

OPEN LESSONS IMPACT STATISTICS TEACHING TEACHERS' BELIEFS

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Teachers' beliefs regulate teaching practices in the classroom and influence the interpretation that teacher makes teaching and learning and influences in what to say and do in class. Furthermore, beliefs are changed from reflection on practice, practice and collaboratively, constituting open classes a powerful tool to trigger change process on teacher beliefs. We investigate the over time impact of open classes on teachers' beliefs in the context of a Lesson Study. Lessons were prepared, observed and discussed by researchers and classroom teachers with experience in Lesson Study providing content and ecological validity to the classes. 28 observer teachers answered a Likert scale referred to teaching of statistics beliefs before and after observing open classes. Student's t-test showed impact of first year open lesson and it remained during the second one.

INTRODUCTION

Primary teachers lack training in Statistical Education and confuse statistic education purposes with school arithmetic purposes (Ben-Zvi & Sharett-Amir, 2005; Garfield & Ben-Zvi, 2008), which has been repeatedly observed by proponents of this study in the courses they teach teachers in training programs at the Institute of Mathematics, Pontifical Catholic University of Valparaíso. Proportion of primary teachers who participate in continuing education is low relative to the number of well-trained teachers in math that requires the educational system (Olfos, 2010), to which we believe that public classes have the possibility to meet many teachers at once, becoming a form of effective teacher professional development potential. We have found that there are few studies on teachers' beliefs about education statistics, this probably due to the inclusion of statistics has remained for years as an appendix in the context of mathematics education. We have not found any studies that have looked for evidence of the impact of public research lesson teachers' beliefs about education statistics, despite the beliefs of teachers are central to teaching and public lessons are key learning instances vicar, vicar in the sense of Bandura (1977).

Background and Rationale

This study investigates the association between "open lesson" and "teacher beliefs". A public or open research lesson is a particular form of lesson study (Isoda and Olfos, 2009), which is characterized by being open to an audience usually teachers and prospective teachers who do not participate in the lesson preparation. The public comes to see new ways of driving or attempting content in classrooms. Viewers public reflect on the proposal established in a lesson plan, on the teacher students interaction, and the materials used for the lesson. In the process of observing, audience insights and judgments made in connection with the lesson conduction and around the implemented class. A teacher leads the lesson planned and discussed with peers or an expert, intensifying innovation aspects she wants to share with peers' spectators. Both the plan of the lesson as the lesson discussion implemented immediately completed the lesson, are situations that could affect teachers' beliefs about driving the lesson. Indeed, lesson plan reveals quality of the task given to the students, its level of cognitive demand, the choice of variables and organizing teaching lesson moments. Discussion implemented after completing the lesson also carries descriptive elements of beliefs, allowing them access to information and allowing triangular the information developed during the class. Thus it constitutes a complete lesson study research.

Lesson Study Research is a form of professional development that has been cited as a key factor in improving mathematics teaching (Stigler & Hiebert, 1999). Lesson Study Research is the main form of professional development in Japanese elementary schools for improving teaching in the classroom context and its use has been increasing throughout the world since 1999. Perry and Lewis (2009, p. 366) describe the lesson research process as follows: Lesson Study is a cycle that improves instruction in which teachers work together to: develop collaborative goals for learning

and development long term the student; plan a "class research" designed to implement these objectives, conducting class managed by a team member, gathering evidence about student learning and development, and reflect on and discuss the evidence gathered during the lesson, using them to improve the lesson, unit and instruction. Rock and Wilson (2005) argue that the research process serves as a catalyst lessons to encourage teachers to become more reflective practitioners and use what they learn to revise future lessons collegially. Japanese educators conduct lesson study research both in their schools and at regional and national levels (Stigler and Hiebert, 1999). Nationally, lesson study can be used to explore new ideas about teaching and curriculum. Teachers interested in the same subject including common professional interests can form lesson study inter-district groups (Murata and Takahashi, 2002; Shimizu, 2002). A school can also form their own Lesson Study group to serve their professional development needs.

Pehkonen (2004) distinguishes three lines of research in the study of mathematics education beliefs: beliefs about (a) the mathematics as a discipline, (b) mathematics learning and problem solving, (c) and teaching mathematics in general. To Handal (2003) there is consensus among researchers to study a) what is mathematics, b) how mathematics is taught and learned c) as the teaching and learning of mathematics could be improved. In Pajares (1992) emerge several ideas on the beliefs of the teachers, especially that they affect their perception and judgment, and thus what they say and do in class, and these affect how people learn to teach, and thus how interpret the information they acquire about teaching and learning and how this information is implemented in their classes, and the importance of identifying and understanding the beliefs of practicing teachers and prospective teachers to achieve improved practice and syllabus for initial teacher training. Meanwhile Schoenfeld (1998, cited in Felbrich, Schmotz & Kaiser, 2012) notes a sociocultural influence in shaping beliefs, differentiating level of individual or collective orientation of the countries. Teacher beliefs regulate teaching practices in the classroom (Pehkonen, 2004) and appear as filters through which teachers make decisions about teaching, playing a crucial role in classroom practices (Felbrich, Kaiser & Schmotz, 2012 , Furtak & Alonzo, 2010), sometimes more weight than pedagogical knowledge and curriculum guidelines. In the literature and research on processes of change and implementation of curriculum reforms, the role of beliefs crucial figure to favor or delay the process of change, given its conservative and dialectical relationship with the practices (Fullan & Stiegelbauer, 1997; Handal 2003; Furtak & Alonzo, 2010; Pehkonen, 2004).

The school system itself appears as a vehicle to transmit and perpetuate traditional orientation beliefs. In many countries, teachers tend to be practical, intuitive and individualistic in making curricular decisions, and facing the multiplicity of events in the classroom, teachers tend to mobilize their beliefs rather than knowledge. Thus, teachers are generating their own beliefs about teaching, which are perpetuated in their practices. While researchers say that their teaching is guided by their beliefs, studies also reveal that teachers indicate school context factors (traditional approach system, school administration, parents, students traditional style, external evaluations) that hinder the implementation of their ideals and beliefs innovation in teaching mathematics (Handal, 2003). As teachers' beliefs about mathematics, teaching and learning influence instructional practices, it can be assumed that they have some degree of influence on student learning (Staub & Stern, 2002, Yates, 2006). Studies cited by Felbrich, Kaiser and Schmotz (2012) attribute a significant role to beliefs in learning outcomes in terms of student performance in mathematics. Stipek, Givvin, Salmon and MacGyvers (2001) studied the beliefs and practices of mathematics teachers, with regard to the nature of mathematics, learning, control of mathematical activity of students, the nature of mathematical ability, the value extrinsic rewards for engaging students, self-confidence and enjoyment of teachers in the teaching of mathematics, finding consistency between beliefs and practices of teachers.

We hypothesize open lessons can effectively influence teachers' beliefs. In the present study assumes that classroom practices are subject to a strong influence of teachers' beliefs and that the beliefs are changed from reflection on practice, practice and collaboratively, constituting the open lesson a powerful tool to trigger the process of change in teacher beliefs.

METHODOLOGY

The study involves the participation of 28 primary teachers in two open lessons implemented in the context of a Lessons Study Research. Researched Lessons were prepared, observed and discussed by researchers and elementary teachers with experience in lesson study, providing content validity and ecological research. We adapted an instrument on teachers' beliefs in statistics education, and established psychometric properties (Zieffler, Park, Garfield, delMas, & Bjornsdottir, 2012). Teachers responded to the instrument, a Likert scale on beliefs about Education Statistics, before and after their participation in two open lessons. Through student's t test was measured open lessons impact on teachers' beliefs.

Instrument

The scale included 12 asserts with 5 options, from strongly disagree to strongly agree. Items refer to what and how to teach statistics, as can be seen in these two examples:

- It is more important students learn to construct graphs than to interpret data that can be inferred from them (What?).
- For helping students to learn statistics is better a clear teacher's explanation than students' exploration (how?).

The scale showed 0.8 Alpha of Cronbach reliability, and related to the two components, an internal consistency of 0.79 to 6 items that measure "What to teach?", and a consistency of 0,85 for the 6 items referring to "how to teach?".

Classes

The first class was analyzed in previous paper (Olfos, Estrella & Morales, 2013). The second class referred to collecting and ordering data is detailed in depth as book chapter (Estrella & Olfos, 2013). The teacher felt that the class had flowed fast and hoped that the students had produced more representations. But he was satisfied and motivated by the experience, mainly because the children had enjoyed the challenge, especially once they were concluding their work.

RESULTS

With regard to what to teach, the items discriminate between teachers who teach statistics consider corresponds to teach formulas and techniques to determine measures of central tendency and construct tables and graphs, versus those teachers who feel that the main thing in teaching statistics is to put students in situations that faces represent and analyze real data, be it through statistics as measures of centrality and dispersion or through charts and graphs, in order to make decisions. With respect to how to teach, the reagents are oriented on one side to the presentation of the techniques by the teacher for students to imitate and consolidate the processes from the examples that provides the teacher, and on the other hand are oriented to characterize teaching as providing challenges students to explore information or discuss the work or even in groups.

About Teachers' Beliefs Measuring

Given the classes and valid instrument to measure the impact of them into teachers' beliefs, the study was implemented under a quasi-experimental design. For the application of the scale teacher answered it in the room before to observe each lesson, but some of them online a couple of days before. For answering again, the scale was provided online after each lesson. To encourage teachers responses, they were invited to participate in a lottery chance. We postulated the hypothesis that the lesson or modifying the conceptions teachers' beliefs about the teaching of statistics. The application of the t test, mean difference showed a significance greater than 0.0001 comparing to the implementation of the first year, showing significant differences between the group of teachers who responded to the scale before and after the first researched open lesson implementation. For the second class we considered teachers that participate in the first one. In this case measurements provided evidence teacher believes remain similar before and after the second lesson as after the first observed lesson the prior year, improving only in the second component, (alpha 5%).

CONCLUSIONS

Teachers observing how an innovative teacher conducts the lesson in a similar school context realize ways of teaching and possibilities that could change their practices. The change in teaching approach is associated with teacher beliefs, which in turn exist in a sociocultural context. So teachers critical reflection about their beliefs in a context of innovation socially validated, as it would be open lessons implemented by teachers of recognized authority, is a benchmark for innovation, leading to cause substantive beliefs changes of teachers about the appropriateness of their teaching practices.

Since in Japan and in many countries (Isoda, Mena-Lorca & Arcavi, 2007) open lessons have been successfully incorporated within to help teachers update. This project looked to investigate the impact of two open lessons into teachers' beliefs. The choice of belief as a variable to study is clear from the focus of interest in our previous work (Olfos, 2011) that identified a positive association between teachers' beliefs about mathematics teaching and learning on their students; as also justified in the literature concerning the existence of an association between the orientation of the classroom practices and teachers' beliefs about mathematics and its teaching (Stipek, Givvin, Salmon & MacGyvers, 2001).

From this study we infer open lessons impact over time teachers beliefs, conceptions, about what and how to teach elementary descriptive statistics. The factors likely influenced the teacher change conceptions or beliefs may be related to the fact that our lessons offered a pattern accessible for teachers, attractive for students and endorsed in the discussion. The experience was successful and we infer open lessons research provide opportunities to influence teachers beliefs.

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