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## **'Being Good' at Maths: Fabricating Gender Subjectivity**

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# 'Being Good' at Maths: Fabricating Gender Subjectivity

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## **Abstract**

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Current research in mathematics education places emphasis on the analysis of men and women's accounts about their life trajectories and choices for studying, working and developing a career that involves the learning and teaching of mathematics. Within this realm, the present study aims to highlight how mathematics, gender and subjectivity become interwoven by focusing the analysis on a single case study, that of Irene –a teacher in her early 40s. Based on how she articulates hegemonic discourses and narrates her relation to mathematics from the time she was a schoolgirl up till her recent work as teacher and her endeavours as participant in a professional development teacher training course, we argue how 'mathematics' becomes a mythical object for her subjectification. Irene as a female subject appropriates through her narrative the socially, culturally and historically constructed ideals about maths and gender and essentialises mathematical ability. Our study reveals how dominant discourses concerning 'mathematics' and 'gender' relate closely to subjectivity fabrication.

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**Keywords:** mathematics, gender, subjectivity .

# 'Ser bueno/a' en Matemáticas: Fabricando la subjetividad de género

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## Resumen

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La investigación actual en educación matemática pone énfasis en el análisis de las historias de hombres y mujeres sobre sus trayectorias y elecciones para estudiar, trabajar y desarrollar una carrera que implica el aprendizaje y la enseñanza de las matemáticas. En este ámbito, el presente estudio pretende destacar cómo las matemáticas, el género y la subjetividad se interrelacionan centrandose en análisis en un estudio de caso individual, el de Irene -una maestra que tiene poco más de cuarenta años. En base a cómo articula los discursos hegemónicos y cómo narra su relación con las matemáticas desde que era una joven alumna hasta su reciente trabajo como maestra, y sus practicas como participante en un curso de desarrollo profesional de formación del profesorado, comentamos como "las matemáticas" se convierten en un objeto mítico para su subjetivación. Irene es una mujer que se apropia a través de su narrativas de los ideales construidos social, cultural e históricamente sobre las matemáticas y el genero y esencializa las habilidades matemáticas. Nuestro estudio revela cómo los discursos dominantes relativos a las "matemáticas" y el "genero" se relacionan estrechamente con la fabricación de la subjetividad.

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**Palabras Clave:** matemáticas, género, subjetividad.

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During the last two decades, we have witnessed serious efforts at the levels of both academic dialogue and policy making, to render mathematics accessible to young children and adults. At the same time, issues of equity in direct relation to men and women and people from diverse communities and cultural, racial and linguistic backgrounds have been of high priority to the field of mathematics education (Rogers and Kaiser, 1995). Specifically, distinctive endeavors come from varied, but at times interrelated disciplinary areas such as socio-semiotics, anthropology, sociology, psychology, critical theory and poststructural studies. Next to alerting us for a critique of hegemonic practices, they strive towards theorising and politising alternative perspectives on what mathematics could be and how people potentially relate to this field of knowledge. Related theoretical discussions and events lead to an increased awareness of mathematics as emergent and construed through multiple sociopolitical contexts and complex historical trajectories (see Walkerdine, 1988, 1998; Restivo, 1992; Skovsmose, 1995; Brown, 1997; Walshaw, 2004a).

However, mathematics continues to preserve a mythologised public image of an alien, extrinsic and inhumane subject. Mathematics is, by and large, socially represented, as closely connected to pure reason, absolutism and mysticism, and thus, stereotypic transcendental and supernatural viewpoints become adhered to what mathematical practices are (see Restivo, 2009, 1992). At the same time, a number of studies reveal how prevailing discourses about mathematics, mathematicians or even lay people who use either deliberately, by chance or routine mathematics as part of everyday life dealings and work permeate with stereotypes and very limited understanding of what mathematics is and how people relate to it (Applebaum, 1995). Such hegemonic discourses tend to promote and perpetuate images of mathematics as hard labour, lonely work, cold logic, and the eternal search for precision, abstraction and absolute truth. Tied to these, prime representations of mathematical work as correct outcome and drill are connected to the product of a solitary, and yet, inspired mind whose nature is cast in occultism and uncouthness.

A number of trends in feminist research have related such a dominant perspective on mathematical knowledge to issues of gender. Reconciling

the theories that attempt to account for the gendered subject in mathematics education practices, one needs to acknowledge the presence of diverse epistemological and ontological stances. Margaret Walshaw (1999) distinguishes between the liberal approach where the dominant discourse evolves around '*the woman as a problem in mathematics*' and the reconstruction approach where '*women become central to mathematics*' and their experiences across cultures, society and history become honored and evinced. She argues that both approaches are circumscribed by essentialist views related to subject identity seen as rational, self-determined and stable. In accordance with Walkerdine's (1988, 1998) poststructural perspective, Margaret Walshaw (1999, 2001) claims that virtues such as stability, universality and rationality are contested as fictive. In consequence, an overemphasis on female experiences and ways of knowing as being of a distinct nature assume a type of commonality amongst all women. As such, women's life becomes an idealised singularity –a view that has been challenged by and large through feminist postmodernist and postcolonial studies.

In the light of the above discussion around the gendered dimension in mathematics education, these two lines of thought and research (i.e. woman as problem and woman as central and distinct) need to be seen as strategic approaches within the modernist regime. They both serve to promote and perpetuate a binary optic routed in what Judith Butler (1990) calls a masculinist construction of an essentialised self. Accepting and remaining idle within this modernist frame of thinking there is very little chance for developing an alternative inquiry of self and subjectivity. Escaping the hegemony of essentialist discourses means moving away from the discursive narratives that assist to produce them. It is through this frame of thinking that we attempt here to problematize and deconstruct grant narratives about gender, mathematics and subjectivity through the case of Irene -a female primary school teacher in her early 40s. As a first step in this long path, we aim to map the potential effects of the essentialised meanings produced as part of her narrative. In short, we problematise her travail to articulate hegemonic discourses about mathematics and gender as part of her personal struggle to fabricate subjectivity.

### **Mathematics and Gender: Articulating Discourses and Subjectivity**

As far as a gendered approach to mathematics is concerned, the relative connectivity amongst mathematics, gender and subjectivity is not a new concern in the field of mathematics education. Valery Walkerdine (1988, 1998) was amongst the first who worked systematically towards unravelling the tacit connections among gender, mathematics and subjectivity. In her seminal book 'Counting Girls Out: *Girls and Mathematics*' Walkerdine (1998) takes her readers through an archaeology of knowledge that sketches how gendered hierarchies in the field of mathematics education have their roots in modernist discourses about science, childhood and education. She also discusses gender and its relation to power and discourses of mathematical ability from nursery, to primary and up to secondary school when adolescent girls have to make decisions about the further studying of mathematics.

Through her meticulous longitudinal qualitative empirical research with children, teachers and parents, she argues that there still continues to be a huge class divide, where '*...middle-class girls are being allowed and pushed to achieve academically*' whilst '*...working-class girls still facing a huge gulf in terms of the possibilities for attainment anywhere near matching that of middle-class girls*' (Walkerdine, 1998, p. 169). Although the gender gap seems to be closing and girls more and more prove their mathematical abilities at the standards of international assessment items and examination tests, it becomes evident that, in Walkerdine's words, the future is still not 'female' in a uniform sense. She moves on to discuss middle-class girls and boys' anxiety about high performance in mathematics –and academic performance in general- as a matter closely linked to gendered subjectivity. She explains:

This anxiety often related to the conflicts between feminine sexuality and intellectuality. While on the surface many of these girls appeared to have a Post-Feminist dream of having one's cake and eating it, beneath the surface many suffered from the feeling that they were never good enough no matter how hard they tried and that their femininity could never ever be allowed to get in the way of their success. (Walkerdine, 1998, p.170)

Walkerdine has pointed out repeatedly how female subjectivity is often captured in essentialist categories dictating a certain and static identity that is biologically determined and socially situated in universal patriarchal roles and expectations.

Margaret Walshaw (1999, 2001) follows this line of thought and argues how the subject of the woman or girl centered research approaches is often circumscribed by fictitious ideals that tends to romanticize the so-called female ways of knowing around very simplistic notions of 'experience' and 'feeling'. Drawing on the work of Luce Irigaray and Pati Lather she claims that engaging with the complexity of gender and mathematics one needs to move beyond the binary logic of a unique or singular male or female pattern of knowledge. Such analytic tools become blind to material and discursive constraints that constitute people as subjects and empower them to perform certain tasks and narratives. Chronaki (2009), discussing the significance of a number of studies concerning gender, mathematics and technology in the body of education, denotes how binary politics of knowledge and essentialist theorisations serve to perpetuate the old body/mind dichotomy on several layers of how students, teachers, parents, curriculum material and mathematics education communities interact and relate to each other. She, along with others, stresses the importance of moving beyond dichotomising as a political path for research in the field of mathematics education and argues further, for the inclusion of a feminist research optic that espouses a critique of postcolonial theorising. Such a perspective sheds new light and potentially challenges the ethics and morals of mathematical knowledge use and production as integral part of our technoculture in and out of school. Heather Mendick (2005, 2006) has argued how dominant discourses serve to construct mathematics as an experience disconnected from cultural life, emotion and self. Based on her studies she claims that most young people reject the possibility of a 'mathematical' world and resist mathematics as an activity embedded in their imagery as an object of pleasure and joy. Walkerdine (1988, 1998) has also drawn on the politics related to the particular fantasy of controlling human life and the world via mathematics. She argues that, through fiction and imagery, human subjects position themselves in mathematical practices and construct

subjectivities related to either failure or success. All these studies seem to agree on how mathematics, gender and subjectivity in the field of education, and in particular, the mathematics classroom, influence each other in multiple ways. Their agreement could be summarised along three main lines: *firstly*, the prevailing public image of mathematics itself is of a masculine domain of knowledge. It has been constituted through modernist discourses of science and has been the product of sociopolitical struggles through contingent historical localities. For example, Walkerdine (1998) cites Charles Darwin who in 1896 claims in his book entitled *The Descent of Man and Selection in Relation to Sex* that:

The chief distinction in the intellectual powers of the two sexes is shewn by man's attaining to a higher eminence, in whatever he takes up, that can woman ...if men are capable of a decided pre-eminence over women in many subjects, the average mental power in man must be above that of woman. (cited by Walkerdine, 1998, p.15).

*Secondly*, the dominant views of girls and women's relation to mathematics have been theorised through discourses that represent them as marginal and non-passionate users and producers of mathematical knowledge. Studies in this perspective resort to direct comparisons between men and women or boys and girls and focus on issues of mathematical ability, skill and attitudes (Fenema, 1996). Although, an increased closing of the 'gender gap' has been noted, the overtones of such studies are still with us and are reflected upon the ways both lay people and scientists think and discuss research outcomes and possibilities. Very often innate and biological traits are called upon in order to explain and interpret female 'passive' activity or non-participation. *Thirdly*, the espousing of a poststructuralist optic assumes gender subjectivity as becoming fabricated and weaved discursively in multiple sociopolitical contexts. It emphasizes the roles played by hegemonic and marginal discourses as vital for subjectivity all way through, but also places equal emphasis on subject agency as contingent, multiple, local, fluid, fragile and emotional (see Weedon, 1987; Walshaw, 2004b).

Concerning the discursive formation of subjectivity, one needs to think about what discourse is and how it relates to human subjectivity. Discourse refers to a certain way of structuring and organising areas of knowledge and social practice. According to Foucault (1989), in modern western societies the practices in the production of knowledge are regulated and limited by certain disciplines, inside given institutional, political and economical “regimes of the production of truth”. Foucault dealt with the historical procedures of the construction and evolution of various “discourses”, especially those concerning the humanities. Specifically, he attempted to bring to the forefront the processes by which various definitions are embodied and excluded; the principles and the rules of hierarchal classification that define what may be taken as an object of thought and what not; how an object of thought is constructed; if it is legitimate or not to mention it etc. From this standpoint and pertaining to mathematics, there is no matter of right or wrong, which doesn't mean, as Wittgenstein (2009) affirms, that it is necessary to question that  $1+1=2$ . On the other hand, doubts can be cast on the conviction that mathematics is a series of truths exposed by mathematicians (see Lakatos, 1976; Ernest, 1991; and Restivo, 1992).

Discourse refers to the set of rules and significations that specify what it is possible to speak, do, and think, at a particular time. So, it is more than a way of an attempt to provide meaning to the world; it has real, material effect on people's lives. It implies a particular form of social organisation and social practices, at different historical times, which formulates institutions and constitutes subjectivities. Rosalind Gill (2008) claims that the focus on subjectivity:

“is relatively underexplored, with the exception of a few groundbreaking and important studies’ and continues stressing that ‘[...] There is very little understanding of how discourses relate to subjectivity, identity or lived embodied experiences of selfhood. We know almost nothing about how the social or cultural “gets inside”, and transforms and reshapes our relations to ourselves and others”. (Gill, 2008, p. 433)

Discussing subjectivity in relation to mathematics, one needs to encounter how the hegemony of such prevailing discourses determines

subject agency on at least two levels, the level of acting locally and the level of narrating local actions, acquaintances and feelings: As far as the level of *activity* is concerned, varied discourses on either mathematics or gender affect the decision making processes and choices for action. The neoliberal view of the subject as an autonomous decision maker is pertinent in the realm of a free choice discourse. In relation to the *narrating* level, one needs to take into account how subject agency (including resistance and change) becomes rationalised through events of acting and narrating. Individual narratives are inevitably situated in spatiotemporal localities and reflect one's own personal attempts to account on ways of doing things within a social context. Such attempts heavily encompass the struggle to articulate contingent experiences by resorting to locally embedded discourses that seem to influence and mobilise choices, decisions, the need to innovate but also inertia or resistance to anything new (see Laclau and Mouffe, 1985; Mouffe, 1992; Blackman & Walkerdine 2001; Walkerdine, 1997; and Walkerdine et al. 2001).

Current research related to gendered choices in studying and working in mathematical related fields (Mendick, 2006; and Walshaw, 2005) have brought into the fore perspectives that do not locate issues of 'choosing' maths merely with an ideal 'autonomous' individual but, instead, refocus our attention on the social, cultural and political complexities where men and women weave humane lives along with study and career paths. Autonomous choice and subject agency have been challenged as core concepts not only towards understanding but also explaining and pursuing our relation to varied layers of a social reality where we live as gendered, racial and aged subjectivities as we strive to become learners and educators. Discourses concerning agency, autonomy and choice, along with rationalism, active participation or collaboration are central to a neoliberal agenda of politics. The publishing of the book 'Changing the Subject' in 1984 was amongst the first systematic and coherent attempts towards articulating a critique of the 'autonomous' and 'self-regulated' subject ideal that mainstream psychology discourses were producing and promoting (Henriques et al. 1984). It certainly paved the way for more studies to unravel the multiple relational complexities amongst psychological and sociological

analysis and, in fact, created the space for theoretical social studies to advance. However, the discourse of 'free choice' is still mobilised and becomes the hegemonic theorisation of capturing and interpreting behaviour, motive and change in local settings. In this realm, mathematics seems to play a pivotal part as it is heavily connected to power. The relation between power and mathematics is mainly explained as symbolic, but as we reveal through our data it is also heavily rooted and contingent to local attempts to rationalise choice for action. The present paper starts with an outline of main claims concerning mathematics and mathematics education as a gendered phenomenon and aims to discuss –through the analysis of the case of Irene as a student at school and as an adult in work life- how mathematics becomes part of a complex performing of subjectivity. As we shall see, Irene, our interviewee in this research study, articulates a diffused neoliberal and essentialising discourse in order to deal with the concealed contradictions produced through her speech, and to fabricate an ostensible coherence in what she says.

Neoliberalism is a hegemonic discourse, and in this sense it is central to understanding contemporary social reality or a particular aspect of reality, such as the relation between mathematics, education and gender. The notions 'free', 'autonomous' choice and 'agency' are central to this discourse, which sees the individual as an independent actor who is rational and solely responsible for his or her life biography (Walkerdine et al., 2001). This discourse frequently mobilizes the concept of free and autonomous agent in order to explain and understand behaviour. However, we will see that these terms offer little understanding of the complex lived experience of girls and women in relation to mathematics education in our contemporary society and school communities. We claim that we need to develop an understanding of subjectivity in ways that do not complicit individuality solely with 'inside' or 'interiority' (Gill, 2008). That means we should not abandon the social, cultural, political constraints upon the subject's action. On these premises, we question whether Irene is ultimately free and autonomous in her choice of mathematics. We do this by considering how Irene deals with the socially, culturally, historically constructed ideals about mathematics and gender; how it is that these ideals are internalized or embodied, and felt not as external constraints or impositions, but as her own.

### **Methodology: Research Context and Questions**

This paper is part of a broader research project concerning the gendered dimensions of mathematics and technology use at the basic levels of the Greek educational system<sup>1</sup>. A part of the project was the interviewing of 24 male and female teachers aged between 36 and 47, who attended a biennial academic course aiming to offer in-service training for teachers in affiliation to a Greek University. The aim was to consider how they negotiate and construct their subjectivities through their narratives. Particularly, they were asked to express how they felt about mathematics and how these related to education and gender; whether they had positive or negative experiences from their contact with this field; to state the different teaching styles they had experienced as students, as well as those they themselves used in class; to describe and explain their professional and academic choices and their future aspirations; to state their beliefs about gender. In other words, we asked them to narrate their lived embodied experiences of mathematics and education.

Drawing from this project, we focus here on the case study of Irene, a woman in her early 40s who, even though she was good at maths, did not manage to study in a related field; she studied to become a librarian, she worked as a librarian for some years and currently she moved to a teaching career at a primary school. Based on her narratives of a life-story, we encounter and problematise her relation to mathematics all the way through –from her early years as a school-girl, her time as adolescent when crucial decisions about studying were made, her adult life in paid work as a librarian, the shift towards becoming a teacher and her present experiences as teacher trainee participant in a professional development university based course. Our focusing on this particular interview was not random. Our criteria included the fact that Irene considered herself very competent at mathematics and on this premise she differentiates herself from others in the course by idealising her mathematical ability as innate. Based on our analysis, we suggest that this idealisation offers us an opportunity to reflect upon whether such a perception of mathematical ability as an esoteric assemblage of mind-tools develops in relation with the acceptance and utilisation of gender binaries. At the same time, we problematise the entailment and

reproduction of the dominant hierarchical gender order all the way through her narrative (Connell, 1987). In addition, idealization of this form of knowledge results in favoring mathematics at the expense of other school subjects.

Such an articulation functions in claiming a specific dominant position for herself (i.e. good at maths and maths makes me different to others at school and work) and permits us to argue that Irene performs a certain form of masculinity (Mendick, 2006; Connell, 1995). In this context, we explored the limits and ramifications of such a performance (Butler, 1993), not only for herself, but also for the prevalent gender regime. In other words, we examined what makes it possible for her to claim such a positioning and whether those masculine embodiments were connected to essentialist perceptions of gender. So, what we wish to do in this paper is to develop a practical critique of the limits of self that takes the form of a possible transgression (Foucault, 1984, pp. 46-54). What we mean is an analysis of how we constitute ourselves subjects who think and act in particular ways in order to open up new spaces for thought and action (Wong, 2007). Foucault (1984, p. 43) describes the '*permanent critique*' of self-constitution as a '*critical ontology*' of ourselves. Hence, from the critical ontology's point of view we examine ideas and principles, especially about mathematics and gender, that denote interchangeable ways of organising discourse through alternative narratives in order to mobilise the potentiality to think and act differently.

### **The Case of Irene: Narrating her Relation to Mathematics**

Irene is 42 years old and comes from a rural area in Northern Greece where her family is involved with farming. At school she was very good at maths and, indeed, she expressed passion and ability for top grades. Although she wanted to study architecture (as she was very good at geometry) she ended up studying and working as a librarian for some years. She, then, studied pedagogy and followed a teaching career. She has not got married or have children until now. Recently, she completed her dissertation for a master's degree in Pedagogical Studies. Currently, Irene is satisfied with her academic and professional career, and further aspires to engage in research in the field of special education; possibly at the level of a PhD. She claimed that her choice not to follow a maths

related path was, more or less, random. Although, her first choice, as she said, was architecture, mostly because of her aptitude in mathematics and geometry, her drive to leave home was so deep that by the time she had secured a place in librarian studies she could not think of the extra effort needed to repeat her exams.

Irene's case becomes an interesting one for our research as it enables us to observe and deeper analyse how human subjectivity becomes fabricated as people struggle to produce meaning through available discourses in their social and cultural localities. Through her case, we were able to denote; a) her close relation to mathematics that expands from childhood (e.g. Irene as a schoolgirl is good at maths) up to the current time when Irene works as a teacher, b) how mathematics becomes narrated as part of performing her masculinity on the basis of an inherited rationality, objectivity, accuracy and mysticism, and c) that her choices are heavily dependent on contingency and her deep urge to live. All the way through, Irene essentialises 'mathematics' as a trait that enables her to differentiate from others ignoring how the 'discourses' she appropriates, articulates and re-produces, result into trapping her. In the following sections, we will try to unpack each one of the above issues and discuss them as part of our analysis.

### **Being Good at Maths: the Gift of Mathematical Ability**

A core part of our discussions with Irene was her past relation to mathematics in the school curriculum and also her current encounterings with the subject as part of her training course and teaching practice. We were eager to understand how she remembers herself as a school-girl and how she talks about her relation to mathematics at school and we wanted to identify in what ways mathematical knowledge has become important to her. In other words, how her mathematical ability has been inscribed at present times and how it contributes to her subjectification. Irene, quite proudly referred back to her school days denoting her high ability in doing mathematics. In particular, she exclaimed:

Irene: At school I was really good at maths. [...] In high-school I had top grades in mathematics and writing. [...] Really good grades! [...] I had a gift for maths.

The above interview extract sums up, in a representative way, Irene's endeavors to articulate her relation to mathematics as a school girl. As we can see, she develops her argument along two lines; first, emphasizing excellence in maths at both primary and secondary school and second, interpreting her excellence as a gift. Drawing on the first line, Irene, proudly emphasizes her excellence in mathematics as curricular knowledge at a continuum from primary to secondary levels of schooling. By stressing her mathematical skills in primary and secondary school, she wishes to denote that she could cope well not only with arithmetic and practical problem solving (i.e. as taught in primary school) but also with more abstract mathematics such as theorems, proof and argumentation (i.e. as taught in secondary school). At the same time, the act of distinguishing among primary and secondary, rises the prominence of her continuous performance in mathematics as ceaselessly good. In relation to the second line of her argument, but also interweaved to the first, Irene refers to her mathematical knowledge and skills as not something really possessed or controlled by herself, but as an external fairing. She characterises her own mathematical ability as the 'gift' of a mathematical mind –a trait given to her by birth or God- and thus adhering supernatural powers to it.

Concerning Irene's accounting of her mathematical ability as a 'gift' coming from external sources, Valery Walkerdine's reference to attribution theory as explained by Weiner (1972) or Bar-Tai (1978) might be useful here so as to take a deeper look at her positioning. According to this theory an essential gendered difference exists between boys and girls as far as their ways of talking about failure and success are concerned. Specifically, boys tend to attribute their success to internal and stable causes (ability) and their failure to external, unstable causes (e.g. lack of effort), whereas girls tend to reverse this pattern taking personal responsibility for failure but not for success (as referred by Walkerdine, 1998, p. 22). But, this was not the case with Irene. On the contrary, Irene breaks this gendered pattern and performs the 'brilliant academic male'. Such positioning serves to some extent women's struggles to prove themselves equal to men by performing intellectual masculinity recognized as rationality, logic, ability, talent and competition. This interpretation reflects the liberal 'woman as

problem' feminist discourse.

In parallel, and in connection to the above, Irene characterises her mathematical ability as a 'gift' with mystical connotations to a net of supernatural powers coming from heaven. Mendick (2006) narrates her personal experience of studying mathematics at a prestigious college in the UK marked by a competitive and masculine cultural context. Her colleagues, besides all being male, were not open to disclosing processes and personal paths of learning in doing mathematics. As such, construction of mathematical knowledge was represented as an individual, mystical, innate, closed task relevant only to the chosen few (see Mendick, 2006, p. 8). Irene, in a similar way talks about her talents in mathematics as having almost the magic touch of gifts. In this way she unconsciously creates barriers for any potential to unlock the material and social assemblages that afford her success in doing mathematics and permit the construction of her mathematical ability. She shuts and occludes any personal and collective efforts for becoming better, accomplishing effective strategies, and even sustaining success. Articulating success as a matter of magic signifies success as closed, mystical and, ultimately, inaccessible. Restivo (2009) argues how mathematics '*has been shrouded in mystery and halos for most of its history*' making it '*impossible to account for the nature and successes of mathematics without granting it some sort of transcendental status*' (Restivo, 2009, p.39). He goes further to explain that such a sacred way of viewing mathematics assists mainly to conceal the complex geopolitical scientific networks that serve to create the history of becoming a subject. For example, the persisting monolithic view that the development of non-Euclidean geometry was a remarkable phenomenon that occurred simultaneously in distinct scientific laboratories fails to acknowledge that scientists had already formed social and scientific networks and ideas circulated amongst them. This perspective conceals the construction of mathematical knowledge as a social assemblage that mobilises people for further action and, at the same time, becomes mobilised by human agency. Whilst it is relevant here to ask why the idea of mathematical knowledge as absolute and mystical strenuously persists, we also need to denote how Irene's struggle for articulating her relation to mathematics as a school girl in such essentialising genre enables her to perform a masculine subjectivity.

### **Being Good at Maths Is Not Enough: the Urge to Live**

As Irene admitted, being good at school maths was not enough to safeguard her enrollment to a mathematically related study-course at higher education. She explains:

Irene: My first choice was architecture [...]; I didn't pass the admission exams... Eh... I studied to be a librarian, which was my 20th choice... I liked it along the way. But, it was not my first choice.

Interviewer: And why didn't you insist in order to study architecture or something related to mathematics?

Irene: At eighteen I just wanted to leave home. Yes. I was accepted at the university in Athens; I had friends and acquaintances there, so I went and I never had any regrets. I worked as a librarian for eight years and liked it a lot. I liked the structure of this field. It was something completely new to me.

Taking into account Irene's pride in being good at maths and its significance for performing the mathematically talented school girl, it is difficult to see how she, at the stage of planning her studies at higher education, so easily chooses to abandon mathematics and give in to her twentieth option. Instead of insisting on pursuing a mathematically related field that was closer to her heart and abilities she opted for library studies that, at the time, was something entirely different from her interests. Irene, quite honestly, admits that it was her urge to live an independent life away from her parents and her village that motivated her for any option that could take her away from the rural home community of her upbringing and closer to the cultural urban capital. So, Irene's urge to study at higher education is closely connected to her urge to escape from a culturally deprived community heavily dependent on traditional and patriarchal values.

As has been argued, the farming sector of labor and work in rural Greece during the early 80s was highly gendered. Female status in the context of family, community and work practices was marginalised –even though women and girls were a major part of working labor. By and large, women in rural communities were working at several fields

such as household, farming and are primarily responsible for raising children among others. However, their work was mostly unpaid or very low-paid and their subject identity was regulated and restricted to follow specific sociocultural norms and ethical codes of their community (for more details see Strategaki, 1988, Papataxiarchis, 1995). This is the context, where Irene as an adolescent in rural Greece of the early 80s was raised. A cultural context where young women's attendance in public spaces was limited and their life was restricted to home and school. As such, she had to perform a lifestyle closely regulated by family and community values and customs. Patriarchy and religion were among the pillars for raising and bringing up children, and especially girls. For Irene, but also for other women in the rural country, the opportunity to enrol in a study course in higher education was, almost, the only chance for freedom. Leaving home was an escape from a highly controlled and gendered cultural context and way of living. Papadopoulou, Stephenson, and Tsianos (2008) discuss 'escape' as a route for facing deadends in an oppressive life that is obedient and subdued to regimes of subversion, oppression and marginalisation. Resorting to Nietzsche's ideas from his early book 'Birth of the Tragedy' they argue how '[t]he exodus from the lived life is to be found in life itself'. Nietzsche argues that the promise of a better future to come has a series of actions such as revolutions, innovations, occupations and discoveries amongst others as its object. Promise and object seem logically and inextricably connected despite the fact that they rarely fulfill each other. In other words, as in Irene's case, women in rural countryside cannot easily bring any straightforward change how life is experienced through local forms of resistance. Nietzsche tries to break this logical connection between promise and object by suggesting that life itself is 'the solution to the problem of life'. They continue arguing that '[w]ith Nietzsche the lived life and the logic of life come together' (Papadopoulou et al, 2008, p.85)

In a similar vein, Irene's choice to leave home at the cost of abandoning her thirst for mathematics was inexorably connected to her urge for exploring life. Being female in a rural community she had faced processes of close regulation of her everyday encounters, behaviour and whereabouts in an environment more or less culturally deprived. Her urge to live mobilized her to risk the safety of a stable identity

embedded within the discourse that fulfilled her subjectification as the female mathematical genius. Related to how the sociocultural context determines women's choices in mathematically related fields of study, Mendick (as cited in Chronaki, 2008) refers to the case of Anelia, a Turkish adolescent who lives in the UK with her family and, who, although good in science and mathematics, resolves not to study this subject but to abstain due to being in the presence of many male students. By declining a favourable option, she preserves herself from any possible seduction that might make her risk her family values. Summing up, being good at mathematics proves not enough when adolescent girls confront the need to balance existing possibilities in their material contexts. Irene's choice to study anything that would enable her to escape home, was not an autonomous free choice according to the prevailing liberal discourse, but, for her, it was an escape from a socio-cultural regime of control that oppresses her. Within such contexts, for Irene, the urge for exploring life seems to win.

### **Returning to Maths: Developing Status Quo As a Teacher**

Having worked for eight years as a librarian, Irene moved to a higher education course in pedagogy by enrolling to a teacher training course. Her pedagogical studies ensured her with a teaching post and the last five years she has been working as a primary school teacher. She talked rather enthusiastically about her career change from a librarian to a teacher. Although her work as a librarian was beneficial and useful, the teaching profession fulfilled her more. She, recently, had the chance to participate in a University based training course contributed to her professional development through courses, seminars and project-work. She felt that her teaching skills and status could benefit the most through new terrains of knowledge in specialised topics related to pedagogy, didactics, technology and mathematics. Moreover, through her teaching experience at school and her further training at the university, Irene had the chance to get in touch with mathematics in more depth once again. For her this was almost like a return to mathematics – the object that in many ways determined her life as a school girl. In the course of our interview the discussion, thus, turned towards unravelling how she, at present, perceived her relation to mathematics as part of her current experiences in teaching and learning

the subject. Does it currently function in similar ways for her as it did in the past?

Her continuous delight for mathematics was evident in the enthusiasm she had shown when speaking about the specific seminars on ‘mathematics didactics’ offered at the university based professional training course. Despite the fact that most of the teacher trainees evaluated this seminar as too difficult due to its austere focus on mathematics, Irene held a positive attitude. Mathematical austerity was for them problematic as they were not provided with opportunities to connect such a high and abstract level of pure mathematics offered at the seminar with the mainstream practices as required by the school

Irene: This year, that we have a course in math, I notice it again [she refers to her competence in math]; although my other colleagues complain about the course, and despite the fact that it is difficult and all the concepts are new. We are taught stuff I hadn’t heard about in school. I am fascinated by it and if I didn’t have so many other obligations right now (I am focusing on my dissertation), I would like to investigate this new field further.

Interviewer: So do you believe that your current training in math has been beneficial?

Irene: Eh... yes, because it gives me stimuli and contact with fields of knowledge I was oblivious of. And I reckon that I might become involved with them in the future.

Interviewer: Do you think that this knowledge might be applicable when teaching at school?

Irene: No. Not as such, because it involves a higher level of mathematics. But, as our professor tells us, to teach something simple, you have to understand the philosophy of mathematics; it is not enough to simply be familiar with the material presented in class. You need to possess comprehensive knowledge, in order to communicate it.

Interviewer: Do you agree with your tutor’s point of view?

Irene: I think this is the case in any field of knowledge. Otherwise it would be possible for...eh, say, a high-school graduate to teach primary school students. Knowledge certainly needs to be profound in order to be properly communicated.

Irene undoubtedly celebrates a way of teaching mathematics during the seminar that has caused a number of problems to many of her colleagues both male and female. It's of importance here to take into consideration what is actually happening during the course. Characteristically, the training course was attended by 24 teachers of whom exactly half are female and six of them had proved to be very competent at mathematics. Besides, it is worth mentioning that the highest score at the final exams for the seminar 'mathematics didactics' was achieved by a female teacher trainee. In addition, two male students had expressed their negative disposition towards mathematics all the way through and complained for the abstract way of delivering the seminar. Albeit this, it is worth mentioning that all interviewees, including Irene, complied with the stereotypical view that male teachers were more competent, skilled and hold positive attitudes as compared to female teachers. In this way most teachers tended to reproduce a prevailing image of female incompetence and insufficiency, thus fuelling the sense of stress and unease many women experience concerning those fields.

Irene was an indicative case of appropriating dominant discourses. Her unquestioned acceptance of the way class was organised and taught during the training course may be interpreted on two levels. At one level, we might argue that Irene becomes fascinated by a subject that is considered difficult and challenging by most of her colleagues. At another level, we might construe her preference for this abstract way of working with mathematics as a pleasurable challenge. Although pure mathematics has little to do with the actual requirements for teaching and learning school mathematics she expresses creativity and contentment. In parallel, Irene's narrative reveals how her resort to mathematics supports her efforts towards differentiating herself from other teachers and denoting her superiority. Mathematics, and her mathematical competence in particular, is instrumentally used towards augmenting her status quo as a teacher. She performs the supreme teacher who, although female, dares to do the maths required for maths at the primary school class. Instead of dreading, she masters the subject on both the basic arithmetic and the high or abstract level. Being female constitutes her certainly as exception. In this manner, she attempts to

provide herself with high regime, since mathematics is considered to be a field of considerable status as such. The above become even clearer when we consider how she talks about her colleagues at primary school and their relation to school mathematics.

Interviewer: Do you think there is a difference in the way men and women engage in mathematics?

Irene: I realised that here, on the course, my male colleagues are quicker to respond to questions asked by the professor. Usually male colleagues teach older children –fifth or sixth grade classes-, where mathematics is at a higher level. Female colleagues usually take on younger ones, and there math is basic.

Interviewer: How come? Why is it that men teach higher grades?

Irene: There is a status quo... not that it is standard, but it usually works this way.

Interviewer: And why does this happen?

Irene: I have met female colleagues who didn't want to teach higher grades because they felt insecure about math. I think that sometimes teachers "fall short" when it comes to the material they need to teach (in mathematics) in fifth and sixth grade.

Interviewer: Both, male and female?

Irene: Females more often, yes. Because I remember helping some female colleagues prepare for the exercises they had to teach the following day.

Irene refers to a gendered division of labour at the primary school where male teachers become more often responsible for higher grades whilst female teachers take the lower ones. She explains that this is due to the fact that younger children are taught basic skills (i.e. arithmetic) whilst older ones require more advanced mathematical knowledge. For Irene, school mathematics at higher grades is challenging and argues that, unlike her, most female teachers cannot take this risk. To sum up, Irene's argument is founded on a bipolar perception, according to which, maths is divided into complex or basic, difficult or easy and becomes accordingly appropriated to high and low grades in primary school. It is therefore implied that male subjects are more familiar with complex and difficult math. Throughout her narrative, Irene reproduces the patriarchal order of mathematics as a male domain that is carried

through to a controlled and patriarchal division of labor between men and women as teachers.

Mathematics is thus being reproduced as a masculine field of practice. Specifically, we realise how Irene considers readiness to understand and solve a problem to be the cornerstone of mathematical thought, and on these premises she claims that her male colleagues have undoubtedly a better and more effective understanding than their female colleagues, and, therefore, they are better at maths as compared to female primary school teachers. What is of interest here is that although Irene adheres to this essentialist position, she differentiates herself so as to stress her resemblance to male and not to female behavior. In other words, whilst most females are prone to dislike or fear mathematics she takes a different position. It becomes evident again how she uses mathematics to perform her masculine subjectivity. Mendick (2006) argues:

One of the main tensions that I have experienced in thinking and writing about gender [...] is between equality and difference. The idea that women are different was the starting point for feminist political struggle. However, it is always double-edged, being prone to political misuse as a defence of discriminatory practices and status quo. As discussed in ch1, explanations based in gender difference so easily become self-perpetuating; indeed, when I have presented material from this book I have met the view that work such as mine, which seeks to explain gender differences, is actually part of the problem. Perhaps without all this talk about gender differences there wouldn't be any... (Mendick, 2006, p. 101)

At an additional layer, which is nevertheless linked to all others, Irene is reproducing the prevalent gender regime to the extent that she both idealises the dominant male-orientated status of mathematics and conceals how it becomes constituted. In this way, she ignores the fact that this discursive strategy might provide some students -especially girls and women- with ostensible obstacles in the appropriation of such knowledge. She does so in a way that gender becomes a technology of self, in Foucault's words, for re-producing old knowledge politics by means of ethical or moral evaluations (Foucault, 1978). We could also denote how Irene uses maths to subjectify as a successful, competent

teacher who is able to cope with difficult and challenging arenas of knowledge such as mathematics. Since mathematics has been conceived as a male culture, Irene positions herself as a masculine teacher in the gendered field of education. Her relation to maths supports her efforts to perform a particular teacher identity that could compete even her male colleagues and she performs –through and with maths- a power position. In, some ways, she re-lives her success story as a school girl who was gifted in mathematics and now is the master of mathematics.

### **Returning to Mathematics: Essentialising Mathematical Ability**

Perceiving mathematics as an essential body of knowledge is even more obvious in the way she narrates her handling of school mathematics in the classroom as a teacher. Specifically, Irene argues that she often alters the official school curriculum by stressing and expanding the teaching of mathematics at the expense of other subjects. She admitted paying less attention to subjects such as music, arts and religion evaluating them as secondary. Her vision as teacher was to advance her pupils in mathematics. In this manner, she clearly reproduces a hierarchal classification of school knowledge where mathematics comes at the top and the arts follow.

Irene: Between Greek (language) and mathematics I suppose it is math I am best at. In Greek I only teach what is mandated by the curriculum. In mathematics, it is different. When I was teaching second grade last year, all the children (14 of them) learned how to multiply. The teacher who took over the class this year told me that she had taught sixth grade the previous year and that those kids (who went off to junior high this year) still couldn't multiply properly. [...]But I taught mathematics at the expense of other subjects such as music or art, which also isn't right.

Her example concerning the emphasis she placed on pupils' training on multiplication signifies a particular perspective of mathematics. Asked about her views on mathematics and the potential connotations mathematics brought to her mind, she talked about '*organisation, order, method, eh... one step above, structured thought and affection. [...] I feel a special kind of affection towards mathematics*'. And she added

that; *'Mathematical thought makes you more precise. It helps you get straight to the point providing you with a framework'*. Irene connects mathematics to order, precision, structure, rationalism, and superiority to other types of knowledge. In her own words, mathematics is 'one step above'. However, through her unquestioned acceptance of the hegemonic bipolar optic of mathematical knowledge, she embodies equally hierarchal gender binaries according to which mathematical thought is socially and culturally linked to the male-mind. Asked whether she could discern any gendered differences on mathematical competence among her students at school she claimed that boys have certainly a special flair for mathematics.

Interviewer: How do you explain that?

Irene: I believe it lies in the structure of the psyche of each sex. [...] I have often thought that men have greater technical dexterity and skills. But it is not something I can explain scientifically. [...] And this fuelled my curiosity because as a child I had a special ability in and affection for maths. And the more I was praised for my aptitude, the harder I tried, I ...played that part. It's the motivation; I was good at math ever since I was a child and I was encouraged by my parents and teachers.

Interviewer: So your parents encouraged you.

Irene: Yes. And the more they did, the harder I studied, because I knew I was going to be praised.

Almost forgetting –or not being conscious- about her own efforts for developing knowledge and becoming a female success in mathematics, Irene narrates her effective mathematics ability as an innate trait that resembles naturally the male-mind. Although her learning was highly dependent upon the social conditions of her close environment and the support provided by teachers and her parents, she assigns her skills the magic gift of innate motivation and flair. Irene's interpretation probably draws on popular psychology and pedagogy where emphasis is generally given to the individual or to special social categories such as women and their distinct temperament. This optic tends to account for their deficiency in certain fields, like maths or technology, instead of focusing on social factors such as the nuts and bolts of education. This

way the dominant male-orientated structure of those fields remains largely unchallenged (see [Walshaw, 1999, 2001](#)).

Irene seems trapped in mythologies about maths as an absolute body of knowledge to such an extent that she becomes blind even to her own personal experience. As said above, she cannot consider how she as a female has managed to move forward, to be able to do mathematics and develop motivation and affection for mathematics. In consequence, she cannot also see how some of her colleagues at the training course did not relate to pure mathematical knowledge. For her, mathematics is an absolute power. It is a matter of right and wrong, black and white and indisputable answers. Within the frame of thinking, rationality is directly related to pure maths method of proof and claims for mathematical certainty. Despite efforts for challenging this absolutist knowledge and truth in mathematics by seminal philosophers in the mathematics education field (see [Lakatos, 1976](#); [Ernest, 1991](#); [Skovsmose, 1994](#); and [Burton, 1995](#)) their work, although appealing, has not had yet great impact on teachers' values and practices. [Mendick \(2006\)](#) problematises the appealing status of mathematics as absolute and objective. Both, appeal and pleasure take us to discuss our relations to discourses and in particular how discourses position people within networks of power. [Foucault \(1989, 1979\)](#) alert us to presuppose not an idealised discourse foisted upon the individual but also the forming power of specific disciplining, regulating and controlling practices on self.

### **As a Way of Conclusion**

As already mentioned, our focus here has been on discussing possible interrelations amongst representations of mathematics, education, gender and subjectivity. We intended to explore through Irene's narrative the specific discourses in which these representations are inscribed; the subject positionings that their articulation could make possible; and their potential effects for subjectivity fabrication. Based on Irene's case, as presented in the previous sections, we wish to stress three main issues as a matter of concluding our analysis; *firstly*, performing success in mathematics contributes towards fabricating a gendered masculine subjectivity as a self-forming power, *secondly*, gendered subjectivity depends heavily on appropriating an essentialist ideal of both mathematics and gender through a struggle of articulating

available discourses, and, *thirdly* the essentialist appropriation of hegemonic discourses on gender and maths do not liberate but trap the subject in contradictory and conflicting discourses and practices.

*Becoming masculine:* As far as the first issue is concerned, Irene's case was an exemplification of performing success in mathematics both as school girl and as teacher. Her subject positioning of the gifted, talented and charismatic in maths at school time secured her a very positive and celebrated socialisation. Her abilities and skills were praised by parents and teachers. In this way, she was able to perform not only the gifted one in a difficult domain such as mathematics, but also the female subject who breaks the norms and stereotypes of a patterned male subject through her success in maths. In other words, she was able to perform a male who, according to Irene's resorting on prevailing discourses, excels naturally in mathematics. It was evident that her subjectification with mathematics was an attempt to perform masculinity. Bob Connell's perspective of masculinity (1995, p.71) allows us to claim that masculinities are not inherently limited to men (or femininities to women). Male or female experiences are not uniform or homogeneous, overlapping is not excluded, and actions that do not correspond to the person's gender are not silenced. Under this perspective a broad band of options need to be available for any variety of people. Thus, opening up activities conditioned by gender seem important as they facilitate reflection and recognition of the effects gendered classifications have on social life, in order to become less influenced by these. In this realm, Irene's gendered engagement with mathematics can be seen as having direct effects on her social life.

*Essentialising strategies:* Concerning the second issue, Irene articulates hegemonic and essentialising discourses about mathematics and gender to speak either for herself or for her colleagues and pupils. She assumes a series of ideals and dichotomies that represent hers and others' experiences in relation to mathematical ability and success. Mendick (2006) has argued that the subject position 'good at maths' is inevitably a performance of masculinity as it evolves through the acceptance and utilisation of a set of binaries such as competitive-cooperative, active-passive, naturally competent-hard working, always appointing the inferior term to women. Such false categories according to which the feminine is conceived as exclusively and essentially

representing nature, emotionality, sensuality and irrationality. This negative representation of the feminine emanates from the mind/body dichotomy which has dominated western science and philosophy. Within this grant dichotomy, which was clearly and powerfully expressed by Cartesian thought, mind and rationality has gained priority over the body (for more details see [Chronaki, 2009](#)). Through this viewpoint, the mind is customarily correlated with public space (i.e. politics, economy, warfare, science) and masculinity, while the body connected with the private sphere (i.e. home, children upbringing, labor, arts) and femininity. On those grounds, mathematical competence has been constructed as inherently natural, individual and male, withholding their social, symbolic and historical nature, thus concealing the fact that such skills are a product of practice and social construction ([Bordo, 1993](#); [Walkerdine, 1988](#); and [Mendick, 2006](#)). The process of dichotomising and at the same essentialising constructs mathematics as oppositional to femininity and, thus, makes it difficult for many women to identify as capable, effective or successful and even to invest within a related field of study or work. What is of interest here is how Irene through such dichotomising and essentialising use of available discourses fabricates subjectivity. By means of her natural and gifted ‘mathematical ability’ Irene constructs for herself, all the way through, a superior position that entails power and provides her high status as a school girl and as a teacher.

*Being trapped:* Irene’s talent at mathematics opens for her the opportunity to engage in a gendered domain. From this perspective, performing a masculine gendered subjectivity might entail the dynamics to challenge the prevalent gendered order and trouble oppressive practices or the established gender binaries. On the contrary, she seems trapped through espousing the essentialising strategies of narrating relations about maths. Irene, by and large, attempts to manage the contradictions inherent in her speech by invoking a personal explanation that stems from a diffused neoliberal discourse informing an ontological individualism. Her individualist explanation lends an ostensible coherence to what she says, and covers up tensions that result from conflicting roles and aspirations. For example, her own performance in mathematics belies her conviction that men are superior in this field.

This contradiction causes confusion and seems to be resolved through her invocation of maths as talent and charisma. One of the crucial issues tackled by critical ontology is what Foucault calls the '*paradox of the relations of capacity and power*' (1984, p. 47). The question Foucault (1984, p. 47) raises is, '*how can the growth of capabilities be disconnected from the intensification of power relations*'? Individuals become autonomous agents through the development of capacity for thought and action (Tully, 1999, p. 93). However, such capabilities are developed within disciplinary regimes of pedagogical, medical and punishing institutions where the subject becomes also normalized and hierarchized (Foucault, 1984, 1986; Wong, 2007, p. 73). Hence, drawing from Foucault (1984: 45), we should search for the points '*where change is possible and desirable, and to determine the precise form this change should take*'.

Adherence to the discourse of essentialising the mathematical mind as a God's gift is a formidable barrier to ending the hegemony of absolute and pure reason in mathematics education practices. If we want to seriously undermine tendencies to purify and essentialise the categories and classifications that inevitably and universally organise our social and moral orders and produce differences and distinctions, we urgently need to reject transcendentalism and supernaturalism. The essentialised articulation of discourses effects in producing an equally essentialist subjectivity and in particular a '*masculinist construction of an essentialised self*' in Judith Butler's words. The positioning of mathematics as 'natural gift' does not allow her to perceive the contingency of doing school mathematics and in consequence, the hard work invested in this practice. Thus, Irene, and any other subject as Irene, cannot disclose the fact that mathematics as well as gender is constantly constructed and reconstructed from and within discursive articulations as part of their social relations and practices (Mendick, 2006, p.18, and Restivo, 1992, p. 102).

As a final comment, we would like to affirm that an alternative approach seems necessary. The goal of such an approach would be the systematic deconstruction of essentialist gendered categories in order to show how woman and man are constructed as categories within discursive formations (Mouffe, 1992) even in the field of mathematics education. Therefore, we can claim that the deconstruction of gender

categories in mathematics education aims to challenge traditional objectified classifications of certain qualitative features attributed to each one of them, and thus renders the nature of every attempt for fabricating subjectivity contingent and precarious. In this manner, qualitative features are liberated from essential classifications leaving them floating and available for everyone.

## Notes

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