

Welcome to the MMACA

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Abstract

Contribute to the promotion of mathematical education and to disseminate a social image different from a discipline that is considered difficult, unpleasant and abstract. These are the objectives of the MMACA project, the Mathematics Museum of Catalonia, launched in 2005. It has gone a long way to reach its eighty thousand visitors per year to the permanent exhibition of Cornellà, and to maintain the traveling exhibition active. And there is still a lot to come.

Welcome to the MMACA.⁽¹⁾ This is the greeting expected by each of the more than thirty-five thousand students that every year visit the permanent exhibition completed on the ground floor (aimed for the elementary school students) and the second floor of the Palau Mercader, near Barcelona, in the middle of a busy park.



Palau Mercader view from the inside of a Leonardo's dome built in the park. Photography: courtesy of Guido Ramellini.

The educator hosting the group communicates some important rules to soften the impact of such a large number (and wild!) of visitors, on a limited area in a historic building - which means fragile. Then they continue to show how to interact with the modules of the exhibition through a brief guided activity, chosen based on the age of the group or the demands of the accompanying teaching staff.

The rest of the tour is a free workshop-like activity, where students can choose what activities to do and how much

time they spend within the time the group will be in the room. After that, they move to another of the six environments that form the permanent exhibition, aimed at school groups from fifth grade to high school. Two groups of students visit the exhibition in parallel, accompanied by their teachers and a museum educator, who is available to facilitate communication with the modules and among the groups spontaneously formed (or not so) to resolve challenges and finish the activities collaboratively.



A permanent exhibition room. Photography:
courtesy of Guido Ramellini.

The intervention of the educator must be as minimal as possible, and their instructions brief and limited. Students must have time to do their self-chosen activity, to build the necessary concepts to do so, and also to reflect on the contents, formulate hypotheses and conduct their experiments. The educator must not solve challenges. They should only converse and guide, and suggest through questions. They do accompany, but they do not guide. Our goal is not to satisfy all the questions, but to generate new ones and, if possible, to get to more accurate and fruitful questions. We want to influence and stimulate a learning process unlimited in time and in space: heuristic, holistic. The visit to the exhibition for the youngest students (first to fourth year of elementary school) is more directly driven. The educator gives a general overview of the exhibition before the group is able to work with the material alone. The space for such activity is smaller and hosts a single group. At the same time, another group will be doing a calculus or geometry workshop right in the next room, with the most suitable contents for each age. After seventy-five minutes both groups will exchange their activities.



A material (labyrinth of arrows) from Sala dels petits (kids room). Photography: courtesy of Guido Ramellini.

The exhibitions in the Palau Mercader are open to school visits in the morning from Monday to Friday, with a schedule that has been adapted and extended to respond to an overflowing demand. For the same reason, we have enhanced the format of the visits with a workshop (the “cúpules de Leonardo”, Leonardo’s domes) and a scavenger hunt, which are held in the park. Almost all the visiting schools ask for more than one activity. Last year we received eighty thousand students, approximately.

The exhibition is open to the public, either individually or in groups, on Mondays and Wednesdays and on Sunday morning. Anyhow, our goal remains the same - offering a different way of learning and enjoying mathematics and changing its social image, one of an arid, boring and too difficult discipline.

Seeing the response of our visitors during the five years since the permanent exhibition’s inauguration (eleven since the itinerant exhibition’s), it certainly looks like we are managing to reach the two types of people that, in our opinion, do exist in the world: those who love mathematics and those who still do not know that they love mathematics.

We do everything with simple, friendly, attractive modules that are easy to use. We make sure that their dimensions, colors and materials (basically MDF, PVC and EVA) are the most appropriate for such principle. Our modules communicate and invite the visitor to solve the proposed challenges. Calculus, geometry, statistics, combinatorics and topology accompany our strategy games and our collection of giant mirrors and kaleidoscopes, which may be more distant to mathematical contents, but such activities are surprising and even more involving. Our golden rule remains the same there too: "Not touching is forbidden!"

We produce almost all our modules in personal workshops that, following the evolution of the project, have been enriched with new machinery.

Who are we and where do we come from?

Nothing of what we do and explain would exist without the societies of mathematics professors, which are present

in all the regions of the State and have associated in the FESPM (Spanish Federation of Societies of the Mathematics Teaching staff).

There are five associations of territorial scope in Catalonia: the [APMCM](#) (Association of Professors of Mathematics of the Southern Regions), the [ADEMGI](#) (Association of Professors of Mathematics of the Girona Region), the [ABEAM](#) (Barcelona Association for the Study and Learning of Mathematics), the [APaMMs](#) (Association of Professors of Mathematics) and the [Lleimat](#) (Association of Professors of Mathematics of Lleida).

These entities are federated in the [FEEMCAT](#) (Federation of Entities for the Teaching of Mathematics in Catalonia). They are very active, as they organize their own and collective conferences like the [C2EM](#) Congress with the [Xeix](#) (Balearic Society of Mathematics) and the Society of Mathematical Education [Al-Kwaritzmi](#), from the Valencian Community, and in collaboration with the [CESIRE](#)-Creamat of the Department of Education of the Government of Catalonia and the [SCM](#) (Catalan Society of Mathematics); activities for students ([Estalmat](#), [Anem x+ Mates](#), [Cangur Tests](#), [Fem Mates](#), [Bojos per les Mates](#), and so on), contests (minivideos, photography and stories) and edit, always in collaboration with the SCM, the magazine [Nou Biaix](#).

This was the fertile soil that allowed the growth of the MMACA from seeds like the exhibitions organized for the International Year of Mathematics (2000) and some research work by some members of the first nucleus of the MMACA: Anton Aubanell, Josep Rey and Pura Fornals.

For my part, I participated in the design and promotion of the 2000 Mathematical Pieces exhibition, organized by the [SMPM](#) (Madrid Mathematics Teachers Society Emma Castelnuovo). I also collaborated as a lecturer at the Italian Liceo of Madrid with the Museo Nacional de Ciencias Naturales, in the European project Comenius2 "SMEC: The Scientific Museum as a teaching tool". It was my first museographic experience, which I took advantage of when I arrived in Barcelona in 2005. By then the working group of the [Institute of Education Sciences of the Polytechnic University of Catalonia](#) was being created in the city. It was the beginning of what would become the MMACA.

Although the working group remained open to everyone who wanted to participate, it was initially formed by representatives of the various associations of the FEEMCAT, representatives of the SCM and of several universities that joined quickly. Because of this, the project was born with a remarkable educational idiosyncrasy.

We were a kind of teaching staff that, based on the work of Montessori, Decroly, Castelnuovo and Puig Adam among others, tried to bring the materials to their mathematics classes and encouraged the [JAEM](#) (Days for learning and teaching mathematics), the conference that every two years brings together an increasing number of mathematics professors from the whole country and from all educational stages. However, we saw that we still needed something to trigger a radical change in the way we taught our discipline, which we thought (and still do) is necessary.

We were convinced that, in order to help schools change their teaching model and the perception of mathematics on a social scale, a more striking intervention was needed, one that took place outside school buildings.

We discussed for two years which of our experiences, either in the classroom or in workshops, could be transformed into an ideal format through an exhibition based on handling modules.



Modules of the exhibition. Photography: courtesy of Guido Ramellini.



Modules of the exhibition. Photography: courtesy of Guido Ramellini.

We were moving away, perhaps even unconsciously, from the school's ways to introduce ourselves in the field of the non-formal education.

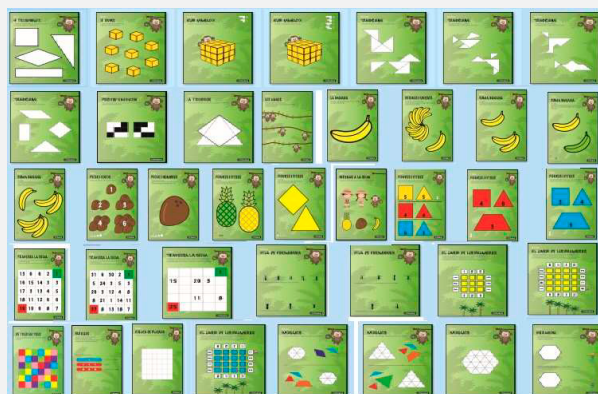
We analyzed other experiences (the [Giessen Mathematikum](#) in the first place), we asked for advice from more competent friends and we read museography manuals. Later, when we founded the MMACA (Association for Promoting and Creating a Museum of Mathematics in Catalonia) and had prepared the first modules for the traveling exhibition, we attended some museology courses (organized by [CosmoCaixa](#), [Agbar Museum](#) or [Museum of Natural Sciences](#)) and international conferences ([Ecsite](#)), and we observed museum collections with a more professional perspective. And not only those about Science or Technology. We had to learn a new language and new, different forms of communication.⁽²⁾

We, doubtfully and hypercritically, opened our first exhibition in November 2007 in a town near Barcelona. It was about a hundred square meters big, and remained open for ten days during the Science Week.

A new adventure began. Within eleven years, we brought the temporary exhibition in different formats to eighty different places, opened our permanent space in Cornellà, participated in fairs and other local and international events ([Festival della Scienza](#) di Genoa, [Imaginary Conferences](#), [Matrix](#) and [Ecsite](#), [MathWeek](#) in Ireland), conducted workshops ([Leonardomes](#)), educational suitcases activities and scavenger hunts in parks, designed exhibitions and modules for other museums ([CosmoCaixa](#), [Museo Nacional de Ciencia y Tecnología - MUNCYT](#) and [National Museum of Mathematics - MoMath](#)), and organized the [Matrix Conference 2018](#), the biannual meeting of exhibitors and mathematics divulgators.

In the meantime, we were already a nonprofit association declared a public utility and an official entity for the training of the mathematics teaching staff.

Teachers brought their students to our exhibition and attended the training courses that accompany our itinerant exhibition, and even asked for materials to continue with the experience in their classroom. This is how our project for designing and producing educational suitcases was born. Our idea was to mount pop-up exhibitions in the schools with a duration of about twenty-five or thirty modules in DIN A3 or DIN A4 format. We used selected materials that can be easily reproduced and brought into the classroom, accompanied by a didactic guide that suggests fifty other activities as a guided workshop, either manual or virtual.



Boards of the briefcase modules for Initial and Middle School Cycle.

We are negotiating with the Department of Education of the Catalan Government to provide all pedagogical resources centers with these educational suitcases so they can distribute them among nearby schools.

However, the MMACA project still has an important growth potential, which largely depends on a few lines of development that have not changed.

For example, given the increase in school groups that ask to come to the MMACA and we can not accommodate, it seems urgent to get more space, which, for many reasons, we can not have at Can Mercader, in Cornellà.

On the one hand, having a larger building would allow us to offer more services: temporary exhibitions of our own and external ones, different workshops for different contents and users, lecture cycles, talks, concerts, spaces for collaborative projects to do with the visitors or rest and fun areas. It would also give us visibility, increasing our impact on the territory where we would be located, and it might even make us more attractive for potential sponsors, as much public as private.

In this regard, we find a perfect example of this fact in the exhibition "Mirrors. In and out of reality", which recently opened at CosmoCaixa following on our ideas, but counting with the spaces and human, technological and economic resources of Obra Social La Caixa.



Poster of the exhibition and conferences of the Mirrors exhibition.



Poster of the exhibition and conferences of the Mirrors exhibition.

On the other hand, a network of small offices that collaborate, contributing and exchanging ideas and materials, is easier to manage for local groups that are linked to MMACA since the very beginning, and it is also economically more sustainable. Less than 20% of the current income of MMACA comes from public or private financing, either direct or in benefits. The rest is generated through the tickets for our permanent exhibition, the rental of our traveling exhibition and our workshops or collaborations in specific projects.

Our lighter structure (although we have a dozen part-time paid members in Cornellà) makes our tickets' price acceptable for school groups. We even reduce the price to half in situations of proven difficulty to fulfill their payment).

This helps us to get closer to our visitors, who are able to come back more times, regardless if alone, with friends or with family. They take better advantage of a structure that they feel of their own.

It also allows us to connect better with local groups: teaching staff, scientific and cultural associations, pedagogical resources centers, libraries or youth camps. This encourages complicities and common projects.

In any case, we are clear that we want to influence the reality in which we operate and to maintain the maximum control over the content, production and management of our initiatives. We want to avoid as much as we can the outsource production and services (administration, education, design), opening the possibility of a partnership to younger members and everyone who contributes with ideas or the will and ability to realize them.

Whoever enters the association must show enthusiasm and complicity with the strategy of the project, and give work and energy to the management of the activities.

We think that spaces like ours, which we continue to call "museum"⁽³⁾ because we do not have a different term that collects the functions we perform, can be transformative in many ways. First, we can affect the way mathematics and its learning are considered, but we can also be a place where education, research and dissemination dialogue and approach people. We want to be this place where people rethink the work environment and relationships of the professional figures that are necessary to make the social utility of the 21st century museum recognizable. The first

step must be educators, their professional identity, their training and their functions. We firmly believe that it is necessary to reverse the current tendency to outsource the creation and design of modules and activities, the education and the maintenance service, which should constitute the heart of our installations. They should be transparent services open to the participation of our users.

From now on, we will see what the future provides, but the adventure of the MMACA continues to be very exciting and different in many aspects. Despite that, and fortunately, it is not unique nor isolated.

Notes

1. Museu de Matemàtiques de Catalunya (Mathematics Museum of Catalonia).
2. I place here the only bibliographical reference of the whole article, since I believe that the readers of this magazine have a broad and profound knowledge of the theoretical implant in which we are moving. However, I feel obliged, for reasons of proximity to ideas and personal esteem, to include a reference to Guillermo Fernández's recent book, *El museo de ciencia transformador*, <http://www.elmuseodecienciainformador.org/>. In a word: indispensable! In two words: absolutely indispensable!
3. Unfortunately, the word "museum" has been deformed and loaded with dust, relegated to describing structures tasked with the conservation of a heritage that is sometimes far from the people, and thus losing its original service to the community as a place to discover its cultural wealth. It would be better to reinvent and update its function and its language, rather than the word that defines it, and to claim the merits of these facilities, which have long contributed to creating more artistic and scientific vocations than any other means.

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