# DISCOURSES OF POWER IN MATHEMATICS EDUCATION RESEARCH: CONCEPTS AND POSSIBILITIES FOR ACTION

Paola Valero

*Mathematics education is powerful. This is an assertion that appears often in mathematics education research papers. However, the meaning of the assertion is far from being clear. An analysis of different ways of talking about power in relation to mathematics education, in research literature, is put forward. Three main discourses are identified: Power as an intrinsic capacity, power as structural imbalance, and power as distributed positioning. Identifying these discourses allows clarifying the values associated to mathematics education and the pedagogical imaginaries that are possible to envision for mathematics teaching and learning.*

*Keywords*: Discourses of power in mathematics education research; Liberal view of power; Marxist view of power; Post-structuralist view of power.

Discursos sobre el Poder en la Investigación en Educación Matemática: Conceptos y Posibilidades para la Acción

*La educación matemática es poderosa. Esta afirmación aparece con frecuencia en artículos de investigación; no obstante su significado no es siempre claro. Un análisis de las distintas maneras de hablar sobre el poder en relación con la educación matemática se ponen al descubierto en tres tipos de discursos: el poder como capacidad intrínseca, el poder como desequilibrio estructural y el poder como posicionamiento distribuido. La identificación de estos tres discursos permite elucidar los valores que se le atribuyen a la educación matemática, y hacer evidente los imaginarios pedagógicos posibles para pensar la enseñanza y el aprendizaje de las matemáticas.*

*Términos clave*: Discursos de poder en la investigación en educación matemática; Visión liberal del poder; Visión marxista del poder; Visión post-estructuralista del poder.

Valero, P. (2008). Discourses of power in mathematics education research: Concepts and possibilities for action. *PNA 2*(2), 43-60.

As researchers go in depth in the study of mathematics teaching and learning, it has become evident that the enormous complexity of mathematical thinking processes and of teaching designed to support them is complemented by the equally vast complexity of teaching and learning as practices in schools, educational systems and societies. The "social turn" in mathematics education (Lerman, 2000, 2006) has resulted in a growing interest for exploring the social aspects of mathematics education, with the use of theoretical and methodological frameworks from disciplines such as sociology, social psychology, anthropology, political science and cultural studies[1], rather than cognitive psychology as has been the case for a great deal of research in the area.

Within this trend, research with an interest not only on the social, but also on the political dimension of mathematics education, have also had a role to play. As I have argued elsewhere (Valero, 2004), socio-political research is an approach —with a variety of representative research production, theory and methods— which has as a central concern the study of mathematics education as social practices related to the way in which power is distributed and structured in society[2]. Much of this research has dealt with issues of equity in the distribution of and access to mathematics education to different groups of students on the basis of their ability, gender, ethnicity, and social class. It has also tried to provide an analysis of the operation of mathematics education in schools, working places and out-of-school situations where it is possible to see how mathematical teaching and learning are inevitably bounded to processes of social inclusion/exclusion and of power distribution.

Within this trend, I have been particularly interested in a conceptual and theoretical reflection about mathematics education and democracy (Skovsmose & Valero, 2001, 2002; Valero, 1999), and more recently on the notion of *power* and the way in which it is has been constructed in mathematics education research (Christensen, Stentoft, & Valero, 2007; Skovsmose & Valero, 2002; Valero, 2007). I find such an analysis to be of relevance as an integral part of mathematics education research because it allows seeing the different values that are given to the teaching and learning of mathematics and to mathematics itself, and allows thinking about possible implications of adopting particular approaches and conceptions both in research and in practice. Such an analysis is a contribution to the understanding of how mathematics education is constructed continually in the social practice of researchers and teachers, one of the analytical aims of the field of study called mathematics education.

[1] For an overview of the main points of the social turn in mathematics education research see Lerman (2000, 2006).

[2] For indications of the type of research within the socio-political trend see, for example, Mellin-Olsen (1987), Skovsmose (1994, 2005), Keitel (1989, 1998), Zevenbergen and Ortiz-Franco (2002), Burton (2003), Valero and Zevenbergen (2004), Walshaw (2004), and Nolan and De Freitas (2007).

In this paper my intention is to examine and discuss some of the discourses that can be found in mathematics education research literature about the notion of power and its connection to mathematics education. I will start with some theoretical and methodological remarks about the grounds for my discourse analysis of the mathematics education research discourses about power. I will continue with a characterization of three forms of conceiving and talking about the relationship between mathematics education and power. Each of these three discourses represent different assumptions about the nature of mathematics education and, particularly, about the nature of power. I will conclude with a reflection about the implications of such analysis for research in mathematics education.

## DISCOURSES AND CONSTRUCTION OF REALITY IN MATHEMATICS EDUCATION RESEARCH

What is the point of studying discourses about power as a part of mathematics education? The point of departure for my considerations is the idea that language and the way in which people phrase the world is not an innocent act but an act through which the construction of the world is effected. Language formulates ideas and meanings that regulate individual and collective action and that, at the same time, make possible that action. Discourses are the sets of language formulations, together with the systems of reason that emerge in the relationship between the phrasing of the world and social practice. These ideas are part of what may be called the "linguistic turn" in the social sciences and have been discussed by a variety of authors such as N. Fairclough (Fairclough, 1992, 2001, 2003), M. Foucault (Foucault, 1972; Foucault & Faubion, 2000) and J. P. Gee (Gee, 2005; Gee & Green, 1998), among many others. These ideas have found echo in mathematics education research as well, such as in the recent work of, for example, T. Brown (Brown, 2001; Brown & McNamara, 2005), C. Kieran and E. Forman (Kieran, Forman, & Sfard, 2001), A. Sfard (Sfard, 2001), and D. Wagner (Wagner, 2004).

One of the implications of the linguistic turn in relation to socio-political trends in mathematics education research is the invitation to consider the way in which scientific disciplines, in this case, mathematics education, formulates their "problematiques". As Wedege (2006) has argued, research "problematiques" are not an arbitrary construction but a historical, systematic definition of boundaries which create a space within which it is possible to think some phenomena and, thereby, exclude other possibilities. In this sense, research creates discourses about phenomena and objects which do not necessarily exist as such, but that exist in as much as the power/knowledge of the scientific endeavor has phrased them and, therefore, created them (see Popkewitz and Brennan, 1998). This means that the phenomena that mathematics education studies do not have an independent existence from the practice of the researcher who constructs them as

objects of study, from particular theoretical perspectives and with particular interests and intentions[3].

The task of analyzing the discourses of mathematics education research from this perspective constitutes, as I see it, one of the challenges of a critical mathematics education because by making visible what is possible to study and to say about mathematics education practices, it is also possible to evidence what is excluded as possible, legitimate constructions. It is in this evidencing of contingencies that alternatives for change and resistance can be thought. The analysis of the dual character of the discourses of mathematics education, I would argue, constitute an advance in thinking the role of mathematics education (as research and as teaching-learning practices) in our current societies.

Discourse analysis is a term that has very many meanings in different research traditions in the social and human sciences. In my work I have developed a type of discourse analysis that, inspired in some of the characteristics that Fairclough (1995) proposes for critical discourse analysis, builds on the analysis of published research literature, identifies the dominant, recurrent constructs that characterize those texts, and discusses the characteristics of those constructs. The aim of such an analysis is to evidence the discursive objects as they are portrayed in the texts and to bring a dialogue between those discursive objects and other possible constructs and interpretations of the constructs to which they refer. In this way it is possible to offer a reading of the texts that questions the underlying ideas and systems of reason that operate as the basis for the creation of concepts in those texts.

## Three Discourses on Power in Mathematics Education

In what follows I will present a condensed analysis and characterization of three discourses about power and mathematics education. My particular methodological strategy in this case is to analyze texts that I consider to be representative of a type of discourse and point to the ideas that I see the text builds on. I also link the ideas present in the texts to different notions of power and engage in a discussion of different implications of each discourse for the construction of a conception of the role of mathematics education in society.

### The Intrinsic Power of Mathematics and Mathematical Learning

In the recent *Handbook of International Research in Mathematics Education*, English (2002b) invited contributing authors to think about the issue of "access to *powerful* mathematical ideas". In her text, English provides meaning to this phrase and to the term *powerful*, in the following way:

[3] For an extension of this discussion see for example Popkewitz (2004).

> *... the lack of access to a quality education —in particular, a quality mathematics education— is likely to limit human potential and individual economic opportunity. Given the importance of mathematics in the ever-changing global market, there will be increased demands for workers to possess more advanced and future-oriented mathematical and technological skills. Together with the rapid changes in the workplace and in daily living, the global market has alerted us to rethink the mathematical experiences we provide for our students in terms of content, approaches to learning, ways of assessing learning, and ways of increasing access to quality learning.* (English, 2002a, p. 4)

She follows her explanation about "powerful mathematical ideas" in the following terms:

> *Students are facing a world shaped by increasing complex, dynamic, and powerful systems of information and ideas. As future members of the workforce, students will need to be able to interpret and explain structurally complex systems, to reason in mathematically diverse ways, and to use sophisticated equipment and resources… Today's mathematics curricula must broaden their goals to include key concepts and processes that will maximize students' opportunities for success in the 21st century. These include, among others statistical reasoning, probability, algebraic thinking, mathematical modeling, visualizing, problem solving and posing, number sense, and dealing with technological change.* (p. 8)

Let me examine English's words. In the first quotation she established a connection between the quality of the mathematical education of a person and the person's potential and economic opportunity. This seems to imply that good mathematics education gives "power" to a person because it gives people mathematical skills that are of paramount importance in current social processes. English also establishes a connection between mathematics (and mathematics education) with current economic and productive processes. The power of mathematics and mathematics education is also brought in relation to a person's participation in a global economy. The demands of the global economy should make educators rethink the kind of mathematical experience provided to all students. In the second quotation English makes more explicit the demands of the global economy to people's performance. Powerful mathematical ideas are those that will allow people to think in ways that secure their success as working force in the 21st century, that is, in the global economy.

I take English words as representative of a type of discourse about power and mathematics education. Her definition of powerful mathematical ideas does in fact resonate with the way in which the term power features in most literature in mathematics education, where it appears in association with statements such as: "Since mathematics is a *powerful* knowledge in our society, then it is important

to improve the access of as many students as possible to a quality mathematics education so that they get *empowered*". Such a statement brings together two basic ideas: On the one hand, that mathematics has power, and that, therefore, mathematics can empower those who acquire it, on the other hand. These assumptions are sometimes explicit, but most of the times they remain tacit. When remaining tacit, the assumptions do not differ substantially from the also tacit concern of hardcore psychological research in mathematics education, where it is assumed that there is an intrinsic resonance between the goodness of mathematics and all the positive contributions of mathematics education both to the individual and to society[4].

These assumptions also rely on a notion of power rooted in a liberal functionalist tradition. In many analysis of power within this trend (for example, Weber, 1947), the concept is defined as the capacity of an actor *A* to influence the behavior of another actor *B*. *A* has power over *B* if *A* can modify *B*'s actions and therefore the results of *B*'s actions. If power is such capacity, then *A* is in possession of a form of control over other people or situations. *B* accepts *A*'s influence on the grounds of *B*'s acknowledgement of the legitimacy and desirability of *A*'s influence. The public recognition of *A*'s capacity allows *A* to exercise influence despite possible disagreement or even opposition from *B*'s side. Furthermore, on the grounds of *A*'s authority and legitimacy, *A* can empower *B*, if desired. Power can be passed on the will of the powerful and the acceptance of the empowered.

When translated into an educational arena, this view of power has led to view education as a powerful process where the teacher has power not only because s/he can modify the student's behavior, but mostly because s/he possesses a capacity that allows him/her to control students. Such a capacity is normally associated with teachers' knowledge. When one says that teachers can empower students, it is further assumed that the capacity that makes teachers powerful (in this case knowledge) can be transferred. Teachers transfer knowledge to students and as a result students acquire power. It is in this way that education is an empowering process. Knowledge allows students to think and therefore act in appropriate and desirable ways in the society in which they live. Students have gained power, which they can later exercise in relation to other people and other situations inside and outside the school.

In mathematics education this assumption is even stronger: Mathematics teachers transfer a very special and in itself powerful knowledge. The traditional idea that mathematics education is important because it develops the brain and thinking functions of people due to its dealing with ideas and structures (Niss, 1996) is in line with this view. Once mental structures are in place then individuals can engage in legitimate, credible actions such as describe, count, measure, control, predict, argue, communicate, etc., in order to influence their environment. All of these activities are possible thanks to the possession of mathematical

[4] See Skovsmose and Valero (2001) for further details on this discussion.

knowledge, abilities, competencies, etc. Teachers, the possessors of knowledge, transfer mathematics to students who then become empowered by the acquisition of a knowledge that allows students to exercise powerful actions.

This conception of power and of power in relation to mathematics and mathematics education is problematic. First of all, saying that mathematics is powerful is equivalent to asserting that mathematics exerts power. Saying that mathematics exerts power implies that mathematics *can do* something in itself. That is, mathematics is given the status of a social actor who can perform actions. In this way mathematics is given a life of its own. Supposing that mathematics has a life of its own (independently of people) implies a reliance on Platonist philosophies of mathematics that conceive mathematics as ever existing objects. Such a view is incompatible with the social constructivist ontologies of mathematics, which are at the base of socio-political approaches to mathematics education. Here we fall in a contradiction, which may easily lead to an internalistic conception of both mathematics and mathematics education.

Second, this conception supposes that there is transference in education from the structures of mathematics to mental structures, and from the potentialities of mathematics to people's capacities. The issue of transference of power has been questioned from poststructuralist viewpoints (Foucault, 1972). I will come back to this view later on. Suffice to say by now that the constitution of power in social practice is much more complex that what this view of power supposes, and therefore it is not possible to assume that empowerment (or transference of *A*'s capacity to *B*) can take place in such an unproblematic way. The issue of transference in learning, particularly the transference of schemes of thinking from one situation from another, has also been criticized by situated cognition theories that emphasize the dialectical relationship between social practice and its setting, and thinking and learning (as in, for example, Lave, 1988).That is, if thinking and learning happen in the constitutive relation between a person's action, a social setting and activity, then it is not possible to assume that people can always manage to transfer thinking from one situation to another. Thus, it is not possible to assume either that the ways of thinking involved in the development of the discipline of mathematics can be transferred to children in school, since the way in which children in school develop their thinking is related to the social practices happening in school settings, and those setting and practices are different in time, space and activity from those in which the thinking of mathematicians develops. Furthermore, it is not plausible to suppose that, once school children have developed one or another way of mathematical thinking, they will transfer that way of thinking into any other field of practice, in particular everyday life settings (Boaler, 1997).

This type of conceptualization of power in relation to mathematics and mathematics education, I have argued, does not bring us further in an understanding of the functioning of mathematical knowledge and of school mathematics

education in the current modern, Western world. Rather, it leads us to some contradictions and shortcomings.

**Power as Structural Imbalance of Knowledge Control**

In the work of M. Frankenstein (as in, for example, Frankenstein, 1995) there is a different way of talking about power in relation to mathematics education. She says:

> *So, I argue that mathematics education in general, and mathematics in particular, will become more equitable as the class structure in society becomes more equitable. Since I also contend that working-class consciousness is an important component in changing class inequities, developing that consciousness during teaching could contribute to the goal of ensuring equity in mathematics education… I think that mathematical disempowerment impedes an understanding of how our society is structured with respect to class interests.* (p. 165)

A first concern of Frankenstein is the existence of deep class inequalities in society that are also present in school and that permeate the way in which mathematics is taught. Students' awareness of these class inequalities is essential in a move towards a more equitable society. Mathematics education (of certain kind) can help students gaining class-consciousness since it can make visible the way in which mathematical calculations are implicated themselves in the production of those inequalities. Mathematics education empowers students to gain this awareness. A lack of mathematical capacities —mathematical disempowerment— blocks the gaining of class consciousness.

I take Frankenstein words as representative of a different way to conceive power in mathematics education research. In this perspective there are new elements associated to the meaning of power. First of all, there is a clear assumption about society —an unequal, class-divided society— which differs from the kind of global, market society to which English (2002a) refers to. Frankenstein's perspective is in line with Marxist interpretations of the capitalist society. The general inequalities in society are reproduced in the ideological apparatus of the state, which include schools, and within them, mathematics classrooms. Second, there is also a definition of power rooted in the Marxist tradition. Power is the capacity of the owners of productive resources to alienate others from such resources including their own working force, and, as a result, to create a situation of oppression and dispossession for the latter. These inequalities produced through the production system and made visible in the divisions of class are structurally reproduced through practices in many other fields of social action, particularly in those fields where ideology is constituted. Schools are a particular space for that reproduction, and there power is exercised by some people at the expense of others. Although this definition, so formulated, may misrepresent the depth of its theoretical lineage, it is important to highlight that the essence of

such a definition is a struggle between those who are structurally "included" and those who are "excluded". This struggle represents a relation in which the powerful tend to win —although there may be chances of resistance on the side of the excluded, or initiatives of critical people to help the excluded break their alienation and gain power. Third, mathematical empowerment is seen as the capacity that an individual gains, via the learning of mathematics, to see the way in which mathematics operates in society and contributes to perpetuate an unequal class distribution. Its opposite, mathematical disempowerment, contributes to the general alienation of people as part of the operation of the capitalist system. Empowerment, though, is not a result of an individual enlightening process but rather a social process in which the disempowered are assisted by others in order to gain consciousness.

Although the discourse on society and the structural misdistribution of access to resources is different in the first and second perspectives, the discourse around mathematical power in this Marxist perspective does not seem significantly different from the one in the Liberal perspective. The idea that mathematics gives students or people a capacity to act in the social world is similar and therefore these two perspectives may fall in the contradiction of ascribing mathematics the role of a social actor. In both perspectives mathematics empowers students. However, they differ in their view of the kind of actions that can be undertaken with the use of mathematics. While in the liberal position mathematics is seen as a positive constructive tool, in this Marxist, critical position it is seen as a tool that both can be used in constructive and in destructive ways.

Another example of this perspective is to be found in the political challenge posed by ethnomathematics to the reign of Western, white mathematics. A fundamental critique by D'Ambrosio (1993) is the uncontested imposition of mathematics as the privileged form of thinking of human beings. Because of this high, culturally given status in the Western world, mathematics "is positioned as a promoter of a certain model of exercising power through knowledge" (p. 24, my translation). In the historical development of the Western world, which has as well impacted the transformation of the rest of other peoples, mathematics imposes the rationality of the dominant power over all other kinds of forms of thinking and expression in non-Western, indigenous, colonized cultures. Powell (2002) also highlights that ethnomathematics departs from forms of thought that privilege "European, male, heterosexual, racist, and capitalistic interests and values" (p. 17). This essential critique to mathematics as a tool of ideological domination is incorporated in research and in the pedagogical proposals derived from it, such as in the work of Powell (2002).

One element that emerges clearly from this type of definition of power —in association with the use of Critical Theory (see, for example, Held, 1980) and Marxist approaches— is the necessity of questioning both mathematics and mathematics education practices. In the case of an ethnomathematical program it is clear that any reformulation of mathematics education as social and cultural

practices should look critically at the goods and evils of the uses of mathematics within the social structures in which they emerge. In the case of Marilyn Frankenstein's critical mathematics education, mathematics is implicated in the creation of unequal social structures by means of the way it is used in society. The "uses of mathematics" here do not only refer to the concrete applications of mathematics in the development of technological devices —as Skovsmose (1994) emphasizes— but also the "functionality" that people give to it in the construction of social relations and culture.

A risk in adopting this definition of power in mathematics education could be to adhere to the thesis of the *dissonance* between mathematics education, power, and democracy (Skovsmose & Valero, 2001). This risk would equate with seeing no possible alternative to break the "intellectual oppression" exercised by the imposition of mathematics and mathematics education over other possible human rationalities. The "destructive" effect of power may be emphasized to a point where it becomes impossible to think about the "constructive" effects of power.

**Power as Distributed Positioning**

In his plenary address to the Third Mathematics Education and Society Conference, Popkewitz (2002) presented the pillars of his analysis of mathematics education as a school subject. He says:

> *The mathematics curriculum… is an ordering practice analogous to creating a uniform system of taxes, the development of uniform measurements, and urban planning. It is an inscription devise that makes the child legible and administrable. The mathematics curriculum embodies rules and standards of reason that order how judgments are made, conclusions drawn, rectification proposed, and the fields of existence made manageable and predictable.*
>
> *I consider mathematics education in this manner not only because mathematics education is one of the high priests of modernity. Mathematics education carries the salvation narrative of progress. The narratives are of the enlightened citizen who contributes to the global knowledge society. The story of progress is also told about a pluralism of the diverse people who come to school. Yet while the speech is about a universal child who is not* left behind *and* all children will learn*, some children are never even brought to the table! How does that happen? What are the concrete cultural practices in the curriculum that produce the distinctions and divisions that qualify some and disqualify others?* (p. 35)

In Popkewitz' word, mathematics education is seen as a social practice which, together with other sets of practices, contributes to the governance of citizens. That governance is carried through the instauration of systems of reason, that is,

socially constructed and accepted forms of characterizing and organizing the world, which frame what is possible, desirable and appropriate and that, therefore, constitute the basis of classification of individuals in a society. The mathematics curriculum and the teaching of mathematics are not devices and processes in charge of the transmission of a highly valued knowledge. They are social practices that, through the transformation of knowledge from one field of practice to another field of practice, helps regulating the action of students, their thinking frames and their possibilities of participation and exclusion from participation in the social world. Mathematics education operates as part of broader mechanisms which determine what is valued, what is right and what is normal in society. Mathematics education are practices through which social relations of classification and regulation are established, and through which some social actors use particular resources in particular situations to position themselves and others in those socially defined categories and norms.

I take Popkewitz' formulations as being representative of a third view of power. Popkewitz' perspective is highly inspired by Foucault's analysis of the microphysics of power in modern societies. In this view, power is a relational capacity of social actors to position themselves in different situations, through the use of various resources. This definition implies that power is not an intrinsic and permanent characteristic of social actors; power is relational and in constant transformation. This transformation does not happen directly as a consequence of open struggle and resistance, but through the participation of actors in social practices and in the construction of discourses. In this sense power is not openly overt but subtly exercised. This also means that power is both a constructive and destructive force, and that duality is always present in any social situation. When power is defined in these terms, it becomes possible to enter into a very fine grained analysis of how mathematics and mathematics education are used in particular discourses and of the effects of those discourses in people's lives.

This way of defining power has not been so popular among mathematics education researchers. However this type of definition could bring new insights in research because it finds resonance not only with the advance of postmodern ideas in education (e.g., Popkewitz & Brennan, 1998) and in mathematics education (Ernest, 2004) but also with new possibilities of reinterpreting many of the theories that have been at the core of the discipline.

In the recent book *Mathematics Education within the Postmodern* (Walshaw, 2004), there is a series of articles adopting this perspective of power. Hardy (2004), for example, presents to the reader a toolkit, a series of notions coming from Foucault (1972), which have helped her seeing how in mathematics classrooms power is exercised in the relationship between students, a teacher and school mathematics activities. Though the examination of a video excerpt from a teacher training material published by the UK government as part of the National Numeracy Strategy, she presents an interpretation of the interaction between teacher and students in which the teacher's pedagogical techniques are in opera-

tion. From her perspective the teacher creates a situation of surveillance in which students' actions are exposed to the control of the teacher, who publicly approves and disapproves students' answers to calculations. Students are not only "answering" to the teacher's demands, they are being identified with an answer and are learning to identify themselves with an accepted (or rejected) behavior and thinking. The teacher's way of managing the classroom discourse plays with the double strategy of individualizing (that is, making noticeable in public an individual action) and totalizing (that is, hiding individuals within a collectivity) through her constant distinction between particular students (with proper name) and the collectivity of the class (the "we" referring to "all" in the classroom). This strategy is used in systematic ways: individualization is used to publicly correct wrong answers and to reward right answers and by this creating a clear differentiation between those who cannot and can do the mathematics; while totalization is used to give a collective legitimacy to what the teachers considers to be appropriate behavior. With this analysis Hardy illustrates that the power dynamics of a classroom go deeper than the expected mathematical empowerment assumed by the views of power presented in the two previous sections of this paper.

Meaney (2004) also uses Foucault's idea of power as embedded in social actors' relationships in order to analyze her role as a white expert consultant when working with a Maöri community, socially positioned as a disadvantaged community, in the development of a mathematics curriculum. In her analysis of the changing positions that both her and the community acquired during the inquiry process, she highlights that what comes to be considered as valid knowledge and truth is deeply dependent on the way in which the relationship among the project participants evolved. She argues that power fluctuated among participants in their differential use of strategies to argue for and give meaning to the knowledge being constructed in their relationship.

Both Hardy and Meaney, as well as other authors such as Cotton (2004) and Valero (2007), argue that an analysis of power in these terms is not restricted to the practices of teaching and learning where school mathematics is implicated. The analysis should also extend to the way in which research is produced. Researchers, in their privileged position as active constructors of knowledge, and with it, of discourses about what is valid true, participate in the consolidation of certain systems of reason. As Popkewitz (2004) argues, "intellectual traditions of research construct ways of thinking and ordering action, conceive of results, and intern and enclose the possibilities imagined" (p. 259). In this sense, researchers' discursive practices are not a neutral search for truth but an active engagement in opening/closing possibilities for phrasing and giving meaning to the social world. Therefore, this view of power opens for an examination of the way in which researchers are also implicated in the social distribution of power.

## Possibilities for Action

The three discourses presented above both open and close possibilities for conceiving and doing research, that is, to pose questions and find solutions to perceived problems in practice. The discourse of "power as an intrinsic capacity" is in line with a liberal tradition which focuses on the contribution of (mathematics) education to the maintenance of a Western culture. The particular formulation of English in the fragments analyzed represent a contextualization of those ideas to the current historical situation of technological development and globalization. The discourse, however, is in essence the same as the one launched at the time of the Sputnik Shock: mathematical competencies —not matter how they are defined— are central in the construction of scientific progress, and economic and social welfare. This discourse allows to think about how particular qualifications, in this case mathematical qualifications of citizens and the working force, help fulfilling productive functions and, therefore, securing both individual and collective advancement. However, the association of this discourse to a modern narrative of progress (Skovsmose, 2005) makes difficult to pose critical questions about whether the salvation narrative of mathematics education is meaningful from either teachers' or students' point of view. In other words, do students and teachers see and feel in their lives the idea of "empowerment" that researchers have constructed? If not, what is then the effect of such a narrative on those who do not succeed in appropriating that discourse?

The discourse of "power as structural imbalance" opens the possibility of asking questions about how mathematics education is implicated in the reproduction of unequal social structures and provides spaces for asking questions out of the frame of a dominant Western, capitalist culture. However, the conception of power shares both differences and similarities to that in the view of power as capacity. The main similarity of power conceived as a transferable capacity limits the possibilities of transcending traditional categories of exclusion —gender, class and ethnicity— in relation to mathematical competencies. That is, there is a risk in seeing the dynamics intermeshing between individual construction of identity on the grounds of gender, class, ethnic, ability affiliations and the differential participation of individuals on mathematics-related practices. The alternatives of resistance to structural power are then limited almost to large redistribution of power and may be seen distant from individual and collective resistance though participation in alternative mathematical discourses and practices.

The discourse of "power as distributed positioning" opens for possibilities of analysis of the micro-politics of mathematics education in situated practices, as well as offers the possibility of connecting such an analysis with larger systems of reason. However, as part of a particular post-structuralist analysis, this discourse is commonly being criticized for a lack of formulation of what are in fact actual possibilities for action in practice. Once power is evidenced, this discourse falls short in formulating alternative theoretical possibilities and, therefore, show-

ing what is possible to imagine as educational practices. A sense of hopelessness for both researchers and practitioners may arise from this type of analysis of power and mathematics education.

A choice of a theoretical and methodological approach in mathematics education research (or in any research in general) is not an accidental act. As I have tried to show from my analysis, different possibilities are opened and closed by different approaches. Even the very same socio-political approach to research in mathematics education, in particular the assumption behind theories and research methods that power is a central element in mathematics education practices, prioritizes certain research problems and foci. The socio-political approach I have chosen invites researchers to discuss the ontological and epistemological basis for the process of knowledge production in the field. Considering power in mathematics education invites to pose questions about what has been taken for granted in the historical construction of the research objects in the field. Without such critical stand point research runs the risk of either adhering uncritically to a modern salvation narrative which does not make sense to students, their lives, and their school mathematics experiences, or of closing the possibility of achieving a richer and more nuanced understanding of mathematics education practices in our current society. The approach I have chosen does not explain directly concrete teaching practices, nor does it provide indications of how to improve teaching. Rather, it contributes with a broader understanding of mathematics and mathematics education in a social context, which is, I think, one of the primary tasks of the field of research called mathematics education.

## REFERENCES

Boaler, J. (1997). *Experiencing school mathematics. Teaching styles, sex, and setting*. Milton Keynes: Open University.

Brown, T. (2001). *Mathematics education and language: Interpreting hermeneutics and post-structuralism* (Rev. 2nd ed.). Boston: Kluwer Academic Publishers.

Brown, T., & McNamara, O. (2005). *New teacher identity and regulative government: The discursive formation of primary mathematics teacher education*. New York: Springer.

Burton, L. (2003). *Which way social justice in mathematics education?* Westport: Praeger.

Christensen, O. R., Stentoft, D., & Valero, P. (2007). Power distribution in the network of mathematics education practices. In K. Nolan & E. De Freitas (Eds.), *Opening the research text: Critical insights and in(ter)ventions into mathematics education* (pp. 131-146). New York: Springer.

Cotton, T. (2004). What can I say and what can I do? Archaeology, narrative, assessment. In M. Walshaw (Ed.), *Mathematics education within the post-modern* (pp. 219-238). Greenwich: Information Age.

D'Ambrosio, U. (1993). *Etnomatemática. Arte ou técnica de explicar e conhecer*. Sao Paulo: Ática.

English, L. D. (2002a). Preface. In L. D. English (Ed.), *Handbook of international research in mathematics education* (pp. xi). Mahwah: Lawrence Erlbaum.

English, L. D. (Ed.). (2002b). *Handbook of international research in mathematics education*. Mahwah: Lawrence Erlbaum.

Ernest, P. (2004). Postmodernity and social research in mathematics education. In P. Valero & R. Zevenbergen (Eds.), *Researching the socio-political dimensions of mathematics education: Issues of power in theory and methodology* (pp. 65-84). Boston: Kluwer Academic Publishers.

Fairclough, N. (1992). *Discourse and social change*. Cambridge: Polity Press.

Fairclough, N. (1995). *Critical discourse analysis: The critical study of language*. New York: Longman.

Fairclough, N. (2001). *Language and power*. Harlow: Longman - Pearson Education.

Fairclough, N. (2003). *Analyzing discourse: Textual analysis for social research*. New York: Routledge.

Foucault, M. (1972). *The archaeology of knowledge* (1st American ed.). New York: Pantheon Books.

Foucault, M., & Faubion, J. D. (2000). *Power*. New York: New Press.

Frankenstein, M. (1995). Equity in mathematics education: Class in the world outside the class. In E. Fennema & L. Adajian (Eds.), *New directions for equity in mathematics education* (pp. 165-190). Cambridge: Cambridge University.

Gee, J. P. (2005). *An introduction to discourse analysis theory and method* (2nd ed.). New York: Routledge.

Gee, J. P., & Green, J. L. (1998). Discourse analysis, learning, and social practice: A methodological study. *Review of Research in Education*, *23*, 119-169.

Hardy, T. (2004). "There's no hiding place". Foucault's notion of normalization at work in a mathematics lesson. In M. Walshaw (Ed.), *Mathematics education within the postmodern* (pp. 103-119). Greenwich: Information Age.

Held, D. (1980). *Introduction to critical theory. Horkheimer to Habermas*. Cambridge: Polity Press.

Keitel, C. (1989). *Mathematics, education, and society* (science and technology education, document series No. 35). Paris: Unesco.

Keitel, C. (Ed.). (1998). *Social justice and mathematics education. Gender, class, ethnicity, and the politics of schooling*. Berlin: IOWME – Freie Universität Berlin.

Kieran, C., Forman, E. A., & Sfard, A. (2001). Guest editorial. Learning discourses: Sociocultural approaches to research in mathematics education. *Educational Studies in Mathematics*, *46*(1-3), 1-12.

Lave, J. (1988). *Cognition in practice: Mind, mathematics, and culture in everyday life*. Cambridge: Cambridge University Press.

Lerman, S. (2000). The social turn in mathematics education research. In J. Boaler (Ed.), *Multiple perspectives on mathematics teaching and learning* (pp. 19-44). Westport: Ablex Publishing.

Lerman, S. (2006). Cultural psychology, anthropology and sociology: The developing 'strong' social turn. In J. Maasz & W. Schloeglmann (Eds.), *New mathematics education research and practice* (pp. 171-188). Rotterdam: Sense.

Meaney, T. (2004). So what's power got to do with it? In M. Walshaw (Ed.), *Mathematics education within the postmodern* (pp. 181-200). Greenwich: Information Age.

Mellin-Olsen, S. (1987). *The politics of mathematics education*. Dordrecht: Kluwer.

Niss, M. (1996). Goals of mathematics teaching. In A. J. Bishop, K. Clements, C. Keitel, J. Kilpatrick, & C. Laborde (Eds.), *International handbook of mathematics education* (Vol. 1, pp. 11-47). Dordrecht: Kluwer.

Nolan, K., & De Freitas, E. (Eds.). (2007). *Opening the research text: Critical insights and in(ter)ventions into mathematics education*. New York: Springer.

Popkewitz, T. S. (2002). Whose heaven and whose redemption? The alchemy of the mathematics curriculum to save (please check one or all of the following: (a) the economy, (b) democracy, (c) the nation, (d) human rights, (d) the welfare state, (e) the individual). In P. Valero & O. Skovsmose (Eds.), *Proceedings of the Third International Conference on Mathematics Education and Society* (pp. 29-45). Copenhagen: Center for Research in Learning Mathematics.

Popkewitz, T. S. (2004). School subjects, the politics of knowledge, and the projects of intellectuals in change. In P. Valero & R. Zevenbergen (Eds.), *Researching the socio-political dimensions of mathematics education: Issues of power in theory and methodology* (pp. 251-267). Boston: Kluwer Academic Publishers.

Popkewitz, T. S., & Brennan, M. (1998). *Foucault's challenge: Discourse, knowledge, and power in education*. New York: Teachers College Press.

Powell, A. (2002). Ethnomathematics and the challenges of racism in mathematics education. In P. Valero & O. Skovsmose (Eds.), *Proceedings of the Third International Conference on Mathematics Education and Society* (pp. 15-28). Copenhagen: Center for Research in Learning Mathematics.

Sfard, A. (2001). There is more to discourse than meet the ears: Looking at thinking as communicating to learn more about mathematical learning. *Educational Studies in Mathematics*, *46*(1-3), 13-57.

Skovsmose, O. (1994). *Towards a philosophy of critical mathematics education*. Dordrecht: Kluwer.

Skovsmose, O. (2005). *Traveling through education: Uncertainty, mathematics, responsibility*. Rotterdam: Sense Publishers.

Skovsmose, O., & Valero, P. (2001). Breaking political neutrality: The critical engagement of mathematics education with democracy. In B. Atweh, H. Forgasz, & B. Nebres (Eds.), *Sociocultural research on mathematics education. An international perspective* (pp. 37-55). Mahwah: Erlbaum.

Skovsmose, O., & Valero, P. (2002). Democratic access to powerful mathematical ideas. In L. D. English (Ed.), *Handbook of international research in mathematics education. Directions for the 21st Century* (pp. 383-407). Mahwah: Erlbaum.

Valero, P. (1999). Deliberative mathematics education for social democratization in Latin America. *Zentrlblatt für Didaktik der Mathematik*, *99*(1), 20-26.

Valero, P. (2004). Socio-political perspectives on mathematics education. In P. Valero & R. Zevenbergen (Eds.), *Researching the socio-political dimensions of mathematics education: Issues of power in theory and methodology* (pp. 5-24). Boston: Kluwer Academic Publishers.

Valero, P. (2007). A socio-political look at equity in the school organization of mathematics education. *Zentralblatt für Didaktik der Mathematik*, *39*(3), 225-233.

Valero, P., & Zevenbergen, R. (2004). *Researching the socio-political dimensions of mathematics education: Issues of power in theory and methodology*. Boston: Kluwer Academic Publishers.

Wagner, D. (2004). *Silence and voice in the secondary mathematics classroom*. Edmonton: University of Alberta.

Walshaw, M. (2004). *Mathematics education within the postmodern*. Greenwich: Information Age.

Weber, M. (1947). Social stratification and class structure. In T. Parsons (Ed.), *The theory of social and economic organization* (pp. 424–429). New York: Free Press.

Wedege, T. (2006). Hvorfor stave problematik med q? - Om centrale problemstillinger i matematikdidaktisk forskning. In M. Blomhøj & O. Skovsmose (Eds.), *Kunne det tænkes? - om matematiklæring* (pp. 312-332). Albertslund (Denmark): Malling Beck.

Zevenbergen, R., & Ortiz-Franco, L. (Eds.). (2002). Equity and mathematics education [Special issue]. *Mathematics Education Research Journal, 14*(2).

This paper builds on three previous papers: (a) Valero, P. (2005). What has power got to do with mathematics education? In D. Chassapis (Ed.) (2005), *Proceedings of the 4th dialogue on mathematics teaching issues: Social and cultural*

*aspects of mathematics education* (pp. 25-43). Thessaloniki (Greece): Aristotle University of Thessaloniki – Primary Education Department; (b) Valero, P. (2007). What has power got to do with mathematics education? *Philosophy of Mathematics Education Journal*, *21*; (b) and Valero, P. (2006). Diskurser om magt i matematik didaktisk forskning – Begreber og handlingsmuligheder. In O. Skovsmose & M. Blomhøj (red.), *Kunne det tænkes?* (pp. 296-311). København: Malling Beck.

Paola Valero
Aalborg University, Denmark
paola@learning.aau.dk