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Hypatia PROJECT

GOOD PRACTICES ON GENDER INCLUSION IN STEM COMMUNICATION

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This project has received funding from the European Union's Horizon 2020 Framework Programme for Research and Innovation (H2020-GERI-2014-1) under the grant agreement No. 665566.

Summary

The present report concerns a number of gender-inclusive science education activities designed by European science centres, museums, research institutions, industrial institutions, and other science education institutions. The 49 science education activities were reported by institutions from 14 European countries, all Partners or Third Parties in the project Hypatia. The report begins by briefly introducing the gender inclusion framework developed earlier in the project Hypatia. Then, the 49 collected activities are summarised in terms of stakeholder involvement, content, format, and intended audience. The activities are then analysed in terms of the gender inclusion framework. This analysis allows for the identification of good practices for each of the ten identified activity formats. For each of the ten formats, areas for further consideration are also identified. A complete list of the reported activities can be found as an annex to this document.

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Introduction

The project Hypatia will engage teenagers in science, technology, engineering, and maths (STEM) in gender-inclusive ways. The goal is to expose more girls (and boys) to the variety of STEM-related careers open to them, and to spark the interest of these girls and boys by establishing connections to their own lives and skills. To achieve this goal, Hypatia will collect, refine, and distribute packages (so-called toolkit modules) of gender-inclusive science education activities throughout Europe. The present report constitutes an important step towards this initiative by *summarising* a collection of existing, gender-inclusive, science education activities, by *analysing* these activities to systematically identify good gender inclusion practices, and by *pointing out* areas for further development.

The 49 science education activities summarised and analysed here have been reported by Partners and Third Parties of the Hypatia project, collectively representing 14 countries (a complete list of the reported activities can be found in the annex). These activities were reported by the partners and third parties based on their attention to a first set of inclusion criteria, namely the capability of the activities to

- **Encourage and support girls in following a study path and career path in STEM;**
- **Raise girls' interest for STEM careers;**
- **Promote gender-balanced images of men and women in STEM careers;**

A final criterion for inclusion was that the activity was developed and/or implemented in cooperation among relevant stakeholders, including schools, science centres and museums, researchers, industry and policymakers.

The tool used for analysing the reported activities is the framework of Gender Inclusion Criteria, developed in the report D2.1 *Gender Inclusion Criteria*. In the following section, this framework is briefly summarised.

Framework of Gender Inclusion Criteria

When institutions[1] plan and implement science education activities, they do not do so in a vacuum. Science educators, whether they work in schools, science centres, research institutions, or industry, carry out their planning and implementation work within a complex environment that constrains and conditions their work in a variety of ways. This environment consists of the society and culture in which the institution is located, the culture of the institution itself, the scientific discipline(s) being disseminated, the specific elements of the science education activity planned by the educators, and finally, the characteristics of the intended participants (Achiam & Marandino, 2014). We can thus think of the complex environment surrounding the development and implementation of science education activities as a hierarchy of levels where constraints and conditions may originate and manifest themselves.

The term *gender* refers to the cultural meaning constructed around what it means to be male or female. It does not correspond in a straightforward way to biological sex; in fact, there may be greater gender differences between two girls than between a girl and a boy. Gender is thus not just a personality characteristic, but is something that is constructed and continuously negotiated across an individual's personality, interactions with others, communities and culture (Risman & Davis, 2013). Clearly, the range of conditions and constraints that influence the efforts of

[1] We designate science education providers such as schools, science centres and museums, research institutions, and industry as *institutions* in the following.

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institutions to develop and implement science education activities may include conditions and constraints that influence the ways in which participants can construct and negotiate their gender. This again means that to assess the gender inclusiveness of science education activities, we must consider the gender inclusiveness of the activities at a number of different levels, namely the individual level, the interactional level, the institutional level, and the societal/cultural level. We must consider carefully whether the activity implies a certain (gendered) learner at these levels, or whether it is inclusive to the entire spectrum of gender. In short, a gender-inclusive science education activity is an activity that allows for, or even encourages, a diversity of ways of 'doing gender' within science.

From this perspective, 'good practices' are those science education practices that

1. **can be identified in the reported science education activities, and**
2. **are inclusive to a broad spectrum of learners at the individual, interactional, institutional, and cultural/societal levels, and**
3. **can be used as benchmarks in science education activities in schools, science centres and museums, research institutions, and/or industrial institutions.**

In the following, we briefly summarise the criteria developed in the document D2.1 *Criteria for Gender Inclusion* at the individual, interactional, institutional, and societal/cultural levels. Please refer to document D2.1 for further information.

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Individual level	***Ensure that the activity takes a point of departure in what learners already know about the scientific subject matter, acknowledging that different learners have different kinds of prior knowledge that may be relevant in different ways.*** ***Ensure that the activity allows for or requires several different trajectories of inquiry that correspond to different ways of being interested in the subject*** ***Ensure that the activity gives equal consideration to specific details of the activity and the bigger picture.*** ***Challenge learners to depart from their preferred interests and widen their engagement in science (many children have gender stereotypic interests; it is our responsibility as educators to challenge those).*** ***Avoid presenting learners with strongly gendered activities that may contribute to the internalisation of 'female' or 'male' identities.*** ***Ensure that the diversity of science is represented to the largest extent possible in the activity.*** ***Acknowledge that individual learners may have experienced gender exclusion in some types of institutions.*** ***Encourage all learners to participate to an equal extent, and set high expectations for all learners.*** ***Ensure the activity can encompass a variety of different ways of engaging.***

Interactional Level	***Ensure that the activity has a balanced approach to participants' learning preferences, i.e. includes thinking tasks, motor skill tasks, and value-related tasks.*** ***Ensure a suitable variation of different interaction forms.*** ***Ensure that the different roles required by the activity have equal status, or that the roles rotate between participants, to counteract instances of 'othering' or subordination.*** ***Ensure that the involved science educators and scientists reflect a variety of personalities. Girls and boys are most inspired by role models they feel psychologically similar to. Otherwise, the standards set by the other person become a contrast that girls and boys may react against.***

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Institutional Level	***Be explicit about the socio-scientific role of the institution (research, industry, education) when addressing learners, and about how this shapes the science education activities in question.*** ***Ensure the best possible alignment between the institution's stated aim and the activity's opportunities for gender inclusion.*** ***Acknowledge that different pedagogical approaches appeal to learners in different ways.*** ***Ensure that a balanced approach to the discipline is taken.*** ***Ensure that the variety of ways of conducting research within the scientific discipline are represented in the activity.*** ***Ensure that the physical learning environment support the planned activities.***

Societal/ Cultural Level	***Acknowledge that science may be represented in certain gendered ways in the public sphere. If taking a point of departure in these public representations (to spark interest in activity), consider how to support multiple ways of participating in the activity, beyond those publicly recognized.*** ***Consider the way gender is implicitly or explicitly conceptualised by stakeholders (ministries, politicians, funding organisations, interest groups etc.) and the potential effects of this conceptualisation on the activity.*** ***Consider what is included in the definition of 'science' in national cultural context, and what is excluded. Assess whether employing a broader conception of 'science' in the activity could support the inclusion of a broader range of learners.***

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Summary of Reported Activities

The Partners and Third Parties of Hypatia reported a total of 44 gender-inclusive STEM education activities. In the following sections, the reported activities are summarised by stakeholder collaboration, STEM perspective and discipline, format, and target audience.

Collaborations with relevant stakeholders

An important requirement for the collected gender-inclusive activities was that they were developed and/or implemented in cooperation with relevant science education stakeholders. This requirement ensures that the activities represent a broad effort to change attitudes towards gender in STEM, as well as drawing on the collective expertise of a variety of education professionals.

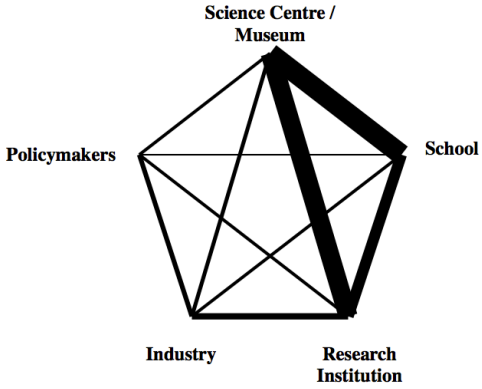

Figure 1. The collaborations between relevant stakeholders in the reported science education activities. The thickness of the lines indicates the number of instances of collaboration in the development and/or implementation of the activities.

The most commonly occurring instances of collaboration are between science centres/museums and schools, followed by those between science centres/museums and research institutions (Figure 1). A number of activities involved only one type of stakeholder: Science centre/museum (5 activities), research institution (1 activity), and industry (1 activity).

Perspectives on STEM

The reported activities address STEM from two main perspectives: An internal perspective and an external perspective. The activities that have an internal perspective on STEM are those that disseminate the science of scientists, introducing learners to the scientific enterprise itself. These activities look inward, building their content from the range of techniques, ways of thinking, and explanations characteristic of STEM (cf. Roberts & Bybee, 2014). In contrast, the activities that take an external perspective on STEM disseminate the ways in which STEM permeates and interacts with human undertakings and life situations, focusing on STEM subjects that have more personal and social implications for learners (cf. Roberts & Bybee, 2014).

More than half of the reported science activities (62%) have an internal perspective on STEM, i.e. they seek to engage participants in the science of scientists. An example is the activity *Top Ciencia*, reported by La Caixa Foundation. This activity uncovers the work of scientists working on the latest scientific developments, and allows participants to enter a virtual laboratory and carry out an experiment related to the scientist's work. The stated objective of *Top Ciencia* is to engage teenagers directly in STEM.

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A little less than half of the reported activities (38%) have an external perspective on STEM, i.e. they seek to engage participants in discussions about science as a human and cultural endeavour. An example of an activity with an external perspective on STEM is *Find your Talent*, reported by the science centre NEMO. This activity includes a card game that focuses on participants' career opportunities based on their talents and competences as perceived by their teachers, their families, their peers, and themselves. The objective of *Find your Talent* is to give the participants insights into common reasons for opting out of a science and technology career pathway, especially those reasons that are based on stereotypical perceptions.

STEM disciplines

The reported activities include a variety of STEM contents. Slightly more than half of the activities (58%) have contents that are specific to science, engineering or technology; none of the reported activities focus specifically on mathematics (Figure 2). An example of an activity with a specific disciplinary focus (engineering) is the activity *Little Bits*, reported by Teknikens Hus. In this activity, participants work with electronic 'building blocks' to make creations, i.e. remote controls, jukeboxes, and motion sensors. The activity aims to 'put the power of electronics into participants' hands, so everyone can build, prototype and invent'.

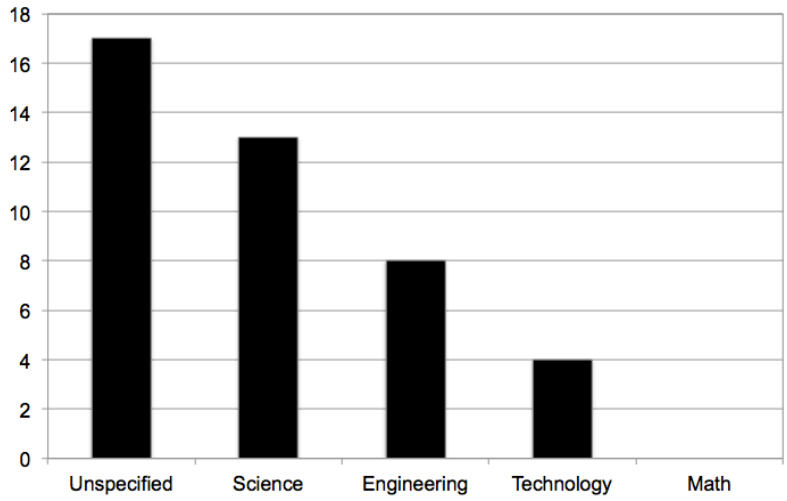

Figure 2. The STEM disciplines of the of the reported science education activities.

Slightly less than half of the reported activities (42%) have no specific STEM content, but can be adapted to local topics and conditions. An example of activity with an unspecified STEM content is *Speed Dating*, reported by the Bloomfield Science Museum Jerusalem. In this activity, participants in small groups meet a number of female scientists from a variety of STEM fields, in turn. Speed Dating emphasises that both girls and boys *can* pursue a variety of STEM careers.

None of the reported activities directly involve math contents.

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Activity formats

The reported activities have a variety of formats, ranging from practical, hands-on activities to more leisure-style games and competitions. The most frequently occurring activity format is *Practical*, which includes activities that engage participants in working with materials, data, or problems of STEM, whether in the form of laboratory work or in a computer workshop. Encounters with real STEM professionals are also widely reported, both in form of short-term conversations (*Meet a Scientist*) and more long-term relationships (*Internship*). The formats are described in Table 1.

Format	Number reported	Description
Meet a Scientist	17	***Involves a short-term encounter with a STEM professional from research or industry***
Practical	16	***Involves hands-on and/or laboratory work with a STEM-related problem or materials***
Moderated Discussion	6	***Engages participants in guided discussions about STEM and gender topics***
STEM Festival	4	***Presents participants with a STEM-related performance or series of events***
Lecture	3	***Involves an academic lecture with a STEM professional from research or industry***
Teacher Workshop	3	***Engages teachers, pre-service teachers, and other education stakeholders in exercises and discussions about their gender-inclusion teaching practices***
Internship	2	***Involves a longer-term engagement with a STEM professional from research or industry***
Exhibition	2	***Involves a visit by participants in a STEM-related exhibition, sometimes with a guided tour***
Game	2	***Engages participants in STEM-related gaming activities***
Competition	1	***Engages participants in a STEM-related competition activity***

Table 1. The ten formats identified among the 49 activities reported by the Partners and Third Parties. The total is greater than 49 because several of the activities use a combination of formats.

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It is worth noting that three of the 49 reported activities specifically involve teachers, pre-service teachers and other STEM education professionals (*Teacher Workshop*).

The reported activities fall into three main clusters, namely a cluster that deals directly with STEM, often in authentic contexts (Practical, Meet a Scientist, Internship, and Lecture); a cluster that mainly involves STEM in alternative ways, often in designed environments (STEM Festival, Exhibition, Game, and Competition); and a cluster that views STEM from an external perspective (Moderated Discussion; Teacher Workshop) (Figure 3).

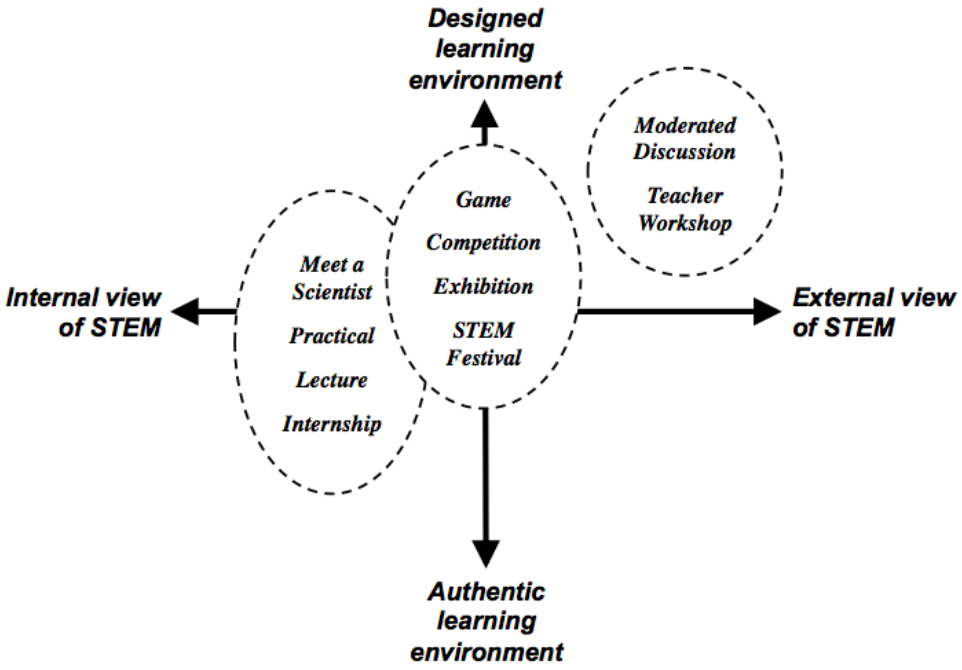

Figure 3. The ten formats of the 49 reported activities fall into three main clusters. These clusters have commonalities regarding the view of STEM they take and the learning environment in which they take place.

Target audience

The 44 science education activities mainly target girls and boys from the age of six and older. Most of the activities are designed for both girls and boys, but a few are specifically designed for girls (Figure 4). Eight of the reported activities were designed for science education professionals, i.e. science teachers, pre-service teachers, and other stakeholders in STEM education. These activities were either only for this target audience (three activities) or for both this target audience and girls and boys (six activities).

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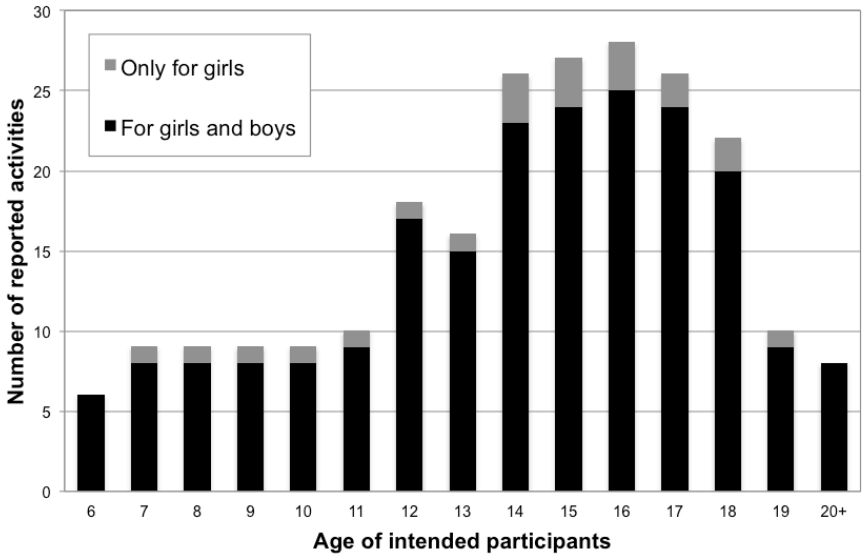

Figure 4. **The age distribution of the participants targeted by the reported science education activities. The chart does not include the activities designed specifically for teachers, pre-service teachers, and other STEM stakeholders. The total is greater than 44 because the reported activities typically targeted a range of ages; thus each activity is counted in each of the ages it is intended for.**

In summary, the reported activities involve a variety of different stakeholders in their development and/or implementation, take both internal and external perspectives on STEM, represent a variety of different STEM disciplines, represent a variety of different formats, and target a range of audiences, all relevant to gender-inclusion.

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Analysis of Reported Activities

In this section, we analyse the reported activities to identify good practices. We use the criteria developed in the document D2.1 *Criteria for Gender Inclusion*, summarised in the Introduction, to guide this analysis. For each activity format, we list examples of good practices as well as areas for further development.

Format: Practical

***Practical* refers to those reported activities that include elements with a focus on hands-on STEM activities, whether 'dry' activities such as programming, or 'wet' activities such as dissection. Collectively, the rationale for these types of activities seems to be that they promote positive affect among participants by showing how STEM can be fun, exciting, inspiring, imaginative and creative. Furthermore, the autonomy given to participants in *Practical* activities is seen as an important means to engage them in STEM. From a gender-inclusion point of view, good practices in *Practical* activities are:**

- **Clearly providing for different ways to practically engage with the STEM content or material; this allows participants to autonomously choose the trajectories of inquiry that are most meaningful to them in their pursuit of an answer or result (Inquiry into Chemical Reactions).**
- **Creating the conditions for participants to alternate between the specific details of a task, and its more overarching implications; this addresses both those participants who are interested in specific scientific details and those who are interested the larger (socio-) scientific consequences (Wearable Technologies).**
- **Creating the conditions for evocative and memorable hands-on experiences using authentic STEM materials; this increases the impact of the activity while contributing to portraying STEM in an authentic way (Organ Dissection/Autopsy Workshop).**
- **Offering participants the opportunity to meet real STEM professionals through a STEM practice rather than just through conversation; this allows participants to get a realistic image of what it means to be a scientist (Organ Dissection/Autopsy Workshop).**

From a gender-inclusion point of view, areas for further consideration in *Practical* activities are:

- **Due to the large degree of autonomy *Practical* activities offer participants, it is easy for those participants to choose the forms of interaction or questions they are most comfortable with. It is important to consider how to support or challenge participants to depart from these preferences, thus widening their engagement in STEM.**
- **Although the hands-on aspect of *Practical* activities is part of their popularity among many participants, it is important to also build more cognitive or interpretative components into the activities. Not only will such components ensure a more balanced approach to participants' various learning preferences, it will also portray science in a more realistic way, as an interaction between action and reflection.**

Format: Meet a Scientist

***Meet a Scientist* refers to those reported activities with elements that focus on relatively short-term encounters with authentic STEM professionals. The rationale for these types of activities is that meeting or interacting with real STEM professionals can give participants a realistic image of**

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what being a STEM professional entails; that it can be fascinating, exciting and social and that it is not just 'boring stuff in a basement', carried out by unapproachable or antisocial individuals. From a gender-inclusion point of view, good practices in *Meet a Scientist* activities are:

- **Organising longer-term, one-to-one acquaintances between STEM professionals and participants;** this allows for a personal relationship to grow, and for a very realistic perception of what it means to be a STEM professional to emerge among participants (Generation Innovation Mentoring Program).
- **Engaging participants in work on complex STEM problems and in presenting their chosen solutions to representatives from research and industry;** this allows participants to gain an understanding of the scientific endeavour as a creative problem-solving process and validates their solutions from an authentic STEM point of view (Spark - Young Ideas about New Energy).
- **Presenting participants with testimonial videos created by STEM professionals from a range of disciplines;** because the professionals themselves choose what they want to record, a very wide variety is ensured (Vocations).
- **Providing STEM professionals with a brief guideline on constructive ways to have conversations with groups of participants;** the guideline emphasises how the professionals can encourage all participants to participate to an equal extent (Speed Dating).

From a gender-inclusion point of view, areas for further consideration in *Meet a Scientist* activities are:

- It is tempting to invite STEM professionals to *Meet a Scientist* activities that are young, attractive, charismatic, and female, but gender inclusion entails offering a *range* of potential role models that portray STEM. Consider whether the diversity of STEM professionals could be increased to provide role models for a range of participants to feel psychologically similar to.
- If the goal is to give participants a realistic image of what a STEM career path entails, it is important not to gloss over the less attractive aspects of those career paths. Consider whether the activity is portraying STEM in a balanced way, giving equal attention to attractive and less attractive aspects.

Format: Moderated Discussion

The format *Moderated Discussion* describes the reported activities that are based on moderated or guided conversations about STEM topics, and include science cafés. The rationale for these types of activities seems to be that confronting stereotypes and prejudices about STEM and the people most suitable to engage in it can lead participants to reflect on their own role in promoting, counteracting, or complying with those stereotypes. The topics involved are thus often external to STEM in that they deal with the ways in which STEM influences everyday life situations, and have more personal and social implications for learners. From a gender-inclusion point of view, good practices in *Moderated Discussion* activities are:

- **Creating an awareness of how STEM is represented in gendered ways in the public sphere;** this allows participants to better discern between public perception and actual characteristics of STEM (Find the Stereotypes Analysis).

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- **An explicit focus on specific obstacles to participating in STEM (e.g. low self-esteem or the attitudes of others); this allows individual participants to reflect on whether they have been hindered by such obstacles in the past (What's Your Opinion?).**

- **Focusing participants' attention on the fact that STEM disciplines are often associated with specific ways of doing gender; this allows participants to reflect on and discuss how all STEM disciplines in fact have built-in dualisms (e.g. hard vs. soft; technological vs. social; individual vs. collective) and encourages them to engage in the disciplines of interest to them (Test Your Self).**

From a gender-inclusion point of view, areas for further consideration in *Moderated Discussion* activities are:

- **Lively discussions may be more comfortable to some participants than to others (i.e. some participants are more eager to speak up, make arguments, and respond to counter-arguments than others). Consider how to include a broader variety of interaction forms in the *Moderated Discussion* activity to ensure the voices of all participants are heard.**

- **Although understanding gender stereotypes for what they are - namely simplistic generalisations about groups of people - can help counteract some of their effects, it is important to acknowledge that these simplistic generalisations exist and therefore, that participants will continue to encounter them. It is thus important for activities to include discussion of strategies to address instances of gender stereotyping that may occur in participants' future.**

Format: Lecture

The format *Lecture* describes activities that involve participants in university-style lectures with one or more STEM professionals. The activities reported in this format seem to draw on the symbols of academia, requiring participants to attend presentations or addresses carried out by STEM authorities in auditoria or lecture halls. From a gender-inclusion point of view, good practices in *Lecture* activities are:

- **Providing participants with accounts of women's (or other minorities') contributions to STEM, presented by nationally acknowledged authorities; this gives participants a more nuanced perception how STEM is the work of many, not just of certain select groups. The trustworthiness of the source may strengthen the participants' perceptions (Simposio Ada Lovelace).**

- **Allowing participants to experience 'real' lectures gives them a sense of what an academic STEM study path entails; this may help participants make informed choices about their future career pathways (Lectures of Small and Big Scientists).**

From a gender-inclusion point of view, areas for further consideration in *Lecture* activities are:

- ***Lectures* (understood as one person carrying out a monologue in front of a group of passive participants) are coming under increasing criticism for being excluding to a variety of participants; considering ways to engage participants in activity with regular intervals may improve the educational potential of the lecture.**

- ***Lectures* run the risk of portraying a simplistic view of STEM (e.g. the 'one scientific method'); therefore, it is important that lecturers consider how to illustrate the individual and unique trajectories of inquiry that led them to their interpretations and conclusions.**

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Format: STEM Festival

We use the format *STEM Festival* to describe the reported activities that have strong similarities to more leisure-related initiatives, e.g. shows, marketplaces, etc. In addition, the reported *STEM Festivals* incorporate a number of activities of the other formats analysed here, i.e. *Moderated Discussion* or *Meet a Scientist*. In this section, we address those aspects of *STEM Festivals* that are not dealt with elsewhere. From a gender inclusion perspective, good practices in *STEM Festival* activities are:

- **Simultaneously offering participants a variety of activities to choose from.** This caters to the interests and preferences of a wide diversity of participants with respect to learning preferences, preferred forms of interaction, interests, etc. (Technolution).

- **Offering participants the opportunity to engage in ways that go beyond traditional STEM activities;** this may inspire interest among participants who otherwise would not consider STEM as a worthwhile subject to engage in, potentially recruiting new participants to STEM (Astroparty)

From a gender-inclusion point of view, areas for further consideration in *STEM Festival* activities are:

- **In some ways, *STEM Festivals* attract participants to STEM by presenting STEM as something it is not: leisurely, festive, or something that only occurs on special occasions. Thus, it is important to consider how the event as a whole can provide participants with a balanced and realistic perspective on STEM.**

- **In providing a multitude of activities, it may be tempting to go beyond the area of expertise of the institution in question. Consider whether those activities that are outside the institution's usual remit reflect STEM in an integral way.**

Format: Teacher Workshop

The format *Teacher Workshop* describes those activities that involve in-service and pre-service STEM teachers in reflections and discussions about their gender inclusion teaching practices. Because the adults in a teenagers' life (parents and teachers) have a strong influence on their study and career pathways, sensitising those adults to gender inclusion issues is an important aspect of their ability to provide constructive guidance in the long term. From a gender inclusion perspective, good practices in *Teacher Workshop* activities are:

- **Uncovering hidden gender-excluding messages;** due to the fact that many gender exclusion mechanisms are embedded deep within our everyday habits and sanctioned (in a sense) by institutional and cultural practices, focusing specifically on drawing these concealed mechanisms out this helps sensitise STEM teachers to the issues at stake (Gender Equality in the Classroom).

- **Following up on the discussed gender inclusion issues by requiring participants to send a postcard to themselves, listing the concrete teaching practices they intend to adjust or change.** By sending the postcard to the teachers several weeks after the workshop, the teachers receive a reminder and a reinforcement of their gender-inclusion initiatives (Write a Letter to Yourself).

From a gender inclusion point of view, areas for further consideration in *Teacher Workshop* activities are:

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- **STEM teachers have extensive personal experience with gender in the classroom; however, they may not always have a clearly articulated stance on what it means to be gender-inclusive. Consider whether gender inclusion workshops with teachers should introduce a conceptual framework[2] for teachers to clarify their positions and discuss implementation strategies.**

Format: Internship

***Internship* activities are similar to *Meet a Scientist* activities in that they involve encounters between participants and real STEM professionals; however, internships allow for longer-term relationships to emerge because they often match one professional to one participant. From a gender inclusion perspective, good practices in *Internship* activities are:**

- **Requiring a long-term commitment from individual STEM professionals, which encourages professionals to take ownership of the activity and its objective of including more teenagers in STEM; this ownership ensures broader stakeholder commitment, which may in turn contribute to real gender inclusion changes across institutions (Teens Meet Technology).**

- **Facilitating the emergence of long-term, one-to-one relationships between STEM professionals and participants; as in *Meet a Scientist* activities, this allows for a strong personal relationship to grow, and for a very realistic perception of what it means to be a STEM professional to emerge among participants (Girls on an Internship).**

From a gender-inclusion point of view, areas for further consideration in *Internship* activities are:

- **Care should be taken to achieve good pairings between participants and STEM professionals. Participants could and should be encouraged to go beyond their immediate comfort zone, but conversely, if the participant turns out to be incompatible with the STEM discipline in question or the STEM professional, a negative image of STEM will result.**

Format: Exhibition

The format *Exhibition* includes those reported activities that take a point of departure in an exhibition, i.e. a collection of displayed objects, phenomena, and/or installations. In some cases, the exhibition itself is the activity, and participants interact with the exhibition to engage with the STEM content; in other cases, certain aspects of the exhibition are emphasised through a guided tour. These types of activities are, not surprisingly, located in science centres or museums (rather than research institutions or industrial facilities). From a gender inclusion perspective, good practices in *Exhibition* activities are:

- **Creating a good fit between the institutional specificity of museums and science centres and the gender inclusion activity. The primary interface between museums/science centres and their visitors is the exhibition; using the exhibition to frame the activity therefore meets and addresses visitors' expectations and takes maximum advantage of the institution's expertise (Evolution in Terms of Gender).**

- **Allowing participants to experience STEM in alternative contexts; for some participants, experiencing STEM in contexts designed to be inviting, engaging, exciting, and personally meaningful can contribute to making STEM approachable.**

[2] For instance the framework reported in the section *Gender Inclusion in Science* in the Hypatia document D2.1 *Criteria for Gender Inclusion.*

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- **Taking a point of departure in an existing STEM exhibition (which is not specifically designed to be gender-inclusive), and pointing out the contributions to STEM made by women;** this helps participants realise how STEM is often portrayed in a masculine-gendered way (Ground Breaking Scientific Discoveries by Female Scientists).

From a gender-inclusion point of view, areas for further consideration in *Exhibition* activities are:

- To be gender-inclusive, is important to not just consider women, but to include other minorities in narratives of STEM, i.e. socioeconomically disadvantaged people, people of different races, etc. Can these other minorities be similarly emphasised in exhibitions and guided tours?

Other Formats: Game, Competition

The formats *Game* and *Competition* include activities with features that are usually not related to STEM. In their usual forms, games and competitions typically emphasise leisure and fun, rather than learning *per se*. Thus, these formats have particular challenges as gender-inclusive science education activities. From a gender inclusion perspective, good practices in *Game* and *Competition* activities are:

- **Combining competition with other STEM-related activities.** Competition tends to appeal to a narrow range of learners; thus, including other types of interaction ensures that the activity appeals to a broader range of learners (Austria is looking for the Technology Queen).

- **Using a game as a metaphor for career considerations.** Although career considerations should be taken seriously, a game format may be a way for participants to become aware of and engage with a range of STEM options, through the rules of the game, that they would not normally have considered (Find Your Talent card game).

From a gender-inclusion point of view, areas for further consideration in *Game* and *Competition* activities are:

- Just like *STEM Festival, Game* and *Competition* activities attract participants to STEM by presenting it as something it is not. As described in the preceding, it is important to consider how the event can provide participants with a balanced and realistic perspective on STEM.

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Conclusions

The present document analysed 49 science education activities to identify their good gender inclusion practices. An important result of this analysis is the insight that each activity format embodies STEM content in a different way, and therefore, what counts as a good practice in one activity format is not necessarily transferrable to another. Accordingly, we have identified good practices for each of the ten formats in the reported activities, emphasising the gender-inclusion strengths of each format and pointing out where we feel there were weaknesses or under-utilised potentials for further gender-inclusive measures. However, the real capacity of the activities to attract and engage a wide variety of learners to STEM will be manifested in the refinement and implementation of select activities by the project's Partners and Third Partners in the coming project phases. We hope the present document will be a useful tool in that process.

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Annex: Reported Activities

Practical	**Organ Dissection/Autopsy Workshop**	**TP1 AHHAA**
	Robotics Course	**TP4 NOESIS**
	Program, Compile, Run	**TP8 Teknikens Hus**
	Little Bits	**TP8 Teknikens Hus**
	Animation Night Camp	**TP1 AHHAA**
	Program and Test a Robot	**P6 Universcience**
	Find the Stereotypes Analysis	**P6 Universcience**
	Inquiry into Chemical Reactions	**P2 MUST**
	Wearable Technologies	**P2 MUST**
	Pocket DNA	**P2 MUST**
	Special Activities for 'Young Researchers'	**TP9 Experyment**
	Explore Your Universe	**TP7 ASDC**
Meet a Scientist	**Generation Innovation Mentoring Program**	**TP6 SCNetzwerk**
	Programming is Easy to Learn	**TP5 CPS**
	Top Ciencia	**TP2 CAIXA**
	Spark - Young Ideas about New Energy	**TP8 Teknikens Hus**
	Vocations	**TP2 CAIXA**
	Science4Girls	**TP6 SCNetzwerk**
	Speed Dating	**P3 BMSJ**
	Make Up Your Mind	**P2 MUST**
	L'Oréal For Girls in Science	**L'Oréal Foundation**
	Classroom Interventions of 'Science Ambassadresses'	**P6 Universcience**
	Girls on an Internship	**P5 EXP**
	Teens meet Technology	**TP6 SCNetzwerk**
	Tube your Future	**P1 NEMO**
	Cool Jobs	**TP3 Sci Gallery**
Moderated Discussion	**Test Your Self - Implicit Association Test**	**P3 BMSJ**
	Science Café	**TP4 NOESIS**
	Café Scientific with Women Scientists	**P3 BMSJ**
	What's your Opinion?	**P3 BMSJ**
	Play Decide - Gender Day	**P1 NEMO**
Lecture	**Experyment Academy**	**TP9 Experyment**
	Lectures of Small and Big Scientists	**TP9 Experyment**
	Simposio Ada Lovelace	**TP2 CAIXA**
STEM Festival	**Astroparty**	**TP4 NOESIS**
	Technolution	**TP6 SC Netzwerk**
	Science Show	**TP4 NOESIS**
	Intel's Mother and Daughter Event	**TP3 Sci Gallery**
Teacher Workshop	**Write a Letter to Yourself**	**P5 EXP**
	Gender Inclusiveness in your Science Teaching	**P5 EXP**
	Gender Equality in the Classroom	**P3 BMSJ**

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Internship	**Girls on an Internship**	**P5 EXP**
	Teens meet Technology	**TP6 SC Netzwerk**
Exhibition	**Ground Breaking Discoveries by Female Scientists**	**P3 BMSJ**
	Evolution in Terms of Gender	**TP2 CAIXA**
Game	**Find Your Talent card game**	**P1 NEMO**
Competition	**Austria is Looking for the Technology Queen**	**TP6 SC Netzwerk**
-	**Mission Related Groups**	**TP3 Sci Gallery**

A detailed list of the reported activities is found in the document Hypatia_WP2_D2.2_120116_Annex

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