

STATEMENTS AND DISCOURSES ABOUT THE MATHEMATICS TEACHER. THE RESEARCH SUBJECTIVATION

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The research fabricates an image of mathematics teachers, which shape our knowledge of truths, by sustaining the development of different discursive formations about the teacher. This image is deployed within social, cultural and political contexts, namely, spatio-temporal conditions. By studying the statements, which are circulating in the research about the mathematics teacher, we seek to explore how the mathematics teacher is configured as a subject. It is bring in operation some tools from the theoretical toolbox of Foucault (1980) and Deleuze (1994) and from methodological toolbox of Pais and Valero (2012). The aim of this paper is to study how discourses are operating in the fabrication of the mathematics teacher and in the production of truths about them.

Keywords: Statement, Discourses, Subjectivity, Dispositive, The Mathematics Teacher

INTRODUCTION

There is an interest in the study of the mathematics teacher within mathematics education research. This interest has focused researchers' attention on diverse topics pertaining to mathematics teachers; moreover, it is possible to see trends in the diverse studies of the issues surrounding them. By attempting to lead to set understanding, problematizing and reasoning about the mathematics teacher, which are shaping the constitution of diverse discourses about the teacher and images of the teacher.

For example, the research in mathematics education focused on mathematics teachers has been a growing subfield since the 1990s. From this type of research, certain truths and corresponding systems of reasoning have emerged to encourage us to think about pedagogical topics that mainly emphasize teachers' knowledge (of mathematics, of mathematics for teaching, of pedagogy, etc.), competencies and skills. Topic about teachers' identity, professional communities, affective rapport between teachers and students, etc. have recently been investigated. All these characteristics have been the product of the dominance of a cognitive approach. Moreover, the adoption of socio-cultural theories has been adding a variety of views on identity formation and also on the sense of belonging within communities of practice.

This paper opens a discussion that will help us to understand the configuration of different discourses that circulate about mathematics teachers and how these discourses operate the construction of knowledge, of truths about teachers. We are seeking to show how mathematics teachers are established as a subject and how an ideal image of them is configured from the discourses that circulate in mathematics

education research. Hence, in this paper we develop a discursive analysis in which we focus on how the research is shaping an ideal image of subject, the mathematics teacher, and which, under different conditions, promotes rational and subjective ways of thinking about teachers.

To think about an ideal image of the mathematics teacher as our subject will help us to position the teacher as an historical and political product, which is produced through games of power that have led to certain knowledge and ideas. In other words, this will help imagine the teacher as a person subjected to diverse technologies (Foucault, 1980, 1997) and dispositive control (Foucault, 1980), where thinking about the mathematics teacher is a dynamic idea, a theoretical construct established from diverse practices. The discourses that are emerging in the mathematics research are shaping what has been previously accepted or the rejected about what is true or false about mathematics teachers and their ideal image. Thus, the discourses promote knowledge about the mathematics teacher using a particular rationality.

This study is built upon three premises: (a) intentions, needs, and desires configure the conditions for set mechanisms of power, truths and discourses, which constitute the reality; (b) power produces knowledge, that is, the power is both the object and instrument of knowledge,

“What makes power hold good, what makes it accepted is simply the fact that it doesn’t only weigh on us as a force that says no, but that it traverses and produces things, it induces pleasure, forms knowledge, produces discourse’ (Foucault, 1980, p. 119);

For the third premise (c) the mathematics teacher is an historical and political product. This construct is in constant development, and this development depends on spatio-temporal conditions.

STUDYING THE RESEARCH DISCOURSES ON THE MATHEMATICS TEACHER

We consider the discourses about mathematics teachers as a technological power, which “determine[s] the conduct of individuals and submit them to certain ends or domination” (Foucault, 1997, p. 18). Mathematics teachers are subjected to discursive formations, leading to new ways of thinking about the mathematics teacher. Within the discourses that circulate in the research about the mathematics teacher, is possible to see resonances and recurrences in the statements that constitute these discourses. Statements lead to the fabrication of truths and ways of thinking about the mathematics teacher, moreover leading to ways of being for the teachers by promoting an image of the mathematics teacher, which is configured from what “must be” and from what is desired in the society.

All research is developed given certain intention, assumptions, ideals, and rules or notions, which are part of games of power that are configured within a social, political, and ideological contexts. The research shapes practices and knowledge through discursive formations that are set in the different investigations. Moreover,

the research establishes networks, where it is valid or possible to enunciate determinate things about the mathematics teacher. These enunciations are products of predominant rationalities, which lead to ways of understanding and thinking about the teacher. The subject is fabricated and configured within these networks; thus the mathematics teacher –as a subject and as an ideal image– will be a result of discursive formations produced by the research.

In this study, we focus on the discourses that circulate about the mathematics teacher within the research on mathematics education. We seek to understand two questions: (a) Why has a particular discourse been established (predominate discourse) about the mathematics teacher and not others? In other words: What were the necessary conditions to establish these discourses and their prevalence through time? (b) What are the implications having established these discourses. In other words: What type of truth, knowledge and rationalities are configured within of discourses and how discourse fabricates an image of mathematics teachers to produce an understanding about them..

In every society the

“production of discourse is [...] controlled, selected, organized and redistributed according to a certain number of procedures, whose role is to avert its power and its dangers, to cope with chance events, to evade its ponderous, awesome materiality” (Foucault, 1972, p. 216).

The discourses are established as truth through diverse dispositive of control, where regularity in the use of certain statements leads to the configuration of certain discourses, which are accepted as true and naturalised. Therefore, these discourses are not questioned and are accepted. For this work, we keep in mind that the discourses are composed of statements.

“We shall call discourse a group of statements in so far as they belong to the same discursive formation [...]. Discourse] is made up of a limited number of statements for which a group of conditions of existence can be defined. Discourse in this sense is not an ideal, timeless form [...] it is, from beginning to end, historical – a fragment of history [...] posing its own limits, its divisions, its transformations, the specific modes of its temporality” (Foucault, 1972, p. 117)

And, the prohibitions that surround to discourse reveal its link with desire and with power (Foucault, 1971).

ANALYTICAL STRATEGY

In this discourse analysis, we think about the mathematics teacher as a historical-cultural construction, situated in a particular spatio-temporal configuration; moreover, we think about the mathematics teacher as a subject immersed in discursive practices, where his or her image is configured within networks and discursive formations.

In our strategy we deploy concepts from the theoretical toolbox of Foucault (1971, 1972, 1980, 1997) and Deleuze (1994); our focus is mainly on discursive formations and subjectivity, which allow us to detangle the statements and divulge the possible conditions of power effects by studying the discourses that circulate in the research. Valero (2014) argues that the mathematics education research creates language for naming study objects and ways of thinking about these objects. This language is composed of discourses and attempts to set and configure new discourse or reinforce the discourses that are circulating. The discourses are not understood in terms of “a particular instance of language use –a piece of text, an utterance or linguistic performance– but [describes] rules, divisions and systems of a particular body of knowledge” (Arribas-Ayllon & Walkerdine, 2008, p. 99). Rather, they are the repetition of enunciations in certain possible conditions that allow the generation of truths and the constitution of forms of reasoning.

Therefore, in this study, we perform a Foucault-inspired discourse analysis, which seeks to ascertain the regularities and systematicities that lead to discursive formations, where the diverse statements form a rhizomatic field affecting the desired subjects within mathematics. The role of the analysis is to reveal the convergence of a complex network of discursive practices and to allow us to study the constitution and configuration of ideas or notions within diverse games of power.

For empirical material, we used the 17th volume of the *Journal of Mathematics Teacher Education* (JMTE, 2014), composed of 6 issues; each issue has 3 or 4 papers with an introduction written by the editor. This journal was selected because is one of the most important sources of mathematics teacher research. Moreover, the journal publishes research about mathematics teachers from diverse topics and theoretical frameworks.

The focus is on statements that circulate and resonate within the field. These resonances lead to discourse formations about the mathematics teacher. When analysing the research, we took only exterior enunciations; we did not evaluate the researcher of the study, rather we have quoted the journal pages because the journal provides the empirical material that evidences how the mathematics teacher is thought. We looked for the regularities or resonances of statements and not the people that formulated it.

We propose, from a Foucaultian sense, that discourses are generated by a spatio-temporal rationality and not by some particular people. Authors reveal the convergence of a complex network of discursive practices; hence, the discourses are not established because a person formulated them, rather because we reproduce them through discourse, “the function of an author is to characterize the existence, circulation, and operation of certain discourses within a society” (Foucault, 1977, p. 124).

Studying the diverse statements formulated in the research, it is possible to see regularities or resonances in the different arguments deployed in the conclusions of

the studies. These shape desired images of the mathematics teacher and lead to conditions that configure the teacher as a subject. It is possible to establish two circulating categories of discourses from the diverse resonances that emerge in the research. The first category is made of a cluster of statements where the mathematics teacher is reduced to a body of mathematical knowledge and skills that he or she has or should have; the second category is made of a cluster of statements which indicate the mathematics teacher is thought of as a useful tool for the governance of others, to conduct others, and to conduct oneself.

In both categories, the mathematics teacher is configured as a discursive object, synthesizing in him or her that which is desired and feared. The categories present the “must be” of the mathematics teacher and shapes truths about an ideal subject. This study has allowed us build a rhizomatic web of statements that circulate, leading us to formulate categories of statements that emerge from ways of thinking and reasoning about mathematics teachers.

TRUTHS AND KNOWLEDGE ABOUT THE MATHEMATICS TEACHER

“Truth is a discursive construction and different regimes of knowledge determine what is true and false” (Jørgensen & Phillips, 2002, p. 13). Truth is founded on systems of reason that characterize community and society; this system of reason sustains the production of knowledge and lead to the fabrication of a particular subject subjected within a system of beliefs and ways of thinking. For example, currently it is possible to see a predominate reasoning, which prioritizes the calculation and standardization of everything (e.g., JMTE, 2014, pp. 5-36, 429–461), where the concept of the mathematics teacher forms part of this reasoning and in turn contributes to its construction. This reasoning is based in the objectivity of knowledge that has developed around mathematics teachers. More precisely, “objectivity and subjectivity are expressions of a particular historical predicament, not merely a rephrasing of some eternal complementarity between a mind and the world.” (Daston & Galison, 2007, p. 379)

Moreover, from a Foucaultian approach, knowledge is conceived as a set of assumptions; these are based on the theoretical and personal experiences that emerge within a network and engage in interplay of different practices. Hence, knowledge is understood as an event, not as a universal structure, unique, absolute, or unbiased. The “knowledge is always a certain strategic relation in which man is placed. This strategic relation is what will define the effect of knowledge” (Foucault, 1970, p. 14). Knowledge is produced within different discursive practices; it cannot be conceived without a particular discursive practice and a discursive practice is defined by the knowledge itself (Foucault, 1972). In short, knowledge is composed of a series of continuities, events and discursive formations established by diverse configurations of power. Knowledge is partial and fickle in relation to its historical-political context. Therefore, far from preventing knowledge, power produces it (Foucault, 1980).

Truth and knowledge that emerge from the discourses that circulate in the research shape ideal images of mathematics teachers and configurations of the subject. This ideal image is used as a framework to think about the teacher, to speak about him or her, to recognize the teacher socially, and to understand his or her practices, education, and work. Moreover, this ideal image is a product of the detangling of diverse games of power, dispositive regimes of knowledge, discursive formations, and rationality. Through this detangling, we can formulate the two statements category, where is possible to see statements, such as:

Many PPTs [prospective primary teachers] wanted to continue taking another mathematics course because they wanted to improve their mathematics knowledge and skills not only for themselves but also for the sake of their future students (JMTE, 2014, p. 356)

These categories are composed of enunciations that evidence “well-intentioned” principles about the mathematics teacher. For example, it is possible to find enunciations, such as, “[the teacher should] provide students opportunity to clarify and communicate their thinking” (JMTE, 2014, p. 483). Showing the desired and feared ideas about mathematics teachers; therefore, these principles help to configure an ideal image, knowledge, practices and discourses, and moreover, help to configure the subjectivity of the mathematics teacher.

TEACHERS’ KNOWLEDGE AND THEIR PASTORAL CALL

The job of the elementary school mathematics teacher (i.e., teaching), is generally regarded as a complex and demanding practice that requires a mixture of both theoretical and practical knowledge, rehearsed skills and deep understanding of children (White, Jaworski, Agudelo-Valderrama, & Gooya, 2013). In addition, the practices of mathematics teachers are configured within a network of practices and discourses, which fabricate the rational, objective, and universal subject to become the modern cosmopolitan citizen (Valero & García, 2014). Therefore, the mathematics teacher becomes an important agent for governing others, since, currently, governance is required to shape particular types of subjects. In other words, the mathematics teacher has an important role in developing and fabrication of the modern subject. In the 19th century, the narrative connected progress to economic superiority, and citizens began to develop an intelligible mathematical competence; by the end of the 20th century emerged the connection between people’s mathematical qualifications and social progress (Valero, 2013); Changes in demands for skills have profound implications for the competencies which teachers need to acquire to effectively teach 21st century skills to their students.

Through an analysis of empirical research materials on the mathematics teacher, it is possible to observe certain regularities in the statements that circulate in the research formulated from idealized images of mathematics teachers. Moreover, this ideal image establishes the “must be” of the mathematics teacher; hence, this ideal image regulates the understanding of “a good teacher,” and also defines the knowledge,

skills and qualities that the teacher should have to reflect that ideal. The regularities observed are gathered into two categories: The first category considers statements where the mathematics teacher is reduced to the knowledge and the skills that he or she has, for example, mathematical knowledge and pedagogical knowledge, among others. The second category considers statements where the mathematics teacher is understood as a governing agent, for example, the teacher is responsible for the fabrication of a particular subject, a rational and logical student.

Examples of these two categories of statements that emerged in the discourses of the research on the mathematics teacher are revealed below:

The first category. The mathematics teacher is reduced to his or her knowledge and skills

They found that teachers' lack of content knowledge interfered with their judgements and that there was a mismatch between their perceptions of students' difficulties and the actual difficulties demonstrated by their students. (JMTE, 2014, p. 405)

[Teachers need to] develop professional knowledge in support of their practice. (JMTE, 2014, p. 455)

There is a strong correlation between the teacher's knowledge of mathematics and successful classroom practice. (JMTE, 2014, p. 373)

The second category. The mathematics teacher as agent for governing.

Mathematics teachers play a unique role as experts who provide opportunities for students to engage in the practices of the mathematics community. (JMTE, 2014, p. 105)

... promoting reform, considered by many to be a major responsibility of prospective teacher preparation (JMTE, 2014, p. 295)

It is possible to enunciate that both categories were elaborated under an ideal of perfection (ideal teacher, ideal situations, ideal practices, among others) and under the mathematics teachers' "must be" s and with a desired image of the mathematics teacher.

More specifically, the first category responds to objective knowledge and the importance that was given to mathematical knowledge in modern society. Mathematical knowledge is privileged knowledge and is related to progress and the societal development. The second category argues that discursive formations are favouring the fabrication and conduction of the subject toward an ideal, located in an epistemology of that which is desired, therefore, the mathematics teacher is thought of as a dispositive. Hence, mathematics teaching is thought of as a profession that has a pastoral call. For example, the mathematics teacher is believed responsible to promulgate the ideas and the ideals that mold the desired citizen by impelling to his/her students toward what is desired, aspired for, and accepted within society.

In some statements is possible to see both categories imbricated, as for example:

Teachers rely on established beliefs to choose pedagogical content and curriculum guidelines [...]; and teachers reflect their beliefs in their teaching, thus shaping their students' beliefs [...]. (JMTE, 2014, p. 305)

They [effective teachers] ensure that the lesson content has a strong mathematical focus and contains opportunities for students to think, reason, communicate, reflect upon and critique mathematics. (JMTE, 2014, p. 299)

These two examples show that mathematical knowledge is not questioned; the knowledge is considered an important and sacred truth. This stance toward knowledge influences how students understand the world, which favours a type of rationality and subject.

CONCLUSIONS

The discourses reveal our historic, ideological and political framework. Because the statements express desired ideas about the subjects involved in education and the role of school mathematics to imagine a better world, they also express some truths circulating in diverse teaching practices of school mathematics and its learning (Valero & García, 2014). Moreover, we can understand the discourses as forces acting on the subject, since these discourses are promoting practices, rationalities, thoughts, assumptions and knowledge, among others, from a spatio-temporal context, all which favour the fabrication of a particular subject. Therefore, we can understand discourses about the mathematics teacher as a dispositive power.

From the review of the pedagogical research on mathematics teachers, it is possible to see that it seeks to homogenize mathematics teachers in a context where differences and particularity are predominant. Moreover, diverse research promotes a denaturing and an abstraction of mathematics teachers, ignoring aspects of the complexity of teaching, for example, about the particulars of teaching as work, the internal dynamics of the work place, etc. The denaturation and objectivity in the research promotes a rationality, which favours the thought of the mathematics teacher as a neutral and perfect subject, an established ideal image. A large number of researchers have sought to compare the mathematics teacher (subject) with this ideal image, favouring the establishment of an epistemology of the deficit knowledge. Consequently, many researchers have focused on exploring the skills and knowledge of mathematics teachers, emphasizing their deficiencies and their negatives aspects. For example:

... the teachers' knowledge of functional thinking was below the level expected for teaching middle-school algebra. This provides further evidence of teachers' inadequate understanding of mathematics for teaching (JMTE, 2014, p. 418)

This can generate a paradox because the ideal is defining the mathematics teacher from an unattainable idea, but when the teacher approximates this ideal, the ideal is redefined and increases the distance between the ideal and the subject (the

mathematics teacher). In addition, this ideal is constantly reformulated, according to the research and the new demands of the society.

Hence, the diverse affirmations that were found in researched enunciations can establish a framework and a network for imagining the subject of the mathematics teacher, establishing statements about good practices, appropriation and management of specific knowledge, and its importance for society. For example, it is arguable that “mathematical knowledge for teaching stresses the importance of using mathematical knowledge to bring about pedagogically useful mathematical understanding” (JMTE 2014, p. 229).

Consequently, the intention of the mathematics education research is not only to show, question or analyse what mathematics teachers doing. Mathematics education research configures a disposition that shapes the subjectivity of the mathematics teacher, where the knowledge has great value and the mathematics teacher is thought of as an agent for governing others.

We can see that the statements established have been strongly influenced by objective ideas, the favouring of certain practices, and discursive formations seeking abstraction and generalization. Moreover, thinking of the mathematics teacher from a social perspective, we can see diverse discourses that establish knowledge of a useful subject that seeks to form part of the desired truth and conduct other toward the desired truth

The discourses and knowledge established from the research are subjected to the study of the mathematics teacher under a particular logic that defines the real; this logic is developing from an epistemology of ideas both desired and feared. In addition, the discourses determine what is true or false about mathematics teachers, which helps establish a particular ideal image of the teacher and a particular subject. In the words of Deleuze (1994), the subject does not pre-exist, the subject isn't reproducing the repeats that are part of the world. But rather the subject is produced by the multiples games of the real and these games are validating practices and knowledge.

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