



Towards Women In Science & Technology



EU Project No: 244584

Project acronym: TWIST

Duration: 36 months

**Project title:**  
Towards Women in  
Science and Technology

**Funding Scheme:**  
Coordination and Support  
Actions (Supporting) –  
Science in Society

Deliverable No: 7.2

**Project Coordinator:**  
Experimentarium,  
Denmark

**Workpackage leader for  
this deliverable:** ECSITE -  
The European Network  
of Science Centres and  
Museums, Brussels,  
Belgium

**Project partner author of  
this deliverable:** ASDO –  
Assembly of Women for  
Development and the  
Struggle against Social  
Exclusion (Rome, Italy)

# TWIST

Guidelines for communication  
activities on women in science  
to be implemented by Science  
Centres and Museums

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## INTRODUCTION

Gender equality in science and technology is an issue of increasing significance, insofar as demand for knowledge and technology is also growing. As a matter of fact, producing knowledge, applying its results and turning scientific views of reality into a shared culture require an expanding number of science and technology graduates, science communicators, scientific managers, technology developers an increasing diversity of scientific personnel so as to reflect the global nature of scientific endeavour as well as a broadening interest and engagement of the public at large on scientific and technological research. None of this can be done without the full involvement of women in science.

The TWIST project has been developed just to face this challenge. Its aim is to raise awareness of the role and representation of women in science and technology throughout science centres and museums in Europe to enhance their capacity to contribute to the need for a gender-inclusive science.

The project, financed under the EU 7<sup>th</sup> Framework Programme for research and technological development, is carried out by a consortium of 11 European institutions of science centres and museums, networks and research bodies. It includes a wide range of activities such as the creation of a multimedia database on women scientists as well as an exhibition module and puppet on gender issues on show in the science centres involved and the celebration of Gender Days with specific activities such as role-playing games and exhibits were developed.

These Guidelines for science centres and museums on gender equality are one of the outputs of the project. They have been developed by ASDO in the framework of a workpackage led by Ecsite and in also close cooperation with the other partners of the TWIST

consortium. The main objective pursued through the Guidelines is to provide science centres and museums with a set of recommendations and examples of strategies and tools for activating or enhancing their commitment to gender equality.

The guidelines are based on multiple sources. The main source has been the output of the “Survey on gender, science and society”, undertaken under the TWIST project through an extensive questionnaire involving 74 European and non-European science centres and museums. The survey provided an overview of the mission, communication strategies and gender commitment in science centres and museums and identified many examples of initiatives, strategies and tools used by them to better address girls and women.

Another source has been a broad review of literature and websites which gave useful inputs and empirical material. Finally, a lot of support came from the information given by the consortium members, on the basis of their own experience.

The Guidelines are made up of 9 sections, this introduction included. The next two sections will dwell respectively on the background and motivations for a broader commitment of science centres and museums to gender equality. In the following section, a set of “top ideas” for improving the action of science centres and museums in this domain will be briefly presented. The other five sections will provide a set of recommendations, each enriched with practical examples selected among a wide empirical material collected through the survey. The sections respectively regard five action domains: gender policy, exhibition, programming, communication and marketing, education and training.

## BACKGROUND

### Gender equality in science

#### **The under-representation of women in science and technology**

The issue has been on the table for many years now: despite (slow) progress, women remain strikingly under-represented in science and technology. In this regard, available data are unequivocal. Taking into consideration natural sciences and engineering only, European women account for 31% of students, 36% of PhD graduates, 33% of researchers, 22% of associate professors (Grade B) and 11% of full professors (Grade C) (Source: European Commission, She Figures 2009).

Similarly striking is the under-representation of women scientists in the media. As shown by the 2010 Global Media Monitoring Project Report, among scientists appearing in the news (TV, radio and print), only 25% were women and they were central only in 4% of the news.

#### **Four main trends**

These simple and well-known data are sufficient to single out the key trends:

- science, technology, engineering and math (STEM) careers are still now scarcely attractive to girls and young women;
- science and technology sectors remain unfriendly environments for women;
- women are seriously hindered in their career paths towards leadership positions (such as full professorships, top administrative level, communication manager or university board member);
- in global communication, women's contribution to science and technology is marginalised.

In this frame, it is also legitimate to suspect (as research is increasingly documenting) that gender discrimination also has some impact on important aspects of the research process, such as funding, evaluation procedures, the choice of research topics or maybe scientific contents.

### **A complex phenomenon**

As any other complex phenomenon, women segregation in science and technology is the output of a wide range of factors such as:

- widespread cultural stereotypes on women in science producing indirect discrimination and, among women, self-censoring behaviour;
- the still male-dominated cultural environment in science and technology sectors;
- the enduring presence of pay gaps between men and women researchers (from 11.5% in Denmark to 47.2% in Estonia);
- the extra obstacles women scientists face to publish;
- the unbalanced distribution of family responsibilities between men and women;
- non-transparent and gender-biased recruitment and promotion procedures;
- the under-representation of the contribution of women in the advancement of science;
- male-oriented teaching styles.

### **The stakes are high**

The stakes are high. The issue of women’s discrimination in science and technology, in addition to being a matter of rights, strongly affects the future of Europe. To attain the objectives stated in the Lisbon Agenda, Europe needs to find and retain an extra 700,000 researchers; matching this gap is evidently impossible keeping unaltered the many gender segregating mechanisms presently affecting science and technology. In a broader perspective, gender discrimination is manifestly a burden if scientific research has to match the needs of the “knowledge society”, increasingly requiring knowledge in every domain of social, cultural and economic life.

## **Gender equality in scientific culture and communication**

### **The pro-active role of science centres and museums**

Science centres and museums are at the core of this picture. They are no longer only places where the historical memory of science and technology is preserved. Much more, they are increasingly proactive players at the crossroad of the science & society relationship, actors of scientific education, labs where science and technology turn into shared culture, and promoters of a “scientific citizenship” enabling people to get involved on an equal footing with science and technology, with their own rights and responsibilities. Moreover, science centres and museums are increasingly involved with shaping and spreading a new and more updated representation of science and “the scientist” within society.

## The TWIST Survey

In order to gain an insight into orientations and activities of science centres and museums regarding gender equality in science and technology, under the TWIST project a survey has been carried out. Through an extensive questionnaire, 74 science centres and museums were asked to provide information on a set of issues such as their mission, communication strategies, quality and, obviously, gender commitment.

## A multifaceted action

From the survey, the pro-active role performed by such institutions has clearly emerged. In particular, all the surveyed institutions have equipped spaces for informal learning and education activities (e.g. labs, classrooms, workshops, etc.), 91% has spaces for permanent exhibitions, 88% for travelling exhibitions, 82% for conferences and meetings and 64% for dialogue events. Their regular activities include programmes addressing secondary school students (97%) primary school children (93%), and training initiatives aimed at teachers (88%), public conferences, consensus conferences and workshops (74%), adult education programmes (70%), events for groups with specific needs such as elderly, disabled or minorities (61%) and activities for university students (60%), preschoolers (60%) and scientists (40%). Through their outreach programmes, science centres and museums have an ever-greater impact on the territory and especially on educational institutions. Moreover, science centres and museums are increasingly developing new ways to communicate science, especially exploiting the potential of Information and Communication Technologies (ICT). More than 75% of surveyed organisations extensively or significantly were adopting ICTs, such as multimedia, robotics/artificial intelligence, 3D technology or podcasting.

## A widespread orientation for a more gender-balanced science

In this framework, it is easy to understand the key role science centres and museums can also play and often actually play in promoting a gender-balanced scientific culture by, for example, attracting girls and young women to scientific careers, overcoming gender stereotypes, offering a gender-aware representation of science and technology, promoting a recognition of the often neglected women's contribution to the history of science or supporting an open debate on the controversial issues related to women and science.

The survey points to a widespread interest in gender equality: around 7 out of 10 of the respondents are in fact inclined to include it as a part of their core business. The motivations are different, such as attaining equal opportunities in science and technology, making the science more in tune with society, combating the waste of talent or renewing scientific contents and research strategies

**The action of science centres and museums on gender equality**

Moving from orientations to actual commitment, the survey documents that many science centres and museums are actually engaged, to different extents and in different ways, in gender equality in science.

A large percentage of the respondent institutions (50%) adopts specific methodologies or procedures to ensure that in each target group of their activities both genders are involved. Around 42% of the organisations have specific internal gender expertise, while around 25% of the science centres and museums explicitly put gender commitment at the very centre of their strategies.

**The link between gender commitment and innovation**

Moreover, it is to be noticed that the science centres and museums that show a strong orientation towards gender issues are also those mostly prepared to innovate their social role in the relationship between science & society. This can be easily understood. Innovation implies adopting participatory approaches, involving citizens in debates on current controversial research topics, promoting two-ways dialogue between scientific and societal actors and bringing the different audiences to a pro-active engagement with science and technology. All this necessarily entails increasing attention on features and expectations of the target groups and tailoring activities and action tools to them, therefore including girls and women.

**A wealth of experience to be used**

At the same time, the survey also shows that these institutions already have considerable experience on gender issues and have developed a wide range of effective and sometimes highly innovative strategies, practices and tools to gender mainstream science and technology communication. This concerns all the aspects and dimensions of the activities of science centres and museums, including gender equality policies addressing personnel, exhibits or outreach activities.

This document is based on such experiences. Its aim is to support science centres and museums in building or reinforcing commitment on gender issues, providing them with a set of recommendations and a wide list of examples and resources. The hope is that the ideas and material offered could help them find their own ways of developing broader and more penetrating actions to promote gender equality in science and technology.



## THE REASONS FOR ENGAGING IN GENDER EQUALITY

There are many reasons why science centres and museums should be engaged in gender equality. In the following pages, some of them are set out, using the very words of decision makers and the science centres and museums themselves.

### The top-down view: the decision makers

#### **Promoting equality in science and technology**

The Council of the European Union (...), invites Member States to: (a) make available existing information on the gender balance of R&D personnel; and establish methods and procedures to collect and produce appropriate data and indicators in the medium-term (...) to measure the participation of women in the development of science and technology in Europe;(b) actively engage in the dialogue proposed by the Commission in its communication by exchanging views on policies pursued at the national level so as to be able to analyse the situation and make a joint assessment of on-going policies, taking into account benchmarking and best practice in Member States (...);(c) pursue the objective of gender equality in science by appropriate means, including through other national policies (e.g. through national employment action plans, where relevant).

*Council Resolution of 20 May 1999 on women and science*

#### **Allowing female researchers to contribute to the world of research**

The European Parliament (...) draws the attention of the Member States to the fact that education systems in Europe continue to sustain gender stereotypes, in particular in areas of research such as the natural sciences; Believes that it is of the utmost importance to promote science as an interesting field for both sexes from early on; (...); Calls on the Commission and Member States to take appropriate measures to ensure that women's contribution is not excluded in publications on the history of science and technology, not just because this is a clear case of discrimination but also because the absence of role models may harm efforts to increase the presence of women in such fields; Calls on the Commission and the Member States to take due account in the definitions of excellence and a 'good researcher', of the differences between male and female scientific careers; stresses that female researchers also contribute to the world of research with different perspectives and choices of research topics.

*European Parliament, "Report on women and science. Committee on Women's Rights and Gender Equality", April 2008.*

### **Mainstreaming a gender perspective**

The Commission on the Status of Women may wish to call on Governments, the United Nations system, international and regional organizations, academia, research institutions, the private sector, non-governmental organizations, civil society and other relevant actors, as appropriate, to: Mainstream a gender perspective in, and monitor and evaluate the impact on women and men of, all science, technology and innovation policies and programmes (...); Develop comprehensive national strategies with clearly defined targets, time frames and resources, in collaboration with all stakeholders, to increase the participation of women and girls in science and technology education and training and employment; (...) Promote a positive image of careers in science and technology for women, including through sensitizing parents, students, teachers, career counsellors and curriculum developers; Expose girls and boys and women and men to female role models in science and technology (...) and increasing the visibility of female scientists and engineers.

*Report of the UN General Secretary Ban Ki-moon at the 55th session of the Commission on the Status of Women (February-March 2011)*

### **Changing values and views**

The gender issue is not only a matter of quantity and the necessity to balance the number of men and women who gain access to science, participate in knowledge production and occupy senior positions. A gender perspective in science implies a critical viewpoint about existing epistemologies, the proposals for innovative cultural dimensions and the enlarging of intellectual fields that can broaden the functioning of capabilities in knowledge societies. Gender is not purely a matter of 'sameness' between men and women but a criticism against a whole system of values and limited views governing and ordering science and/in society.

*MASIS Report, European Commission, 2010*

### **Quality of science**

There cannot be quality in science and research without a balance involvement of both the sexes in research decision-making – decisions regarding the direction taken by the research, and in the definition of priorities and targets. There cannot be quality in research if it focuses only on the characteristics, the needs and objectives of just half the world's population.

*Stocktaking 10 years of "Women in Science" policy by the European Commission 1999-2009, European Commission, 2010*

## The bottom-up view: the science centres and museums

### **A real societal issue**

There is a real society issue with too few young people and in particular girls in higher education and in jobs in the sectors of science, technology and industry. Science centres and museum have an expertise in mediation and finding ways to "get the message through". They know the right arguments to promote a positive image of science and technology to all genders, and especially girls.

*Cap Sciences, France*

### **Expanding the scientific workforce**

The expansion of the scientific workforce will necessitate the inclusion of women as full participants. The general public engagement by women and men with science is critical. While there are still barriers to women succeeding in science, there must be organizational attention paid to this issue.

*Exploratorium, USA*

### **Waste of resources**

Women has the same or even greater abilities to "make" science. So Europe could get almost 40% more science if women had the same attitude to science and tech as the men.

*Experimentarium, Denmark*

### **A gender perspective in every day working life**

Every science centre and museum should put a "gender filter" on every activity, from building exhibitions, developing programmes, educating staff, training teachers to how you work within the organisation. You can't just put the question in a certain corner in the centre and just talk about it there. You have to raise the issue in every day working life.

*Teknikens Hus, Sweden*

### **Diversity in the research teams**

It is to stress the importance of heterogeneous teams. Diverse team members think differently, solve problems with diverse tools and approaches and therefore contribute to much more comprehensive and complete solutions.

*Ustanova Hisa Experimentov, Slovenia*

### **Including women perspective in the core business**

Science Centres and Museums should necessarily include in their core business specific activities oriented to women, for women constitute half of our society (52% of the whole population). They need to develop their scientific skill and update their knowledge so as to be able to play a better role in the improvement of human conditions.

*Tunis Science City, Tunisia*

**A more inclusive science**

Women are excluded from the advancement of science and technology in the contemporary society (mainly due to social aspects and decision processes), while S&T applications have a great impact on their life (i.e. health and life sciences). Science centres and museums should vehicle a better image of science in society, more inclusive and respectful of women's needs.

*Fondazione Idis-Città della scienza, Italy*

**Social responsibility**

Science centres and museums should integrate a gender commitment as part of their social responsibility, by making best use of their special assets.

*Bloomfield Museum, Israel*

**An important role in science**

Because women, despite all kinds of efforts, are still behind: career-wise; recognition-wise, but not by putting them apart, but rather by showing girls and boys that women do play an important role in science and technology.

*Science Centre Nemo, The Netherland*

**Prejudice and mistrust**

We and the rest of the society still do not take it for granted that women should be involved in science, math and technology. Women do still meet prejudice and mistrust.

*NAVET science centre, Sweden*

## PRINCIPLES

Recommendations and practical examples contained in these guidelines – mostly grounded on the experience of science centres and museums and related research – are extremely varied and pertain to a wide set of objectives and activities.

Still, a common fabric of cross-cutting principles seems to emerge from this variety, and gives an overview of the way in which science centres and museums are shaping their commitment towards gender equality in science, while at the same time providing useful indications for those who intend to follow this course of action.

This section therefore focuses on singling out and briefly presenting some of these principles. Needless to say, the list is far from being exhaustive. Nevertheless, it includes principles, which are deeply rooted in the practice of science centres and museums as emerging from the many programmes examined. As a matter of fact, most of them have been identified as foundational principles by the representatives of the science centres and museums, which have been involved in the TWIST survey.

In the following pages, the brief description of each principle is completed by a set of “related keywords” highlighting its connection to the concrete examples, which are more analytically presented in the other sections of the Guidelines.

The aim of this section – as the general aim of the Guidelines – is in effect to help science centres and museums develop or enhance their own approach towards gender equality in science, according to their nature, size, objectives, interests, as well as the features of their social and economic context. The Guidelines are intended to provide them with some food for thought and ideas to this end.

### **Six principles are set out in the following pages:**

- Mainstreaming
- Negotiation
- Appeal
- Partnerships
- Sustainability
- Commitment

## Mainstreaming

A condition to deliver a truly impacting gender perspective is that it permeates every aspect and activity within the science centre and museum internally and externally. It is not something to be added later, when a programme is already defined or an exhibit designed. Rather, the gender perspective should be an integral part of the identity of the organisation, to be ordinarily included in all programmes and initiatives at the very first development stage.

### Related keywords

Mainstreaming gender-inclusive **design** procedures of exhibitions and programmes may trigger deep cultural and organisational change. This also involves promoting **gender-balance** in the design staff.

The goal of introducing gender-sensitive concept models requires systematically linking action to **knowledge**. It entails regularly generating or collecting data and research, for instance about the characteristics, preferences and needs of girls and women visitors, the presence and position of women within the organisation, the resources available at the local level.

In this same vein, it is equally important to never stop learning from one's own experience by setting up regular **gender impact monitoring and evaluation strategies** (including reviews, evaluation surveys, visitors' studies, etc.) It is also important to capitalise on **lessons learned** in other science centres and museums or other kinds of organisations.

One more way to increase the impact and scope of inclusive design is to frame gender issues in the broader context of **diversity** issues (such as ethnicity or age-based diversity), however preserving the specificity of gender diversity.

## Negotiation

Mainstreaming a gender perspective is a complex process, both inside and outside the organisation. Experience has shown that gender-oriented initiatives often provoke an ambivalent set of reactions in scientific and technological professional environments. Negotiation strategies are therefore needed to build consensus and commitment around gender-equality initiatives, addressing different leadership levels and the many stakeholders directly or indirectly affected by change.

### Related keywords

A prerequisite for successful negotiation is incorporating **awareness raising** components on gender and science in all activities, at the internal level at first, but then also addressing the public.

Besides, negotiation entails engaging the whole organisation in gender equality efforts. That primarily means **negotiating with staff** on objectives and tools, but also **negotiating with the leadership** to secure support and resources.

To ensure continuity and organisational learning, it may also be necessary to create **institutional space** (such as specific units, managers or reference officers), to effectively implement, monitor and develop gender-equality-oriented strategies.

As for initiatives addressing the public, gender-sensitive **participatory approaches** are most suitable, such as involving visitors in programme design, so to give both genders the opportunity to express their preferred approaches, needs, and priorities.

## Appeal

Making science and technology appealing to both genders (and to different audiences) is a traditional objective for science centres and museums. This involves managing the symbolic and emotional dimensions of science, and dealing with reported gender differences (whose extent is still controversial) in approaching and perceiving science.

### Related keywords

The starting point is the adoption of gender-sensitive **language** in all aspects of internal and external communication (including both texts and pictures) to represent inclusiveness and prevent the involuntary replication of stereotypes, often hidden in language.

Creating a welcoming **atmosphere** for girls and women also requires carefully assessing the organisation of space, the selection of colours, pictures, layout and graphic signs. The setup of the website is relevant too.

A welcoming environment is also one where **female role models** are available and women are frequently portrayed, enjoying high **visibility** as primary actors in science and technology, on an equal footing with men.

In the same perspective, a gender-balanced composition of **front-line** staff is needed to facilitate communication and interaction with girls and women.

Besides, the emphasis on **interactivity, cooperation, motivation and self-confidence** was found to be critical in creating the right conditions for girls to get engaged in science.

## Partnerships

Gender inequality is so rooted and widespread in all spheres of social life that any effort to redress it necessarily requires the combination of a wide range of players and institutions. Creating local, national or even international partnerships allows science centres and museums to broaden their scope of action, diversify their public, access additional resources, opportunities, ideas and expertise, and develop impacting outreach programmes. The reverse is also true.

Partnerships allow science centres and museums to have a favourable influence on other players, motivating them to take action on gender issues. When well balanced, partnerships are therefore win-win strategies.

### Related keywords

A first type of integration is with **experts** on gender and science, be they single individuals, institutions or networks, in order to acquire and exchange knowledge and competencies.

Another key aspect is being part of **networks** of science centres and museums, to be viewed as “communities of practices” to share problems and solutions about how to effectively introduce a gender perspective in their specific sector.

Developing **local cooperations** is seen as being increasingly more important, to actually involve and mobilise local stakeholders (such as women scientists, research institutions or women’s associations, economic actors, education players), and local authorities (especially those in charge for diversity and equality policies).

Another emerging orientation is establishing **project-focused partnerships**: with informal and formal education institutions (such as scout groups, schools or universities, for instance to develop various kinds of after-school or outreach programmes); with economic players (for instance to develop programmes to attract women towards technological careers); with civil society organisations (for instance to promote special projects addressing girls and women from minority groups).



## Sustainability

Gender equality in science and technology is a long-term objective. Balancing the presence of women in organisational leadership positions, modifying a male-dominated culture and representation of science, or enhancing gender diversity in the scientific pipeline don't happen suddenly. Therefore, ensuring continuity in gender commitment is a necessity for science centres and museums, not just an option, and the issue of sustainability comes to the forefront. Different kinds of sustainability are to be considered (e.g., economic, institutional, organisational, etc.) and coordinated.

## Related keywords

A first concrete step towards sustainability is to develop **long-term gender action plans** to be incorporated in the overall planning process of science centres and museums.

The plan should aim at promoting the establishment of realistic and progressive objectives, securing **economic and human resources** and finding a balance between programmes specifically addressing girls and women and programmes addressing both genders.

Sustainability is also greatly increased by incorporating gender commitment into the very **mission of the organisation**. In practical terms, this means incorporating gender commitment when developing external activities addressing the public as well as when developing internal activities and training aimed at reaching gender equality within an organisation (for example through the drafting of internal documents, procedure manuals and handbooks).

Equally important, in view of long-term sustainability, is to enhance internal **transparency** by promoting the **visibility of commitment to gender**, both internally and externally, for instance by devoting a section of the organisation's website to it, including gender-oriented activities in regular **communication tools**, such as newsletters, press-releases or blogs, circulating related information to all the staff. The more the commitment is public and explicit, in fact, the more it is likely to last.

## Commitment

Gender equality in science is not an isolated issue, as it inevitably raises the more general concern of science & society relationships, which involves critical risks and opportunities for Europe's future. A deep understanding of this broader picture and its many ethical and social implications is important for science centres and museums to fully grasp what is at stake in the issue of gender equality in science and technology and not to underscore the significance of their action on this front. There is therefore a commitment concerning gender and science which science centres and museums are asked to culturally develop and spread for the benefit of both science and society.

## Related keywords

For science centres and museums there is firstly the need to acknowledge the rapid and profound transformations presently affecting society in connection with the increasing importance attached to science and technology.

Science is becoming the very “fuel of the future-generating machinery”, not only as regards economic **competitiveness**, but also in the shaping of the **knowledge society**. In this shift, science is – in turn – undergoing transformations at every level, such as the overcoming of its disciplinary organisation, the ever more competitive access to funds, the weakening of the boundaries between science and technology and between fundamental and application research.

All this means greater involvement of social, economic and political actors in the research process, which is multiplying science-society links. To define these changes, some even speak of “**post-academic science**”.

**Gender inequality** dramatically reduces the capacity to guide these changes and has distorting effects on scientific research, limiting its quality, impacts and benefits.

As key actors in the field, science centres and museums should be committed to communicating this strong link between gender issues and the **governance of science**, promoting a continuous **social dialogue** to feed what has been called “**scientific citizenship**”, that is, a set of responsibilities, rights and duties concerning science and technology which involve everyone, scientists and ordinary people, albeit with different roles and competencies, in a sort of **democratisation process** of science and technology.

## GENDER POLICY

In order to develop gender-oriented activities and to communicate a new image of science and scientists, science centres and museums are primarily to be **gender-inclusive institutions**. In fact, to be effective in their action addressing the public, they are asked to get their organisational culture in tune with gender equality issues. Hence the need for activating a Gender Policy to promote an institutional and cultural transformation aimed at mainstreaming gender issues in all aspects of the organisation's life. The first step to put this orientation into practice is launching a comprehensive Gender Action Plan as a permanent strategy.

### Launching a Gender Action Plan

- The Natural History Museum of London established a Gender Equality Scheme ([www.nhm.ac.uk/resources-rx/files/gender-equality-15995.pdf](http://www.nhm.ac.uk/resources-rx/files/gender-equality-15995.pdf)) which provides for a wide range of actions, including pay and reward, career progression, work-life balance, job evaluation and family friendly policies. An Equality and Diversity Steering Group has been established for facilitating the implementation of the scheme and consulting people on developments.
- The US Association of Science-Technology Centers developed an Equity and Diversity Toolkit for Museums and Science Centers ([www.astc.org/resource/equity/toolkit.htm](http://www.astc.org/resource/equity/toolkit.htm)), providing guidance and recommendations on 7 different areas, including equity and diversity policies, diversity leadership and diversity policy assessment.

To develop such an action plan, **three main strategies** can be identified:

1. Making science centres and museums a **friendly environment for women**.
2. Rendering science centres and museums culturally prepared to promote **gender-aware science**.
3. Promoting **women's leadership** in science centres and museums.

### Gender Policy - Strategy 1:

Making science centres and museums a friendly environment for women

Science centres and museums should be a friendly working environment for women, who should never have to feel like intruders in a male-dominated environment, not recognised in their specific needs and capacities or discriminated in their career. No centre or museum can be credible and effective in adopting a gender perspective in its communication strategies having, at the same time, a hostile working environment for women staff members.

#### 1.1 Document and monitor the presence of women in the centre/museum staff

- The Swedish Museum of Natural History and the Royal Belgian Institute of Natural Sciences use gendered data in order to keep a check on the gender composition of the staff and develop specific hiring policies and career schemes to attain gender balance.
  - Swedish Museum of Natural History 2008 Report: [www.nrm.se/download/18.42d44b9511f368fc8af80007326/KeyResultsYR2008\\_wb.pdf](http://www.nrm.se/download/18.42d44b9511f368fc8af80007326/KeyResultsYR2008_wb.pdf)
  - Royal Belgian Institute of Natural Science 2009 Report: [www.naturalsciences.be/common/pdf/institute/annualreport/INTERNET\\_RA\\_2009\\_EN.pdf](http://www.naturalsciences.be/common/pdf/institute/annualreport/INTERNET_RA_2009_EN.pdf)
- The Natural History Museum of London activated a workforce equality and diversity monitoring system aimed at documenting

progress and drawbacks in balancing the gender composition of the staff at all levels.

- Brief description of the system:  
[www.nhm.ac.uk/resources-rx/files/gender-equality-15995.pdf](http://www.nhm.ac.uk/resources-rx/files/gender-equality-15995.pdf)

- The Museum of London Group carries out an impact assessment of its Gender Equality Scheme, the outputs of which are published as an attachment to its annual report.

- Text of the scheme:  
[www.docstoc.com/docs/17564942/Gender-equality-scheme-2007%E2%80%932010](http://www.docstoc.com/docs/17564942/Gender-equality-scheme-2007%E2%80%932010)

### 1.2 Implement internal awareness raising initiatives on gender issues involving all staff

- At Teknikens Hus of Lulea (Sweden), an internal working group on gender (with representatives from all departments and led by the head of Education Department) has been created, with the task of raising awareness on gender issues by launching activities, meetings and discussions amongst staff (i.e. lectures, meetings with gender experts, etc.). Theatre groups representing organisational life between men and women on the workplace have also been organised.

- Website of the Teknikens Hus (in English):  
[www.teknikenshus.se/english/index.html](http://www.teknikenshus.se/english/index.html)

### 1.3 Promote work-life balance through flexible time schemes

- Flexible time schemes for mothers and fathers have been adopted at the Molekyverkstan in Stenungsund (Sweden), the Frida & Fred Children's Museum of Graz (Austria), the Museo de la Ciencia Principe Felipe in Valencia (Spain), the Explora Children Museum in Rome (Italy), and the Techmania Science Centre in Pilsen (Czech Republic). A telework scheme for parents has been introduced at Deutsches Museum (Germany)

- A salary rise scheme to stimulate parental leave policies for both sexes has been established at Teknikens Hus of Lulea (Sweden), while a flexible working policy and a career breaks policy have been introduced at the Natural History Museum of London as outputs of a women in science review undertaken with the involvement of women from the different departments.

- Website of the Teknikens Hus (in English):  
[www.teknikenshus.se/english/index.html](http://www.teknikenshus.se/english/index.html)
- Source: the TWIST SURVEY; website of the National History Museum:  
[www.nhm.ac.uk](http://www.nhm.ac.uk)

### 1.4 Promote work-life balance creating or facilitating access to services

- At the Royal Belgian Institute of Natural Sciences, in Brussels, an in-house childcare service ("Baby Dino") has been created to support female personnel with children and to allow new mothers to continue breastfeeding.

- Website of the Royal Belgian Institute of Natural Sciences (in English):  
[www.naturalsciences.be/](http://www.naturalsciences.be/)

- A provision of childcare vouchers for the employers has been established at the Natural History Museum of London. 12 people took up the childcare voucher scheme in 2009/10.

- Gender Equality Scheme at the Natural History Museum:  
[www.nhm.ac.uk/resources-rx/files/gender-equality-15995.pdf](http://www.nhm.ac.uk/resources-rx/files/gender-equality-15995.pdf)

- Childcare services on holidays and summer to support employees with children have been organised at the Museo de la Ciencia Principe Felipe in Valencia (Spain) and the Explora Children's Museum in Rome (Italy).

- Museo de la Ciencia Principe Felipe website (in English):  
[www.cac.es/museo/?languageld=1](http://www.cac.es/museo/?languageld=1)

- Explora Children's Museum website (in English):  
[www.mnbr.it/en.html](http://www.mnbr.it/en.html)

### 1.5 Adopt a gender perspective in hiring

- The Royal Belgian Institute for Natural Science, noticing that the proportion of women among the scientific personnel remains well below what expected, is launching a recruitment campaign aimed at improving female statutory staff.
  - Royal Belgian Institute of Natural Science 2009 Report: [www.naturalsciences.be/common/pdf/institute/annualreport/INTERNET\\_RA\\_2009\\_EN.pdf](http://www.naturalsciences.be/common/pdf/institute/annualreport/INTERNET_RA_2009_EN.pdf)
- To promote the recruitment of women, Teknikens Hus of Lulea (Sweden) offered scholarships to female engineering students to employ them as explainers.
  - Website of the Teknikens Hus (in English): [www.teknikenshus.se/english/index.html](http://www.teknikenshus.se/english/index.html)
- In order to increase the number of women on its staff, the Indian National Council of Science Museums offers incentives and assistance to young female researchers to write projects on science centres. More and more women candidates have started joining the museums and taken up responsible positions as curators and educators.
  - Website of the Council (in English): [ncsm.gov.in](http://ncsm.gov.in)
- Different kinds of strategies have been devised for establishing, applying and monitoring more gender-aware recruiting procedures at the Bolton Science and Technology Centre (UK), the Science Gallery of Trinity College of Dublin (Ireland), the Deutsches Museums in Munich (Germany), the Eugenides Foundation (Greece), and the Explora Children's Museum in Rome (Italy), based on new rules, new information procedures aimed at making recruiting more transparent, initiatives for encouraging women to apply for open positions, and gender balance in recruiting committees.

### 1.6 Provide women with personal support to develop their career plan

- A set of science centres and museums adhering to the European consortium, EDIT, launched a mentoring scheme aimed at supporting young women in their career plan, by helping them in completing their thesis or in beginning their post-doctoral research at the institution.
  - Description of the scheme: [www.e-taxonomy.eu/node/811](http://www.e-taxonomy.eu/node/811)
- The same EDIT consortium provides young women working at member institutions with short-term fellowships for training or research to ensure that they are actively promoted in their early career.
  - Description of the fellowships: [www.e-taxonomy.eu/node/9](http://www.e-taxonomy.eu/node/9)
- ScienceLinX of Groningen (The Netherlands), in collaboration with the University of Groningen and the Rosalind Franklin Fellowship, provides fellowships aimed at promoting and supporting female participation in science. The fellowships are awarded to outstanding women scientists from a wide range of disciplines including mathematics, physics, astronomy, chemistry, biology, pharmacy, environmental studies, computer science, artificial intelligence, industrial engineering, and science education.
  - Description of the fellowship: [www.rug.nl/fwn/onderzoek/rff/index](http://www.rug.nl/fwn/onderzoek/rff/index)

### 1.7 Analyse and monitor the gender pay gap

- The Natural History Museum of London carried out an audit on the functioning of the pay system in order to identify differences in pay by gender and detect and eliminate deviations. Changes in pay terms and conditions for a part of the personnel have also been introduced.
  - Brief description of the audit: [www.nhm.ac.uk/resources-rx/files/gender-equality-15995.pdf](http://www.nhm.ac.uk/resources-rx/files/gender-equality-15995.pdf)

## Gender Policy - Strategy 2:

Rendering science centres and museums culturally prepared to promote gender-aware science

Communicating science adopting a gender perspective requires a cultural orientation which is aware of the stereotyped and male-gendered nature of the current representation of science, as well as of the presence of gender biases which could even affect some aspects of the scientific process. Science centres and museums are therefore asked to take a decisive step in this direction in order to better perform their role as key actors in science communication.

### 2.1 Promote training initiatives to enhance internal expertise on gender issues

- At Teknikens Hus of Lulea (Sweden), an internal training initiative called “gender detective mission” is promoted, aimed at observing life in the centre from a gender perspective, both inside the organisation and as regards the activities addressed to the public. Each month there are meetings with the whole staff in the Educational Department about what people observe.
  - Website of the Teknikens Hus (in English): [www.teknikenshus.se/english/index.html](http://www.teknikenshus.se/english/index.html)
- Training staff is understood as a pivotal aspect for designing and implementing diversity policy also by Museums Association (UK), which organises training seminars to help supervisors develop and implement successful positive-action training initiatives addressing staff.
  - Description of the scheme: [www.museumsassociation.org/download?id=98529](http://www.museumsassociation.org/download?id=98529)
- In the framework of the permanent exhibition on gender equality in science and technology promoted under the TWIST project, a training session has been undertaken addressing the explainers in charge of handling the virtual

character used to interact with the public on gender stereotypes in science.

- Project website: [www.the-twist-project.eu/it/](http://www.the-twist-project.eu/it/)
- The Natural History Museum of London deliver “train the trainer” seminars and workshops in order to ensure all managers have access to equality and diversity training.
  - Brief description of seminars and workshops : [www.nhm.ac.uk/resources-rx/files/gender-equality-15995.pdf](http://www.nhm.ac.uk/resources-rx/files/gender-equality-15995.pdf)
- Under the European project “Pilots”, a group of science centres and museums from Belgium, France, Italy, Portugal and Slovenia, in cooperation with Ecsite, planned and tested a set of training modules to enhance the role of explainers, taking into account gender differences in the learning process.
  - Project website: [www.thepilots.eu](http://www.thepilots.eu)

### 2.2 Create a specific internal unit in charge of supporting staff in gendering scientific contents

- The Museum of London, in the framework of its equality and diversity policies, established the Diversity Panel, aimed at gendering the scientific contents of any activities carried out by the institution, be they exhibits, galleries, events or programmes.
  - Text of the scheme: [www.docstoc.com/docs/17564942/Gender-equality-scheme-2007%E2%80%932010](http://www.docstoc.com/docs/17564942/Gender-equality-scheme-2007%E2%80%932010)
- The Association of Science-Technology Centers (USA) suggests the establishment in every science centre or museum of a Diversity Committee, to help organisations focus and resource their diversity efforts. Diversity committees need to have a work plan that is feasible and measurable, they should be provided with necessary resources (e.g. time, money, training and space) and should be aligned with other strategic initiatives.
  - Description of the role of the Diversity Committees: [www.astc.org/resource/equity/ASTC\\_DiversityEquityToolkit\\_Policies.pdf](http://www.astc.org/resource/equity/ASTC_DiversityEquityToolkit_Policies.pdf)

### 2.3 Establish partnerships with organisations specialised in women and science

- The NEMO Science Centre, based in Amsterdam, established a partnership with VhTo, an expert organisation specialised in women and science, to develop a checklist for the staff aimed at supporting them in gendering contents and approaches in all the activities promoted by the Centre.
  - Website of the NEMO Science Centre (in English): [www.e-nemo.nl/?id=5&s=85&d=551](http://www.e-nemo.nl/?id=5&s=85&d=551)
- The Tunis Science City (Tunis), in order to enhance their activities addressing girls, established a partnership with women's associations such as the National Union of Women of Tunisia (UNFT) and the Women and Science Association.
  - Website of the Tunis Science City (in English): [www.cst.rnu.tn/html/en/pg.htm](http://www.cst.rnu.tn/html/en/pg.htm)

### 2.4 Promote communication and debate within the organisation about gender and diversity issues and initiatives

- In its diversity toolkit, the Association of Science-Technology Centers (USA) recommends science centres and museums communicate about diversity issues and initiatives within the organisation, adopting internal communication strategies (through videos, small groups, staff meetings, internal newsletters, etc.) reaching all the staff, including male staff members. Systems for gathering employees' feedbacks are also strongly recommended.
  - ASTC communication toolkit: [www.astc.org/resource/equity/ASTC\\_DiversityEquityToolkit\\_Communication.pdf](http://www.astc.org/resource/equity/ASTC_DiversityEquityToolkit_Communication.pdf)
- In the Natural History Museum of London, gender-enabling forums have been established to give groups of employees the opportunity to discuss and have a voice on gender-related issues and on any matter they would like to see the Museum's management act upon.

- Brief description of the forums: [www.nhm.ac.uk/resources-rx/files/gender-equality-15995.pdf](http://www.nhm.ac.uk/resources-rx/files/gender-equality-15995.pdf)

## Gender Policy - Strategy 3:

### Promoting women's leadership in science centres and museums

Attaining gender balance in leadership positions is a key objective for science centres and museums. This is decisive for them in order to fully exploit the capacity of their female personnel, to contribute towards innovating science communication, to adopt a gender perspective in their activities and to effectively and authoritatively speak to girls and women.

#### 3.1 Adopt a gender-equality proofed method for job evaluation

- The London Natural History Museum and the Museum of London Group adopted a method for job evaluation (Job Evaluation and Grading System-JECS) which facilitates management in adopting a gender-equality oriented approach in identifying and selecting candidates for a given job position. The effect has been an increase in the number of women also in middle and high managerial positions.
  - Use of JECS at the Natural History Museum: [www.nhm.ac.uk/resources-rx/files/gender-equality-15995.pdf](http://www.nhm.ac.uk/resources-rx/files/gender-equality-15995.pdf)
  - Use of JECS at the Museum of London: [www.docstoc.com/docs/17564942/Gender-equality-scheme-2007%E2%80%932010](http://www.docstoc.com/docs/17564942/Gender-equality-scheme-2007%E2%80%932010)

#### 3.2 Modify rules and procedures for appointing board members

- The Ontario Science Centre in Toronto (Canada) promoted a policy aimed at increasing gender and ethnic diversity among board members. Through a consultation involving external experts, board members, senior manager teams and their networks, selection criteria have been modified so as to increase board membership diversity.

- Brief description of the experience:  
[www.maytree.com/PDF\\_Files/DiversityMatters.pdf](http://www.maytree.com/PDF_Files/DiversityMatters.pdf)

### 3.3 Support women staff members to attain leadership positions

- The Natural History Museum of London established a coaching service designed to support talented staff members and to facilitate succession planning, in order to keep a high quality management at the institution. The project is also designed to develop new managers on a gender-equality basis, allowing more women to attain top leadership positions.
  - Brief description of the initiatives :  
[www.nhm.ac.uk/resources-rx/files/gender-equality-15995.pdf](http://www.nhm.ac.uk/resources-rx/files/gender-equality-15995.pdf)
- At the Frida & Fred Children's Museum of Graz (Austria), training initiatives in support of women's leadership on different issues (i.e. fund raising, partnership building, networking and communication) have been organised, in cooperation with the Hernstein Institute for Management and Leadership of Vienna.
  - Source: interview from the TWIST SURVEY; website of the Frida & Fred Children's Museum:  
[www.fridaundfred.at](http://www.fridaundfred.at)

### 3.4 Facilitate leaders to assess their action in a gender perspective

- The Association of Science-Technology Centers (USA) offers a set of tools and procedures facilitating leaders of science centres and museums to assess their action in the domain of diversity management, including gender. A leader self-assessment questionnaire is proposed, the results of which can be used in several ways: as a performance evaluation instrument for executives, as a starting point for executive team discussions, or departmental level focus groups.
  - Self-assessment questionnaire:  
[www.astc.org/resource/equity/ASTC\\_DiversityEquityToolkit\\_Assessment.pdf](http://www.astc.org/resource/equity/ASTC_DiversityEquityToolkit_Assessment.pdf)



## Additional resources

American Association of Museum; webpage providing resources on diversity for museums:

[www.aam-us.org/museumresources/div/Diversity-Links.cfm](http://www.aam-us.org/museumresources/div/Diversity-Links.cfm)

Association of Science-Technology Centers: Research Report on leadership in science and technology centers in the United States:

[www.astc.org/about/leadership\\_study.pdf](http://www.astc.org/about/leadership_study.pdf)

Council of Women World Leaders, The business case for Women: Quantifying The Economic Value of Diversity. A Research Guide (2010):

[www.gbaforwomen.org/assets/files/BusinessCaseforWomen.pdf](http://www.gbaforwomen.org/assets/files/BusinessCaseforWomen.pdf)

Eichinger C., Racial, ethnic and gender diversity of the U.S. museum workforce:

[www.gradworks.umi.com/14/73/1473686.html](http://www.gradworks.umi.com/14/73/1473686.html)

Harvard University, Closing the gender Gap Conference, 2010:

[www.hks.harvard.edu/var/ezp\\_site/storage/fckeditor/file/pdfs/centers-programs/centers/wappp/events/Business%2520Case%2520Conf%2520-email.pdf](http://www.hks.harvard.edu/var/ezp_site/storage/fckeditor/file/pdfs/centers-programs/centers/wappp/events/Business%2520Case%2520Conf%2520-email.pdf)

Museums Association, Diversify toolkit, a practical guidance for employers in the museum sector for creating a divers workforce:

[www.museumsassociation.org/download?id=98529](http://www.museumsassociation.org/download?id=98529)

National Army Museum – Gender Equality Scheme:

[www.nam.ac.uk/about-us/schemes-policies-procedures/gender-equality-scheme](http://www.nam.ac.uk/about-us/schemes-policies-procedures/gender-equality-scheme)

Schwarzer M., Women in the Temple, Gender and Leadership in Museums, AAM American Association of Museums:

[www.aam-us.org/pubs/mn/gender.cfm](http://www.aam-us.org/pubs/mn/gender.cfm)

Victoria & Albert Museum: Gender Equality Scheme:

[media.vam.ac.uk/media/website/uploads/documents/legacy\\_documents/file\\_upload/41799\\_file.pdf](http://media.vam.ac.uk/media/website/uploads/documents/legacy_documents/file_upload/41799_file.pdf)

## EXHIBITIONS

As the core business of science centres and museums, exhibition design and management provide the greatest opportunity to affect visitors' attitudes towards gender-inclusive science.

It is sometimes controversial whether it is recommendable to set up special exhibitions on women and women's issues. Some consider it more effective and less stereotype-reinforcing to always think in terms of the two genders, working on common exhibitions and activities, with an eye to engaging both males and females.

Valuable examples of both approaches can be found in the practice of science centres and museums which are the most engaged on gender and diversity issues. A variable combination of the two approaches may in fact serve specific purposes and adapt to the contingent situation of different organisations, at different levels of involvement and progress.

Three main strategies can be highlighted:

1. **Addressing women's invisibility in science**, showing both women's scientific talent and contribution, and the problems and challenges they face.
2. **Gendering exhibitions' contents and approaches**, from design, monitoring and evaluation to staff training.
3. **Producing and using research** to keep pace with progress in the area.

### Exhibitions - Strategy 1:

#### Addressing women's visibility in science

Many aspects of women's experience in scientific and technological research are usually under-represented, thus following and simultaneously reinforcing the stereotype of women scientists as strangers in a man's land. Feeling like a stranger is in turn a strong disincentive for girls to get engaged in science, producing a sort of vicious circle.

One way of addressing feelings of estrangement is to portray what is often neglected: women's crucial contribution to scientific progress; women's special talent and passion for science; women's daily experiences, successes and challenges. Shedding light on the existence of problems and stereotypes still to be overcome is also important, so as to convey public commitment about them.

#### 1.1 Celebrate outstanding historical or contemporary women scientists

- The Principe Felipe Science Museum in Valencia (Spain) has held since 2006 an exhibition entitled "The line of Isis", with the sponsorship of l'Oreal Spain, to show the role played by women scientists during history and in all fields, up to the present. The itinerary is based on 18 modules centred on three themes: "Women with science", "Women without science" and "Science without women".
  - Brief description of the exhibition: [www.cac.es/prensa/noticia/?contentId=4992](http://www.cac.es/prensa/noticia/?contentId=4992)
- The Exploratorium in San Francisco (USA) set up and first hosted (2000-2005) the national travelling exhibition "The changing face of women's health", honouring the lives and achievements of American women in medicine. The "Changing the Face

of Medicine" website contains the virtual version of the exhibition also offering educational and professional resources, as well as lesson plans for classroom activities. The site also includes a section called "Share Your Story," which allows the public to add stories about women physicians they know.

- National travelling exhibition website:  
[www.exploratorium.edu/health/index.html#99](http://www.exploratorium.edu/health/index.html#99)
- Virtual exhibition:  
[www.nlm.nih.gov/changingthefaceofmedicine/exhibition/](http://www.nlm.nih.gov/changingthefaceofmedicine/exhibition/)

- The Museo Civico of Rovereto (Italy) hosted (2010-2011) the travelling exhibition "Nobel Prizes denied to women scientists", presenting 6 outstanding women scientists and a reflection on the difficult recognition of women's scientific merit. The exhibition was accompanied by a series of thematic lectures.

- Brief description of the exhibition:  
[www.museocivico.rovereto.tn.it/events\\_detail.jsp?IDAR=EA=5&ID\\_EVENT=312&GTEMPLATE=default.jsp](http://www.museocivico.rovereto.tn.it/events_detail.jsp?IDAR=EA=5&ID_EVENT=312&GTEMPLATE=default.jsp)

- Not a temporary or sectoral exhibition, the International Women's Air and Space Museum is an example of a museum which is entirely dedicated to the preservation of the history of women in aviation and space and the documentation of their continuing contributions today and in the future.

- Website of the Museum: [www.iwasm.org/wp-blog/](http://www.iwasm.org/wp-blog/)

## 1.2 Portray the everyday life of women scientists

- The Field Museum of Chicago (USA) created a virtual exhibition presenting personal interviews with 13 women working at the Museum about why they chose science, their diverse careers, their thoughts about being scientists, and their personal reflections about their lives as women. The aim is to help increase awareness of careers in science, to foster understanding of the real people who practice science, and to encourage young people to pursue individual areas of interest.

- Virtual exhibition:  
[www.fnmh.org/exhibits/exhibit\\_sites/wis/main\\_page.htm](http://www.fnmh.org/exhibits/exhibit_sites/wis/main_page.htm)

- The Natural History Museum of Florence (Italy) hosted the photo exhibit titled "The Women who run the biggest machine ever built by Man", devoted to the scientific and life experience of 30 Italian women researchers currently involved with the experiment of recreating the conditions immediately after the Big Bang at the Large Hadron Collider at the CERN in Geneva

- Brief description of the exhibition:  
[www.ba.infn.it/donne-lhc/](http://www.ba.infn.it/donne-lhc/)

- The portable exhibition on women and physics created for the Museum of South Africa by SAASTA (South African Agency for Science and Technology) profiles a number of women scientists to present different career options using real life examples. It demonstrates how physics can be fun and is an essential part of everyday life, so as to inspire a new generation of physicists.

- Brief description of the exhibition and some profiles of women physicists:  
[www.saasta.ac.za/scienceawareness/physics.shtml](http://www.saasta.ac.za/scienceawareness/physics.shtml)

## 1.3 Use interactivity and theatre to uncover and challenge stereotypes

- Technopolis in Mechelen (Belgium) created a travelling exhibition (on display in different countries since 2002) called "The gender experiment" where, by means of more than 40 interactive exhibits (28 of which are integrated in a registration system which keeps track of visitors' scores), visitors take part in an experiment where they can discover their own and each other's talents and skills, also finding out what women can do better than men or what men can do better than women. The aim is to show that science and technology are not exclusively "men's" business.

- Brief description of the exhibition and contact details:  
[www.technopolis.be/eng/?n=9&e=156&s=319](http://www.technopolis.be/eng/?n=9&e=156&s=319)

- The TWIST Exhibition, designed in the framework of the EC-funded TWIST project, is to be permanently installed in 7 European science centres and museums. It is an

exhibition on women and science which includes, among other things, an interactive multimedia database containing 42 biographies of outstanding women scientists from different countries; the aim is to promote interactive dialogue with the public with the specific aim of challenging gender stereotypes in science and technology.

- [www.the-twist-project.eu/en](http://www.the-twist-project.eu/en)

- The Science Live Theater of the Science Museum of Minnesota (USA) organises the comedy “Lost in science”, telling visitors about how a character, Professor SmartPants McGee, learns that the contribution of women in science far exceeds those in his dusty old textbooks, full of stereotypes.

- Brief description of the main performances of the Science Live Theater:  
[www.smm.org/sciencelive/descriptions/](http://www.smm.org/sciencelive/descriptions/)

## Exhibitions - Strategy 2:

### Gendering exhibitions’ contents and approaches

The strategy here is mainstreaming gender into all the exhibitions and activities of the centre or museum. To do so, useful suggestions can be drawn from research and successful experiences. What is even more important, though, is putting tools in place to constantly assess the gender impact of any initiative and improve its inclusiveness and fairness, whilst enhancing its potential in attracting both genders and challenging stereotypes.

Continuous staff training is a prerequisite for this aim, and can be achieved by regular monitoring, evaluation and improvement of the design of the initiatives. Moreover, training is inherent in the adoption of strongly participatory approaches.

## 2.1 Display different perspectives on science

- The primary goal of the PDK Poster Project, hosted in 2001 as a temporary exhibition at the Texas Memorial Museum of Science and History in Austin (USA) and now available online, is to encourage scientific literacy and promote the public's awareness and appreciation of science and technology by humanising the image of science and the scientists. According to promoters, the project (whose slogan is “Using visual means to challenge stereotypes”) “represents an intersection between science and art, gender socialisation and education”. It displays an image of science far from the ivory tower, cut off from people, which often scares people, and especially girls. One of the objectives of the posters is in fact to prove that scientific proofs get made through conversation and interaction with the community, and research is a process that involves collaboration.
  - PDK Poster Project website:  
[www.pdksciart.com/homepage.htm](http://www.pdksciart.com/homepage.htm)
- To highlight the link between scientific and social issues, which is credited with arousing greater interest among girls/women, the “Trash fashion” exhibition was created by the Science Museum of the South Kensington Museum of London (UK). It focused on the use of new technologies to create style without waste by recycling old materials.
  - Brief descriptions of the exhibition:  
[www.antenna.sciencemuseum.org.uk/trash-fashion-live-event-wrap-up/](http://www.antenna.sciencemuseum.org.uk/trash-fashion-live-event-wrap-up/) and:  
[www.antenna.sciencemuseum.org.uk/trashfashion/](http://www.antenna.sciencemuseum.org.uk/trashfashion/)
  - Video posted on the website of the Guardian:  
[www.guardian.co.uk/science/video/2010/aug/09/body-scanner-edible-clothes](http://www.guardian.co.uk/science/video/2010/aug/09/body-scanner-edible-clothes)
  - Video posted on the website of the New Scientist:  
[www.newscientist.com/video?bcpid=25196461001&bclid=1904732932&bctid=309066482001](http://www.newscientist.com/video?bcpid=25196461001&bclid=1904732932&bctid=309066482001)
- The exhibition “Teen Facts”, organised at the Nemo Science Centre in Amsterdam (The Netherlands) addressed teenagers and aimed at allowing visitors – through a strong multi-sensory and interactive approach – to journey through puberty and sexual growth, as well as

to understand and even experience some aspects of typical teenage phenomena. The exhibition demonstrates to young visitors how scientific knowledge is not something removed from reality but on the contrary can be directly relevant to the everyday experience of young boys and girls.

- Highlights from the exhibition can be viewed here:  
[www.fonztv.nl/fastsite/qt/nemo-teens.htm](http://www.fonztv.nl/fastsite/qt/nemo-teens.htm);  
[www.flickr.com/photos/ideonex/sets/72157613850942803/](http://www.flickr.com/photos/ideonex/sets/72157613850942803/)

- Technorama, (Swiss National Museum of Science & Technology) and Teknikens Hus hosted the travelling exhibition “The inventions of women” with the aim of promoting entrepreneurship and stimulate women's and girls' interest in science and technology. The exhibition’s main message is that all people are creative in the contexts in which they operate. Using objects, the exhibition tells the story of the problem solved by the invention, the circumstances of the inventor, and the end result. The exhibition, recently re-opened with more than 30 new exhibits and a general make-over, presents 80 inventions in several areas within which women inventors have contributed in particular, what drives women to solve problems, and women who serve as examples in history and their contexts.
  - Website of the exhibition:  
[www.tekniskamuseet.se/1/331\\_en.html](http://www.tekniskamuseet.se/1/331_en.html)

## 2.2 Adopt participatory design

- Internal procedures have been introduced at the Teknikens Hus in Lulea (Sweden) through a checklist to be used and discussed by science educators when they develop new programmes. Under the “gender perspective” checklist heading questions are asked such as: “Is this fun for both boys and girls?” “Can both boys and girls identify themselves in the setting and with the task?” “Can everyone have the opportunity to speak up?”, and also indications are given: “Try to be compensatory (stimulate ‘brave girls’ and

‘tender boys’”).

- Website of the Teknikens Hus (in English):  
[www.Teknikenshus.se/english/index.html](http://www.Teknikenshus.se/english/index.html)
- The Nemo Science Centre in Amsterdam (The Netherlands) published a “Gender checklist”, i.e., a booklet for science centres and museums containing guidelines on how to make their exhibitions and events appealing and interesting to both genders, especially targeting boys and girls. The checklist, which was designed in cooperation with the VHTO, a national expert organisation on girls/women and science/technology, is organised into 7 sections: a) choosing the issue and developing contents; b) the exhibition; c) interactive devices; d) recommendations for parents and teachers; e) design and atmosphere; f) communication; g) evaluation.
  - Website of the Nemo Science Centre (in English):  
[www.e-nemo.nl/?id=5&s=85&d=551](http://www.e-nemo.nl/?id=5&s=85&d=551)
- The Science Museum of London (UK) directly involves the public in exhibition design through focus groups and specialist audience panels, which are also occasions to provide information about the museum’s learning resources and other initiatives on gender diversity.
  - Source: interview from the TWIST SURVEY; website of the Science Museum of London:  
[www.sciencemuseum.org.uk/](http://www.sciencemuseum.org.uk/)

## 2.3 Constantly monitor and assess gender impact

- Science Linx, the University of Groeningen science centre (The Netherlands), carries out user tests to assess exhibition prototypes and their impact, as regards aspects such as language, colours, layout, interactivity, etc. focusing special attention on attractiveness for both genders.
  - Website of Science Linx: [www.rug.nl/sciencelinx/index](http://www.rug.nl/sciencelinx/index)
- At the Città della Scienza of Naples (Italy) visitors are asked to leave opinions and suggestions by writing them in a dedicated corner of the exhibition hall. The analysis of

these materials represents an important basis for identifying the different interests and attitudes of boys and girls towards the exhibition.

- Website of the Città della Scienza (in Italian and English): [www.idis.cittadellascienza.it/](http://www.idis.cittadellascienza.it/)
- At the Swedish Museum of Natural History exhibition design is made on the basis of the work of a reference group consisting of experts and staff members that has in-depth knowledge of visitors' reactions, thoughts and comments on prior exhibitions.
  - Website of the Swedish Museum of Natural History: [www.nrm.se/en/frontpage.16\\_en.html](http://www.nrm.se/en/frontpage.16_en.html)
- At the Nemo Science Centre in Amsterdam (The Netherlands) groups of girls and boys are sent as mystery guests to visit new exhibitions, to assess their impact and the differences in male and female interest and reaction. Teacher evaluation is also collected and used.
  - Website of the Nemo Science Centre (in English): [www.sciencemuseum.org.uk/](http://www.sciencemuseum.org.uk/)

## 2.4 Regularly involve and train staff

- The Navet Science Centre in Borås (Sweden), promotes discussion on gender issues among its staff through the establishment of working groups with a diverse membership, both in terms of gender and geographical origin.
  - Website of the Navet Science Centre (in English): [www.sciencemuseum.org.uk/](http://www.sciencemuseum.org.uk/)
- At the Teknikens Hus in Lulea (Sweden), meetings among educational staff with a balanced gender attendance and a multidisciplinary approach are regularly conducted to develop the ability of developing exhibitions and educational programmes taking into account the gender perspective. Gender checklists and test groups are used. Special attention is devoted to accessibility for both boys and girls (for instance designing different exhibits for the use of small/big hands, considering the

difference among women and men in terms of physical strength).

- Website of the Teknikens Hus (in English): [www.Teknikenshus.se/english/index.html](http://www.Teknikenshus.se/english/index.html)
- At the Museu Agbar de les Aigües of Barcelona (Spain), gender is included among the standards to be considered by staff when developing products and programmes. Internal focus groups are organised on a regular basis to meet this requirement and at the same time train staff on gender issues.
  - Website of the Museu Agbar de les Aigües (in English): [www.museuagbar.com/?idioma=3](http://www.museuagbar.com/?idioma=3)

## Exhibitions - Strategy 3:

### Producing and using research on gender and science

To continuously improve gender inclusiveness and impact a science centre/museum should establish and maintain effective links between current research on gender attitudes, learning styles and interests in relation to scientific exhibitions. This would also result in positive outcomes in staff training, updating and skills development.

Museums can directly promote research or establish partnerships with universities and research centres. Making the most of already existing scientific literature, by regularly organising internal presentations and discussions, is a more economic but still effective mean to keep up with new ideas and approaches.

### 3.1 Promote or participate in research

- The Teknikens Hus in Lulea and the University of Lulea (Sweden) cooperate in carrying out studies on the attitudes of boys and girls towards their visit to the centre and the specific programmes they participated in during their visit. Results will be used to see patterns of participation from a gender perspective.
  - Website of the Teknikens Hus (in English): [www.Teknikenshus.se/english/index.html](http://www.Teknikenshus.se/english/index.html)

- Supported by a three-year grant from the National Science Foundation, four science museums in the Philadelphia area conducted a study of family learning. The collaborative, known as PISEC (the Philadelphia/ Camden Informal Science Education Collaborative) consists of: the Franklin Institute Science Museum, the New Jersey State Aquarium at Camden, the Academy of Natural Sciences, and the Philadelphia Zoological Society. Under this programme, observational studies of family behaviour in informal science settings are conducted, targeting families with children from 5 to 10 years of age. Among others, the finding can be mentioned which indicates that sons are more frequent visitors than daughters, so that gender bias operates in the form of a selection factor at work before families even come to the science museum.

- Synthetic report available at:  
[www.informalscience.org/researches/VSA-a0a6t9-a\\_5730.pdf](http://www.informalscience.org/researches/VSA-a0a6t9-a_5730.pdf)

- In 2007, the Children's Museum in Vienna, in partnership with the Institute for European Ethnology of the University of Vienna, launched the research project "Science with all senses: Gender and science in the making" to observe children's (4 to 10 years) interactions with and within science and technology-related exhibition displays in Viennese museums. The project is interested in the production of implicit and explicit knowledge by multisensory, multimedia displays taking in account the more general topic of "felt" knowledge and its relation to gender. It therefore investigates modes of gendered sensuality and embodied knowledge. The "sensescape" of exhibitions is explored and the different uses that children make of object-worlds are analysed. The project furthermore identifies design-elements and communicational features with a gender impact and will – together with exhibition planners, curators, mediators and artists – develop and evaluate gender-sensitive inclusive science communication

formats for young people.

- Webpage of the project:  
[www.wwtf.at/projects/research\\_projects/details/index.php?PKEY=827\\_DE\\_O](http://www.wwtf.at/projects/research_projects/details/index.php?PKEY=827_DE_O)

### 3.2 Review and apply research results

- The Glasgow Science Centre (UK) applies the ROSE theoretical matrix on differences in gender attitudes towards science and technology to exhibition design. ROSE (Relevance Of Science Education), is a continuing international comparative project (40 countries are currently involved) meant to shed light on affective factors of importance to the learning of science and technology. Key international research institutions and individuals work jointly on the development of theoretical perspectives, research instruments, data collection and analysis. The target population is students towards the end of secondary school (age 15).
  - Background and rationale of the ROSE project:  
[www.uv.uio.no/ils/english/research/projects/rose/actadidactica.pdf](http://www.uv.uio.no/ils/english/research/projects/rose/actadidactica.pdf)
  - Overview of key findings:  
[www.roseproject.no/network/countries/norway/eng/nor-Sjoberg-Schreiner-overview-2010.pdf](http://www.roseproject.no/network/countries/norway/eng/nor-Sjoberg-Schreiner-overview-2010.pdf)
- Blogs reviewing and discussing research outcomes can be particularly useful for internal discussion and training sessions at science centres and museums. The blog "Space wands and table saws: Tools and rules for girls at California's science centers" is an interesting example. Partly granted by the Consortium for Women and Research at the University of California, Davis, it reports extensive literature review and the results of research carried out at science museums and centres of varying sizes in California. The blog regularly publishes new posts on about 25 different thematic categories related to the issue of girls/women and science centres and museums.
  - Website of the blog:  
[www.museumblogging.com/2009/11/19/girls-and-science-centers/](http://www.museumblogging.com/2009/11/19/girls-and-science-centers/)

## Additional resources

ASTC Equity and Diversity Toolkit: Exhibit, program & audience resources:  
[www.astc.org/resource/equity/ASTC\\_DiversityEquityToolkit\\_Exhibits.pdf](http://www.astc.org/resource/equity/ASTC_DiversityEquityToolkit_Exhibits.pdf)

Dancu T.N.: Designing exhibits for gender equality:  
[www.exploratorium.edu/partner/pdf/TD\\_Diss\\_FNL.pdf](http://www.exploratorium.edu/partner/pdf/TD_Diss_FNL.pdf) (2011)

Bartkovski A.: Language, gender, directions and explainer training:  
[www.explainers.wordpress.com/2010/09/29/1009/](http://www.explainers.wordpress.com/2010/09/29/1009/) (2010)

Benne Kremer K., Mullins G.W., Children's gender behaviour at science museum exhibits (abstract):  
[www.onlinelibrary.wiley.com/doi/10.1111/j.2151-6952.1992.tb00733.x/abstract](http://www.onlinelibrary.wiley.com/doi/10.1111/j.2151-6952.1992.tb00733.x/abstract) (2010)

Allison-Bunnell S., Borun M., Schaller D., Chambers M., One Size does not fit all. Learning style, play, and online interactives:  
[www.archimuse.com/mw2007/abstracts/prg\\_325000848.html](http://www.archimuse.com/mw2007/abstracts/prg_325000848.html) (2007)

Arambula Greenfield T., Sex differences in science museum exhibit attraction (abstract):  
[www.onlinelibrary.wiley.com/doi/10.1002/tea.3660320905/abstract](http://www.onlinelibrary.wiley.com/doi/10.1002/tea.3660320905/abstract) (2006)

Gottlieb H., Simonsson H., Gävert-Asplund L., Lindberg S., Audio guides in Disguise – Introducing Natural Science for Girls:  
[www.idc.ul.ie/museumworkshop/Papers/gottliebatAl.pdf](http://www.idc.ul.ie/museumworkshop/Papers/gottliebatAl.pdf) (2005)

*Abrahamy M., Blake Finkelson E., Lydon C., Murray K., Caregivers' socialization of gender roles in a children's museum:*  
[www.bespin.stwing.upenn.edu/~upsych/Perspectives/2003/Abrahamy.pdf](http://www.bespin.stwing.upenn.edu/~upsych/Perspectives/2003/Abrahamy.pdf) (2003)

The Smithsonian Institute: The making of exhibitions: Purpose, structure, roles and process (describing the stages of exhibition-building, in the perspective of diversity):  
[www.si.edu/opanda/Reports/BackgroundPapers/Exhibitions/WPModels.pdf](http://www.si.edu/opanda/Reports/BackgroundPapers/Exhibitions/WPModels.pdf) (2002)

Audience research blog created by Linda Kelly:  
[www.amarclk.blogspot.com/](http://www.amarclk.blogspot.com/)

Virtual exhibition on Female Nobel Prize Laureates (and other resources on women and science), by the Nobel Prize Internet Archive:  
[www.nobelprizes.com/nobel/women.html](http://www.nobelprizes.com/nobel/women.html)

Virtual exhibition "4000 Years of Women in Science", by the University of Alabama:  
[www.astr.ua.edu/4000WS/](http://www.astr.ua.edu/4000WS/)

Website "Women in Biology Internet Launch Pages" by the womenbio.net containing links to many virtual exhibitions (and other resources) on women and science:  
[www.womenbio.net](http://www.womenbio.net)



## PROGRAMMING

It is not just exhibitions, but the whole programming process that should be involved in delivering a gender perspective in communicating science and technology. This does not only mean including specific initiatives targeting girls and women only (the effectiveness of which is still debated), but also assuming gender as one of the basic criteria shaping the programming process, thus making all initiatives carried out gender-sensitive. Hence the need to devise a “policy of programming”, which could include gender equality as a specific objective to pursue, addressing both girls and women (to attract them to science) and the public at large (to promote a gender-sensitive culture of science).

In this regard, the experience of science centres and museums can provide helpful examples of how such a gender perspective can be practically developed, to the benefit of both male and female audiences. Even more important, these examples suggest that a gender-inclusive approach requires the reinforcement and wise management of the main structures to make a programme a good programme, such as innovation and creativeness, a solid strategic set-up, partnerships and in-depth knowledge of the target groups’ needs and expectations.

On the basis of this experience, four main strategies have been identified:

1. **Creating partnerships** for ensuring the impact of gender-inclusive programmes.
2. **Getting talented women to emerge**, through support activities and women’s recognition initiatives.
3. **Organising special events to promote a gender-aware scientific culture**, mainly among youth.
4. **Devising mechanisms to enhance gender-inclusive programming** over time.

### Programming - Strategy 1:

Creating partnerships for ensuring the impact of gender-inclusive programmes

Developing a gender-inclusive programming process usually requires a wide range of resources which science centres and museums often do not have. As a matter of fact, women are not a minority, but more than half of the population; they are not a homogeneous group, but as diversified as the entire population is. Moreover, gender-inclusive programming addresses both women and men. All these elements involve coordinating many skills, languages, and communication channels and networks. For these reasons, gender-inclusive programming is much more effective when a system of solid partnerships capable of mobilising a wide range of resources and expertise is developed.

This strategy is therefore specifically aimed at addressing this aspect, by prompting science centres and museums to devise their own partnership policies focusing specific attention on gender equality.

#### 1.1 Cooperate with economic and research actors to make science and technology careers attractive for girls and young women

- The South-African Sci-Bono Discovery Centre promoted a partnership with local research institutions to design and carry out the outreach programme “Take a girl learner to work”. The programme aims at orienting girls to scientific careers, especially those coming from schools places in destitute areas. Under the programme, visits to partners’ workplaces in scientific and technological sectors are organised so as to promote direct contact between girls and scientific professionals.
  - Brief information on the programme: [www.emasondosondo.blogspot.com/2009/05/take-girl-learner-to-work.html](http://www.emasondosondo.blogspot.com/2009/05/take-girl-learner-to-work.html)

- The Molekylverkstan Museum in Stenungsund (Sweden) established a partnership with local petrochemical industries to deploy a set of education programmes addressing young women in secondary schools in order to attract them to science and technology careers.
  - Website of the Molekylverkstan Museum: [www.molekylverkstan.com/](http://www.molekylverkstan.com/)
- The Carnegie Science Centre of Pittsburgh established a cooperation agreement with local research institutions and individual researchers to develop the “Tour your future program”, a career exploration initiative aimed at connecting girls aged 11-16 with Pittsburgh-area institutions, in order to give them an opportunity to meet female professionals who work in those organisations and to be introduced to different scientific careers.
  - Programme website: [www.braincake.org/TourYourFuture/](http://www.braincake.org/TourYourFuture/)

## 1.2 Involve local education players to reach female students

- The Miami Science Museum promoted a partnership with Miami Dade County Public Schools and SECME (a pre-college alliance) to launch the Raising Interest in Science & Engineering (RISE) Programme. RISE was designed in response to the national need to increase the numbers of traditionally under-represented students, particularly girls. It includes a wide-ranging set of activities such as: Saturday workshops; a four-week summer design course; internships and college tours for girls; professional development for science and math teachers; parent involvement activities.
  - Programme website: [www.miamisci.org/rise/](http://www.miamisci.org/rise/)
- The science centre Cap Sciences, based in Bourdeaux (France) promoted a broad partnership, including the Aquitaine Board of Education and local secondary schools, to promote a wide-range action plan mainly

addressing female students. The action plan includes a prize for girls’ scientific and technical vocation, meetings and debates on “Sciences for girls and boys”, a website on science and gender actions at local level, a creativity laboratory and a workshop involving local companies. For each yearly edition of the prize, the portraits of each winner and each mentor are set out as digital files with a photo taken by a professional photographer, and a text written by a journalist, both being laid out by Cap Sciences’ graphic designers. Then, they are published on Cap Sciences internet site and displayed in the Industry and Research Gallery area within Cap Sciences (a workstation is specifically devoted to these portraits).

- Website of Cap Sciences: [www.cap-sciences.net](http://www.cap-sciences.net)

## Programming - Strategy 2:

### Getting talented women to emerge

An important cultural role which science centres and museums are increasingly playing is supporting talented girls and young women so that they can emerge in scientific and technology sectors. This is mainly done both by creating enabling opportunities for girls and young women to be recognised for their talent and potential and supporting them in fully exploiting their own skills and capacities. Therefore, visibility and support of talented girls and young women are the two main tracks through which this strategy can be put into practice.

### 2.1 Use awards to make women’s participation in science visible

- The National Science Centre of Kuala Lumpur (Malaysia), in cooperation with other scientific institutions, established the “Bridging the science gender gap in developing countries” Women Scientists Award with an aim to encourage excellence of women in science and technology. The award is given to women researchers from

developing countries for their research activities, in one of four categories, namely life sciences, agricultural science, medicine, engineering and technology.

- Brief description of 2009 edition: [www.bic.org.my/?action=events&do=body87](http://www.bic.org.my/?action=events&do=body87)

- The Exploratorium of San Francisco (USA) organises the Annual Awards Dinner focused on Women in Science “Women in Science: Inspiring Women in the Field”, aimed at celebrating women leaders in science and technology sectors and attracting girls to scientific careers.
  - Web address: “She blinded me with science”, 32nd Annual Awards Dinner: [www.7x7.com/arts/she-blinded-me-science-exploratorium-awards-dinner#nav](http://www.7x7.com/arts/she-blinded-me-science-exploratorium-awards-dinner#nav)

## 2.2 Promote science-related competitions, focusing especially on young women

- The science centre NEMO of Amsterdam promoted the video contest “Tube Your Future”. Students of secondary schools are invited to interview a professional in the field of science and technology, to film it and to develop a short movie. The best films of each school are nominated by the students and uploaded on the NEMO’s website and YouTube. The contest ends with a national gala award event where the best films are awarded by a panel of experts. The purpose is to interest more students, especially girls, in an educational programme or a career in science and technology, to meet the demand for role models, especially female role models, and to provide information about science and technology professions tuned in on students of this age.
  - Programme website (in English): [www.tubeyourfuture.nl/pagina/english](http://www.tubeyourfuture.nl/pagina/english)
- A network of South-African institutions, including four science centres (Sci-Bono Discovery Centre, Unizul Science Centre, North West University Science Centre and Mondri Science Centre) promoted the

“Astroquiz”, a competition aimed at Grade 7 secondary school students based on themes of astronomy. The contest includes different quiz rounds and the final quiz event between finalists. The project is intended to attract girls and boys to basic astronomy and to celebrate the participation of women in astronomy so as to foster interest in girl learners for career opportunities in the discipline.

- Programme website (in English): [www.saasta.ac.za/index.php?option=com\\_content&view=article&id=35&itemid=40](http://www.saasta.ac.za/index.php?option=com_content&view=article&id=35&itemid=40)

## 2.3 Motivate school girls to study science and technology through mentoring and direct support

- The Miami Science Museum activated the Girls Engineering Competition Open (GECO), addressing the need to widen the engineering pipeline by raising awareness of and interest in science and engineering among middle school girls and motivate them to pursue advanced courses in mathematics and science. The Museum organises engineering training workshops for 120 girls and their teachers, led by Museum staff and four female mentors from the University of Miami. The project culminates in a day of engineering challenges and a Family Day at the Museum.
  - Brief description of the programme: [www.miamisci.org/www/gender-equity.php](http://www.miamisci.org/www/gender-equity.php)
- The Boston Museum of Science, in the framework of a larger project of the Computer Clubhouse Network, participates in the “Hear Our Voices” mentoring programme, addressing girls aged 8-18 years old. The programme aims at fostering long-term mentoring relationships between women and girls and at utilising technology as a positive tool for experimentation, self-expression, creativity and collaboration. Examples of activities include: creating flash animation, 3-D animation, and robotics projects; writing, filming, and editing original movies and video productions; constructing science and

engineering projects participating in workshops and field trips that support girls' academic goals and career planning.

- Programme website:  
[www.computerclubhouse.org/content/gender-equity](http://www.computerclubhouse.org/content/gender-equity)

- In the framework of the Prize for girls' scientific and technical vocation annually organised by Cap Sciences (France), winners are supported for a period with a mentor (preferably a women) working in the field of activity the winner intends to enter. The mentors come from all over France and are chosen for their proximity to the young girls' school. The mentorship lasts at least one year.
  - Website of Cap Sciences: [www.cap-sciences.net](http://www.cap-sciences.net)
- Different science centres and museums - such as Bloomfield Science Museum of Jerusalem (Israel), National Council of Science Museums (India), Teknikens Hus of Lulea (Sweden) or Navet Science Centre in Borås (Sweden) - are involved with other forms of direct support to young women such as studentships, scholarships, internships or assistance to young women in compiling project works.

### Programming - Strategy 3:

Organising special events to promote a gender-aware scientific culture

The programming process helps science centres and museums to overcome any static approaches and adopt a pro-active attitude to scientific communication. They are no longer simple "places to visit" but increasingly agents of scientific culture at the local or national level.

This strategy aims at giving this increasing pro-active role played by science centres and museums a gender-inclusive character, making them cultural agents of a gender-aware scientific culture. This means, for example, promoting a recognition of women's contributions to science and technology, showing to the public the

diversified impact and use of science and technology on the male and female population, attracting girls and young women to science, reaching them in the places where they live, using venues of science centres and museums as meeting points for cultural initiatives or raising the public's awareness on critical points such as the influence of gender stereotypes on scientific research and the risks of a gender unbalanced scientific culture.

#### 3.1 Develop specific tools and initiatives to fight gender stereotypes

- The Bloomfield Science Museum of Jerusalem organised in 2011 an initiative on gender stereotypes in science addressing boys and girls. Students were invited to respond to three provocative statements on women and science, voting them by expressing agreement, indifference or disagreement. The results of voting were publicly discussed with students in order to raise their awareness about their own unconscious gender biases.
  - Website of the Bloomfield Science Museum (in English): [www.mada.org.il/en/](http://www.mada.org.il/en/)
- The Science Museum's Dana Centre in London organised in 2009 a meeting called "War of the sexes", entirely focused on stereotypes on differences between men and women. The initiative was part of the larger "Conflict and Harmony" programme proposing a series of lectures and meetings on controversial issues in sciences.
  - Presentation of the programme: [www.danacentre.org.uk/events/programmes/18](http://www.danacentre.org.uk/events/programmes/18)
- In the context of the 2011 Gender Day the Nemo Science Centre in Amsterdam hosted a debating event for high school students (aged 15-17 years) called "Women in the top". The aim of the event was to give students an idea of the differences between the careers of men and women and how these differences are influenced by cultural, political, economical, psychological and biological factors. To this end, Nemo, using the format "Play Decide", developed a role game on

gender stereotypes about science and technology addressing boys and girls.

- Website of the Nemo Science Centre (in English): [www.e-nemo.nl/en/](http://www.e-nemo.nl/en/).
- Presentation of the “Play Decide” format: [www.playdecide.eu/play/inspiringstories/1406](http://www.playdecide.eu/play/inspiringstories/1406)
- The Trinity College’s Science Gallery in Dublin carried out an initiative to raise visitors’ awareness of their implicit and explicit attitude and gender stereotypes. In the framework of this initiative, visitors were invited to take part in the Implicit Association Test (IAT), applied to find out biases concerning women in science.
  - Presentation of the event: [www.tdc.ie/wiser/twist](http://www.tdc.ie/wiser/twist)
- The Science Museum of Minnesota promoted in 2010, in the framework of the nationwide programme “She’s Geeky”, a so-called “unConference” designed to give women in technology and other “geeky” fields like engineering, math and science an opportunity to get together and discuss the issues they face in their respective fields. The 2-day event was open to women and girls working in science and technology sectors and non-professionals having a passion for technology.
  - Presentation of the event: [www.shesgeeky.org/sg/2010/07/shes-geeky-twin-cities-august-6-7th/](http://www.shesgeeky.org/sg/2010/07/shes-geeky-twin-cities-august-6-7th/)
- In the framework of the Gender Day promoted under the TWIST Project in 2011, Experimentarium of Copenhagen organised a set of events focusing on breaking down barriers for women within science, including prejudices and stereotyped ideas of men and women in science. One of the many initiatives carried out was putting provocative questions and showing prejudices using posters, banners and printed sweatshirts distributed to science communicators and visitors.
  - Website of Experimentarium: [www.experimentarium.dk/](http://www.experimentarium.dk/)

### 3.2 Provide opportunities for girls to meet with role models

- The Trinity College’s Science Gallery in Dublin organised a 3-day “TWiSTing Science” event, aimed at celebrating women in science and technology. The event included different components, including: “XXLAB”, to Celebrate the role of women and science, engineering and technology through a variety of participatory and interactive research experiments and research projects; “XX Factor”, allowing a group of women scientists to speak for 5 minutes about a key person, place or object that has inspired them in their scientific work and career; “XX TALK”, a conversation with the young inventor Damini Kumar, a multi award winning international expert in product design, creative thinking, and design thinking.
  - Programme website: [www.tcd.ie/wiser/twist/TWiSTingScienceProgramme.pdf](http://www.tcd.ie/wiser/twist/TWiSTingScienceProgramme.pdf)
- The Museum of Science of Boston annually promotes a special programme called “Inspiring minds: meet women in science”, centred around a series of meetings with women scientists specialised in fields ranging from archaeology and astrophysics to marine biology and weather forecasting, who are asked to describe their research work and experiences.
  - 2011 Edition: [www.mos.org/events\\_activities/events&d=4849](http://www.mos.org/events_activities/events&d=4849)
- Science Linx of Groningen (the Netherlands) organised a “science speed-dating” event, where visitors had the opportunity to meet women scientists face-to-face and talk to them about their career plans, private lives and challenges. In this way, women scientists can become “role models” able to interact with visitors, especially girls.
  - Science Linx website (in Dutch): [www.rug.nl/sciencelinx/index](http://www.rug.nl/sciencelinx/index)

- Experimentarium of Copenhagen, in the framework of the European project PILOT, promoted an initiative, titled Xciters, under which a group of students were taught to communicate science to younger ones and act as role models for them, so as to increase especially girls' interest in science. Xciters is inspired by the 'learning by teaching' strategy or 'peer-to-peer' teaching often used in Danish schools when the focus is on emotional topics. Preliminary results indicate that the Xciter students became more interested in science and developed confidence in their communication skills, abilities and their knowledge of science subjects.
  - Programme website: [www.xciters.dk/](http://www.xciters.dk/)

### 3.3 Attract girls to science and technology through group experiences

- Since 1972, the Columbus Science Centre (USA), in partnership with the Girls Scout Seal of Ohio Council, has been organising an overnight programme, called "COSI Camp-In", allowing groups of young campers to explore the science centre, including exhibitions, shows, demonstrations and workshops. The campers spend 19 hours in the institution, while it is closed to the general public. In April 2009, COSI reached the milestone of 1 million campers.
  - Programme website: [www.cosi.org/educators/camp-in/](http://www.cosi.org/educators/camp-in/)
- A summer programme for female students, called "Science Program Inspiring Creative Exhibits" (Girls SPICE), has been promoted by the Miami Science Museum. The programme addresses the need to develop girls' interest in science, self-esteem, use of technology, and communication skills. Participants meet afterschool twice a month and attend a three-week summer academy, where they work collaboratively in small teams to create interactive museum exhibits.
  - Brief presentation of the programme: [www.miamisci.org/www/gender-equity.php](http://www.miamisci.org/www/gender-equity.php)

### 3.4 Give a symbolic significance and visibility to the issue of gender and science

- Under the TWIST project, a "Gender Day" including a set of initiatives celebrating the contribution of women to science was carried out by 7 science centres and museums on the 2011 International Women's Day. Each museum developed a different programme including a wide range of initiatives such as a tour in the museum on the discoveries made by women scientists, workshops on women and science, talks and debates on gender equality in science, the distribution of a test allowing visitors to measure their own gender biases, information points and showrooms on gender and science, speed dating for meeting women scientists, lectures on female inventors, students' debates, hands on science workshops addressing primary school boys and girls and interactive debating games.
  - Brief description of the Gender Day: [www.ecsite.eu/news\\_and\\_events/e\\_news/ecsite-e-news-march-2011](http://www.ecsite.eu/news_and_events/e_news/ecsite-e-news-march-2011)
- Different science centres and museums, together with scientific institutions, schools and private companies, were involved in the celebration of Girl's Day, promoted nationwide by the Dutch public organisation VhTo, with the aim of promoting a higher participation of women in science and technology and raising awareness of the role of women in scientific and technological advancement.
  - Brief presentation of the initiative (in Dutch): [www.girlsday.nl/deelnemers-2010.html](http://www.girlsday.nl/deelnemers-2010.html)
- For the International Year of Astronomy (2009), the Tunis Science City (Tunisia) organised a wide range of workshops and events, including a meeting entirely devoted to the celebration of the contribution of women to astronomy, in the framework of the Unesco programme "She is an astronomer".
  - Programmes of initiatives promoted by the Tunis Science City for the International Year of Astronomy (in

English):

[www.astronomy2009.org/static/archives/documents/pdf/iya2009\\_tunisia\\_6m\\_report.pdf](http://www.astronomy2009.org/static/archives/documents/pdf/iya2009_tunisia_6m_report.pdf)

### 3.5 Promote specific outreach initiatives addressing non-regular visitors

- In order to reach non-regular visitors and people far from science centres and museums, the Royal Belgian Institute of Natural Science Museum launched the XperiLAB, a programme which centres around a science truck set up for making demonstration experiments in different fields such as chemistry, biology, physics and technology (such as making toothpaste, examining fibres under the microscope or carrying out a chromatography). The programme was designed to attract both male and female students 10-14 years of age.
  - Programme website: [www.naturalsciences.be/common/flash/xperilab/index.html](http://www.naturalsciences.be/common/flash/xperilab/index.html)
- The National Science Centre and the US Army promoted the MDC (Mobile Discovery Center), a mobile classroom placed on an 18-wheeler van, aimed to enhance girl visitor interactivity on science issues. A 45-minute programme of scientific demonstrations was organised.
  - Brief presentation of the programme: [www.lanl.gov/news/index.php/fuseaction/home.story/story\\_id/2335](http://www.lanl.gov/news/index.php/fuseaction/home.story/story_id/2335)

## Programming - Strategy 4:

Devising mechanisms to enhance gender-inclusive programming over time

As science & society relations change, the gender perspective and cultural debate on science and technology changes too. Consequently, gender-sensitive programming should continuously change and update contents, tools and strategies. This fourth strategy specifically addresses this need. Its aim is to provide some examples of science centres and museums which introduced

mechanisms to update or renovate their approaches to improve the targeting of female audiences, developing more appropriate tools to communicate science in a gender perspective or making their initiatives more attractive for women or girls.

### 4.1 Launch cooperative efforts to develop innovative tools and strategies

- A group of science centres/museums and research institutes carried out the European project “Gender Awareness Participation Process” (GAPP), with the aim of, on the one hand, understanding the reasons for the decrease of interest in youth for scientific careers and, on the other, developing innovative practical tools to address the problem in a gender perspective. Under the project, some pilot initiatives were launched, experimenting various kinds of tools and approaches.
  - Brief presentation of the project: [www.natuurwetenschappen.be/en/institute/cooperations/gapp](http://www.natuurwetenschappen.be/en/institute/cooperations/gapp)
- The Thrackray Medical Museums of Leeds organised in 2010 the workshop “Community engagement in Science. Featuring Women Scientists”, aimed at promoting the development of new outreach models, dealing with questions such as the role of science museums in promoting women in science and the forms of cooperation between science centres and museums and community organisations to support gender equality. The workshop convened experts and organisations engaged in community outreach, information education, science communication and gender equality.
  - Brief presentation of the seminar: [www.jiscmail.ac.uk/cgi-bin/webadmin?A3=ind1002&L=IALONLINE&E=quoted-printable&P=42825&B=-----\\_%3D\\_NextPart\\_001\\_01CAAC07.D39C9214&T=text%2Fhtml;%20charset=utf-8](http://www.jiscmail.ac.uk/cgi-bin/webadmin?A3=ind1002&L=IALONLINE&E=quoted-printable&P=42825&B=-----_%3D_NextPart_001_01CAAC07.D39C9214&T=text%2Fhtml;%20charset=utf-8)

## 4.2 Evaluate projects in a gender perspective

- A comprehensive evaluation, using written questionnaires, face-to-face interviews, focus groups, direct observation, and telephone interviews, was conducted over a five-year period by the Franklin Institute Science Museum in its “Girls at the Center” (GAC) programme, **addressing girls aged 6-14**. The key features of **GAC** are community and museum-based workshops that foster active science investigation, at-home science activities, and special family events.
  - Short report on the evaluation results:  
[www.greatscienceforgirls.org/curriculum/girls-at-the-center](http://www.greatscienceforgirls.org/curriculum/girls-at-the-center)
  
- The Chabot Space & Science Center in Oakland (USA) set up a system for monitoring and evaluating its Techbridge initiative, made up of afterschool and summer programmes which have been serving, since 2000, over 2,500 primarily underserved girls in grades 5-12 through hands-on projects, career exploration opportunities, and academic and career guidance to expand girls’ interests and options in technology. Techbridge also offers professional development for teachers, role models and partners. The monitoring and evaluation system included pre- and post-surveys, focus groups, interviews with girls, teachers, and families, and programme observations.
  - Programme website:  
[www.techbridgegirls.org/](http://www.techbridgegirls.org/)



## Additional resources

Platform Bèta Techniek: “Betamentality 2011-2016: Attracting Young People to Science and Technology”, text presenting a model aimed at reaching teenagers to attract them to science and technology, integrating gender considerations in a strong mainstreaming context:

[www.platformbetatechniek.nl/docs/Beleidsdocumenten/betamentality20112016\\_engels.pdf](http://www.platformbetatechniek.nl/docs/Beleidsdocumenten/betamentality20112016_engels.pdf)

Board of Science Education, Center for Education, Learning Science in Informal Environments: People, Places, and Pursuits:

[www.nap.edu/catalog.php?record\\_id=12190](http://www.nap.edu/catalog.php?record_id=12190)

Friedman A., Framework for Evaluating Impact of Informal Science Education Projects:

[www.caise.insci.org/uploads/docs/Eval\\_Framework.pdf](http://www.caise.insci.org/uploads/docs/Eval_Framework.pdf) (2008)

Girls RISE (Raising Interest in Science and Engineering) Museum Network: website providing resources for programming:

[www.girlsrisenet.org/about](http://www.girlsrisenet.org/about)

Great Science for Girls: Extension Services for Gender Equity in Science through After School Programs (GSG): website providing examples of outreach programmes evaluation:

[www.greatscienceforgirls.org/](http://www.greatscienceforgirls.org/)

Hegarty E. et al., Evaluating the London Science Museum’s Activity Boxes at UK STEM Clubs:

[www.wpi.edu/Pubs/E-project/Available/E-project-043009-134958/](http://www.wpi.edu/Pubs/E-project/Available/E-project-043009-134958/)

Institute of Education Science, Encouraging Girls in Science and Maths:

[www.ies.ed.gov/ncee/wwc/pdf/practiceguides/20072003.pdf](http://www.ies.ed.gov/ncee/wwc/pdf/practiceguides/20072003.pdf)

Puget Sound Center for Teaching, Learning and Technology, Evaluating Promising Practices in Informal Science, Technology, Engineering, and Mathematics (STEM) Education for Girls:

[www.greatscienceforgirls.org/files/evaluating\\_promising\\_practices\\_in\\_informal\\_stem\\_education\\_for\\_girls.pdf](http://www.greatscienceforgirls.org/files/evaluating_promising_practices_in_informal_stem_education_for_girls.pdf)

## COMMUNICATION AND MARKETING

Science centres and museums are primarily communication agents and – as such – they are also powerful agents of cultural change. Communication is in fact necessarily implied in their whole set of activities, from exhibitions to outreach, special projects and partnerships of various kinds, which all can be oriented to reach gender equality goals, as exemplified throughout these Guidelines.

Besides, some specific efforts can be isolated which represent a direct attempt to incorporate gender considerations in the formal channels of communication of the centre/museum or in their explicit marketing strategies, thus focusing on websites and other ICT tools, advertising materials, public events with high communication impact. These efforts are the object of the section.

Three strategies can be suggested in this regard:

1. **Exploiting the potential of ICTs in a gender perspective**, using tools which are effective, in particular, to reach young people, without getting trapped in their more discriminating features as concerns girls' access and use;
2. **Tailoring marketing strategies to girls and women**, by critically assessing and modifying the images, texts and topics conveyed by the marketing materials of the museum/centre;
3. **Hosting highly-visible events to keep gender issues in the foreground**, actively taking up the role of change agents in the local, national or international community.

### Communication and Marketing - Strategy 1:

Exploiting the potential of ICT in a gender perspective

ICT tools are extremely suitable for reaching young audiences. It is to be stressed, however, that they also imply the concrete risk of reinforcing stereotypes and involuntarily selecting a prevalently male target group, as research consistently shows.

Among communication tools, websites are the most used one to disseminate the activities of science centres and museums. Efforts to design websites in a gender perspective are sometimes undertaken, while many science centres and museums are creating special areas or web pages for girls or women on their websites.

In both cases, what is crucial is that general or dedicated tools are designed with a strong awareness of the gendered dynamics of ICT use, and the differentiated purposes they can serve with respect to boys and girls. For instance, ICT tools can be usefully adopted to strengthen girls' self-confidence and interest in science, also through the creation of online communities and social networks.

#### 1.1 Design layout, language and interactivity with a gender perspective

- The website of the Science Museum of London has been designed keeping in mind the necessity to make both genders feel at home in science, by portraying equal numbers of males and females in the pictures, but also by providing different access paths to scientific topics that can be of different interest to boys and girls. Advanced technological and "hard" subjects do not only go for instance under headings such as

“physics and maths” or “space”, but are also included under: “everyday things”, “art”, and “environment”, while a counter-stereotypical matching is proposed in the case of “communication and computing”, its symbol being a Barbie doll at work at a computer station. Recognition is also given to women’s contribution to various fields (such as Ada Lovelace in computing).

- “Subjects” page (“online stuff” section) of the website of the Science Museum of London:  
[www.sciencemuseum.org.uk/onlinestuff/subjects.aspx](http://www.sciencemuseum.org.uk/onlinestuff/subjects.aspx)
- The web site of the Exploratorium of San Francisco addresses its different publics through a “Who are you” menu, where the section “Teens” may for instance be chosen, thus accessing attractive contents for teenagers, with a particular attention at representing girls and fighting gender stereotypes.
  - Teens webpage of the Exploratorium website:  
[www.exploratorium.edu/who/teens/](http://www.exploratorium.edu/who/teens/)

## 1.2 Launch social networks, online communities and initiatives

- The Carnegie Science Center in Pittsburgh (USA) set up BrainCake.org, an online sisterhood for girls aged 11-17, which features programmes, scholarships, virtual mentoring, girl blogs, homework help, research, and resources in a framework that integrates pop culture, science, and learning. Sections for mentors, teachers, and stakeholders interested in gender equity are included. The site draws more than 30,000 individual visitors monthly, receives more than 12 million hits a year, and serves a growing member database of 12,500+ users from 70 countries across the globe.
  - BrainCake website:  
[www.braincake.org](http://www.braincake.org)
- The above mentioned BrainCake project, promoted by the Carnegie Science Center in Pittsburgh, is running the podcasting programme “Girl Talk Radio”, where women

scientists and technicians from different fields are interviewed by girls. A similar initiative was undertaken by Exploratorium of San Francisco, which involved young girls as “Teen Explainers” in interviewing speakers on scientific issues in a gender perspective during the Women’s Health Conference held at the Museum in 2000. The interviews are now available at the Exploratorium website through webcasts.

- Girl Talk Radio website:  
[www.braincake.org/girltalk/GirlTalkPodcasts.html](http://www.braincake.org/girltalk/GirlTalkPodcasts.html)
- Exploratorium web page where interviews can be accessed through webcasts:  
[www.exploratorium.edu/health/webcast\\_10\\_17.html](http://www.exploratorium.edu/health/webcast_10_17.html)
- “Dragonfly TV”, promoted by PBS (US Public Broadcasting Service), is an award-winning multimedia science education programme partnering with many science centres across the United States. It combines television, community outreach, the web, and hands-on activities at science centres. Produced by Twin Cities public TV station KTCA, DragonflyTV engages children, parents and teachers and is designed to appeal to persons from diverse ethnic, socioeconomic, and educational backgrounds. DragonflyTV, in partnership with the National Science Foundation, also directs SciGirls, a programme that offers fun science experiences for girls across the country. “SciGirls” get together in camps, clubs, and science centres to watch DragonflyTV videos that showcase girls and women doing science. Then they take the wheel, doing their own investigations that relate to the science seen in the videos. A wealth of resources is also offered: a rich, interactive web site, a biannual children's science magazine, educators' guides, “fun kits”, and other outreach materials.
  - Dragonfly TV website: [www.pbskids.org/dragonflytv/](http://www.pbskids.org/dragonflytv/);
  - SciGirls website:  
[www.pbs.org/parents/dragonflytv/scigirls.html](http://www.pbs.org/parents/dragonflytv/scigirls.html)
- The Davidson Institute of Science Education, established on the campus of the Weizmann Institute of Science (WIS) in Rehovot (Israel), promoted the “Women Scientists Today and

Tomorrow". It is a web-mentoring programme aimed at encouraging female high school students to pursue professional careers in science by using one-on-one email communication. After first contacts by e-mail, the relationships then develop according to the needs and preferences of each mentor/mentee pair. 20 girls and 20 female WIS researchers participated in the programme in 2009.

- Web page mentioning the programme: [www.weizmann.ac.il/acadaff/Scientific\\_Activities/2010/Davidson\\_Institute\\_of\\_Science\\_Education.html](http://www.weizmann.ac.il/acadaff/Scientific_Activities/2010/Davidson_Institute_of_Science_Education.html)

attract diverse interests and represent diverse attitudes and approaches towards science and technology.

- Website of the Museon in The Hague (in English): [www.museon.nl/en](http://www.museon.nl/en)

## Communication and Marketing - Strategy 2:

Tailoring marketing strategies to girls and women

In a wider perspective, all materials produced and disseminated by the science centre/museum are to be assessed from the point of view of their ability to arouse the interest of both male and female visitors and to fight the image of science as a male preserve.

Action in this field usually involves, for example, the careful choice of images to be used in advertising materials, to make them more inclusive of diverse publics and attitudes, the promotion of special days devoted to selected target audiences, the organisation of dedicated discussion sessions of the marketing team of the museum and/or the creation of new working units in charge of marketing for selected target audiences.

### 2.1 Choose images to include diverse people and attitudes

- At the Museon in The Hague (The Netherlands), images on posters not only ordinarily portray girls and women, but also include specific social elements (for instance representing the environmental significance of technological advancements) so as to

### 2.2 Offer special opportunities to selected target audiences

- The At-Bristol science centre (UK) organised in 2010 a special sleepover event for Brownie girl scouts, offering a programme integrating typical scouting activities with a Planetarium show, specifically tailored workshops where the girls work together to build mini-hover crafts and learn the art of papermaking, plus an “explosive” science show. The event followed a long record of collaboration between The At-Bristol Learning Team and Girlguiding UK, which was functional to the development of a relevant programme for the girls.

- Webpage of the event: [www.at-bristol.org.uk/browniesleepover.html?searched=girls&advsearch=oneword&highlight=ajaxSearch\\_highlight+ajaxSearch\\_highlight1](http://www.at-bristol.org.uk/browniesleepover.html?searched=girls&advsearch=oneword&highlight=ajaxSearch_highlight+ajaxSearch_highlight1)

- Many science centres and museums offer free entrance for selected target audiences on some special days. On the 8<sup>th</sup> of March, for instance, entrance is often free for women. Experimentarium in Hellerup (Denmark), IDIS-Città della Scienza in Naples (Italy), the Bloomfield Museum in Jerusalem (Israel), participating in the TWIST project, offered female visitors free entrance on Gender Day, which was organised in the framework of the project.

- [www.the-twist-project.eu/it/](http://www.the-twist-project.eu/it/)

### 2.3 Focus marketing teams on different audience segments

- At the Teknikens Hus in Lulea (Sweden), meetings of the marketing team are organised to discuss how to have marketing materials communicate attractive and

empowering messages to girls. At the meetings, the different meanings of images and texts are discussed: “Who is in the pictures? Who is active/passive? What about the text? Which words do we use? What kind of experiences do we aim at in our marketing material? Can girls feel confident?” etc.

- Website of the Teknikens Hus (in English): [www.Teknikenshus.se/english/index.html](http://www.Teknikenshus.se/english/index.html)

- The Natural History Museum in London established a “New audiences team” that undertakes activity in cooperation with local community groups, so to promote differentiated marketing strategies, not only addressing women and girls, but also other audience segments, in the form of personal selling.

- Website of the Natural History Museum: [www.nhm.ac.uk/](http://www.nhm.ac.uk/)

## Communication and Marketing - Strategy 3:

Hosting highly-visible events to keep the gender issue in the foreground

Hosting prestigious public events which raise the gender and science issue helps science centres and museums gain recognition as relevant communication actors at local, national and international levels, thus reinforcing their networks, credibility and efforts towards inclusiveness.

Among such events, those linked to national campaigns promoted by government, education or equal opportunities authorities can be mentioned, as well as those sponsored by international organisations and networks, be they profit or non profit.

Even when the hosted event is not directly linked to the issue of women or girls and science, the museum can still make use of it, by getting women speakers or giving them other visible roles during the event, or explicitly including the

gender focus in its own contribution.

### 3.1 Host public events focusing on women/girls in science

- Many science museums host the prestigious national award ceremonies of the l’Oreal-UNESCO Prizes for women in science. For example, the Canadian Museum of Civilization hosted the 2007 edition of the award ceremony by l’Oreal Canada-UNESCO, with more than 200 high-profile guests participating; the American Museum of Natural History in New York hosted the 2008 edition of the l’Oreal USA-UNESCO “Women in Science Awards Luncheon”, which was the culminating event of a week of conferences and professional development workshops; the French science museum Palais de la Découverte, in Paris, usually hosts the prize ceremony organised by l’Oreal France-UNESCO.
  - Web page of the event at the Canadian Museum of Civilization: [www.cmw.ca/en/releases/archive/November2007/26/c4092.html](http://www.cmw.ca/en/releases/archive/November2007/26/c4092.html)
  - Web page of the event at the American Museum of Natural History: [www.aaas.org/news/releases/2008/0602loreal.shtml](http://www.aaas.org/news/releases/2008/0602loreal.shtml); web page of the Palais de la Découverte: [www.palais-decouverte.fr/index.php](http://www.palais-decouverte.fr/index.php)
- The Minnesota Science Museum hosted the 6<sup>th</sup> Annual Girls & Science event, targeting girls in the 4<sup>th</sup> grade up and their parents, which was organised by a large partnership including several corporations, Fox 9 Television, the Society of Women Engineers of Minnesota and the University of Minnesota.
  - Website of the initiative on Fox 9 TV: [media.myfoxtwincities.com/special/girlsandscience/2008/2008GSphotos.htm](http://media.myfoxtwincities.com/special/girlsandscience/2008/2008GSphotos.htm)
- The Royal Belgian Institute of Natural Sciences hosted the Annual Conference of the European Platform for Women in Science, titled “Women in Present and Future European Research” held on June 10-11, 2010 in Brussels and attended by about 60

representatives of European organisations of women scientists from 13 countries from all over Europe.

- Web page of the event:  
[www.epws.org/index.php?option=com\\_content&task=view&id=453&Itemid=4545](http://www.epws.org/index.php?option=com_content&task=view&id=453&Itemid=4545)

- The Museum of Science in Boston (USA) has organised for over 10 years the biennial Women in Science Luncheons, sponsored by a large network of public, private and non profit entities in the area of scientific and technological research, and involving distinguished female scientists and engineers. The high profile and visibility of the event greatly contributes to the sustainability of the museum's programmes on women and science.

- Web page of the event:  
[www.bostonmuseumofscience.com/events\\_activities/events&d=4407](http://www.bostonmuseumofscience.com/events_activities/events&d=4407)

- The Museo Nazionale della Scienze e della Tecnica Leonardo da Vinci in Milan (Italy) hosted in 2009 the International Conference "Women and Technology", sponsored by many institutional and corporate entities, in the framework of the European Year of Creativity and Innovation.

- Web page of the event (in English):  
[www.womentech.info/index.php/wt-2009/](http://www.womentech.info/index.php/wt-2009/)

actively seek to ensure that women are adequately represented in all public events in their programming, be they focused on gender issues or not.

- Website of the Science Gallery:  
[www.sciencegallery.com/](http://www.sciencegallery.com/)

### 3.2 Introduce a gender perspective in non gender-focused events

- The Teknikens Hus in Lulea (Sweden) regularly sends gender experts to participate in conferences on various topics promoted by universities and national/local school authorities, both at events held at the science centre and in other venues, to contribute to discussions by introducing a gender perspective on the basis of its experience as a gender-sensitive institution.

- Website of the Teknikens Hus (in English):  
[www.Teknikenshus.se/english/index.html](http://www.Teknikenshus.se/english/index.html)

- Many science centres, such as for instance the Science Gallery in Dublin (Ireland),

## Additional resources

ASTC Equity and Diversity Toolkit: Communicating about diversity:  
[www.astc.org/resource/equity/ASTC\\_DiversityEquityToolkit\\_Communication.pdf](http://www.astc.org/resource/equity/ASTC_DiversityEquityToolkit_Communication.pdf)

Cho S., Goodman M., Oppenheimer B., Codling J., Robinson T., Images of women in STEM fields:  
[www.jcom.sissa.it/archive/08/03/Jcom0803\(2009\)A03/Jcom0803\(2009\)A03.pdf](http://www.jcom.sissa.it/archive/08/03/Jcom0803(2009)A03/Jcom0803(2009)A03.pdf) (2009)

EC-funded project MOTIVATION – Promoting positive images of SET in young people under gender perspective (2009):  
[www.update.jyu.fi/index.php/The\\_Gender\\_Perspective\\_of\\_Young\\_People's\\_Images\\_of\\_Science,\\_Engineering\\_and\\_Technology\\_\(SET\)](http://www.update.jyu.fi/index.php/The_Gender_Perspective_of_Young_People's_Images_of_Science,_Engineering_and_Technology_(SET));  
[www.dab-ev.org/fileadmin/bildmaterial/konsens/k1\\_2\\_3\\_2009/Konsens\\_3\\_54.pdf](http://www.dab-ev.org/fileadmin/bildmaterial/konsens/k1_2_3_2009/Konsens_3_54.pdf)

Gunn R., Moss G., Bowen J.P., Bernal I., Lisney E., McDaid S., Encouraging gender balance: A survey of European science museum websites  
[www.citeseerx.ist.psu.edu/viewdoc/download?doi=10.1.1.64.4495&rep=rep1&type=pdf](http://www.citeseerx.ist.psu.edu/viewdoc/download?doi=10.1.1.64.4495&rep=rep1&type=pdf) (2006)

Steinke J., Science in cyberspace: science and engineering. World Wide Web sites for girls:  
[www.homepages.wmich.edu/~steinke/projects/publications/science\\_in\\_cyberspace.pdf](http://www.homepages.wmich.edu/~steinke/projects/publications/science_in_cyberspace.pdf) (2004)

Smithsonian Institute, Exhibitions and their audiences: actual and potential:  
[www.si.edu/opanda/Reports/BackgroundPapers/Exhibitions/EXAudience.pdf](http://www.si.edu/opanda/Reports/BackgroundPapers/Exhibitions/EXAudience.pdf) (2002)

Some girls & science websites:

- Girls Start, [www.girlstart.com/index.asp](http://www.girlstart.com/index.asp)
- Girl Tech, [www.uk.girltech.com/](http://www.uk.girltech.com/)
- Speak Out: Eyes to the Future, [www.speakout.terc.edu/](http://www.speakout.terc.edu/)
- Women Oceanographers, [www.womenoceanographers.org/](http://www.womenoceanographers.org/)
- National Institute for Women in Trades, Technology and Science  
[www.iwitts.org/index.php](http://www.iwitts.org/index.php)
- BrainCake, [www.braincake.org/default.aspx](http://www.braincake.org/default.aspx)
- DragonflyTV, [pbskids.org/dragonflytv/](http://pbskids.org/dragonflytv/)
- SciGirls: [www.pbs.org/parents/dragonflytv/scigirls.html](http://www.pbs.org/parents/dragonflytv/scigirls.html)
- Josie True, [www.josietrue.com/](http://www.josietrue.com/)
- Girls Go Tech, [www.girlsgotech.org/default.asp](http://www.girlsgotech.org/default.asp)
- Sally Ride Science, [www.imaginarylinesinc.com/](http://www.imaginarylinesinc.com/)
- The Fun Works, [www.depts.washington.edu/rural/RURAL/](http://www.depts.washington.edu/rural/RURAL/)

## EDUCATION AND TRAINING

The educational potential of exhibitions and other programmes at science centres and museums is strongly dependent on the behaviour and attitude of mediating figures, such as parents, teachers, and educators in general, which may challenge or confirm gender stereotypes, ignite or limit interests and aspirations.

Based on their experience, science centres and museums can support the positive involvement of these figures in their educational proposals, either in the centre/museum or through outreach activities and partnerships of various type and scope. Three strategies in this section therefore target different influencing figures.

Moreover, educational approaches which are reported as effective by authoritative sources and research are the object of a fourth recommendation.

1. **Supporting families in boosting girls' passion for science**, fostering their self-confidence and encouraging educational and professional choices in science;
2. **Supporting school teachers in dealing with gender issues**, offering them tools and resources for teaching science and awareness-raising occasions;
3. **Helping informal educators upgrade their skills to support girls' engagement in science**, to build a more committed and competent professional community;
4. **Select educational approaches based on lessons learned** on what works for women and girls in informal science education.

### Education and training - Strategy 1:

Supporting families in boosting girls' passion for science

Family attitudes towards science obviously play a role in influencing educational and professional choices, so that science centres and museum also need to target mothers and fathers to effectively reach the new generations.

Moreover, a growing body of literature dwells on the subtle differences in parental expectations (and consequent behaviour) of boys and girls as far as a career in science is concerned, whereas the latter tend to receive less encouragement to get engaged in this area, following widespread stereotypical beliefs.

Science centres and museums can play a crucial role here, working on mothers' and fathers' attitudes towards science and at the same time raising their awareness of the possible existence of unconscious biases and stereotypes influencing their behaviour.

#### 1.1 Involve parents and children in common activities

- The Franklin Institute Science Museum of Philadelphia promotes the "Girl at the Center" project, in the framework of its "Gender and Family Learning Program" and with the co-sponsorship of the National Science Foundation. The project is a national collaboration, active in 48 US states, to encourage family involvement in girls' science learning by providing girls and adult partners with opportunities to investigate the world around them through inquiry-based, hands-on science activities. The project includes a hands-on introductory package (Sneak Preview), three annual events designed to



cultivate collaborative science learning and questioning between the girl and her adult partner (Discovery Days), and an annual final event (Family ScienceFest).

- Website of the project:  
[www.fi.edu/tfi/programs/gac.html](http://www.fi.edu/tfi/programs/gac.html)

- The Miami Science Museum, with funds from the Kennedy Family Foundation, promotes the Girls Engineering Competition Open (GECO) addressing the need to widen the engineering pipeline by raising awareness of and interest in science and engineering among middle school girls. Besides organising engineering training workshops for 120 girls and their teachers, led by museum staff and four female mentors from the University of Miami, the project includes a Family Day at the museum to support parent involvement in their daughter's science and technology education aspirations.

- Website of the Miami Science Center, with a description of the project:  
[www.miamisci.org/www/gender-equity.php](http://www.miamisci.org/www/gender-equity.php)

## 1.2 Provide training and resources for parents

- The “Science for mums” programme is promoted in Canberra by the National Science and Technology Centre Questacon, in cooperation with the Australian National University. The programme aims to teach mothers the fundamentals of science so that they can help their kids with homework and enthuse a new generation about science.

- Website of the project:  
[cpas.anu.edu.au/workshops/For\\_Mums.php](http://cpas.anu.edu.au/workshops/For_Mums.php)

- A programme promoted by the Bloomfield Science Museum, based in Jerusalem (Israel), in cooperation with the local municipality, addresses mothers as a major factor influencing their daughters' choices for ongoing studies. Under the programme, workshops for both working and non-working women are organised to encourage them to support their daughters' choice of science and technology.

- Website of the Bloomfield Science Museum (in English):  
[www.mada.org.il/en/](http://www.mada.org.il/en/)

- TryScience is a gateway to the learning resources offered by science and technology centers worldwide, coordinated by the Austin Children's Museum of Texas. The website features interactive multimedia activities, with a bank of archived activities always available. In addition to an online educational adventure and a database of more than 500 science and technology centers from around the world, TryScience offers experiments and tips to parents and teachers on ways to engage young people in the world of science. Among the foundational ideas of the project there is the belief that parents and families can make a huge difference in helping their children with science education.

- Parents and teachers pages of the TryScience website:  
[www.tryscience.org/parents/parent.html](http://www.tryscience.org/parents/parent.html)

- The Partnership for Science Literacy is a national initiative of the American Association for the Advancement of Science (AAAS) to increase awareness among parents and families – particularly those in Latino/Hispanic, African American, and other minority communities – of the value of science literacy for all children. The Partnership is building a coalition of local and national organisations to empower families to improve their children's interest in and learning of science.

- Website of the project:  
[www.project2061.org/publications/articles/psl/default.htm](http://www.project2061.org/publications/articles/psl/default.htm)

## Education and training - Strategy 2:

Supporting school teachers in dealing with gender issues

When scientists are asked why they chose their field of study, they frequently mention one special teacher who was able to elicit their enthusiasm for a particular subject. Cooperation between science centres/museums and school

teachers is indeed crucial, not only to arouse students' interest, but also to give it continuity and translate it into an educational and career path in science.

Raising awareness of gender issues in science education is another critical objective. As a matter of fact it can play a crucial role to counteract the misconception held by some that science and math are more appropriate for boys than girls by educating students about what different STEM fields involve and explaining that both men and women can be scientists and engineers.

Cooperation can come in different ways: from outreach activities taking educators from science centres and museums to the classrooms, to the setting up of resources for teachers to use in their daily activities with students.

### 2.1 Make partnerships with teachers to make science more exciting for girls and students in general

- The Australian Government promoted the "SIS-Scientist in school" programme, implemented by CSIRO Education, with the support of the Scitech Discovery Centre of Perth. The programme is based on the establishment of partnerships between school teachers and volunteer scientists coming to the schools and involved as mentors of the students, which has a particularly beneficial impact on girls. The initiative, launched in 2007, has become so popular that it has been financed for three years more. Around 1,400 partnership initiatives of this kind have been established all over Australia.
  - Website of the project:  
[www.sciencewa.net.au/topics/general/2826-csiros-scientists-in-schools-more-popular-than-ever.html](http://www.sciencewa.net.au/topics/general/2826-csiros-scientists-in-schools-more-popular-than-ever.html)
- The Science, Technology, Engineering and Maths Ambassador (STEM) Programme is promoted by the Birmingham Science Museum. Ambassadors are volunteers from a wide variety of STEM backgrounds, disciplines

and careers at all levels, and they represent over 1,000 different employers, from large multi-nationals to small and medium enterprises and other organisations like the National Health System and the Environment Agency. Many STEM ambassadors are also undergraduates, studying at universities across the UK. These individuals act as role models to students through the work they do in schools, something that is especially important for girls, typically lacking role models. A similar programme runs at the Technquest Science Discovery Centre in Cardiff.

- Website of the project in Birmingham:  
[www.thinktank.ac/page.asp?section=435&sectionTitle=Science%2C+Technology%2C+Engineering+and+Maths+\(STEM\)+Ambassadors](http://www.thinktank.ac/page.asp?section=435&sectionTitle=Science%2C+Technology%2C+Engineering+and+Maths+(STEM)+Ambassadors)
- Website of the programme in Cardiff:  
[www.technquest.org/education/english/currentAmbassadors.php](http://www.technquest.org/education/english/currentAmbassadors.php)

- The FIRST-Female Involvement in Real Science and Technology Project is a partnership overseen by the Chabot Observatory & Science Centre in Oakland, California, including the Oakland Museum, the Mills College, the University of California at Berkeley, the East Bay Association of Women in Science and around 45 elementary and middle schools. It involved around 1,200 teachers and girls from the 5<sup>th</sup> to the 8<sup>th</sup> grade. Funds were initially provided by a grant from the National Science Foundation. The intent is to encourage and model an early and successful interest in science and keep this interest alive within the transition from elementary to middle school. Activities are both science-focused and aimed at raising awareness on gender issues, and include: classroom discussions on what life would be like if they happened to be born the opposite sex; classroom activities for both boys and girls; after-school science clubs for girls; leadership training for girls; activities linking female scientists/mentors with girls' science clubs; hands-on activities for students and teachers working together; trips to laboratories, colleges, or nature sites; talks by

women scientists; professional development for teachers including in-depth examination of gender equity issues. Although the initial funding has expired, several schools have continued their participation in FIRST.

- Website of the project:  
[www.engineeringpathway.com/ep/learning\\_resource/summary/?id=5824A057-9D62-4BA6-B34F-CFB9CFB02C25](http://www.engineeringpathway.com/ep/learning_resource/summary/?id=5824A057-9D62-4BA6-B34F-CFB9CFB02C25)
- Chabot Observatory & Science Centre Resource Guide “FIRST Girls: a Guide to Starting Science Clubs for girls”, for teachers, parents and anyone interested in encouraging girls in science:  
[www.techbridgegirls.org/LinkClick.aspx?fileticket=pFs18QVwreQ%3D&tabid=65](http://www.techbridgegirls.org/LinkClick.aspx?fileticket=pFs18QVwreQ%3D&tabid=65)

## 2.2 Set up resources, guides and toolkits for science teachers

- “The Girl Solution”, developed by the Girls, Math & Science Partnership (also promoting the already mentioned website for girls in science BrainCake) is a gender equity toolkit with the goal to help teachers and mentors (but also parents) build better relationships between girls and science by providing innovative resources, ranging from trading cards and posters to electronic homework assignments and research. The centrepiece of The Girl Solution is a Multimedia Gender Equity CD, which contains printable PDFs with background and techniques for engaging girls in math and science.
  - Website of the project:  
[www.thegirlsolution.com/](http://www.thegirlsolution.com/)
- In the video contest Tube Your Future, promoted by the science centre Nemo (The Netherlands) within the framework of the European Project GAPP (Gender Awareness Participation Process), students of the 3<sup>rd</sup>, 4<sup>th</sup> and 5<sup>th</sup> year of secondary education are asked to interview a professional in the field of science and technology, to help them create their own image of what it is like to work in this area. The project is designed as a cooperative effort to be developed with the help of science teachers in schools, which are likely to help their students in the realisation

of the interview. A teachers’ manual has therefore been set up, which provides teachers with an overview of the project, background information on gender and science and girls’ issues as far as engagement in science in concerned, tips, and fully detailed lesson plans.

- Website of the Tube Your Future project (in English):  
[www.tubeyourfuture.nl/pagina/english](http://www.tubeyourfuture.nl/pagina/english)
- Teacher’s manual (in English) available at:  
[www.tubeyourfuture.nl/system/assets/195/original/DocentenHandl\\_2010JJ\\_EN\\_klein.pdf?1292602627](http://www.tubeyourfuture.nl/system/assets/195/original/DocentenHandl_2010JJ_EN_klein.pdf?1292602627)

## Education and training - Strategy 3:

Helping informal educators upgrade their skills to support girls’ engagement in science

Cooperative efforts with informal education professionals are useful to disseminate competencies on gender and diversity management in science education which science centres and museums have gathered through their daily experience.

### 3.1 Provide gender training and resources to informal educators

- Techbridge, a programme launched by Chabot Space & Science Center in Oakland, California, with support from the National Science Foundation, runs a summer institute offering training programmes for educators interested in gaining hands-on curriculum training and strategies for engaging girls in science. A 3-day workshop aims at giving participants strategies and curriculum for inspiring girls in science and engineering. Topics include: mission and underlying philosophy (why and how to accomplish this mission); the programme model (what works well, what doesn’t and lessons learned); critical success factors in programmes for girls; girls’ recruitment and engagement strategies; innovative curriculum design for girls; working with role models and corporate

partners (how to plan a successful and impactful visit); concrete action plan for implementation.

- Website of the Techbridge Summer Institute: [www.techbridgegirls.org/Educators/SummerInstitute.aspx](http://www.techbridgegirls.org/Educators/SummerInstitute.aspx)
- The Miami Science Museum, the Association of Science-Technology Centers (ASTC) and SECME (an institute specialised on minorities and science) promoted the Girls RISE Museum Network, a project supported by the US National Science Foundation aimed at building a national network of museums committed to strengthening the professional capacity of informal science educators to engage and motivate girls in science and engineering. The network supports science museums and centres in designing and implementing innovative approaches to informal education through the promotion of exchange, support to new initiatives and the provision of information and knowledge resources.
  - GirlsRISE Museum Network website: [www.girlsrisenet.org/about](http://www.girlsrisenet.org/about)
- The website of the EC-funded project “Permanent European resource Centre for Informal Learning” (PENCIL), is a European repository for science educators with a special focus on informal learning environments and methodologies. Within the PENCIL project pilot actions were carried out by 14 informal institutions (mainly science centres) in eleven European countries and Israel. One of the projects, carried out by Fondazione IDIS-Città della Scienza of Naples, had a strong gender approach and was called: “So... Science! The social dimension of science, diversity and gender issues”.
  - Website of the pilot project on the social dimension of science, diversity and gender issues: [www.pencil.unina.it/pilotProjects/citadellascienza/main.php](http://www.pencil.unina.it/pilotProjects/citadellascienza/main.php)

### 3.2 Promote conferences and other occasions to share experiences and solutions

- The Pie network (Promoting Science Inquiry and Engineering through Playful Invention and Exploration with new digital technologies) is aimed at bringing educators from different backgrounds together to devise effective tools to bridge gender and socio-economic gaps in science engagement. The network includes MIT, the Exploratorium of San Francisco, the Science Museum of Minnesota, The American Visionary Art Museum, the Fort Worth Museum of Science and History, the Smithsonian’s Lemelson Center at the National Museum of American History, The Center for Children and Technology in New York. The PIE Network is based on close collaboration among MIT Media Lab and the PIE museums. A core group of Media Lab researchers (focusing on design of new technologies for learning and education) works together with PIE museum educators and programme developers sharing ideas, technologies, and support materials with one another. Media Lab researchers also work closely with museum staff to integrate new technologies and educational ideas. Staff development and collegial support are an integral part of the PIE network concept. Educators and programme developers from the museums meet and communicate regularly to share project ideas, offer feedback, make presentations at one another’s events, collaborate on development of materials, and learn from one another’s experiences.
  - Presentation of the PIE Network: [www.media.mit.edu/~mres/proposals/pie-handout.pdf](http://www.media.mit.edu/~mres/proposals/pie-handout.pdf)
- “Beyond Painting Science Pink: Creating Programs that Engage Girls in STEM,” was a session organised at the 2009 ASTC Annual Conference with the aim of promoting discussion and exchange among researchers and informal educators on how to integrate research-based best practices with high-interest content to develop programmes that

serve girls in meaningful ways.

- Website of the initiative:  
[www.astc.org/blog/2009/11/16/astc-connect-forum-beyond-painting-science-pink/](http://www.astc.org/blog/2009/11/16/astc-connect-forum-beyond-painting-science-pink/)
- The final conference of the EC-funded GAPP project (Gender Awareness Participation Process: Differences in the choices of science careers) was an occasion to discuss, among professional educators from different cultural areas and countries, issues such as the reason for the loss of interest of young people, particularly girls, in scientific studies and careers; the need to implement social dialogue between the research community, teachers, students, parents and other social actors and identify main issues and expectations from these groups; which practical activities could help overcome gender differences.
  - GAPP final conference proceedings:  
[www.femtech.at/fileadmin/downloads/Wissen/Themen/Berufsbilder\\_und\\_zugaenge/GAPP\\_Conference\\_Proceedings.pdf](http://www.femtech.at/fileadmin/downloads/Wissen/Themen/Berufsbilder_und_zugaenge/GAPP_Conference_Proceedings.pdf)
- The National Conference Science & Technology in Out-of-School Time (September 2010), sponsored by Time Warner Cable as part of its Connect a Million Minds Initiative and organized by the Coalition for Science After School and Project Exploration. The conference brought together nearly 300 national and local stakeholders involved with science education out-of-school: youth and out of school program service providers; leaders of non profit, science institutions and community-based organizations; representatives from K-12, community colleges and higher education; and researchers and policy-makers tracking regional and national trends in innovation, science and workforce development. Among the sessions: “Lessons from the National Collaborative Girls Project”
  - Programme of the conference:  
[www.scienceafterschoolconference.org/schedule/friday](http://www.scienceafterschoolconference.org/schedule/friday)

## Education and training - Strategy 4:

Select educational approaches based on lessons learned

Even though there is no unanimous consensus on the most effective educational approaches to support girls’ and young women’s learning styles and attitudes in science, efforts have been undertaken to take decades of experience and try and identify the most up-to-date strategies among researchers and professionals in the informal education area.

The one recommendation for this strategy therefore calls on science centres and museums to actively search, discuss and elaborate on the suggestions that come from lessons learned around the world. In particular, quite convergent indications can be found in different sources as regards suitable curriculum content and type of learning experience for female visitors/participants/students.

### 4.1 Make the most of existing studies and evaluations of effective educational approaches

- In 2008, the Evaluation and Research Associates (ERA) of the Puget Sound Center for Teaching, Learning and Technology conducted, on behalf of Girl Scouts USA, a review of informal STEM education programmes in order to identify promising and effective educational approaches for girls. Study components included creating a directory of informal STEM education programmes for girls, conducting a literature review to establish a baseline of effective approaches, developing and administering a survey to programme representatives, and developing a final report of findings identifying effective practice. Survey questions collected both quantitative and qualitative data from respondents.

As regards types of learning experience, the following have been considered, deriving from the literature review, and are reported below starting from those rated in the study as the most effective:

- Hands-on experiences.
- Opportunities to work together with other people.
- Small group sizes.
- Frequent affirmation and verbal support from instructors.
- Utilising a variety of teaching styles.
- Comfortable physical learning environment.
- Low student to staff ratio, e.g., 10 (or less) to 1.
- Girls-only environments.
- Positive interaction between girls is explicitly addressed.
- High-end, up-to-date equipment and resources.

Also as regards curriculum content, practices are reported from the most to the least effective:

- Project-based learning opportunities (e.g. projects with real-world activities).
- Making curriculum relevant, tying it to real-life issues.
- Opportunities to use technology to be creative and explore.
- Broad array of enrichment activities.
- Using curriculum materials that appeal to girls.
- A challenging content level.
- Opportunities to use technology to communicate/social network.
- Curriculum relevant to participants' culture.

The full report: Evaluating Promising Practices in Informal Science, Technology, Engineering, and Mathematics (STEM) Education for Girls, is available at:  
[www.girlscouts.org/research/resources/guide\\_to\\_evaluating\\_promising\\_practices\\_in\\_informal\\_stem\\_education\\_for\\_girls.pdf](http://www.girlscouts.org/research/resources/guide_to_evaluating_promising_practices_in_informal_stem_education_for_girls.pdf)

- The IES (Institute of Education Sciences) at the National Center for Education Research of the US Department of Education set up in 2007 a “Practice guide” to encourage girls in science and mathematics. According to the authors, practice guides “sit somewhere between consensus reports and meta-analyses” while their specificity lies in “providing advice at the level of specific action steps”.

Even though mostly focused on formal education, the five general recommendations that are proposed and detailed – and whose effectiveness has been rated by a panel of experts with national reputation and up-to-date expertise on the topic – can be useful and inspirational also in informal education settings, provided they are properly interpreted and adapted.

The five recommendations (starting again from those with a higher level of evidence, according to the experts' rating), are the following:

1. Teach students that scientific abilities are expandable and improvable.
2. Provide prescriptive, informational feedback.
3. Create an environment that sparks initial curiosity and fosters long-term interest in math and science.
4. Expose girls to female role models who have succeeded in math and science.
5. Provide spatial skills training.

The full report: Encouraging Girls in Math and Science, is available at:  
[www.ies.ed.gov/ncee/wwc/pdf/practiceguides/20072003.pdf](http://www.ies.ed.gov/ncee/wwc/pdf/practiceguides/20072003.pdf)

- The already mentioned SciGirls Project, promoted by PBS (US Public Broadcasting Service), in recognising that “a quarter of century of studies have converged on a set of common strategies that work”, sets out its “SciGirls Seven: Proven Strategies for

Engaging Girls in STEM”. The strategies, each accompanied with relevant literature references) are:

- Girls benefit from collaboration, especially when they can participate and communicate fairly.
- Girls are motivated by projects they find personally relevant and meaningful.
- Girls enjoy hands-on, open-ended projects and investigations.
- Girls are motivated when they can approach projects in their own way, applying their creativity, unique talents, and preferred learning styles.
- Girls’ confidence and performance improves in response to specific positive feedback on things they can control – such as effort, strategies and behaviours.
- Girls gain confidence and trust in their own reasoning when encouraged to think critically.
- Girls benefit from relationships with role models and mentors.

The “SciGirl Seven” document is available at:  
[www.pbs.org/teachers/includes/content/scigirls/print/SciGirls\\_Seven.pdf](http://www.pbs.org/teachers/includes/content/scigirls/print/SciGirls_Seven.pdf)

## Additional resources

AAUW (American Association of University Women, Why So Few, [www.aauw.org/learn/research/whysofew.cfm](http://www.aauw.org/learn/research/whysofew.cfm) (2010)

AAUW (American Association of University Women), Where the Girls Are: The Facts About Gender Equity in Education: [www.aauw.org/learn/research/WhereGirlsAre.cfm](http://www.aauw.org/learn/research/WhereGirlsAre.cfm) (2008)

Beta Partner Project, involving schools, universities and the Nemo Science Centre, aimed at raising interest among pupils in secondary education for science and technology through curriculum reform (a special programme has been designed to stimulate interest in science and technology among girls): [www.clients.ariadnedesigns.com/formit/projects/beta\\_partner.shtml](http://www.clients.ariadnedesigns.com/formit/projects/beta_partner.shtml)

Canadian Council on Learning, Lesson in learning. Gender differences in career choices: Why girls don't like science, containing suggestion for parents and online resources: [www.ccl-cca.ca/pdfs/LessonsInLearning/Nov-01-07-Gender-Difs.pdf](http://www.ccl-cca.ca/pdfs/LessonsInLearning/Nov-01-07-Gender-Difs.pdf) (2007)

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GirlsRiseNet, Planning Role Model Visits and Field Trips to Inspire Girls in Technology, Science and Engineering: [www.girlsrisenet.org/resource/detail/5](http://www.girlsrisenet.org/resource/detail/5) (2008)

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National Girls Collaborative Project (NGCP), reaching girls-serving STEM organisations in the US: [www.ngcproject.org/about/index.cfm](http://www.ngcproject.org/about/index.cfm)



Ride S., Guide for Encouraging Your Daughter's Interests in Science, Math, and Technology (for children grades 4-7),

[www.greatscienceforgirls.org/files/Sally\\_Ride\\_Parent\\_handbook.pdf](http://www.greatscienceforgirls.org/files/Sally_Ride_Parent_handbook.pdf) (2006)

"Science: It's a Girl Thing!", on the website of the AED Center for School and Community Services in New York, containing short entertaining and educational videos and free downloadable PDF activity cards for parents to use in working with their daughters, [www.edequity.org/sigt/](http://www.edequity.org/sigt/)

Science Daily website, with a lot of resources about parents' and teachers' influence on girls' and boys' interest in science and technology, [www.sciencedaily.com/releases/2011/03/110314091642.htm](http://www.sciencedaily.com/releases/2011/03/110314091642.htm)

Xplora website, The European Gateway to Science Education for teachers, science communicators and pupils, [www.xplora.org/ww/en/pub/xplora/index.htm](http://www.xplora.org/ww/en/pub/xplora/index.htm)

Resources section on the website "Great Science for Girls", [www.greatscienceforgirls.org/resources-research](http://www.greatscienceforgirls.org/resources-research)

Blog "Women in Science. Past, present and future"  
[www.sciencewomen.blogspot.com/](http://www.sciencewomen.blogspot.com/)

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[www.tcd.ie](http://www.tcd.ie)



**Teknikens Hus, Luleå Sweden**

This house of techniques is the northernmost science center in Sweden. A whole world of technology and a exiting place for the curious of all ages

[www.teknikenshus.se](http://www.teknikenshus.se)



**Fondazione IDIS Citta'Della Scienza, Napoli Italy**

Citta'Della Scienza belongs to the new generation of science museums  
[www.idis.cittadellascienza.it](http://www.idis.cittadellascienza.it)



**Kings College, London England**

King's is one of the world's leading research and teaching universities based in the heart of London.  
[www.kcl.ac.uk](http://www.kcl.ac.uk)



מוזיאון המדע ע"ש ברנרד בלומפילד ירושלים (ע"ר)  
متحف العلوم على اسم بلومفيلد القدس  
Bloomfield Science Museum Jerusalem

**Bloomfield Science Museum, Jerusalem Israel**

A Science Museum founded by the University of Jerusalem and The Jerusalem Foundation.  
[www.mada.org.il](http://www.mada.org.il)



**NEMO, Amsterdam The Netherlands**

NEMO is the largest science centre in the Netherlands with five floors of activities  
[www.e-nemo.nl](http://www.e-nemo.nl)



**Ecsite, Brussels Belgium**

The European network of science centres and museums, linking science communication professionals in more than 400 institutions in 50 countries. Founded 20 years ago, Ecsite connects member institutions through projects and activities and facilitates the exchange of ideas and best practice on current issues.  
[www.ecsite.eu](http://www.ecsite.eu)

