lesson plan and not the teacher by implementing the lesson study. Also, another goal added in the second year focused on developing the ability of preservice teachers to observe and collect real learning data.	Qualitative 1st year: 32 preservice teachers of preschool education 2nd year: 25 pre-school teachers preservice teachers of preschool education	The results of the research revealed that the first year's preservice teachers failed to collaborate and failed to create a detailed teaching plan. Also there has not been a connection between design and teaching for first year preservice teachers.
Chassels & Melville 2009 Canada	To investigate the benefits and challenges of participating teacher candidates in the lesson study.	Qualitative 60 teacher candidates 20 field practicum associate teachers the pre - service instructor and first author	The research identifies the implementation challenges associated with time.

		Mathematics of elementary school	
Burroughs & Luebeck 2010 USA	To investigate the results of the involvement of preservice and in-service teachers in a cooperative lesson study experience and how the results of this experience can inform future ways to include preservice teachers in the lesson study.	Qualitative 24 preservice teachers Mathematics	A weakness demonstrated by preservice teachers was the lack of understanding of the proper use of technology in algebra. There was a lack of reflection on past knowledge and the prediction of student responses among both preservice teachers and inservice teachers.
Carrier 2011 USA	To examine the views of preservice teachers by implementing the lesson study in their initial efforts to design and teach a lesson of scientific research on their peers and to encourage teacher educators to review some of these long established, research-based teaching strategies with preservice teachers. An additional goal is to motivate school policy makers to look at the effectiveness of these change-promoting strategies and policies, including providing time for teachers to collaborate.	Qualitative 57 preservice teachers Science	The main feature the lesson study lacked was the focus on student learning. Teachers need time and support to be able to plan together and collaborate so they can implement the lesson study regularly to their schools.
Myers 2012 USA	To determine whether, how and to what extent the implementation of the lesson study facilitates reflection on the preservice teachers.	Qualitative 20 preservice teachers Mathematics	The results of the research revealed that the reflection of the preservice teachers remained at the lowest level, thus supporting the existing literature on the reflective skills of the preservice teachers.
Giannakidou, Gioftsali & Tzioras 2013 Greece	To investigate and interpret the reflective act developed by the students of the Department of Education Sciences in Pre-school Age of Democritus University during their teaching practice, implementing an adapted version of the lesson study in conjunction with an open student-centered approach, such as the Project method.	Case study 2 groups of 8 students 1 supervisor Project creating a Greek-Turkish dictionary	The intensive pace of implementation was a determining factor that did not allow students' critical reflection to develop during implementation. Also, the difficulty of students to differentiate their action through reflection in practice, apart from the factor of inexperience, also affected the stress and anxiety they felt.

Rekalidou, Karadimitriou & Moumoulidou, 2014 Greece	To investigate the processes of collaboration, reflection and feedback from the perspective of students and supervisors who have implemented the lesson study to students' teaching practice.	Mixed 127 students 5 supervisors Teaching Practice	In some groups there have been cooperative difficulties and tensions for mitigating which required time to spend. Sometimes the students' fatigue and their attempt to respond to the program requirements were the causes of tension.
Espinoza, Datukan, Burton & Tameta 2018 Philippines	To investigate preservice teachers' perceptions of using the lesson study as a framework for teaching High School Chemistry. In particular, this study investigates whether Chemistry preservice teachers believe that this framework will help improve academic achievements in Chemistry compared to traditional teaching as well as the advantages and disadvantages of this framework. Finally, if they suggest that this framework will be used in primary schools.	Case study 30 young Chemistry preservice teachers Chemistry	The results of the study showed that although most of the participants agreed to use the framework, most of them failed to understand the basic process of the productive lesson study. The drawbacks include the time element.

3rd Research question: What are the conditions and procedures for the effective implementation of the lesson study in basic education of preservice teacher?

Table 4 summarizes the main findings of the researches examined regarding the conditions and procedures for the effective implementation of the lesson study in higher education.

Table 4. Conditions and procedures for the effective implementation of the lesson study in higher education

Researches on the conditions and procedures for the effective implementation of the lesson study in higher education			
Researchers Year Country	Purpose	Type of research Sample size Lesson	Research results
Saito, Hawe, Hadiprawiroc & Empedhe 2008 Indonesia	To investigate a case of lesson study at the School of Mathematics and Science of the University of Yogyakarta in Indonesia. More specifically, it aims at identifying and analyzing existing issues and problems in order to promote the lesson study as a method of improving the quality of education of preservice teachers of faculties at the	Case study 8 students 8 members of Teaching Research Staff Mathematics, Physics, Chemistry, Biology	Strong involvement of trainers is necessary to develop the lesson study as a daily practice of teaching and learning.

	Universities of Indonesia.		
McDowell 2010 USA	To investigate the experiences preservice teachers came across in a lesson study centered on teaching and learning the nature of Science.	Qualitative 6 preservice teachers Science	The reflection of preservice teachers which develops their knowledge, skills and mood to use it in their teaching.
Carrier 2011 USA	To examine the views of preservice teachers by implementing the lesson study in their initial efforts to design and teach a lesson of scientific research on their peers and to encourage teacher educators to review some of these long established, research-based teaching strategies with preservice teachers. An additional goal is to motivate school policy makers to look at the effectiveness of these change-promoting strategies and policies, including providing time for teachers to collaborate.	Qualitative 57 preservice teachers Science	Teacher trainers should support policies that encourage teachers to develop and maintain quality teaching and learning in schools.
Molina 2012 USA	To investigate the microteaching lesson study (MLS) with the presence of a mentor at the initial, final, and all meetings between mentor and student, and their interaction with the development of knowledge for teaching primary school preservice teachers in Mathematics.	Mixed 103 participants Mathematics	The creative presence of a mentor.
Wessels 2018 South Africa	To investigate the reflection of preservice teachers on their own and the following research lessons in order to improve the structure and development of reflective mathematical practice in an undergraduate teacher training program.	Qualitative 3 preservice teachers 56 observers Mathematics	Preservice teachers need well-structured and focused opportunities, both individual and group, to learn to understand students' reasoning.

6. Discussion of Research Results

Overall, the average of surveys per year from 2008 to 2018 is 2.8. Most researches have been conducted internationally and the largest number has been conducted in the US (n = 15), while fewer in other countries. In Greece, a minimum number of surveys (n = 3) compared with the international area (n = 25) has been identified.

Regarding the benefits of implementing the lesson study in higher education, several international studies have been examined in Mathematics (McMahon & Hines, 2008; Parks, 2008; Post & Varoz, 2008; Saito, Hawe, Hadiprawiroc

& Empedhe, 2008; Chassels & Melville, 2009; Matthews, Hlas & Finken, 2009; Burroughs & Luebeck, 2010; Fernandez, 2010; Elipane, 2011; Lucas, 2014; Thompson, 2015; Leavy & Hourigan, 2016), Physics (Saito et al., 2008; Hamzeh, 2014; Juhler, 2018), Chemistry (Saito et al., 2008), Biology (Saito et al., 2008; Hamzeh, 2014),Writing (Parks, 2009), Science (McDowell, 2010; Carrier, 2011; Pongsason, Akerson, Rogers & Weiland, 2011; Thompson, 2015), Geography and Modern Languages (Cajkler, Wood, Norton and Pedder, 2013), Technology (Thompson, 2015), Engineering (Thompson, 2015), English as a foreign language (Angelini & Alvarez, 2018) and Language Courses (Lucas, 2014). In Greece, a smaller number of researches was found, examining the benefits of implementing the lesson study in higher education in Teaching Practice (Rekalidou et al., 2014), the Project method (Giannakidou et al., 2013) and Physical Education (Dania et al., 2013). The most important benefits of implementing the lesson study are co-operation, professional development of preservice teachers, reflection, active learning including important discussion, planning, practice, observation and feedback. These findings are confirmed by other researchers (Stepanek et al., 2007).

Regarding the difficulties in implementing the lesson study in higher education, a small number of international researches have been examined in Mathematics (Chassels & Melville, 2009; Burroughs & Luebeck, 2010; Myers, 2012), Science (Carrier, 2011) and Chemistry (Espinoza et al., 2018), while a much smaller number of researches were found in Greece in Teaching Practice (Rekalidou et al., 2014) and the Project method (Giannakidou et al., 2013). The most important difficulties in the implementation of the lesson study by the preservice teachers are the difficulty of cooperation, the pressure of time, tensions, the inability to predict student responses, the lack of focus on student learning, the lack of understanding of the proper use of technology , the inexperience, stress and anxiety resulting from the observation of the teaching, the reflection, the fatigue due to their attempt to respond to the requirements of the particular method. These findings are in agreement with the results of other researchers (Lenski et al., 2009; Rekalidou et al., 2013).

Regarding the conditions and procedures for the effective implementation of the lesson study in higher education, only five international studies have been examined in Mathematics (Saito et al., 2008; Molina, 2012; Wessels, 2018), Physics (Saito et al., 2008), Chemistry (Saito et al., 2008), Biology (Saito et al., 2008) and Science (McDowell, 2010; Carrier, 2011) and none in Greece. The most important prerequisites for the effective implementation of the lesson study are the reflection of the preservice teachers who develop their knowledge, skills and willingness to use it in their teaching, the participation and cooperation of teachers, the creative presence of the mentor, policy support from teacher educators who encourage teachers to develop and maintain quality teaching. These findings are also recorded in other studies (Stepanek et al., 2007).

7. Conclusions

From the review of the last decade researches studied, results an average 2.8 per year with most of them being conducted in the US, while few in Greece.

In particular, regarding the benefits resulting from the implementation of the lesson study in higher education, most researches have been identified in the international field, mainly in Mathematics but also in other subjects such as Physics, Chemistry, Biology, Science, Writing, Geography, Modern Languages, Technology, Mechanical, English and Language courses. In Greece, a smaller number of studies were found in Teaching Practice, Project method and Physical Education. Consequently, the exploration of the benefits of the lesson study demonstrates the need for further research, especially in Greece.

The most important benefits of implementing the lesson study are co-operation, professional development of preservice teachers, reflection, active learning including constructive discussion, planning, practice, observation and feedback.

Regarding the difficulties resulting from the implementation of the lesson study in higher education, a small number of international studies were found in Mathematics, Science and Chemistry, while in Greece a much smaller number of researches were studied, in Teaching Practice and in the Project method. As a consequence, there is a need for further research, both in the international and the Greek field so as to explore the difficulties in implementing the lesson study.

The most important difficulties in the implementation of the lesson study by the preservice teachers are the difficulty of co-operation, time pressure, tensions, failure to predict student responses, lack of focus on student learning, inadequate understanding of proper use of technology, the inexperience, stress and anxiety resulting from the observation of the teaching, the reflection, the fatigue due to their attempt to respond to the requirements of the particular method.

Regarding the conditions and procedures for the effective implementation of the lesson study in higher education, only five international studies in Mathematics, Physics, Chemistry, Biology and Science were identified and no research was identified in Greece. Therefore, more research is needed in Greece and internationally.

The most important prerequisites for the effective implementation of the lesson study are the reflection of the preservice teachers who develop their knowledge, skills and willingness to use it in their teaching, the participation and cooperation of teachers, the creative presence of the mentor and policy support from teacher educators who encourage teachers to develop and maintain quality teaching.

8. Restrictions

The constraints of this research include the small number of studies under consideration, the search for specific databases, and the focus on specific subjects of the lesson study in higher education.

9. Suggestions

Suggestions for further research could be the theoretical and practical exploration of other subjects related to the lesson study, such as the needs of teachers for training on its implementation. Moreover, by conducting comparative researches at different levels of education in the educational system of Greece on the results of its implementation and its impact on learners and educators, valuable conclusions will be drawn on the mobilization and improvement of trainees' performance, on the attitudes and beliefs of trainees and educators, as well as on the benefits, the difficulties and the conditions for effective implementation of the lesson study.

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