MATHEMATICS EDUCATION FROM A FEMENIST PERSPECTIVE. SOME IDEAS TO APPLY IN THE CLASSROOM

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INTRODUCTION

The invisibility of women, particularly throughout the history of science and technology, produces a historical distortion that needs to be considered. Women have always been linked to science, but their invisibility has been notorious, either because they were not admitted to formal education and research, or because through their husbands, fathers, brothers, they performed work that was less valued by the scientific institution of the time and were relegated to the background, etc. It is necessary to make visible and value the knowledge built by these women, and educational institutions play a fundamental role in this task.

For this reason, the main objective of this paper is no more than, through this visibilization and valorization of the knowledge and stories of these women, to provide some ideas for their introduction in the high school mathematics classroom. Working in this way for another type of education, an education for social transformation, for an integral formation of people from a feminist perspective.

The structure that has been followed is the following: a first part where the foundation of the work is provided, from the framework of studies on science, technology and feminism; a second part that presents the educational framework in which we move in this work, understanding education as an educational process where to work for an integral formation of people; and a third part, which is the core of the work, where some practical ideas are offered to apply in the mathematics classroom through the history of different women mathematicians and some of their contributions to this science.

1. SCIENCE, TECHNOLOGY AND FEMINISM

Through the objective conception of science, it has been expected to produce an accumulation of objective knowledge about the world, which helps us to understand and modify it as we wish. As an academic reaction against this traditional conception of science and technology, the Science, Technology and Society movement arose. We will not delve further into it, but we will establish its definition. The expression "science, technology and society" (STS) usually defines a field of academic work whose object of study is constituted by the social aspects of science and technology, both in terms of the social factors that influence scientific and technological change, and in terms of the social and environmental consequences (Marino et al, 2001). And following this movement, new educational trends have emerged on this subject to be taken into account by educational institutions.

Already at the Budapest Summit[1], in the considerations there was a point where it was stated “Point 24. That there is a traditional imbalance in the participation of men and women in all science-related activities”, and in this regard it was proclaimed “Point 42. Equal access to science is not only a social and ethical requirement for human development, but also a necessity for fully exploiting the potential of scientific communities worldwide and guiding scientific progress in a way that meets the needs of humankind. The problems faced by women, who constitute more than half of the world’s population, in embarking on, pursuing and advancing in scientific careers and participating in decision-making in science and technology should be urgently addressed. There is also an urgent need to address the difficulties that create barriers for disadvantaged groups and prevent their full and effective participation in science and technology.”

We thus link up with Science, Technology and Gender studies, which should not be seen as a sub-discipline of STS studies, since they address issues that are central to it, such as the connections between knowledge and social factors or the reform of science and technology education.

Studies on science, technology and gender, within their heterogeneity, share a political objective: the opposition to sexism and androcentrism reflected in scientific practice. This type of analysis has been developed in a variety of sophisticated ways following the paths marked by general philosophy, political thought and philosophy of science, but all of them recognize a common past linked to the second wave of the feminist movement, the women's liberation movement of the 1960s and 1970s (González García, 1998b, in González García and Pérez Sedeño, 2002).

The feminist discussion on science and technology begins with the recognition of the scarcity of women in science and goes up to questions of epistemological transcendence, that is, on the possibility and justification of knowledge and the role of the cognizing subject. Hence, the studies that fall under this name (CTG) have in common to deal with the situation of women in science and technology, documenting their absence and presence in the history of scientific and technological development, explaining this situation and proposing institutional and educational strategies for a fuller incorporation of women in these fields (Pérez Sedeño, 1998 a, in González García and Pérez Sedeño, 2002).

In this work we will use the term feminist perspective or feminism all the time, knowing that the term feminism is very broad, and that we should rather say feminisms, as well as sciences, technologies or women, and not in the singular, thus making visible the diversity that exists under these words, valuing all of them equally. In this paper we will refer to feminism simply as that proposal of analysis or critical theory that enriches the studies on science and technology in this case.

If we return to the quality we mentioned at the beginning of the objectivity of science, this implies neutrality, autonomy and impartiality. These qualities are questioned by feminism, since the feminist

[1] The Summit was held in Budapest from June 26 to July 1, 1999, and left without concrete commitments of a legal or economic nature, but managed to produce a global consensus on the text of the Declaration and the profile that this new social contract for science should adopt, a consensus in which ethical issues and public participation took on a predominant place, and where STS studies are a valuable tool for this purpose.

perspective has had as a key consequence in the history of science and technology the reconsideration of the object of study itself: what is considered science and technology and what activities and phenomena must be taken into account when studying their development (Pérez Sedeño, 2008).

That is, following Pérez Sedeño's line, from feminism a revision of the underlying notion of science is made, understanding it as the complex relationships between basic assumptions of scientists and their scientific practice. A separation is made between objectivity and subjectivity, through a reconfiguration of the subject of knowledge, something that has usually been done from feminist epistemologies. Epistemologies[2], that although each one puts the focus of study in one aspect or another, all of them agree on the following:

- the situated character of technoscientific knowledge and practice. That is, this knowledge and practice affects what it affects and how it is known;
- the relevance of the subject, thus highlighting the importance of the differences between whoever is the subject of knowledge;
- the political implications of technoscience.

Therefore, from a feminist perspective of science, if we consider that contextual values, or more specifically ideological-political values, are relevant constraints in the reasoning and interpretation that shape knowledge. That is, how knowledge is shaped, who makes it, and under what conditions, is absolutely relevant.

Feminist science and technology work under feminist values, just as supposedly objective science and technology work on other values. The only difference is that the first explicitly states it and the second moves in values that we have internalized so that they are normalized in our society. These values also decide what is researched and what is not, to which answers we try to respond from science and technology and to which we do not, etc.

And this same subjectivity is also produced in the production of the history of science, who writes according to what things, under what conditions, what they decide to write down and what not, etc., and all the subjectivity that this entails in the history that later reaches us. History biased both by excess and by defect.

In relation to the following point, one of the most important areas of research in science and gender studies is the teaching of science and technology and the transformation of the corresponding curricula. What to teach and how to teach it are the pedagogical challenges posed by feminism.

2. **EDUCATIONAL FRAMEWORK**

The educational framework in which this work is framed is that of education for development, understood as an educational process aimed at generating critical awareness of world reality and providing tools for participation and social transformation in terms of justice and solidarity (Baselga et al, 1999). Education for development aims to build a critical global citizenship, politically active and socially committed to a just and equitable human development for all communities on the planet (Baselga et al, 1999).

[2] For further elaboration on feminist epistemologies see Harding, Sandra (1996): Science and Feminism

In recent years, in some circles there has been more talk of education for social transformation than education for development, emphasizing the idea of building global citizenship. And within this approach we frame this work, emphasizing the need for comprehensive training of people, in this case from the formal teaching of mathematics, always from a feminist approach.

Within the educational wake of this conception, we find coeducation. Understood as the fusion of "feminine" and "masculine" cultural patterns in an integral process of the person, it implies the correction of sexist stereotypes to promote gender equality (Salvador and Molero, 2008).

And if we speak of coeducation, it is because we consider that the starting point, both in terms of access to education and promotion in the educational world, is not the same for women as for men. As is clearly explained in the text by Subirats and Brullet (1988), where they comment that the debate on the education of boys has basically dealt with how they should be educated by the school, as opposed to the debate on the education of girls, which has consisted of whether or not they should receive a school education. Hence, the starting point is different, and as many authors show, girls have had access to a structured education for boys and have had to adapt to it.

Therefore, those forms of gender discrimination that existed at the time have changed, both in the educational system and outside it. Women are increasingly gaining access to formal equality, but this does not mean that they really have the same possibilities as men. And as we say, the forms of discrimination have changed, yes, and they have done so in more subtle, less obvious ways, which means that the greatest risk is precisely here. We find ourselves in a situation of equality camouflaged epidermally, we live in moments in which gender inequality is believed to have been overcome, and this belief only helps to consolidate this situation.

To give some current figures, focusing on the area of mathematics, nowadays, as Bayer (2004) comments, although the number of women who obtain a doctorate in mathematics and who then go on to teach and do research has grown spectacularly, it must be said that the presence of women mathematicians in international research centers, in plenary conferences of congresses, in scientific committees of congresses and in editorial committees of research journals is still very scarce. And it goes without saying that no woman has won a Fields Medal (the equivalent of the Nobel Prize in mathematics) to date.

And these inequalities, which then manifest themselves, must begin to be addressed at school. In this context, if we analyze the material used in education today, textbooks have a lot to say. The role given to women in them is an essential element in the education of students and is the material with which they relate day by day, and in it they find, through their images and texts, women in a role relegated to tasks supposedly considered "feminine", where, of course, dedication to science or technology as a professional activity for women does not enter. It is true that this role has been evolving, but even today it is still difficult to see textbooks where women are represented in an egalitarian way.

If we turn to mathematics textbooks, the visibility of women mathematicians is dismaying. Rarely does a single woman appear, and when a woman's name appears, it is in such a tiny percentage with respect to her male colleagues that it is completely diluted.

But it is not only through textbooks where we can find stereotypes or invisibilization of part of history, in this case, mathematics. But it is also through what is known as the hidden curriculum, those norms and attitudes transmitted unconsciously, such as the valuation of male patterns to the detriment of female ones; or also in the language used in the classroom, which is directed exclusively to the masculine gender silencing the female presence.

The role of education in the generation of knowledge and wisdom, and in the valorization of some over others, is fundamental. This implies a critical look at the history presented to us, being aware of what has been shown to us through this history and, above all, what has not.

If we speak now from the mathematics classroom, the teacher must think that he or she is not training mathematicians or mathematics, but citizenship, and we must think about this citizenship when we draw up curricula or prepare classes. Mathematics is a very useful element to understand reality, but it is necessary to know how to transmit it and that the classes of this subject do not become a real ordeal for many students where they do nothing more than accumulate calculations and ways of doing different operations to which few see any sense.

If we explain mathematics not only from the practice and usefulness of its knowledge, but also from its own history, understanding how this knowledge was generated, under what circumstances and by which groups or people, it will help us enormously to understand the different concepts that are dealt with in the classroom. And we will also have the perfect opportunity to do some justice to mathematical history by introducing different women to whom very few, if any, textbooks do justice.

3. **SOME IDEAS TO BE APPLIED IN THE MATHEMATICS CLASSROOM THROUGH THE HISTORY OF MATHE**

Before moving on to the core of the work, we will briefly comment on some other ideas to apply in the classroom, ideas that can promote an egalitarian and transformative education through mathematics.

Mathematics education, through educational competencies, is an option that, immersed in the explicit curriculum of formal education, allows us different ways of, while working on mathematics, working for a comprehensive education of students. Thus, through the competence in communication, we can apply the expression in mathematical language, verbalizing the knowledge that is being acquired. In this way, the students are deploying the mental processes used, and it also helps understanding, since something is not truly learned until it is not known how to communicate.

Through problem solving and conflict regulation, collaborative learning can be fostered, instead of one based on competence, where the relationships established among students are key to the formation of individuals. In this way, emotional competencies can also be incorporated, through the elimination of blockages and anxieties that the study of mathematics often produces. Denouncing the much-feared error in the mathematics class and changing it for, as Molero and Salvador (2008) express, doing mathematics in the mathematics class. The idea that in mathematics there is only the situation of true or false, right or wrong, causes a blockage before a situation that does not allow an elaboration of the answer, an anxiety before mathematics. For this reason, in the mathematics classroom we can work with open mathematics, with problems and investigations that do not have a single answer, where students can ask themselves questions and choose different paths, where mistakes are not punished but can promote new investigations and improve learning.

The traditional teaching of the teacher who explains and the student who receives the teaching in a passive way reinforces the traditional passivity of girls. Creating a place in the classroom where male and female students have time to reflect, abstract and do intellectual work is convenient for everyone, but it benefits the project without discrimination against women (...). Let us do mathematics in the mathematics classroom and give our students opportunities to develop their mathematical thinking (Salvador and Molero, 2008).

In this way, moreover, we will not only be encouraging mathematical thinking, but also critical, autonomous thinking, and thus also developing critical competence, seeing that there is no single solution to every problem we face, but that different views and ways of dealing with a given problem or situation always come into play.

Thus, we come to the last of the ideas to be applied in the classroom, doing mathematics in the mathematics classroom through the history of mathematics, how this knowledge has been generated, by whom and under what circumstances. Learning mathematical knowledge through the understanding and knowledge of its historical evolution, which will undoubtedly facilitate and help its comprehension and internalization.

This point is the core of the present work, and in it we will follow, in a very general way, the main syllabus of the subject mathematics given in baccalaureate, separating it into the three large blocks of the common syllabus (i.e., first and second year of baccalaureate, both the science and the social studies options). That is, algebra, geometry and analysis[3].

Although we separate them into blocks to facilitate the work, mathematics should not be seen as separate from each other, but as interrelated concepts. However, in this case, in order to facilitate the subsequent application in the classroom, we do it following the usual scheme used in the textbooks of this subject.

In the same way, for the extension of this work we will only name a few of these women, women who, just as in a mathematics class in secondary school or high school you ask who is Archimedes, Newton, Gauss, or Pythagoras, and at least the name tells you something, so should it be with some of these women. Thus, we will follow the history of each of these blocks through one or two women mathematicians who made important contributions in each of these areas respectively. In this way, the objective of this point is to make visible and value the work done by different women mathematicians and their possibility of imbuing it within the syllabus that is given of this subject in high school teaching.

- **ALGEBRA**

In the algebra block taught in high school, students learn to calculate with matrices, determinants, and solve systems of equations according to different methods, such as the Gauss-Jordan or Cramer's method. Likewise, mainly in the first year of high school, basic concepts for operating with real numbers are also reinforced. A great deal of importance is given to operations through these mathematical tools but, in general, they do not work through the axiomatization of concepts and abstract thinking.

In this block we propose two women mathematicians through whom important steps have been taken in the advancement of this field.

The first of them is Emmy Noether (Germany, 1882-1935). Emmy was born in Germany in 1882, her father was Max Noether, a mathematician who taught at the University of Erlangen, and her mother was Ida Amalie Kaufmann, who came from a wealthy family in Cologne. Of the four siblings, she and her brother Fritz, also a mathematician, survived childhood.

The conditions under which Emmy's education developed were not at all unfavorable for the time, coming from a well-to-do family with a mathematician father and brother. Even so, she received the education that at that time was understood as conventional for educated women, classical culture, piano, dance, and she also cooked, cleaned and helped her mother with the housework.

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[3] The statistics and probability block would be missing, but since it is not common in these four courses and due to the length of the work, we do not analyze it.

She prepared herself in elementary and secondary school to become a language teacher, and soon after that, for unknown reasons, she decided to pursue university studies in mathematics. But at that time, 1898, the German Senate declared that the admission of women to the university was not possible because it would "destroy the academic order". So, Emmy attended classes at the University of Erlangen (her home town), but only as a listener, without the right to take an exam, and class attendance was conditional on the professor on duty allowing it. Under these conditions he attended the University of Göttingen for a semester, where he received classes from Minkowsi, Blumenthal, Klein and Hilbert, all of them renowned mathematicians.

After this semester she returned to Erlangen, a time when women were already allowed to enroll at the university, which Emmy did in October 1904. She obtained her doctorate cum laude under the direction of Gordan, with a thesis on complete systems of invariants for biquadratic ternary forms. In fact, the theory of invariants was the core of the so-called Erlangen Program to which Klein had given life at the end of the previous century, when he was responsible at that university for the chair of geometry.

In 1911, Emmy met Ernest Fischer, Gordan's successor, who brought her into contact with Hilbert's work on the foundations of groups, bodies and rings, who in 1915 invited her to the University of Göttingen, where she finally moved after the death of her mother when she put all her household affairs in order. At the university she begins to lecture, but cannot do so in her own name, so she does so under the name of David Hilbert until 1919, and of course without any remuneration for this work. Apart from these classes, he helps Hilbert and Klein to solve problems related to the Theory of General Relativity, where he achieved the purely mathematical formulation of several concepts of this theory, and where we can find Noether's Theorem, which according to the physicist Peter G. Bergmann, is one of the cornerstones in the theory of relativity.

As for Emmy's mathematical contributions, they are divided into three periods, the first one, which ends in 1919, where he is mainly devoted to the theory of differential invariants and their connections with the theory of relativity. The second, from 1920 to 1926, where he carried out all the work of abstraction of algebra, focusing on the field of commutative algebra, where he applied his revolutionary idea, which was to work abstractly with rings and ideals (in this way the noetherian label is used to designate a multitude of concepts of algebra, such as noetherian rings, noetherian modules, noetherian groups, noetherian topological spaces, etc.). His work consisted in discovering unifying algebraic principles in places where they had previously been obscured by complicated specific conditions that classical mathematics did not recognize as algebraic. This, in the words of Weyl (1935), gave rise above all to a new style of thinking in algebra that marked an epoch. Or in the words of Dieudonne (1925), it was approaching the process of entirely remaking algebra, systematically giving priority to concepts over calculus. As regards, in particular, linear algebra[4], he freed it from the plague of matrices and determinants it had suffered from for a century, replacing these geometrically meaningless tools with the intrinsic ideas of modules and homomorphisms.

In this period Emmy's conditions improved at the university. In 1919, after the war was over, Germany became a Republic and the laws were relaxed, and Emmy finally got official recognition: she could now teach in her own name, although she still did not receive a salary. In 1922 she was appointed unofficial associate professor, and thus became the first woman to be granted an appointment at a German university, an honorary position for which she received a small fee. She worked in this capacity until 1933.

In 1930 Weyl replaced Hilbert at the University of Göttingen. Weyl recognized Emmy as the most powerful center of activity both in terms of the importance of his research and the number of students over whom he exerted his influence. At this stage the group of students who came to work with her from all over the world became famous, and the so-called Noether mathematical walks, walks in the gardens of the university that took place through great mathematical debates. Many of these students, known as the Noether boys, became famous mathematicians, including Aleksandrov and Van der Waerden among others. Comments from these students, such as this one from Aleksandrov, in which he commented that what struck him about this group was "the

[4] Author's note: This is the part of algebra that is basically taught in middle and high school.

intellectual enthusiasm of its leader, who transmitted to all his students his deep faith in the importance and mathematical fertility of his ideas, and the extraordinary simplicity and warmth of the relations between the leader of the group and her pupils", show the extraordinary passion and inspirational power that Emmy transmitted.

In his third period of work - as far as mathematical contributions are concerned - he laid the foundations of algebraic topology and the necessary conditions that helped the later birth of homological algebra. Likewise, he worked in fields such as non-commutative algebra, the theory of ideals of hypercomplex systems (K-algebras in today's terminology, K being a body) and their representations of finite groups.

In these years, when Weyl left the professorship at the university, not only was the professorship not granted to Emmy, but his permission to teach at the university was withdrawn. This was caused not only by the fact that she was a woman, but also by the fact that she was Jewish, although shortly before her work had been recognized internationally, at the congress held in Zurich, where most of the papers presented followed the path she had opened in the field of algebra.

Soon after Hitler came to power, again because of her Jewish condition, she had to emigrate to the USA, where she institutionalized again her mathematical walks and formed the group of the Noether girls, in the women's University Bryn Mawr College. She also collaborated with the Institute for Advanced Study at Princeton, where Einstein was working at the time, but as we see, again in her teaching role she was relegated to a women's college.

Emmy was undoubtedly one of the great mathematical minds of the twentieth century. Her work in commutative algebra, abstract algebra and non-commutative algebra opened new paths that fundamentally marked the path followed by contemporary mathematics, and her analysis of the groups of symmetries appearing in the special and general theories of relativity made it possible to understand, solve and quantify the problem of the conservation of energy in Einstein's general theory of relativity.

In short, as Corrales (2003) comments, Emmy Noether not only founded a school, but also changed the focus and strategy of an entire discipline. A great mathematician, a great person and a great reference to be taken into account when reflecting on the character of mathematics as a social construct, which mathematics undoubtedly has as a profession.

CLASSROOM APPLICATION: ÁLGEBRA

Throughout Emmy's work we have seen that an axiomatic approach, of great abstraction and generalization, predominates. Very valuable for mathematical knowledge in general, but difficult to introduce with secondary and high school students, where -as we mentioned- abstraction has been little worked on.

In fact, secondary school students in the subject of mathematics are provided with a multitude of concepts, but without going into them in depth, they simply remain in the calculation. They know how to operate with matrices, with determinants, solve systems of equations, make an integral, a determinant or calculate the equation of a plane that meets certain conditions. But in few cases are they provided with mathematical tools for reasoning or problem solving. And when we want to provide them with these tools, the urgency of finishing the imposed syllabus usually prevails over the enjoyment of learning to do mathematics.

For that reason, what is proposed to introduce Emmy in the algebra sessions in secondary education is to make an introduction to this block in a more abstract way, to make a brief historical exposition, its evolution and the passage to modern algebra by the hand of Emmy Noether. To then move on to an exercise that facilitates the work of abstraction of mathematical concepts, such as the idea of module and homomorphism, as basic general concepts to understand algebra.

The second of the women is Sophie Germain (1776-1831) and her contributions to number theory, a field of work within algebra that studies the properties of numbers, in particular of integers, but more generally, the properties of the elements of the integer domains (commutative rings with unitary and null element) as well as different problems derived from their study.

Number theory is not part of the high school syllabus, but it contains a considerable number of problems that are easy to understand and can be adapted to these levels. It is therefore a good element to introduce in these classes and, in this way, to do mathematics in the mathematics class.

Sophie Germain was born in France in 1776, in the middle of the "century of lights", when Paris was the European center of science during the Napoleonic era and mathematics then lived a golden age. At that time, popular science textbooks were published, and some of them were specifically aimed at women, for example, in the form of epistolary novels, which assumed that women were not capable of understanding science and could only dedicate themselves to it in a non-professional way (Figueiras et. al., 1998).

Sophie Germain's father was Ambroise-François Germain, who was a deputy of the Tiers-État in the Constituent Assembly of 1789, a cultivated and liberal bourgeois, who had a large library that Sophie knew how to put to good use. During her adolescence, she read everything related to mathematics, and was particularly struck by the death of Archimedes, who was absorbed in solving a geometry problem and did not realize that a soldier had entered his chambers to kill him. This story made Sophie curious to learn more about the science that was able to achieve such abstraction in a man.

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She self-taught herself differential calculus by consulting books from her father's library. But her family, fearing for her health, decided to leave her without light and heating so that she could not study at night. But if anything characterized Sophie, it was her determination and courage - in fact, she was the first woman who passionately tried to become part of the scientific fabric on equal terms with her male peers - and at night, covered with blankets, she studied by the light of a candle that she had previously hidden. Her family finally, seeing her tenacity, left her free to study whatever she wished.

In 1795, the Ecole Polytechnique de Paris was founded, and although women were not admitted (they were not admitted until 1970), Sophie took the notes of some courses that she was able to follow, again, in a self-taught way.

But let us now enter the field of Number Theory. After reading Gauss's Disquisitiones Arithmeticae, she devoted herself to the study of this branch of algebra. And between 1804 and 1809 he exchanged correspondence with Gauss showing him his investigations. But she hid behind the pseudonym of Monsier LeBlanc, with which she had previously communicated with Lagrange, fearful of the ridicule that at that time a woman scholar implied (quite the opposite of Maria Gaetana Agnesi, as we will see shortly thereafter).

Sophie, despite being excluded from the scientific circles of the time, was able to train herself and to produce the greatest contribution to date on Fermat's theorem. It was in 1808, and it is the theorem that bears her name, Sophie Germain's theorem. But before this contribution, also in connection with Fermat's last theorem, he established an important result of this theorem, thanks to which we have today what are known as Sophie's primes.

In order to better understand all this evolution in mathematical thought, let us briefly look at a small development of these advances in number theory.

Fermat's Last Theorem, as it is known because it was the last theorem written by Pierre Fermat before his death, owes its fame in large part to the way in which it was disseminated and to the fact that it took more than 350 years to be proved. Fermat's son, after his father's death, published several of his father's notes, among which was this theorem, written in pen on a copy of Diophantus' Arithmetica (2nd century) and which reads as follows: "It is not possible to find two cubes whose sum is a cube, two fourth powers whose sum is a fourth power and, in general, two powers whose sum is a power of the same type. I have discovered a truly marvelous demonstration of this fact, which does not fit in this margin" (Corrales, 2001).

The beauty of this proof, as Corrales (2001) comments, is that it was the result of different contributions from different mathematicians over the years. This shows two things, on the one hand the great amount of mathematics that has been done in those years, which shows that mathematics is a field of accumulation of knowledge - where some knowledge is put together with others, and not where a different theory replaces another, as happens in other fields - and that collaborative work brings great results.

And within these contributions we must point out Sophie Germain. In 1804 she proved the equation for the cases where n=p-1, with p a prime number of the form 8k+7 (known as Sophie's primes). This was also a major contribution to Golbach's Conjecture, which states that "Any even number greater than 2 can be written as the sum of two prime numbers". The resolution of this conjecture is considered one of the most difficult problems in mathematics, and in fact it is still unproven for every number n. This proof that Sophie made, although it was an isolated case that cannot be applied to other numbers, had a great elegance that made Gauss admire it.

After this work, in 1808, he again communicated to Gauss his most important discovery in number theory, in fact the theorem that bears his name. It proves that if x,y,z are integers, such that $x5+y5+z5=0$ then at least one of the numbers x,y or z must be divisible by 5. This theorem was an important step in proving Fermat's conjecture for n=5, and will be the most important result related to Fermat's Last Theorem until Kummer's work in 1840.

Gauss, when he learned of his true identity, said the following words which point precisely to that different starting position between women and men when confronted with the study of the sciences, in this case mathematics: "How to describe to you my surprise and astonishment on finding that Monsieur Le Blanc, my esteemed correspondent, metamorphosed into this distinguished personage who serves as such a shining example of what I myself would find difficult to believe. The taste for abstract sciences in general, and especially for the mysteries of numbers, is tremendously unusual, which does not surprise me because the seductive charms of this sublime science manifest themselves only to those who possess the courage to delve into it in depth. However, when a person, according to our customs and prejudices, is obliged to encounter many more difficulties than a man, because she belongs to the opposite sex, in familiarizing herself with these thorny studies and, in spite of everything, manages to overcome the obstacles and penetrate to its darkest corners, then that woman undoubtedly enjoys the noblest spirit, an extraordinary talent and a superior genius. Indeed, nothing would prove to me in a more flattering way and so little equivocal that the attractions of this science which has enriched my life with so many joys are not a chimera, just as the predilection with which you have honored her is not."

When the correspondence with Gauss ceased in 1809, he devoted himself to the study of the problem of the elasticity of surfaces, where he also did exceptional work. Thanks to the study of these elastic surfaces that Sophie and other mathematicians developed, he contributed to the advance in the techniques of infinitesimal calculus. Thus, we link two of the blocks in which we have structured the work, reinforcing the idea of the interrelation between different branches of mathematics. mathematics.

In short, Sophie was a woman who worked outside the scientific community, without a husband, father or brother mathematician or scientist who could offer her that information, since any scientific conversation required invitations and permissions. She was also not part of the nobility and was therefore also isolated from the society of cultivated women. And her isolation became more visible when she began to work in mathematical physics, a branch that did interest the scientific community of Paris at that time, as opposed to a subject as abstract as number theory. No doubt we have a pending debt with this great woman.

CLASSROOM APPLICATION: NUMBER THEORY

In this case we will work more on the conceptual part of the mathematical foundation. Thus, what we propose is to explain, in a simple way, what a theorem, a corollary, a lemma, a hypothesis and a conjecture are in mathematics.

- **GEOMETRY**

In the geometry block of high school we work, broadly speaking, on lines, planes, the study of relative positions between lines and planes, different metric properties such as angles, distances or the scalar, vector and mixed product, trigonometry, the calculation of geometric places, or complex numbers.

The study of this block will be done through Mary Everest Boole (England, 1832-1916), a great mathematics teacher, where one of the areas she worked on was geometry, as well as its didactics.

She was born in Wickwar, England, daughter of Reverend Thomas Roupell Everest and Mary Ryall, and niece of Georde Everest, after whom Mount Everest is named. Although born in England, at the age of five they moved to live in France.

Mary was as interested in mathematics as her father, and from an early age she was educated in this discipline by a tutor, Monsieur Déplace, who taught her for two hours a day every morning. His particular style of teaching made it easy for Mary to excel in her studies. Before solving a problem, he would propose a series of questions. Then he would ask her to write down the answers. When she read them aloud to him, she realized, reading in a certain order, that she would be able to solve her problem. Actually, this method gave her the pieces, and how to place them, to correctly assemble the jigsaw puzzle she was playing with. Mary would never forget that wonderful way of learning.

Mary used her father's books to continue her mathematical training and met brilliant friends of her father's such as Herschel and Charles Babbage. It was then that Mary was taken out of school and became her father's assistant. She took on tasks such as visiting the elderly, teaching school on Sundays and helping her father with his sermons. Mary's dropping out of school did not mean the end of her studies. She taught herself Calculus and said, "I soon found in the library a book of fluxions in which I plunged with delight." "After I had amused myself with my prize for a week, my father found me with the book and took it away, telling me that fluxion notation was out of date and inappropriate, and not welcome at Cambridge." Since women were not admitted to Cambridge, Mary had no way of discovering this for herself. "I went back to my Calculus book, and found, to my great joy, that everything was now perfectly clear to me." (Barbaran, Biography of Mary Everest Boole in Divulgamat).

In 1843 they returned to England, where he continued his mathematical education. At the age of 18 she met George Boole, famous for his work in mathematical logic, who was her teacher for two years. When her father died, she grew closer and closer to Mr. Boole, whom she married and became Mary Boole, in 1855.

At this time, she joined her husband's group of disciples, with whom they revised their book Laws of Thought, a book that was published in 1854 and was a revolution among the mathematicians and thinkers of the time. In it, George investigated the laws that govern the part of the mind that reasons things; he expressed these laws through an algebra of zeros and ones, which is what today we call Boolean algebra (a language of zeros and ones capable of expressing the way the human mind reasons, currently used, for example, in Internet search engines and programming languages). In this publication, as we said, Mary's revisions were fundamental, but not only in this book, because she revised all her works until the language of the same was a clear language for its divulgation.

Mary and George had 5 daughters, several of whom were dedicated to mathematics and science, which indicates in part the education and family environment they had.
But when Mary was only 32 years old, George died. Upon his death, she got a job as a librarian at Queen's College in Harley Street in London, where she felt very comfortable, because although she could not teach (it was not possible for a woman in Victorian England), she began to establish a relationship with the students. She came to organize and chair lively Sunday evening get-togethers attended by students, where they discussed Boolean mathematics, Darwin's natural history and psychology, among other things. One of these students, years later, commented: "I thought we had been having fun, not working. But, after I left school, I realized that I had given us a power. We could think for ourselves.

Over time, Mary began teaching using Déplace's didactic method with her own contributions. She was interested in showing how ordinary everyday activities prepare children to learn mathematics. For she was of the opinion that: "Children do things like drawing or sewing, counting by tens, splitting an apple or painting a sample on a wall. And in the unconscious (usually it does not come to consciousness until years later) grows... (an understanding of) zero and infinity, of adding and multiplying, subtracting... and many other fundamental (ideas) of mathematics" (Nomdedeu, 2000). Natural materials and imagination: that was his magical combination to create excitement in the mathematics classroom.

In 1897, she wrote a detailed analysis of the philosophical writings of the Frenchman P. Gantry, for whom her husband had felt great admiration, comparing them with her husband's mathematical concepts that she tried to explain using simple mathematical concepts, although she was not completely successful. In this book she also attempted to investigate what she called "mathematical psychology," the importance of logical thinking and the nature of genius, beginning to devise a new approach to learning mathematics.

In particular, Mary was concerned with why children, once they had learned certain mathematical concepts, did not know how to apply them to real-life issues. In that sense, she considered that, in mathematics education, the following question had to be asked: "What are the conditions that favor a vital knowledge of mathematics?" She answers by saying that "It may surprise many readers to be told that these conditions are almost entirely moral and spiritual rather than intellectual" (Pérez Sedeño, 2011).

Mary advocates continuous education and learning by teachers, reviewing and improving the methods used, and for this it is essential "to see their (the teacher's) conduct, their purposes, all their attitudes towards their disciples".

Another of his works, the preparation of the child for science, published in 1904, eventually had a great impact on schools in England and the United States in the early part of the 20th century, as did his lecture notes Lectures on the logic of arithmetic published in 1903. Both in the mathematical psychology of Gratry and Boole of 1897 -of which we have previously commented- and in The forging of passion into power of 1910 -one of his last books-, he showed very advanced ideas for that time.

One of the tools she invented for learning geometry are what are known as Boole Cards (or Boole Sewing Cards, in the figure below), which help students learn the geometry of angles and spaces. Mary wrote "In my childhood, cards of different shapes were sold in pairs for sewing tasks. The cards were designed so that you could paint on them; and they had a row of holes around the edge through which the twin cards were sewn together. Since I couldn't paint, something suggested that I could decorate the cards by weaving silk threads through the blanks through the holes. When I was tired of interlacing in such a way that the threads crossed in the center and covered the entire card, it occurred to me to change the entertainment by passing the thread from each hole to one that was not exactly opposite to it, and thus leaving a space in between. I feel now the enthusiasm with which I discovered that the small blank space left in the middle of the letter was bounded by a symmetrical curve composed of a tiny piece of each of my straight silk threads; its shape depends on the outline of the letter..." (Pérez Sedeño, 2011). A friend of Mary's wrote a book entitled A rhythmic approach to Mathematics in which some experiments with Boole's letters are described.

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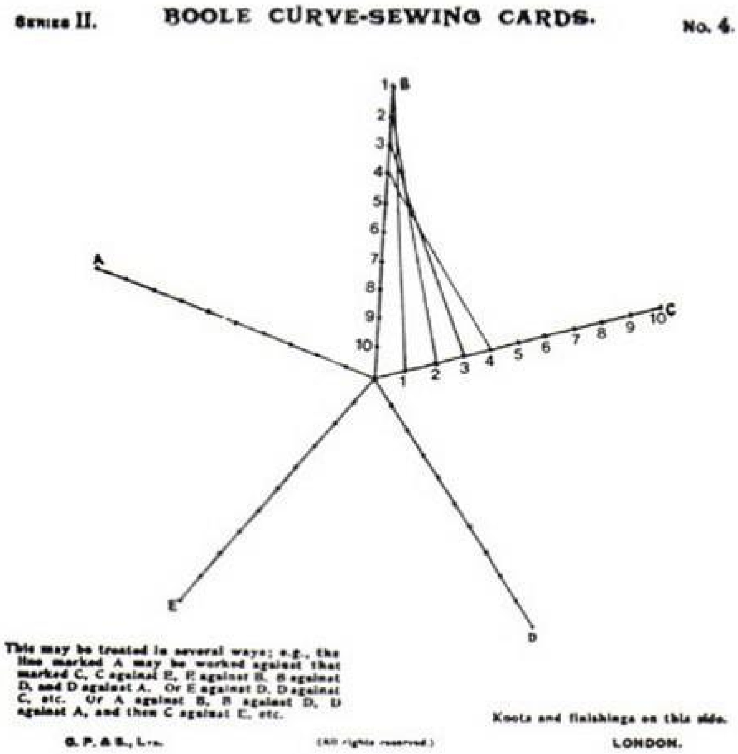


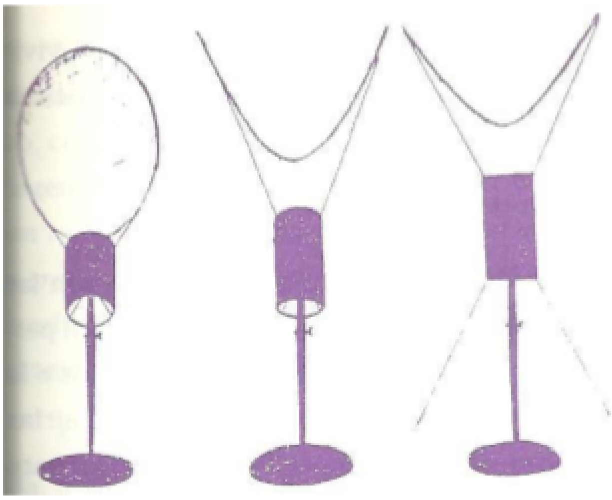
Mary considered herself a mathematical psychologist. Her goal was to try "...to understand how people, especially children, learned mathematics and science, using the reasoning parts of their minds, their bodies, and their unconscious processes." Mary thought that children should be given the mathematical objects to play with and be left to develop ideas and patterns at their own pace. She was not in favor of encouraging competitiveness at early ages as can be seen in her words: "The stimulation of competitiveness in thought processes at early ages is detrimental to both the nervous system and scientific intuition and only dead mathematicians can learn where competitiveness prevails" (Pérez Sedeño, 2011).

Mary is a woman who has been greatly underappreciated in the world of mathematics, mainly for two reasons, because she has been obscured by her husband's work, and because she is considered primarily an educator. Although, despite this little recognition at the time, many of Mary Boole's contributions can be seen in today's classrooms.

CLASSROOM APPLICATIONS: GEOMETRY

In this case we will take advantage of the class to make different geometric constructions with which to work on certain concepts live. Thus, the following exercises are proposed:

- Perform different geometric constructions and relative positions between different surfaces (mainly straight lines and planes) with materials that are usually imagined outside of a mathematics class,
- Through the students' construction of different Boolean charts, study types of angles and geometric spaces.
- Using a lamp and the shadows that it reflects on a wall - depending on the movements you produce to the lamp - study the different types of conics.



Secciones cónicas de una lámpara o linterna (del libro *Matemáticas en la realidad*, de Emma Castelnuovo).

Nomdedeu (2000)

- **ANALYSIS**

In the high school analysis block, we basically study the concepts of limit, continuity of a function, derivability, calculation of derivatives and integrals and their application.

We will also review this block through a woman, Maria Gaetana Agnesi through a woman, Maria Gaetana Agnesi (Italy, 1718- 1791), although we cannot fail to mention, albeit very briefly, Emilie Breteuil, Marquise de Chàtelet (France, 1706-1749).

Maria Gaetana Agnesi was born in Milan in 1718, eldest daughter of Pietro Agnesi, mathematician at the University of Bologna, and Anna Fortunato Brivio, and descendant of a wealthy Milanese family, so she grew up in a wealthy and cultured environment.

He grew up in an environment in which science was part of the common world of the whole family, women included. For at that time, the Italian humanists of the fourteenth century believed in the value of education for both women and men of high social class. During the fifteenth and sixteenth centuries wealthy Italian women could earn degrees and teach at universities and were respected as educated people. Standard higher education included knowledge of Greek mathematics, so these women knew classical mathematics as well as their male counterparts. This tradition of supporting women's higher education resulted in large numbers of women mathematicians.

She soon acquired fame as a child prodigy, at the age of 9 she could converse in 7 different languages, and at the age of 10 she already excelled in mathematics. She is known mainly for her contributions to mathematics and the famous curve that bears her name, which we will discuss in more detail later. But in addition to mathematics, Maria gave her opinion and discussed topics of philosophy, logic, mechanics, elasticity, celestial mechanics and the Newtonian theory of universal gravitation.

In fact, in 1738 she published a complete collection of 190 works on natural sciences and philosophy entitled Philosophical Propositions, which includes expositions on logic, mechanics, hydraulics, elasticity, chemistry, botany, zoology, mineralogy, astronomy, etc.

At the age of 21, advised by Rampielli - professor of mathematics at the University of Padua and friend of her father, and Maria's teacher - she wrote a book on differential calculus, partly with the aim of teaching it to her brothers, Instituzioni analitiche and uso della gioventù italiana. This book he managed to publish at the age of 30, in 1748.

The first volume of the book collected in a clear, rigorous and didactic way the Cartesian geometry. A year later he published the second volume which in its first section dealt with the analysis of finite quantities and some simple problems of maxima and minima, tangents and inflection points. The second section contained a discussion of infinitesimals. The third section dealt with a treatise on integral calculus as well as a discussion of the state of knowledge at that time. And the last section contained methods of solving differential equations. All this was complemented with numerous examples and problems, original methods and generalizations, throughout the book.

Let us remember the importance of these years in the history of mathematics, in which a general formulation of analytic geometry is obtained and analysis, differential and integral calculus, the theory of power series and trigonometric series are constructed. This has great significance in the response that this work caused. For when this book was published it caused a sensation in the academic world and was considered by the Academy of Sciences of Paris as the best treatise on differential and integral calculus since L'Hopital and Euler. The most important scientific circles of the time were of the opinion that it was admirable the art with which he had managed to bring together the various contributions made by the different mathematicians of the time, which each had arrived at with different methods and which Maria had managed to unify as well as complete with original contributions.

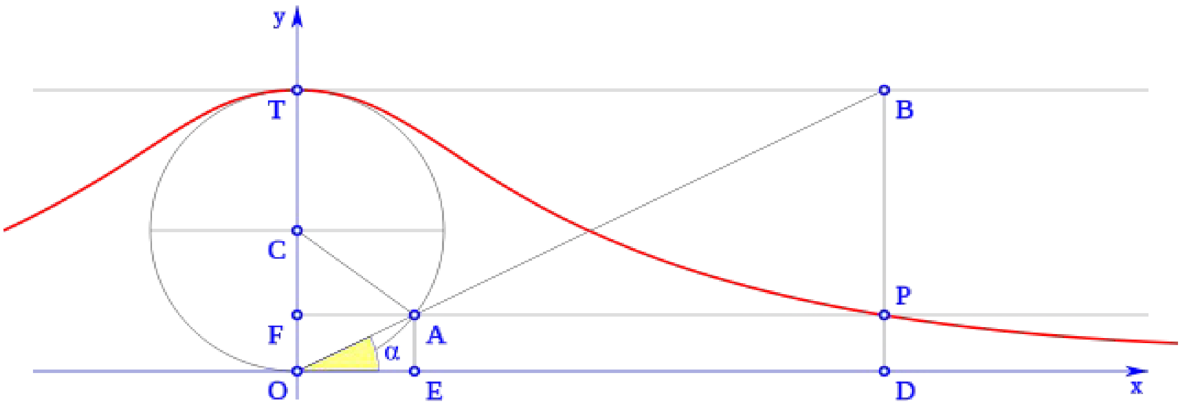
We reproduce the opinion given by the French Academy of Science itself at the time: "This work is characterized by its careful organization, its clarity and its precision. There is no other book, in any language, that allows the reader to penetrate so deeply, nor so quickly, into the fundamental concepts of analysis. We consider this treatise to be the most complete and best written work on the subject".

This commission, which decided on the translation into several languages and the publication of this work in French, was formed by D'Alember, Condorcet and Vandermonde. Colson, a Cambridge professor, learned Italian, "with the sole purpose of translating this book so that the English youth could benefit from it", in such high esteem! (Corrales, 2003).

Two years after this book she was offered a professorship at the University of Bologna, in 1750 - unlike Emmy who was always denied a place in the academic world. Moreover, Maria can be considered the first university professor since in 1748 she took charge of her father's courses at the university and in the autumn of 1750, she was offered, although she only accepted an honorary appointment, that Chair of Higher Mathematics in Bologna. Although, despite these recognitions, he never taught at the university with an appointment of his own.

But Maria did not like to see herself exhibited in these salons, so at the age of 34, when her father died, and with him the pressure he exerted in relation to his mathematical work, she put mathematics aside and dedicated herself to theology, to the care of poor and sick women, and to educating her brothers and sisters.

Mary received recognition in her time. However, her historical reputation was distorted by a flaw in a translation. The versa sine curve is a curve that Fermat discovered and which she analyzed in detail. The original name of the curve is versiera, because of the way the curve originates, as versiera comes from the Latin vertere, which means to turn, to turn. The colloquial Italian evolved and came to say avversiera, a voice similar to avversiere meaning wife of the devil. So the curve remained with the translation of "the witch of Agnesi", as it is known today.



But Maria, like Mary is not valued in the field of mathematics as she deserves. Some papers comment that because she did not make any discoveries that changed the course of science, but what value do these histories give to the previous work of observation, data collection, translation, teaching, systematization of knowledge, dissemination, etc.? How many geniuses would have recorded these histories without these labors silenced by them? The book of Agnesi's Instituziones analíticas was used and recognized as the best for teaching the latest discoveries in mathematics of the time for more than 50 years, is this anecdotal? (Nomdedeu, 2000).

Furthermore, continuing with Nomdedeu (2000), Maria demonstrated that the abandonment of mathematics is not necessarily due to a lack of ability or taste for mathematics, but may be a decision made according to a certain value system.

Maria is a contemporary of the Marquise de Châtelet, about whom we will not go into detail, but who should be mentioned in a mathematics class when discussing analysis. Both women played a fundamental role in the support and dissemination of the works of Descartes, Newton and Leibniz in the scientific salons of the time.

Émilie de Breteuil, Marquise de Châtelet, translated Newton's Principia, with extensive and valid commentaries and supplements that greatly facilitated understanding, and disseminated the concepts of differential and integral calculus. In this way he spread these ideas from England to continental Europe, which remained as philosophical ideas until the middle of the 19th century, and as a fundamental part of Mathematics even in our days. He also wrote several books, among which is The Institutions of Physics ("Les Institucions de Phsiques"), in 1740, for the education of his son and was considered to be an extraordinary and lucid exposition of the physics of Leibniz, one of the fathers of infinitesimal calculus. The book was published in 1740 and contained historical background and a clear and precise synthesis of Leibniz's physics and his infinitesimal calculus.

CLASSROOM APPLICATION: ANALYSIS

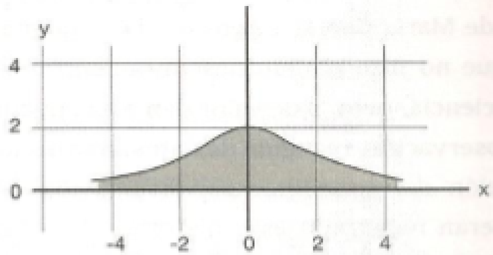
The introduction of the new concepts of limits, derivation and integration requires the construction of new mathematics. These are the tools that make it possible to describe variation and rate of variation or acceleration. Newton and Leibniz, working independently in different places, gave the definitive form to the calculus as we know it today. They introduce the notions of differentiation and derivation (Figueiras et al, 1998).

Therefore, for this part, we propose the following activity to be carried out in the classroom:

The complete study of the sinusoidal curve versa:

- obtaining some Cartesian equation of the curve;
- study and representation of this function: calculation of cut-off points, symmetries, asymmetries, asymptotes, maxima and minima, inflection points, and representation of the curve;
- calculation of the area under the curve through the concept of definite integral;
- explain the relationship of the previously calculated area to the concept of limit.

Y aunque es ilustre y no es bruja, sí que encierra algún misterio, pues ¿cómo es posible que en un contorno infinito se encierre una superficie finita?



$$\int_{-\infty}^{\infty} \frac{1}{1+x^2}\,dx = \left[\text{artg } x\right]_{-\infty}^{\infty} =$$

$$= \lim_{\varepsilon \to \infty} \left[\text{artg } x\right]_{-\varepsilon}^{\varepsilon} = \lim_{\varepsilon \to \infty} \text{artg } \varepsilon - \lim_{\varepsilon \to \infty} \text{artg } -\varepsilon = \frac{\pi}{2} - \left(-\frac{\pi}{2}\right) = \pi$$

No sólo sorprende que su medida sea finita, sino que valga exactamente π, tal vez el número más famoso de la historia.

(Nomdedeu, 2000)

CONCLUSIONS

With this work there has been no greater pretension than to give a small sample of how to introduce the history of different women mathematicians in the classroom. Through their advances in this discipline, their difficulties and obstacles encountered along the way, the specific circumstances in which their lives developed, etc., and how with this information we can present different exercises in class that allow us to do mathematics. Although their bibliography -of some more than others- has been developed in a cursory manner, we have tried to point out in all of them the following: their family history, the type of family they come from, the environment they surrounded themselves with, the historical context in which their lives developed (and the valorization or not in that context of women in science), and the type of education they had. Basically, for one reason, because both the social environment and the education received have been key in their history for their relationship with mathematics, factors that continue to be key for many girls today and their future relationship with this discipline.

As we have seen throughout the stories of Emmy, Sophie, Mary, Maria or Emilie, most of them came from well-to-do families and either had access to personal tutors and education (with all the obstacles they had, but access nonetheless), or to training materials and books. This shows us that women consider the study of mathematics as one more option in life if, in the family environment in which they grow up, mathematics (science in general) is experienced as just another activity in life

(Corrales, 2003).

Regarding the social environment, it is also worth noting the esteem in which most of the above-mentioned women were held by their male colleagues in the profession, and I am referring in particular to those with whom they worked closely. Thus, comments such as those made by Hilbert or by different students to Emmy Noether, by Gauss to Sophie Germain, or by the Academy of Paris, with Vandermonde, Condorcet or D'Alambert at the head, to Maria Gaetana Agnesi, show the great esteem and respect they had for them. This small sample makes visible how the obstacles that these women encountered - focusing at this time on the level of higher education - were largely imposed institutionally, by the time and society in which they developed their lives - with the exception of Maria Agnesi - but not so much by their own co-workers.

But excess is also highlighted in all these women, partly also expected, because as Remedios Zafra (2013) comments, excess is familiar, especially in those transitional periods of those who want to break the traditional schemes by doing something different, but still cannot stop doing the predictable. The answer can make him lose what he wants; and as an alternative, excess: to do both. Thus, these women continued to work at home, to take care of their children, or if not of their fathers or mothers, ..., and at the same time they studied, researched, disseminated their knowledge, made great advances in science, even if it meant spending long nights without sleep under the cover of a blanket and the light of a candle, as the story of Sophie showed us.

But what stands out most, given the relationship of this work with education, of all these women who have been presented throughout this work[5], is their pedagogical capacity and their ability to transmit and disseminate mathematical knowledge, their taste for mathematics, which is also in the mathematical practice we mentioned earlier, this education understood from passion, enjoying what you do and what you learn.

That education in which first of all we must question our own epistemology, what we know and how we know it, make a logocentric critique -in the words of Remedios Zafra (2013)- of the history that has been made for us and of the knowledge generated through that history. This, evidently, demands a change of perspective, quoting Zafra again, it requires to stop looking at the central body of writing to discover a whole web of associations, concepts and perimetral criticism, a realm of life in the margins, an exercise of reflexive criticism and de-hierarchization of the principles of linearity that had prevailed in scientific texts until then, that is, a demonstration of logocentric criticism in every rule*.*

And in this questioning of what we know and how we know it, it is important to value those other processes of knowledge generation, where women have played a fundamental role. Those tasks of data collection, such as astronomers, botanists, computer scientists, disciplines in which there have always been many women but whose role has not been valued because it has supposedly been relegated to tasks placed in the background, but tasks without which such research and advances in science would have been impossible. As Xaro Nomdedeu (2000) says, behind a stroke of genius there is a great deal of well-done work that we tend to ignore. Its historical invisibility makes the genius of the one who is in the last link of the process stand out with a hypertrophied magnitude. Leibniz's genius consisted in uniting the two concepts, that of the quadrature and that of the tangent and, above all, in providing the appropriate symbolization, but Barrow had left the problem at the point[6]. At this point, and to paraphrase Zafra again, even when women have been able to practice as scientists, many have been footnotes.

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[5] With the exception of Sophie Germain, but her own bibliography is more lacking than the rest, so we lack information about this woman.

[6] The origin of infinitesimal calculus has been the subject of much controversy in the mathematical community because of its attribution to Leibniz and/or Newton. Some authors comment that one arrived at these concepts earlier but the other published them first. Controversies aside between the two of them, what is certain is that Barrow, to whom little of these advances are attributed, paved the way for this work. So did a multitude of mathematicians and mathematicians in various branches of this science.

As Isabel Alba says in her text 'Stolen Time', what differentiates female artistic creation from male artistic creation are the conditions in which it develops. Let's change artistic creation for mathematics, or let's leave it the same. Let's leave it the same, and let's call for interdisciplinarity in studies. Thus, linking with the role that formal education plays in all this. In the generation of knowledge, in its dissemination, in the way it is generated, in learning as a process, as the construction of citizenship, from the personal and the collective, where an interdisciplinary approach is fundamental. interdisciplinarity is fundamental. This interdisciplinarity opens the mentality of students and teachers and helps in the integral formation of people that we mentioned before. This understanding of education as a process whose objective is to build critical citizenship, as well as the need to mainstream this approach in formal education, and where the "hidden curriculum" we mentioned earlier can be a good ally.

From the teaching point of view, we must keep in mind that behind every methodology there is an ethical and political principle and an ethical and political result. And here a feminist perspective in education enters de facto, quoting Zafra again, to break that tendency to the repetition of the world is what a politics and thought like feminism pretends, to make visible the facticity of these associations and to initiate changes that allow the freedom and choice of people, without sentencing in advance their future and work according to a body or a name. It is not a problem here to be called Maria J. Or J. Maria (manifesto x0y1).

To finish, a quote from Catherine Goldstein, mathematical historian, which appears in Corrales (2003) and is totally clarifying:

"The main question for me is not so much to explain that two theorems are not the same, or that science and art are very different enterprises, but why the problem of their similarities and differences should be discussed as such. Why, as I posed at the beginning of this article, would anyone think that art and science, visual art and mathematics, are different or similar? The question has two sides. One is linked to the very construction of art and science as different in the first place, a necessary prerequisite for considering either as "the other's paradise lost," and the dichotomy as a deadly lacuna of our civilization. The other is the valuing of identity over difference. Both aspects are deeply political.

The problem of "women and science," among others, should make us particularly sensitive to the effects of crude dualism, even when the discourse is one of reconciliation. In some cases, trying to erase (non-existent) boundaries makes us utter the words that gave rise to these boundaries, forces us to repeat the gestures that strengthened them. The sciences and the arts are not the same, but neither are mathematics and physics, biology and chemistry or painting and architecture. Just as glue physics and quantum field theory, or chamber music and opera are not. Why should we separate these subjects into two pure categories, even if we then suggest a framework to unite them? To fill then one with emotions and the other with reason? One with power and the other with conviction? And by the way, in what way? Such clichés support the status quo. Again, choosing to emphasize identity over difference, or the other way around, is not a politically neutral choice.

When the sixteenth-century French algebraists chose to consolidate their humanistic enterprise by inventing a Greek ancestor, Diophantus, for their discipline, algebra, while distancing themselves from their immediate predecessors and inspirers, the Islamic mathematicians, they were simultaneously deeply engaged with the complicated issues of Roman and French law and the constitution of a modern state. It is to be hoped that collective representations will also play a decisive role in our desire to reconcile two cultures that we stubbornly constructed as separate in the process."

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