1. GENERAL DESCRIPTION OF STEMFAIRNET’S SCIENCE FAIRS

STEMFAIRNET consortium members’ profile: all science fair organisations are non-profit private foundations, the schools are public, and Milset Europe is a non-governmental, non-profit and politically independent youth organisation.
The science fairs one by one

Elhuyar Zientzia Azoka

Elhuyar Zientzia Azoka is a one day event that is celebrated yearly in a popular main square of Bilbao (Plaza Nueva). Around 200/300 projects participate throughout the year, but for the fair day there is a limit of 90/100 projects.

It started in 2004 as a contest. It evolved to a science fair, and in 2019 Elhuyar has celebrated the 6th edition in Bilbao. The event is celebrated on the second weekend of May.

Elhuyar is most proud of the community created around the event: students, teachers, researchers, family, general public…
I Giovani e le Scienze

I Giovani e le Scienze is held by FAST, and the event is held in its organisation’s building during three days. Around 35 teams from all Italy participate in the contest, and there are more than 30 awards. Now they receive fewer projects compared to the initial years, but the quality is higher.

Fast is most proud of the contest because it has contributed substantially in Italy to promote the choice of science careers among the participants. This is confirmed by the periodical interviews and contacts FAST has with past participants, most of whom have joined the Forum of young scientists, in order for them to stay linked with FAST and among them.
Mostra Nacional de Ciência

Fundação da Juventude promotes the Mostra Nacional de Ciência (the national science fair in Portugal). It lasts three days, and nowadays it is held in the Centro de Congressos da Alfândega (Porto).

2019 was the 27th edition this year. The national fair started with the 13th edition; before it was a contest (same as Elhuyar). The 2007 edition started with 70 projects, and now it is limited to 100 projects.
EU Contest for Young Scientists (EUCYS)

Although EUCY’s fair is not a partner of the STEMFAIRNET consortium, the partners decided to add EUCYS’ basic information and visit the fair in September 2019 because it is the reference for most of the science fairs of Europe.

The 31st edition of the competition is being held in Sofia, Bulgaria between 13 and 18 September.

The EU Contest for Young Scientists gives students the opportunity to

- compete with the best of their contemporaries at European level
- meet others with similar abilities and interests
- get guidance from some of the most prominent scientists in Europe
- It highlights the best of European scientific student achievements and attracts widespread media interest.

The contest is an initiative of the Commission under the Science and Society programme. It was set up to promote the ideals of cooperation and information exchange between young scientists.

The criteria used to assess projects are as follows:

- originality and creativity in the identification of and the approach to the basic
problem

- skill, care and thoroughness in designing and carrying out the study
- following through of the study from conception to conclusion
- reasoning and clarity in the interpretation of the results
- quality of written presentation and ability to discuss the project with the jury members

A jury composed of 18-20 members of international reputation, who carry out their duties as individuals and not as representatives of an institution or country, are responsible for the evaluation of the projects following a strict procedure.
2.- RULES FOR THE PARTICIPANTS

Most of the rules of Mostra and Giovani e le Scienze are based on the “EU Contest for Young Scientists” (EUCYS), funded by the European Commission; the reason is that they send groups to EUCYS, so following the same rules makes sense and avoids management problems. EUCYS basic rules are:

- Students must do before starting university.
- Projects can be by individuals or teams of not more than 3 people.
- Each country may submit up to 3 projects, with a maximum of 6 contestants in total.
- Duration of the event: 5 days (3 in case of I Giovani e le Scienze and MOSTRA).

More information about EUCYS: 
https://ec.europa.eu/info/research-and-innovation/funding/funding-opportunities/eucys_en

Although all the fairs are for students, there are slight differences among the fairs. For example the attendees age (Elhuyar: 12-18; FAST: 14:20; FJ: 15-20). Besides, Elhuyar’s fair groups need to be formed by at least two students and top four students.
Finally, EUCYS fair is organised by twelve categories: economy, biology, mathematics, health sciences, environment sciences, bioeconomy, physics, earth sciences, chemistry, engineering, social sciences and computer sciences.

Mostra organizes its fair based in the same categories as EUCYS. FAST does not, although they try to have variety in categories and to promote all sciences (they do not receive much projects of social sciences category). EUCYS gives prizes per category, but FAST doesn’t. Finally, Elhuyar is organized based on age groups (12-14 / 14-16 / 16-18).
3.- SELECTION OF PROJECTS TO ATTEND THE SCIENCE FAIR

Each organisation has a custom system to choose the attendants, due to large amount of students that want to attend the fairs.

Elhuyar Zientzia Azoka

Elhuyar asks the schools about how many teams they have willing to assist. Based on the capacity of the fair (90/100 stands), Elhuyar answers to each school with a proportional number of stands. When one school has less stands than teams, the teachers have to decide who is attending, based on their own criteria (ideally a school-science fair that is organised previously).

I Giovani e le Scienze

The deadline to present the project (by mail) is the beginning of February. The organisation splits the projects in different categories and sends them at least to 4-5 jury members. The first time they evaluate the written report, choosing the first 30/35 projects that will participate in Milan.

The jury are members of associations of ST, specialized in each category. They try to involve the previous fair participants that are specialized in STEM, asking to help with the evaluation too. The jury are volunteers and very engaged.
Awards are only participation on fairs. There is a difference between local and international participants. The international participants only can win gold and silver medals. At least one interview is in English (it is an idea that could be implemented by Elhuyar in its fair).

Mostra Nacional de Ciência

For the evaluations: Institutional support from Ciência Viva (national science education agency, it is public): they contribute with researchers for the management of the evaluation: selection of the projects, organise the visits, select the winners... The coordinator of the jury is managed by Ciência Viva. There are jury coordinators in each category (Biology, Environmental sciences...). The fair is organised by categories.

Evaluator groups: FJ president of the jury choses but they have the opportunity to change…it depends; there is not a strict rule. As they organise the fair in categories, it is easier to organise, based on the background of the evaluator.

Information given to the evaluators: Instructions for the jury for the first evaluation and the table with the labels for the evaluations. And sheet for interviews for the evaluation. If the project could be nominated to an international trip, the evaluator could ask a question in English. Besides, they ask before the English level. Jury give the prizes without being face to face. In the presentations, it is better if the teacher does not interact.
4.- EVALUATION OF THE PROJECTS

The science fair organising committee have shared the evaluation criteria to assess the projects via email after Brussels’ science fair. All of them are very similar to EUCYS’s criteria:

- Originality and creativity in the identification of and the approach to the basic problem
- Skill, care and thoroughness in designing and carrying out the study
- Following through of the study from conception to conclusion
- Reasoning and clarity in the interpretation of the results
- Quality of written presentation and ability to discuss the project with the jury members

5.- HOW DO THEY DISSEMINATE INFORMATION ABOUT THE FAIR?

Dissemination of the science fairs have several target-groups: schools, stakeholders and general public. The communication with each one is planned to obtain as much impact as possible: participants (from schools), sponsors (from organisations) and visitors (from general public). Timing, content and tools are chosen based on those groups.
Specific dissemination actions are taken by the organisations, such as…

- FAST: Facebook page: “The forum of young scientists”. From time to time FAST sends a questionnaire to students so they have information about how they are doing, what they are studying etc. and to know if they have chosen a STEM career or not. Recent data showed that 80-90% have chosen STEM fields careers (200 students).
- FAST uses Facebook to send information about the fair too. They invite those ex-participants to different events, involving them in speeches with students etc. Moreover, they do different kind of parallel activities to foster their participation in the fair. The questionnaires after the event are usually very inspiring.

- ELHUYAR: A press conference is scheduled 3-4 days before the fair. All the sponsors (30 more or less) participate in the press conference besides the inauguration event.

The organisations have experts in dissemination that work specially on the science fair crunches. For example, FAST has one external journalist for dissemination during part of the
Besides the ICT tools, all the organisations try to have a much face-to-face contact with schools to engage them, since participating the first time is one of the most stressful times for them.

6.- TASKS PREVIOUS TO THE FAIR AND SUPPORT FOR PARTICIPANTS

In the following paragraphs each organisation explains briefly the tasks to fulfill prior the organisation of the science fair and some best practices experienced in the last years:

**Elhuyar Zientzia Azoka**

The project starts in September and ends in July. During the process, Elhuyar offers support to teachers via email and telephone when it is required. Otherwise, Elhuyar has a network of professional researchers that offer their time to help and inspire the students and welcome them in their organisations for one morning. Elhuyar manages the contacts between voluntary researchers and students.

Best practice: Elhuyar offered workshops about the basics or inquiry learning to teachers once, and the participation was doubled.

**I Giovani e le Scienze**

The students have to send a report before attending the fair (max. 10 pages).

They do not offer training to teachers, but they could offer one-time help sometimes; for example when students ask which the best topic for their research is. Moreover, organizers go to the schools and talk to the students etc. to engage them for the fair.

Best practice: Some doctoral students are helped by students that participate in the science fair, and those last students prepare the project for the science based on that experience. It is a win-win solution: a) it helps with the thesis, and b) it supports the development of the project, and the young students have the opportunity of visiting the university into the bargain.

**Mostra Nacional de Ciência**

The project starts in September/October, finding the sponsors and preparing the graphics for the fair. Deadline to send the projects is the middle of April, through the web. The jury members do the first evaluation online, based only on the reports; they select the projects that will attend the fair.

7.- THE FAIR EVENT: PROGRAMME
Elhuyar Zientzia Azoka

Prizes are trips (to research centres, technology companies, Science museums... and accreditations to participate in other fairs). Sometimes students need to find complementary funding for trips.

Programme example:

Saturday, “Plaza Nueva” square of Bilbao

12:00 Opening of the Fair

12:00 - 15:00 and 16:00 - 18:00
In the arches and the central tent, students present their projects. Meanwhile some experiments and workshops are offered to children, and professional researchers from universities present their projects.

19:00 - 20:00
On stage, awards ceremony.

I Giovani e le Scienze

Prizes are accreditations to participate in fairs. Sometimes students need to find complementary funding for trips. High schools use to help with that, because the fair motivates students and offers great opportunities (and image for the high school).

During the fair, one or two scientific conferences are organised on a specific theme, or FAST invites a scientist to talk about his/her activity. FAST also organises a visit at either the Science and Technology Museum or the Museum of Natural History. In some cases, they have also offered guided visit to art museums or Milan downtown.
Mostra Nacional de Ciência

During the event the have schools visits and public visits. Schools have to register to attend to the fair, and general public have timetable for visits.

FJ organizes activities made by young scientists. They are interesting workshops for students and teachers. The teachers have the opportunity to attend different workshops such as how to protect your idea (patents, why and how to do it). In other times they invite scientist to do a conference (30 minutes): bio plastics, sustainability, artificial intelligence…

In 2019 FJ included another topic: why the students and the teachers could follow the project to the market, how to monetize the project results, and how to find investors. The idea to convey to the students is that they should continue with the project, not to stop when they go to the university: create a start-ups, research entrepreneurial opportunities, check for commercialization options… advised by experts. In Intel ISEF 99% are patented before the fair (Patenting can cost around 75€). It is important for students to know how they can protect their ideas, and patent the idea before the fair, because after it is more complex.

Prizes: cash for students and trips (international participation are the best prize). Honorary mentions to projects with good quality but not enough for a prize.

The ministry of Science and technology and well-known researchers/scientists visit the students, and that motivates them, specially when the researchers say that they participated in the fair when they were younger and explain the impact that it had in their career.

8.- BUDGET AND SPONSORS

Elhuyar Zientzia Azoka

Financial: The participants do not pay. The project is funded through public funding calls (Spanish, Basque governments and Bilbao town hall). The science fair does not have much funding from private companies (banks, communication companies…). It has negative balance, so it is stressing. Because of that, dissemination to stakeholders is very important.

Some organisation sponsors do not give money but work hours of their researchers.

I Giovani e le Scienze

Budget: One person work per year. Seven years ago they had a lot of sponsors and they paid for everything. Now things have changed, sponsors are limited, organisations pay one part, and the schools pay the other part or find funding somewhere else.
It is celebrated in FAST building because they do not have budget to pay a venue.

Mostra Nacional de Ciência

Main sponsor is a public agency for science in Portugal and the municipality of Porto. First 10 editions were in Lisbon, sponsored by the electricity museum. After that, the municipality of Porto became a sponsor and thanks to them they have free space for the fair. Three days for the fair, two for setting up and one for dismantling it (six in total). Sponsorship philanthropy Society American (with Portuguese roots), and companies (Chemical, Intel...). Small amounts, but they are necessary.

FJ pays the accommodation and meals to students and teachers. The attendees only pay for the travel.

9.- STRATEGIES AND PROCEDURES TO FOSTER INCLUSION

Inclusion in science fairs participation involves:

- Valuing all participants equally.
- Increasing the participation of students in.
- Restructuring the science fairs so that they respond to the diversity of students.
- Reducing barriers to learning and participation for all students, not only those with impairments or those who are categorised as ‘having special educational needs’.
- Learning from attempts to overcome barriers to the access and participation of particular students to make changes for the benefit of students more widely.
- Viewing the difference between students as resources to support learning, rather than as problems to be overcome.
- Acknowledging the right of students to an education in the public events.
- Improving science fairs for organisers and teachers as well as for participants.
- Emphasising the role of science fairs in building community and developing values, as well as in increasing achievement.
- Fostering mutually sustaining relationships between science fairs and schools.
- Recognising that inclusion in education is one aspect of inclusion in society.

Deaf students experience in Agrupamento

1 Adapted from: http://www.csie.org.uk/resources/inclusion-index-explained.shtml
Common problems managing inclusive practices

Not all the fairs can cover all the financial requirements of having someone with a wheelchair, we will discuss it during the workshops.

Real case: Two students arrive at a class on February, when the rest of the students have already started with their projects, and the rule of the fair is the top four students in each group. The teacher talks with the organizers and they decide to make an exception to the rule and allow two teams with five members, so the new students can participate with the rest of the colleagues.

FAST
The issue of inclusion is strictly connected to the problem of gender equality and gender dimension in research as supported by EC within Horizon 2020 and other European initiatives (e.g. the old “Science is a girl thing!”). Therefore, STEMFAIRNET could include this aspect within the project’s inclusion-related aim. Very simple data to support this proposal: this year (2019) we have in Milan 68 Italian contestants, of which 26 are girls and 42 are boys. In 2018 we had 42 boys and 20 girls.
FAST particapetes every year with ad hoc events in a programme supported by the Milan Municipality called “STEM in the city” with the aim to reduce this gap (which is often of a cultural nature). We could discuss this in Milan.

I Giovani e le Scienze
Challenge: include more and more technical schools, other regions, developing regions and area. Try to be more inclusive. For example, if there are doubts selecting the projects that will attend to the fair, they should give preference to those with more difficulties, or poorer regions.

UNAMUNO
It is the first time participating in a fair for the teacher, he does not have experience, but his school has experience in Elhuyar Science Fair.

From January to May they organise a robotics workshop for 15 students (not all the class participates); some students do not finish a project. This year they decided that the third project was not good enough, so they have participated with two.

Teachers at Unamuno miss information about science fairs, he is the only one participating in a fair. Participating in science fairs is not mandatory, so public schools do not participate so much. It is a challenge how to motivate public school teachers. He has to convince that it is interesting and worth it. But he does not have enough time, and has content to teach. The main issues are that the teachers are very alone, and do not have much information. It could change because the government will propose to schools to prepare stem plans, fostering the
participation on this kind of activities. It is seminal that teachers hear about it soon (and email does not work). They should see that it is not that difficult.

Best practice: “We are the protagonist” activity: 13 y.o. show what they have learnt in technology to 12 y.o students. It works very well.

10.- STRATEGIES FOR THE FUTURE

What we have liked most from the fairs:
  · It is fun to be here.
  · Different projects by different organisations, joining together the place, making the offer bigger and more engaging.
  · The tables to eat, relax…
I Giovani e le Scienze

Success case: Valerio invented a way to have Wi-Fi in his small village (6000 people); he was awarded in USA and London in best fairs. Use the connection of the tower electricity as Wi-Fi. At the beginning he received prize, the day after 3 more prizes. 50,000 dollars to pay the university taxes. After Valerio’s experience, his school participated with 21 groups, and Valerio was the only one the beginning: he had great impact on press (local and national).

Another strategy for the future is to use LinkedIn to promote young scientist participation, FAST is experimenting with it. Or to write success experiences when participants have become entrepreneurs: What are they doing?

One more idea, but not so easy: add the students to describe their idea to exploit in the future. They talked with pharmaceutics, and the problem is that it is very expensive, and sometimes the schools are not willing to exploit the opportunity, they are shy. We should ask sponsors to support projects. It is not possible to trigger that without the help of the government.

FAST is also committed to develop STEM careers among young people, and has organised specific events to that aim, especially devoted to gender equality (STEM still seems to be a sector for males only). But this engagement has not been “applied” to the Science Contest yet. It could be seen as a form of inclusion as well.

UNAMUNO

Don’t show (only) the best projects!

There is the need to motivate students to continue studying. High schools do not support all the students, there is a problem with the “bad” ones, and they do not have the opportunity to learn. At Unamuno they are offering cooking, hand working. Worst students are male. They do not know what to do, they are lost.

Dispersion in school: offer expertise, to be responsible of production, specialized workers.

Message to convey: You need to do STEM, it is not enough to be a genius on computers, and you need to be a scientist and researcher. We want general scientists, not only very specialized. It is important to have social skills too for example. We need young people open to opportunities and change, because an expert now on a topic maybe will not be useful, and will need to upgrade to other fields.