

Teachers' Perspectives about Lesson Study

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ABSTRACT

This research aims to know the perspectives of elementary and middle school teachers who participated in three lesson studies about this professional development process and about their professional learning. The study follows a qualitative and interpretative approach, with data collected through interviews, which were realized in June and July of 2016, and data analysis made through content analysis. The teachers' perspectives regarding the dynamic of lesson study development indicated that they considered this an intense process of collaboration and reflection about the elaboration of exploratory mathematical tasks and about pupils' learning. Regarding the professional learning made possible by this process, they refer to have developed and deepened their mathematical knowledge and their knowledge of classroom strategies focused on pupils' thinking. Besides, they indicated that the lesson studies promoted changes in terms of professional and personal relationships of the school routine.

Keywords: Lesson Study. Professional Development. Teachers' Perspectives. Mathematics Education.

Perspectivas de professores sobre estudos de aula

RESUMO

A pesquisa busca conhecer as perspectivas de professores do ensino básico que participaram em três estudos de aula, focando o processo de desenvolvimento profissional destes professores e suas aprendizagens profissionais. O estudo segue uma abordagem qualitativa e interpretativa, baseada em uma análise de conteúdo bardiniana, tomando-se por base de análise um conjunto de dados constituídos por meio de entrevistas semiestruturadas, realizadas nos meses de junho e julho de 2016 com professores do ensino básico de escolas públicas de Lisboa, Portugal. As perspectivas dos professores relacionam-se a duas temáticas principais: a dinâmica do estudo de aula a as aprendizagens profissionais viabilizadas por esse processo. Relativamente a dinâmica do estudo de aula, os professores indicam que consideram o estudo de aula um processo intenso de colaboração e reflexão sobre a elaboração de tarefas matemáticas exploratórias e sobre a aprendizagem dos estudantes. No que diz respeito às aprendizagens profissionais promovidas no estudo de aula, os professores referem ter desenvolvido e aprofundado os conhecimentos sobre a matemática e conhecimentos sobre estratégias de sala de aula com foco nos processos de pensamento dos alunos.

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Além disso, eles indicam que os estudos de aula promoveram mudanças em termos das relações pessoais e profissionais do cotidiano da escola.

Palavras-chave: Estudos de aula. Desenvolvimento profissional. Perspectivas de professores. Educação Matemática.

INTRODUCTION

In contemporary society, universal education for all, involving cognitive, affective and social dimensions, has become a fundamental value (FAURE, 1972). Attempts to make it happen, improving the learning process, led to a strong attention to teacher education. Lesson studies, in which a small group of teachers collaborate around planning and reflecting over a lesson, constitute a professional development process that attracts much attention from those involved in teacher education (CAJKLER; WOOD; NORTON; PEDDER; XU, 2015; LEWIS, 2002; STIGLER; HIEBERT, 1999). Takahashi and McDougal (2016) indicate that lesson studies are oriented towards the teachers' appropriation of knowledge about teaching and learning and Dudley (2011, p.5) underlines that their purpose "is improvement in the quality of teaching through a 'reflexive, recursive and collaborative' process".

Lesson studies have a long tradition in Japan, especially at the elementary school level (FUJII, 2016; LEWIS, 2002). Recently, lesson studies carried out with practicing and prospective teachers have been reported in many countries, such as China (HUANG; LI, 2009; CHEN; YANG, 2013), United States (LEWIS, 2002; LEWIS; PERRY; HURD, 2009), United Kingdom (CAJKLER et al., 2015) and the Philippines (EBAEGUIN; STEPHENS, 2014). However, their use has yielded mixed results (TAKAHASHI; MCDUGAL, 2016).

Many experiences led by researchers suggest that the participant teachers experienced significant professional development, but this evaluation reflects more the point of view of the lesson study leaders than that of the participants. In this context, our study aims to understand the perspectives of elementary and middle school teachers from Lisbon about the professional development process that they experienced and the professional learning that they made in mathematics as they participated in three lesson studies.

LESSON STUDIES AND TEACHER PROFESSIONAL DEVELOPMENT

Lesson studies are carried out in cycles involving five stages in which the participant teachers work together (FUJII, 2016). Based on the analysis of recurrent pupils' difficulties, the teachers begin by identifying an issue regarding pupil learning that deserves special attention. Then, they collaboratively plan a research lesson designed to improve learning on this issue. Next, the lesson is taught in a classroom by a team member with the others gathering evidence on pupil learning. Afterwards, the teachers reflect on and discuss the evidence gathered during the lesson, striving to

improve it. And, finally, they teach and observe the lesson again and other lessons in one or more different classrooms in order to further improve it (PONTE; QUARESMA; BAPTISTA; MATA-PEREIRA, 2014).

The lesson study process involves critical issues that researchers and teacher educators need to pay attention, notably concerning its purpose and its key mechanisms, such as the definition of the focus issue (TAKAHASHI; MCDOUGAL, 2016), the undertaking of the research lesson (FERNANDEZ, 2002), and the reflection that follows this lesson (FUJII, 2016). Lesson studies have key features that make them a very particular professional development activity. For example, Stigler and Hiebert (1999, p.121) highlight that they require “an investment of time and patience: [It] is a process of improvement that is expected to produce small, incremental improvements in teaching over long periods of time”. In addition, Cajkler et al. (2015, p.192) indicate that what “distinguishes this from other forms of professional development is the planning of jointly conceived research lessons to address particular problems with learning, rather than focusing on the performance of an individual teacher”. Ponte et al. (2014) underline that lesson studies focus on teachers’ professional practice and unfold through a collaborative and reflective dynamics. The connection to teachers’ professional practice and their collaborative and reflective nature are underlined by many researchers (FERNANDEZ, 2002; LEWIS, 2002; LEWIS; PERRY; HURD, 2009). Other researchers indicate that lesson studies may be considered as a research process, as it begins with a well-defined question that is to be answered by the planning, realization and analysis of a lesson (FERNANDEZ, 2002; PONTE; QUARESMA; MATA-PEREIRA; BAPTISTA, 2016; STIGLER; HIEBERT, 2016).

Hiebert and Stigler (2000) suggest that lesson studies are more effective than typical school professional development processes because the teachers focus on the knowledge and skills needed to be successful in their classrooms. Ponte, Baptista, Velez, and Costa (2012) consider that, by participating in a lesson study, teachers are encouraged to look critically at their classroom practice, taking into account the multiple processes that permeate that practice and the implications that such practice may have in pupils’ mathematical learning. In this perspective, distancing themselves from their own practice and looking at it critically is one of the main contributions of the lesson study experience for teachers’ professional development. Teachers are led to modify their beliefs and conceptions regarding the teaching of mathematics and also their professional stance. Olson and Sparrow (2011) consider that teachers’ experiences in a lesson study encourage them to reflect critically on their classroom practice and lead them to develop a stance of inquiry. In this way, classroom teaching practice is transformed by teachers’ discussions and joint work with colleagues.

According to Ponte et al. (2014), lesson studies provide professional development opportunities that enable teachers to deepen their knowledge and to reflect on the need and relevance of making changes in their professional practice. In particular they may

deepen their mathematical knowledge and its role in the school curriculum, as well as regarding different kinds of tasks to propose to pupils and their consequences for learning and about different ways of organizing and conducting lessons. Stigler and Hiebert (1999) underline that not only are teachers learning more about the content and how to teach it, they are also learning about their pupils' thinking. And Lewis (2002, p.19) indicates that, in Japan, teachers have identified seven fields of improvement resulting from lesson study: "increased knowledge of subject matter, increased knowledge of instruction, increased ability to observe pupils, stronger collegial networks, stronger connection of daily practice to long-term goals, stronger motivation and sense of efficacy and improved quality of available lesson plans".

Research carried out on lesson studies has shown a wide range of positive results. In a study involving secondary school mathematics teachers, Cajkler et al. (2015) conclude that they experienced changes in their perspectives regarding pupil participation and progress, teaching approaches, and summative evaluation. From a school-university joint lesson study project in Indonesia, Saito, Harunb, Kubokic, and Tachibanad (2006) report improvements in the academic base of lessons, in the structure of lessons and in the pupils' engagement. In the USA, Lewis, Perry and Hurd (2009) report effects of lesson studies on developing teachers' personal knowledge and dispositions, including their sense of self-efficacy and professional identity, and motivating them to assume more responsibility for pupils' learning. They also indicate that lesson studies change the norms and dynamics of teachers' communities of practice as safe, trustworthy and challenging environments in which they not only share knowledge and resources but also experiment new ideas. However, the fact is that most lesson study experiences carried out outside Japan lack sustainability and tend to lose momentum or disappear with time (TAKAHASHI; MCDUGAL, 2016). This suggests that there is something missing in this picture regarding the conditions in which lesson studies may be successfully carried out in different countries as a regular professional development activity.

RESEARCH METHODOLOGY

This research follows a qualitative and interpretative approach (ERICKSON, 1986). The participants are seven basic education teachers from a Lisbon public school, who participated in three lesson studies in 2013, each involving 12 meetings of 2 hours each. The lesson studies were coordinated by a team of researchers from Instituto de Educação, Universidade de Lisboa. Three teachers (Irene, Idalina, Marta) are from 1st cycle of basic education (grades 1-4), one (Luísa) is from 2nd cycle (grades 5-6), and three (Alda, Idália, José) are from 3rd cycle (grades 7-9). All teachers, whose names are fictitious, have between 6 and 15 years of professional experience.

Data were collected through semi-structured interviews, carried out in June-July of 2016, by which the teachers expressed their perspectives regarding their experience in the lesson studies and about their professional learning in by this process. To

seek evidence regarding the teachers' learning in the lesson studies, we sought to identify aspects that were present in their reflections and practice three years after their participation in this process. After the interviews, which were audiotaped, we made their transcription and textualization, thus constituting the empirical material for the study.

Afterwards, they were sent to the participants to validate them. Then, the interpretative analysis was made based on a content analysis (BARDIN, 1977), leading to the identification of the perspectives of the participants about the professional development process that arose from the different stages of the lesson studies. The analysis of the teachers' perspectives is organized around two main issues: (i) the dynamics of development of a lesson study and (ii) the professional learning as a consequence of the participation in the lesson study.

THE DYNAMICS OF THE LESSON STUDY

In relation to the teachers' perspectives about the dynamics of a lesson study, we analyze their views on the nature of this professional development process with special attention to the research lesson. The teachers indicated that when they accepted the invitation to participate in the lesson studies they did not have a clear idea about it. A presentation was made in the first session, including an overview of the whole process together with the viewing of video clips about lesson studies in different countries. Even so, they were still quite confused about the development of this process:

By the description, I did not understand exactly how it worked and we became a little worried. In the first session, we saw some videos clips and the teacher educators explained a little bit more. We understood that someone would be observed teaching a lesson . . . by many people. (Irene)

I knew a little bit [about it] from people that were involved with this project, who had showed us some video clips earlier. However, before [this], I had never heard about it. (Luísa)

It was the first time that I contacted with this [approach to professional development]. I remember [that] we saw videos clips [about lesson studies experiences] from other countries and we found that this practice is relatively common [in some countries, such as Japan]. But I didn't know. (Alda)

None of the seven participant teachers knew about this approach to professional development. Despite the presentation made, they did not initially understand very well its dynamics. In the first session, the lesson study feature that most attracted their attention was the research lesson. The 1st cycle teachers noted that in this lesson there were many observers and they were worried about that. The 2nd and 3rd

cycle teachers pointed that viewing videos about lesson studies in several countries showed that this was a very different approach from what they had experienced so far. They indicated uneasiness regarding the teaching of the research lesson. This uneasiness was related to the fact that the teacher of that lesson would be evaluated by all the observers:

[We realized early on] that [the research lesson] would be observed by many people and would be recorded. This . . . did not make us much comfortable. I was always [felling] apprehensive about this. (Idalina)

There was the fear to be evaluated . . . when I accepted to teach the research lesson . . . and be watched by so many people. My school colleagues also felt this fear of being evaluated and perhaps they did not feel comfortable with the possibility to teach the lesson for the group. (Luísa)

The initial presentation of the lesson study emphasized that the focus of observation was pupils' thinking. However, the teachers kept assuming that, even so, the teacher of the lesson would be also on the spotlight. The teachers were also concerned about the possible reaction of the pupils in the research lesson and possible misbehavior. At the end of the lesson study, they made the following reflections about this professional development process:

The process was occurring little by little . . . until what was fear became confidence. I was noticing more . . . I got to know better the people who were leading the process and it was extraordinary to see all the evolution of the process, the deficiencies involved, the knowledge involved. (Marta)

I think this aspect was very interesting [pupils' learning. . .]. After reflecting about all [lesson study stages] I considered this aspect very interesting because, at the end, we were able to identify the choices, the pupils' choices. (Luísa)

The lesson study was a professional development process with characteristics completely different from any other I already had participated. We were more interventional from the beginning until the end . . . [The lesson study] was a much wider work, through so much time, somehow thorough, and perhaps this surprised me [... there were] things that went deeper than I thought. (Alda)

At the end, considering the whole process, the teachers highlighted that they were surprised by the specificities of the different stages of the lesson study, especially the planning of the research lesson. They emphasized the detailed and deep process of preparing exploratory challenging mathematics tasks and the need to deepen mathematical ideas. In addition, they highlighted their intense involvement and the collaborative nature of the planning of the research lesson which went through all

the stages of the lesson study. At the end, they have a positive view regarding the research lesson:

Everything went all right . . . I was able to [overcome my fear] of having some people observing my lesson. (Luísa)

We worked so hard for this moment [the research lesson], thought so much about everything, with so much detail . . . There was a strong expectation about how it will work . . . everything was prepared and it was an exhausting work, including predicting possible pupil's reactions, possible errors and solution strategies. And I never participated in a professional development process with these characteristics. (Alda)

Contrary the initial impression, the teachers evaluated that research lesson as a very important stage because they had possibility of think the mathematical ideas from pupil's perspective, as well as to observe the pupils while they carried out the mathematical tasks and understand some of their difficulties. This experience also provided moments whereby the teachers had the opportunity to overcome some personal challenges and to growth professionally.

PROFESSIONAL LEARNING DURING THE LESSON STUDY

The second issue that we analyze concerns teachers' professional learning in consequence of the lesson study. Two main aspects were evidenced in the interviews: learning about mathematics and leaning about classroom strategies. When these lesson studies were conducted (in 2013), Portuguese basic education teachers were facing the challenge of implementing a new mathematical curriculum, which introduced substantial changes, including new topics, especially in the 1st cycle. Therefore, these teachers expected that the lesson study could an important help in this regard:

Therefore, when we were aware of this professional development process in which we had the possibility to choose a topic to study, we agreed that it had to be this content [rational numbers] because we had forgotten this content, because we never had taught it. (Irene)

I had then a grade 3 class . . . and we were to implement the new mathematics curriculum, which introduced a lot more demanding content about rational numbers and geometry. (Idalina)

[When the lesson study begun] I become aware that I needed to study this topic [rational numbers] that was new in this curriculum. (Marta)

In contrast, at the beginning of the lesson studies, the teachers from the 2nd and 3rd cycles did not feel an explicit need to pay attention to mathematical issues that they considered to know quite well. This is probably related to the fact that the content changes were less marked on those two cycles. At the initial stage of the lesson studies, in their own ways, the seven teachers expressed the idea that they could help them to think about how mathematics is taught in the classroom:

We thought [this professional development] could help to think about a simpler and open way to teach mathematics to children in the 1st cycle. [Because the new curriculum] brought us new challenges and we were concerned if the children would learn or not. (Irene)

[All] I could get from this professional development to help me in the teaching of this content [rational numbers] I considered very important. [How] to approach certain mathematical topics that . . . had been [taught] in a less demanding way. (Idalina)

And sometimes we need to see the things from other perspective, or rethink them, or think about how to approach in a different way, not only to motivate the pupils but also to improve the lesson in terms of learning. (Alda)

At the initial stage, the teachers expressed a very general concern that they needed to rethink the way they conducted their teaching of mathematics, mostly with a focus on their own behavior. At the end of the lesson study they reflected about their mathematics learning during the process:

Indeed, we needed to work certain things to know how to present this topic [rational numbers] to the pupils . . . This topic demands a lot of abstraction and sometimes it is not easy . . . Indeed, we were all worried to know very well what we were going to teach, what we would face in the classroom, with what we did not know very well. (Idalina)

And by chance it was not [as I thought initially]. Because after, when we were planning the research lesson, I realized that there were many things about this content that we can explore with our pupils. And therefore this experience was very interesting. (Luísa)

We note that, whereas the teachers from 1st cycle and even Luísa, from 2nd cycle, consider that they made significant mathematics learning, the same does not occur with 3rd cycle teachers. That may happen because their mathematics preparation is much stronger and they feel quite confident about their mathematical knowledge.

At the end of the lesson study, reflecting in the whole process, in contrast to their initial general comments, the teachers speak in more specific ways about what they

learned, including the value of careful planning, including challenging mathematical tasks and focusing on pupils' thinking:

I think that [this professional development] also led us to realize that we need to get out of there [of usual practices], what exactly we want from exercises, because we do not think much about this in our everyday routine. And this [the lesson study] made us think about this. (Irene)

In other professional development we had ... to listen, we did activities without understanding them, without having knowledge of pupils' difficulties and everything that happens while we are working with our pupils. (Irene)

We were there not only to prepare ... tasks for pupils. But we were also exploring ways to solve [problems] and approach this topic which we would teach. (Idalina)

My learning in the group occurred when the group made me feel more confident. I am aware that we are able to teach something only when we are confident, and I felt this in this final stage. (Marta)

[To look at pupils' learning] was a very interesting aspect ... it is very important ... to learn about pupils' difficulties, about that they do, if they were able make it in the tasks or not. This we got in this process ... We went to the root of things. (Alda)

The teachers indicated that the lesson studies enabled them to rethink how to design mathematical tasks, with clear and well-defined aims. They also led them to experiment other ways of working mathematical topics in the classroom, which increased their confidence. And they also indicated that the lesson study enabled them to experiment new ways of involving the pupils in the classroom work, giving them opportunity to express their ideas and opinions and to reflect about the ideas of the others. They seemed to be more attentive to the fact that the teacher needs to be much concerned with what the pupils know and what their difficulties are.

CONCLUSION

At the beginning of the three lesson studies, the teachers expressed their difficulty in understanding what this process was and how it unfolded especially concerning the role and purpose of the research lesson. This led them to voice some uneasiness. However, they also showed some curiosity and desire to participate in this professional development activity, hoping that it could help them to understand teaching and learning from a different perspective. At the end, the seven teachers expressed satisfaction with the research lesson, which they regarded as having propitiated significant learning. They mostly appreciated the fact that this professional development process emphasizes pupils' actions and enables a close look at their reasoning processes (STIGLER; HIEBERT, 1999).

Regarding professional learning, the teachers stressed two main themes: mathematics knowledge and mathematics teaching strategies. They refer that they developed and deepened their mathematical knowledge (as in HIEBERT; STIGLER, 2000; PONTE et al., 2016) as well as knowledge associated with teaching practice (as in HIEBERT e STIGLER, 2000; Ponte et al., 2012; Takahashi e McDougal, 2016), including an understanding about the learning process and pupils' difficulties (as in CAJKLER et al., 2015; PONTE et al., 2016; TAKAHASHI; MCDUGAL, 2016) and valuing pupils' knowledge and skills.

The professional culture that predominates at schools tends to preserve existing situations rather than to question and transform them. There is a need for reflexive professional development processes that can promote significant changes at the school level (PONTE et al., 2014). Lesson study emerges as a possibility with a strong change potential. This is a way to bring classroom practice to teacher professional development, contributing towards a new professional culture in which collaboration and reflection about pupils' learning are essential features.

Finally, we note that our analysis focused on teachers' views regarding their experience and their learning in lesson studies and not the most common researchers' views. In consequence, the analysis of the teachers' perspectives three years after they was carried out, made apparent the contributions that, were long lasting, such as deepening mathematics knowledge and knowledge of classroom strategies for mathematics teaching. We also consider that the time elapsed since the lesson studies were carried out enabled the teachers to distance themselves from this experience, looking in a critical and reflective way towards their learning and towards the lesson study process.

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REFERENCES

- BARDIN, L. *Análise de conteúdo*. Lisboa: Edições 70, 1977.
- CAJKLER, W.; WOOD, P.; NORTON, J., PEDDER, D.; XU, H. Teacher perspectives about lesson study in secondary school departments: a collaborative vehicle for professional learning and practice development. *Research Papers in Education*, v.30, n.2, p.192-213, 2015.
- CHEN, X.; YANG, F. Chinese teachers' reconstruction of the curriculum reform through lesson study. *International Journal for Lesson and Learning Studies*, v.2, n.3, p.218-236, 2013.
- DUDLEY, P. *Lesson study: A handbook*. 2011. Disponível em: <http://lessonstudy.co.uk/wp-content/uploads/2012/03/Lesson_Study_Handbook_-_011011-1.pdf>. Acesso em: 10 jan. 2017.

EBAEGUIN, M.; STEPHENS, M. Cultural challenges in adapting lesson study to a Philippine setting. *Mathematics Teacher Education and Development*, v.16, n.1, p.43-64, 2014.

ERICKSON, F. Qualitative methods in research on teaching. In M. C. Wittrock (Ed.). *Handbook of Research on Teaching*. New York, NY: Macmillan, 1986. p.119-161.

FAURE, E. (Org.). *Apprende à être*. Paris: Unesco/Fayard, 1972.

FERNANDEZ, C. Learning from Japanese approaches to professional development. *Journal of Teacher Education*, v.53, n.5, p.393-405, 2002.

FUJII, T. Designing and adapting tasks in lesson planning: A critical process of lesson study. *ZDM Mathematics Education*, v.48, p.411-423, 2016.

HIEBERT, J.; STIGLER, J. A proposal for improving classroom teaching: Lessons from the TIMSS video study. *The Elementary School Journal*, v.101, n.1, p.3-20, 2000.

HUANG, R.; LI, Y. Pursuing excellence in mathematics classroom instruction through exemplary lesson development in China: a case study. *ZDM Mathematics Education*, v.41, p.297-309, 2009.

LEWIS, C. C. *Lesson study: A handbook of teacher-led instructional change*. Philadelphia, PA: Research for Better Schools, 2002.

LEWIS, C. C.; PERRY, R.; HURD, J. Improving mathematic instruction through lesson study: A theoretical model and North American case. *Journal of Mathematics Teacher Education*, v.12, p.285-304, 2009.

OLSON, J. C.; WHITE, P.; SPARROW, L. Influence of lesson study on teachers' mathematics pedagogy. In HART, L.C.; ALSTON, A.; MURATA, A. (Eds.). *Lesson study, research and practice in mathematics education*. Dordrecht: Springer, 2011, p.39-57.

PONTE, J. P.; BAPTISTA, M.; VELEZ, I.; COSTA, E. Aprendizagens profissionais dos professores através dos estudos de aula. *Perspetivas da Educação Matemática*, v.5, p.7-24, 2012.

PONTE, J. P.; QUARESMA, M.; BAPTISTA, M.; MATA-PEREIRA, J. Os estudos de aula como processo colaborativo e reflexivo de desenvolvimento profissional. In: SOUSA, J.; CEVALLOS, I. (Eds.). *A formação, os saberes e os desafios do professor que ensina Matemática*. Curitiba: CRV, 2014, p.61-82.

PONTE, J. P.; QUARESMA, M.; MATA-PEREIRA, J.; BAPTISTA, M. O estudo de aula como processo de desenvolvimento profissional de professores de matemática. *Boletim de Educação Matemática*, v.30, n.56, p.868-891, 2016.

SAITO, E.; HARUNB, I.; KUBOKIC, I.; TACHIBANAD, H. Indonesian lesson study in practice: Case study of Indonesian mathematics and science teacher education project. *Journal of In-service Education*, v.32, n.2, p.171-184, 2006.

STIGLER, J. W.; HIEBERT, J. Lesson study, improvement, and the importing cultural routines. *ZDM Mathematics Education*, v.48, n.4, p.581-587, 2016.

_____. *The teaching gap: Best ideas from the world's teachers for improving education in the classroom*. New York, NY: Free Press, 1999.

TAKAHASHI, A.; MCDUGAL, T. Collaborative lesson research: Maximizing the impact of lesson study. *ZDM Mathematics Education*, v.48, p.513-526, 2016.