

# INTERIM EVALUATION REPORT

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## **Executive Summary:**

In this interim evaluation report, we present the observation and interview guidelines that will be used by Hypatia partners in assessing the effectiveness of the toolkit that will be used by the different partners and Third parties across Europe. In addition, we present the findings from an evaluation interview that was conducted with a representative from the partner responsible for Work Package (WP) 4 - Toolkit development (Museum of Science and Technology Leonardo da Vinci). The interview was conducted in month 15 of the project. Furthermore, we present findings from a documents analysis. The document analysis focuses on the deliverables and reports relating to toolkit development and hub implementation. Specifically, the analysis looked at Deliverables 1.2, 3.2, 3.3, 4.1 and 4.2. The document analysis was conducted in order to have a holistic understanding of the toolkit development and hub implementation. The outlined Deliverables went some way in giving an insight into aspects of the said toolkit development and hub implementation. Towards the end of this interim evaluation report, we provide feedback and remedial action based on the evaluation findings thus far and information about the steps to come in the next months.

## **Introduction:**

Evaluation involves learning new knowledge through gathering information, making credible conclusions or judgements that can be used in decision making and communicating the findings to an audience. It includes looking at the quality of the content, the delivery process and the impact of the activity on the participants. Evaluation provides an opportunity to determine whether the aims and objectives of an undertaking have been achieved or not. It also provides an in-depth understanding of the potential impact of the project, therefore, allowing the project to reflect as well as improve on the processes and outcomes should need be.

In light of the Hypatia project, the evaluation process will include aspects related to the usability of the toolkit, toolkit user numbers, the effectiveness of the toolkit on the way science is communicated, on increasing participation and interest of teenagers in STEM, on contributing to the promotion of careers in STEM involving boys and girls, on encouraging collaboration among different stakeholders as well as on changing gender stereotypes. In addition, the evaluation process will include a look at elements of engagement with the toolkit. In this phase of our

ongoing evaluation of the Hypatia project, we developed observation and interview guidelines which will be used by the third parties that were identified in our strategy document (see Annexe of D7.1). We focus on third parties because the third parties are assigned with the implementation of the STEM toolkit modules whereas the main museum partners have additionally developed the first versions of the modules of the toolkit. The fact that the third parties will be implementing the toolkit modules in their countries makes them ideal entities to carry out observations and interviews.

Additionally, during the same evaluation period, we conducted an interview with a representative of MUST (WP4 leader) to look at the progress of toolkit development. The interview focused on two tasks within WP4 involving the development of and piloting of modules. The interview was focussed on the following aspects;

- a. Consideration of whether there was any input from teenagers in the development of the toolkit modules.
- b. Understanding the successes and challenges of module development
- c. Assessing appropriateness of the chosen modules.

Equally important, we conducted a document analysis that was focussed on the deliverables and reports of activities that were within the timeline between the inception report and the interim report, specifically the documents related to toolkit development and hub coordination and stakeholder engagement. The deliverables that were analysed included;

- a. Deliverable 1.2: 1st Periodic report Hypatia
- b. Deliverable 3.2: Strategic plan for stakeholder engagement
- c. Deliverable 3.3: An outline of the distribution and composition of the hub
- d. Deliverable 4.1: Set of Developed Modules
- e. Deliverable 4.2: Pilot Reports

### **Observation and Interview Guidelines:**

The observation and interview guidelines include several sections which will be used to assess the usability of the toolkit, toolkit user numbers, the effectiveness of the toolkit and stakeholders engagement with the toolkit modules. The observation and interview guidelines are included in Appendix D7.1 of this interim report. As indicated in our Strategy document in Section 6.2.1, the observation and interview guidelines should be sent to some of the third parties implementing the toolkit.

## Interim Evaluation Results:

In the interim, we conducted an interview with the partner who was responsible for Work Package 4 - Toolkit Development. In line with the project timeline, this meant that we were able to interview the partner on the following two tasks: Task 4.1 - Development of modules and Task 4.2 - Piloting of modules. We present the findings from the interview in Section 4.1 below.

### Interview Analysis

The partner responsible for the tasks was MUST (Italy). The aim of this work package was to develop a toolkit consisting of 15 different modules. The 15 modules were developed across three different contexts (5 for schools, 5 for museums and 5 for industries). They were subsequently divided into three categories, covering STEM content, STEM professions and Gender Inclusiveness. Although the content was not focussed on specific areas of STEM, it covered aspects related to gender and STEM careers. Therefore, the STEM content was designed to deal with gender inclusivity among teenagers as well as to influence the choice of STEM studies which may subsequently lead to STEM careers. STEM professions involved the encouragement of STEM careers. The modules covered STEM professions through posters as well as games while gender inclusiveness covered guidelines on how facilitators dealing with the toolkit could look at ways of including gender in the modules. All museum partners collaborated with MUST in developing the modules for the toolkit and developed each 3 modules (1 for respectively industry, museum, school)

In addition they were supposed to give feedback and refine 3 modules originally developed by another museum partner. The final output from the tasks in WP 4 was 15 modules. -

In order to understand the process of the development of these modules, specifically towards the aim of the WP, the interview with MUST focussed on four aspects. An analysis of the interview about the four aspects is presented below.

i. **Consideration of whether there was any input from teenagers in the development of the toolkit modules.**

It is evident from the interview conducted that teenagers played a key role in testing the modules. Firstly the activities for the modules were chosen and then teenagers were invited to test and give feedback. It appears that the different activities were chosen with gender inclusiveness in mind. Initial indications suggest that teenagers were keen to meet professionals in STEM. If this is upheld, it will contribute to meeting some of Hypatia's expected impacts including an *Increase in the participation and interest of girls in STEM* and in *Contributing to the Innovation Union Objectives (better match skills to available jobs)*. In addition, they were happy to discuss issues related to gender.

However, what the interview suggests is that although teenagers were happy to discuss matters related to gender, there was a visible challenge with some facilitators who had no educational background in gender awareness to easily discuss gender issues. This means that the more facilitators were aware of gender, the easier it was to incorporate and discuss it with teenagers. However, the less aware facilitators were about gender, the more difficult it was to incorporate and discuss it with teenagers. The implication is that this could have an impact on the promotion of the activities when it came to gender inclusiveness.

Secondly,, the partner mentioned the use of an observation grid that was used as part of the engagement process. This observation grid looked at some areas which included;

- Emotions that were shown by participants during the activities.
- The cooperation between boys and girls during the activities.
- The level of involvement in plenary work and discussions during the activities.
- The facilitation of the activities looking at setting up conversations.
- The degree of clarity in the activity guidelines.

## **ii. Understanding the successes and challenges of module development**

In measuring the success of the modules, the partners developed a feedback system i to see whether the chosen modules worked or not. Each partner tested their own 3 modules as well as 3 modules from other developing partners. All partners used the observation grid mentioned above covering a range of aspects from emotions, boys and girls working together, discussions with professionals as well as observations on gender stereotypes and where necessary was transferred into local languages. The essence of the grid was to collect feedback and then fine-tune the module. However, the successes of the modules were not without challenges. These included:

- a. Lack of experience in developing modules that relates to industry context compared to the school and museum contexts.
- b. It was difficult to decide on the nature of modules to include in the toolkit.
- c. There was a misunderstanding and lack of clarity on what was suitable STEM content. The relationship between the module content and STEM professions or careers was not clear.
- d. The aspect of developing a module that was gender balanced and inclusive without the need to address gender directly or indirectly.

Despite the above challenges, from the interview, it is evident that there is good collaboration between the partners who have keenly shared their experiences in getting the modules up and running.

### iii. **Assessing the chosen module activities in order to understand why they were chosen**

The interviewee mentioned that 15 modules were developed under WP4. These were divided into three categories across the contexts which are Museums, Schools and Industry. A list of modules that were developed was provided by the interviewee and this partner later sent documentation detailing the chosen modules. It was established from the interview that the modules were chosen because of;

- the experience of the partners that were involved with their development
- the relevance of the module to the three different contexts and categories that the project was dealing with

Having looked at the interview results, it is evident that there was great emphasis put on ensuring teenagers active role in testing the modules. It is also clear that teenagers proactively participated in the toolkit development. Additionally, there was a robust feedback system put in place to ensure that the chosen module activities were relevant. Further, the interview revealed that the modules were chosen mainly due to the experience of the partners involved in their development as well as to the relevance of the modules to the three categories of museum, school and industry. Having looked at the above, a further analysis was conducted through document analysis outlined below.

#### Document Analysis

The third element of this interim report involves a document analysis. We used document analysis to gain an understanding of the progress of the project through looking at some reports and deliverables that specifically relate to the development and implementation of the toolkit. The deliverables that we looked at were;

- **Deliverable 1.2: 1<sup>st</sup> Periodic report Hypatia**  
The deliverable afforded us overview of the projects progression between the period of August 2015 to July 2016. The indication was that WPs between that period were progressing well.
- **Deliverable 3.2: Strategic plan for stakeholder engagement**  
This deliverable covered aspects of stakeholder engagement with particular focus on the establishment of hubs and the recruitment of relevant stakeholders.
- **Deliverable 3.3: An outline of the distribution and composition of the hub**  
Deliverable 3.3 gave an insight into national hub members outlining main partners and third partners. With regard to this deliverable the main role of the partners was to give

guidance and recommendations on the establishment of national hubs which third parties could then use to establish the hubs in their respective localities.

- Deliverable 4.1: Set of Developed Modules

The deliverable highlights the modules developed by the 5 developing Museum partners (BSMJ, Experimentarium, MUST, NEMO and Universcience)

- Deliverable 4.2: Pilot Reports

From April to September 2016, the 5 museum partners conducted tests on the viability of the modules that were developed. This deliverable outlined outcomes of the conducted tests.

From the analysis of the documents, we established that there is a broad range of expertise and stakeholders that the partners involved and intends to involve especially in the distribution and composition of hubs. From the documents, the project is involving a range of stakeholders from industry, local and national authorities, research institutes, schools, informal education institutes and gender experts. In addition, the roles or positions of the people involved in the hubs is diverse which includes heads of section, consultants, professors, engineers, researchers, teachers and industry representatives. This is an encouraging development towards achieving the objectives of the project and meeting the impacts that Hypatia is working towards.

With regards to piloting, looking at D4.2, the partners seem to have followed a rigorous process although we could not locate some vital information such as the exact distribution of boys and girls that were involved in the activities. The documents have given the target audience include age, the number of participants, the number of facilitators and type of audience but we missed an important insight in the proportions of boys and girls involved in the activities to gauge gender inclusiveness.

## **Feedback**

- i. There should be on-going consultation with industry players on what to include in the toolkit with regards to STEM careers or professionals. Although, the toolkit is final, we would recommend on-going consultation to reflect on future developments. STEM is not static therefore in order to have a long-term sustainable impact, the toolkit should be reviewed and amended accordingly.
- ii. There should be a link between the modules that are offered in the three different contexts and a successful uptake of STEM careers. This can be done by ensuring that all the modules consistently address the importance of taking up STEM subjects which have a direct impact on STEM careers

- iii. It is encouraging to learn that partners have recognised the need for a toolkit that consists of gender balanced and inclusive activities. This fits well with the overall aims of the Hypatia project.
- iv. The project is doing well in involving a wide range of stakeholders from different backgrounds. This will have a positive impetus on the work that Hypatia is doing towards meeting its aims.
- v. From the document analysis, it is clear that during the hub creation, a well thought out strategy was in place to ensure that there was evident teenage/gender consideration put in place.

### **Our plans**

With regards to our ongoing evaluation of the project we will Interview the partner responsible for toolkit implementation (WP5 Leader, EXPERIMENTARIUM) and some of the third parties. For more details please see attached evaluation strategy in Annex 2.

## **Annex**

### Annex 1: Hypatia Evaluation- Observation and Interview Guidelines



# **HYPATIA OBSERVATION AND INTERVIEW GUIDELINES**

## **1 Introduction**

Evaluation involves learning new knowledge through gathering information, making credible conclusions or judgements that can be used in decision making and communicating the findings to an audience. It includes looking at the quality of the content, the delivery process and the impact of the activity on the participants. Evaluation provides an opportunity to determine whether the aim of the activity was achieved or not. For instance, in light of the Hypatia project, the evaluation process will assess aspects related to the usability of toolkits, toolkit user numbers, the effectiveness of the toolkits and the engagement with the toolkit activities, thus the need for the evaluation guidelines. The guidelines include several sections as covered below. The expectation is that these sections ought to be covered by the parties undertaking the evaluation. A description of what ought to be included is highlighted in the respective sections.

## **2 Objectives of the Module**

*Provide an indication of whether the objectives in the module have been met or not? If yes, please state how they have been met and if not please give insight into why they have not been met.*

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### **3 Conducting Observations**

The collection of data based on observations is an example of qualitative evaluation tool which involves watching, recording and analysis of behaviour as it occurs in a 'natural' setting.

Observation enables the evaluators to understand the participant (s) engagement with specific tasks and define the key issues that may be followed up in the interviews. As the development and implementation of STEM toolkits is central to this project, particularly in terms of engaging teenagers in STEM, it becomes imperative to observe how teenagers are engaging with engaging with the activities in addition to how institutional hubs are supporting the toolkit implementation and subsequent adoption. As such, a further guideline would be the completion of the following sections specifically related to observed elements within the hub.

#### **3.1 Intended outcome of the module**

*Give an indication of the intended outcome of the module*

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#### **3.2 Toolkit guidelines**

*Please give an indication of the effectiveness of the toolkit guidelines provided as far as facilitation and gender inclusion is concerned. Were there any challenges in:*

- a. *The facilitation of the guidelines? If they were, please highlight what these challenges were.*

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- b. *Ensuring gender inclusiveness? If they were, please highlight what these challenges were*

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### **3.4 Activities**

*Please outline the module activities that were used at the hub.*

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### **3.5 Indicator of success**

*Please use the following success criteria and indicators of success to assess the modules and indicate the outcome in the results column:*

<b>Success criteria</b>	<b>Indicator of success</b>	<b>How to measure</b>	<b>Result</b>
<i>Engagement with module</i>	<i>The number of stakeholders/teenagers engaged with the module</i>	<i>Stakeholder/teenager count.</i>	
<i>Gender Inclusiveness</i>	<i>The level of inclusiveness on the four different perspectives of gender inclusiveness: the individual level, the interactional level, the institutional level and the societal/cultural.</i>	<i>Stakeholder/teenagers count. This should be categorised according to gender at each level to allow an assessment of gender inclusivity across the four different levels.</i>	
<i>Increased teenager awareness of STEM careers</i>	<i>Changes in awareness, knowledge and attitudes towards STEM after taking part in an activity.</i>	<i>Take account of teenagers' reflection on awareness and attitude towards STEM. This could include feedback on STEM information accessed during the activity. Use the following scale of 0 to 3, with 0 being indifferent, 1 being low, 2 being medium and 3 being high</i>	
<i>Overall stakeholder satisfaction with the module</i>	<i>Overall satisfaction with the process and outcome</i>	<i>At the end of the activity take a feedback survey on the stakeholders' expectation, learning outcomes and willingness to participate again if the module was to be used again.</i>	

## 4 Conducting Interviews

Interviews are another type of evaluation tool which is used to understand and obtain useful information from the participant's experiences. To get an in-depth understanding of the implementation and adoption of the toolkits, interviewing relevant stakeholders in addition to observations becomes a necessity. The expectation is that aside from conducting observations with teenagers, third parties conduct one interview with a stakeholder of their choice from the HUB involved with the coordination or facilitation of the hub. While all third parties are conducting the observations, only 5 of the third parties (Ireland, Austria, UK, Poland and Greece) conduct the interviews. .

### 4.1 Interview Questions

1. How useful were the guidelines on facilitation and gender inclusiveness in ensuring that the module was effectively implemented?
  
2. What was the initial response of teenagers to the module i.e. first impression of the module?
3. In your point of view, how do you think these modules affect the interests of the teenagers?
4. Do you think this module has encouraged girls to engage with STEM and have improved their view on STEM subjects? If yes, please elaborate on how their views are improved?
5. What risks/complications/challenges did you encounter while conducting this module e.g. availability of resources, availability and understanding of the staff members, overall management of the activity?
6. If there were any risks involved, how were they tackled? What measures were put in place to minimise those risks?
7. Were there any challenges faced when this module was conducted or during implementation or adoption of the module?
  - a.
8. Describe the strategies which were used to implement the modules?
  - a. Did they work well?
  - b. If there were any challenges, kindly highlight them while describing how they were



overcome?

What improvements can be made to this module for future use?

Annex 2: Inception Report: Evaluation Strategy for Horizon 2020 Project HYPATIA



## **Inception Report: Evaluation Strategy for Horizon 2020 Project HYPATIA**

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## **1 Executive Summary**

It is well documented that there are more boys than girls taking up STEM subjects. However, it is now a general consensus that in order to overcome societies' challenges, both boys and girl ought to be given and have the same opportunities when it comes to education, jobs and other economic empowerment activities, which is consonance with Hypatia's aim and expected impact. In order to ensure that this aim is met and the expected impact is realised effectively, the project needs to be evaluated. The evaluation is important not only to provide evidence about the efforts and quality of the Hypatia's activities, but also to improve outcomes in future. This inception report describes the evaluation strategy for evaluating the Hypatia project. The evaluation strategy will outline the processes of evaluation which will be used in order to assess the objectives of the project e.g. implementing modular toolkits that promote engagement of teenagers in STEM in a gender inclusive manner. Ultimately, the proposed strategy will assess whether the expected impact of the project has been reached. The strategy involves two evaluation approaches which include both formative and summative approaches. These will be employed to meet the objectives of the strategy which involve assessing the impact of the project by determining how toolkits are being implemented, looking at evaluation criteria and gauging indicators of success in terms of the way science is communicated. The expectation is that this will go a long way towards looking at indicators of success that will be used to take into account the expected impacts which include:

- increase in participation and interest of girls in STEM
- encouragement of sustainable collaboration among schools, science museums, research centres on gender equality and science
- contribution towards European Research Area objectives and
- Innovation Union Objectives.

As part of the strategy, the inception report also presents an evaluation methodology that consists of an evaluation design that will include a set of evaluation guidelines to be used in conducting the evaluative activities proposed in this evaluation strategy. Furthermore, the evaluation design will include an evaluation framework which will be used in assessing findings from the evaluation. In addition, the evaluation design will also include approaches that will be employed in data collection such as observation, interviews and document analysis. Further, the inception report touches on a data analysis approach for analysing

results from the evaluation activities. The report then concludes with an outline of activities that are planned for Hypatia's evaluation within a predefined timeline.

## **2 Background**

The evaluation team is part of the Centre for Computing and Social Responsibility (CCSR) at De Montfort University (DMU), Leicester. The centre is one of the leading research centres in the UK and its research areas include; responsible research and innovation (RRI), civil society organisations in research, stakeholder engagement and involvement, ethics (computer and applied ethics), information communication technologies (ICTs), gender in technology and project evaluation. The centre has been involved in a number of EU funded projects at an international level such as Network Analysis of CSO Participation in Research Framework Programmes, Responsible-Industry, Responsibility, GREAT (Governance for Responsible Innovation), CONSIDER (Civil Society Organisations in Designing Research Governance), ETICA (Ethical Issues of Emerging ICT Application) and SATORI (Stakeholders Acting Together On the ethical impact assessment of Research and Innovation) project. The team has wide experience in evaluation methodology and implementation.

## **3 Introduction**

Over the years research has shown that the way science is communicated to young people in and out of school is not yet gender inclusive. As a result, this has left both boys and girls having little knowledge and awareness of the range of careers in science, technology, engineering and mathematics (STEM), and the skills that are relevant for those career paths. This has affected the number of teenagers who are pursuing STEM related careers. STEM subjects are important drivers and cornerstones for development therefore, increasing women's as well as men's pursuit of STEM-related jobs is considered critical for any nation to remain competitive in the global economy[1]. Although this is an important aspect, girls remain underrepresented in many STEM fields. This is down to social influences which include the relative degrees of encouragement that girls may experience to do well in STEM and non-STEM subjects. In addition to that, personal influences such as gender-related variations in self-schemata and attitudes shape girls' motivation in STEM or non-STEM domains [3]. Without science and technology, social and economic development would be difficult to achieve. This aspect is highlighted in several H2020 programmes that indicate that in order to overcome societal challenges, STEM must be at the heart of Europe [4].

As part of the EU's development agenda for a better Europe, the need to change the state of affairs and with regards to STEM and gender inclusivity has become more vital than ever before. It is therefore essential to ensure that STEM careers become increasingly oriented towards society's needs and opening up new dimensions in terms of the skillsets required in a gender inclusive way. In a study by Wilson (2009), it was found that STEM fields constitute 9 of the top 10 college degrees leading to the highest paying occupations. The study suggests that if girls and boys are equally encouraged to pursue STEM related subjects, they can equally achieve equal economic empowerment for both which is positive for overall societal benefit [5]. Therefore, considering proportion of teenage girls pursuing STEM subjects, it is fundamental to expose more girls to the variety of STEM-related careers, empower them to make connections that develop their lives and their own skills.

In order to realise this, there is a need to engage teenagers in STEM in a gender-inclusive way, and addressing the attitudes of STEM education professionals towards more gender-inclusive practices. This is the mission that Hypatia is aiming to achieve by bringing together groups of stakeholders from science centres and museums, schools, research institutions and industry to collaborate with gender experts and teenagers in hubs and co-develop the content and co-organise activities that promote girls awareness of STEM careers. Work being carried out by Hypatia is important in ensuring that there are equal opportunities for both boys and girls in getting enough information of the variety of STEM career pathways they can follow. This is in line with Europe's agenda on RRI of which one of its pillars is 'gender inclusivity'[2]. In line with this, the project has therefore planned to develop and implement expert toolkits in schools, museums, research institutions and industry and conduct a set of seminars across 14 European countries bringing together head teachers, museum professionals, researchers, industry professionals and other related stakeholders to discuss how the toolkits should be implemented. Hypatia aims at ensuring an effective adoption of the toolkit of activities that will focus on ways of communicating STEM to empower teenage girls in exploring the range of skills needed for a variety of STEM studies and careers. The project will also develop guidelines for engaging teenagers in STEM in a gender inclusive way.

Considering the efforts and goal(s) of Hypatia, it is important that the project is evaluated. The project needs to be evaluated against its aim and objectives in order to ensure that the results have been reached. This is where DMU as evaluators will implement the strategy proposed in this inception report. The evaluation strategy is directly tailored to Hypatia and

focuses on the methodology for evaluating the outcomes and impact of the project. The evaluation strategy will ensure that Hypatia's work is meeting its intended objectives of bringing lasting change to attitudes towards STEM and how it is communicated in museums, schools and industry through engaging with teenage girls in STEM across Europe. The evaluation that we propose to undertake for the Hypatia project will be both formative and summative. Using the formative evaluation we will be able to contribute to the refinement of toolkit implementation by identifying weaknesses or areas for improvement [8] through feedback. On the other hand, use of summative evaluation will enable us to evaluate the quality of the project's outputs and outcomes in order to assess its success [8] for example in meeting its stated objectives and expected impacts against a set of success indicators that are laid down in a pre-defined evaluation framework.

In this inception report we will introduce the objectives of the evaluation strategy then we will move on to a brief discussion of evaluation, touching on the two evaluation approaches that will be employed in Hypatia's evaluation. Following this, we will then introduce the methodology that will be used in the evaluation, consisting of the evaluation design proposed for Hypatia, where we will cover the evaluation guidelines that will assist in directing the evaluation process and our proposed evaluation framework. Subsequently, we will then discuss the evaluation approaches in detail before concluding with the timeline for the next evaluation activities.

## **4 Objectives of the Evaluation**

In order to effectively evaluate Hypatia, the evaluation strategy will aim at meeting the following 3 objectives:

### **1. Assessing Impact of the Project**

This will entail assessing Hypatia's expected impact (as described in the DoA) in order to understand whether the proposed activities are meeting the impact or not.

### **2. Looking at Evaluation Criteria**

This will cover elements that will assist in determining whether the expected impact has been met.

### **3. Gauging Indicators of Success against Expected Impact**

This will involve using a set of indicators of success to gauge whether Hypatia has reached its expected impact or not.

## **5 Evaluation**

The term evaluation has many meanings depending on context and purpose of the evaluation, however all the definitions have elements of credibility[9]. Evaluation involves learning new knowledge through gathering information, making credible conclusions or judgements that can be used in decision making and communicating the findings to an audience[10]. Evaluation is paramount because it acts as a control mechanism [11] that ensures that strategic benefits of undertaking project are realised. Broadly speaking, evaluation can be defined as “the process of determining the merit, worth and value of things” [12], and can be used to describe many “different kinds of judgments, from informal assessment that relies on intuition or opinion, to well-defined and systematic research that makes use of social science research methods” [13]. In light of Hypatia project, evaluation will focus on the “design, implementation and effectiveness” of the project’s toolkit activities [14], as well as outputs where we will specifically be looking at the such elements as adoption of the toolkits e.g. from reports/deliverables and attainment of expected impacts [15].

In evaluating Hypatia, we will use both formative and summative approaches to evaluation. These 2 distinct approaches are discussed in the following sections.

### **5.1 A Formative Approach**

A formative evaluation approach examines the quality of procedures or methods of stakeholder engagement while they occur and their outcomes contribute to the refinement of the engagement processes by identifying weaknesses or areas for improvement prior to the project’s conclusion, thereby acting as a feedback mechanism or ‘double loop’ to refine project activities [18]. In relation to Hypatia, with this approach we will look at assessment of deliverables and adoption of modular toolkits among others. For instance, we will assess where and how the third parties are implementing the toolkits in relation to the guidelines. This will give us an understanding of the usability of the toolkits, usefulness and effectiveness of the toolkit as well as who is engaging with the toolkits in terms of gender inclusivity.

## **5.2 A Summative Approach**

A summative evaluation approach assesses the outcomes of procedures or methods [7], [19]–[21], evaluates the quality of engagement project’s outputs and outcomes in order to evaluate its success [7]. In terms of Hypatia, we will use this approach to evaluate whether the project is or has met its stated objectives, expected impacts against a pre-defined evaluation framework [see section 6.1.2]. For example, we will evaluate if the activities have been well adopted and are established within their respective hubs. This will help us determine the overall impact (value or significance) of the Hypatia project.

# **6 Methodology**

## **6.1 The Evaluation Design and Guidelines**

The evaluation design will include a set of evaluation guidelines that will be used in conducting the evaluative activities proposed in this strategy. It will also include an evaluation framework which will be useful in analysing our findings. In addition to these, the evaluation design includes evaluation approaches that will be used in data collection and how the data collected will be analysed.

As there is a budget constraint, partners and third parties will play a key role in implementing the evaluation design in their respective countries. This will be with the guidance of the evaluators who will provide evaluation guidelines described in the following section.

### **6.1.1 Evaluation Guidelines**

The evaluation guidelines expand on the above described evaluation design. The guidelines are mainly a guide to the consortium of the project who as indicated in the preceding section, will play a pivotal role in implementing the evaluation design. The use of the term ‘consortium’ in this document denotes the main partners of the Hypatia project and the third parties. We use both main partners and third parties in this document because we view all parties concerned in Hypatia as playing a relevant role in the evaluation of the project. The Hypatia project is a very interesting and important project, particularly in encouraging teenage girls to get involved in STEM. As such, there are very interesting, important and diverse elements that need and could be evaluated during the course of the project such as:

- feedback on development of toolkit activities to partners
- the implementation of the toolkit activities

- assessing the project impact and providing partners with a better idea of the value of their participation by tracking influence on the process
- improving the design of future related activities

However, as is indicated in section 6, due to the limited resources allocated for the evaluation of the project, evaluating the many diverse elements was always going to be a challenge. As such, it is important to prioritise what can be evaluated, how it can be evaluated, where and when. During the kick-off meeting held in Amsterdam between 2-4 November 2015, the evaluation team was fortunate enough to have received very useful feedback from members of the project that could be incorporated into the evaluation, especially in terms of what we might evaluate, how we might evaluate, where and when we might evaluate. The main feedback which members of Hypatia were keen to realise with regards to evaluation, is for a concerted effort to have European wide evaluation results. This means that the evaluation of the Hypatia project will need to extend to as many European countries as possible while considering the resources available. In order for this to be a reality, Hypatia partners will have to assist with the implementation of the evaluation. Specifically, the most ideal group to assist in this evaluation would be the third parties who are assigned with the implementation of the STEM toolkits. This is because the third parties will be implementing the toolkits in hubs in their respective countries. In light of this, the evaluation team will send detailed guidelines to third parties in month 18. Month 18 has been chosen because the evaluation team has into consideration 2 facts:

- i) That the production of the toolkits will be between month 15 and 18.
- ii) That the expected implementation of the said toolkits will between months 23 to 36.

As such, sending of the observation and interview guidelines in month 18 is ideal because it will give third parties enough time (5 months) to sort out logistics as described in the timeline. Elements of what will be covered in the guidelines are discussed in more detail in section 6.2. In the meantime, below is a discussion of the elected evaluation framework.

### **6.1.2 Evaluation Framework**

The evaluation framework (see Table 3) has four specific elements that focus on the following:

#### ***6.1.2.1 Expected Impact***

The Hypatia consortium answered the GERI-1-2014 call which has specific impacts that the project has to achieve. These expected impacts and how Hypatia intends to achieve them are outlined in Table 1 below:

<b>Expected impact</b>	<b>How Hypatia will achieve this impact</b>
1. Change the way science is communicated	The project will reach schools, informal learning organisations, research institutions and industry activities. It will produce sets of activities and guidelines about how to communicate science with their audiences ensuring the gender aspect is taken on board. The project will measure the number of institutions that adopt the new tools.
2. Increase the participation and interest of girls in STEM	The activities that will be used will be based on existing good practices related to gender in STEM. Now these activities will be implemented in much larger scale.
3. Encourage sustainable collaboration among schools, science museums, research centres on gender equality and science	The creation of hubs in each participating country and the existing connection among partners will ensure a long-term collaboration, supported through the online community Scientix. The wealth of existing activities and the importance given to advocacy and sustainability will ensure a long and strong collaboration among stakeholders.
4. Contribute towards European Research Area objectives (increase female researchers in Europe)	By giving a different perspective on STEM careers to both young boys and girls today we contribute to the increase of female researchers in the future.
5. Contribute to the Innovation Union Objectives (better match skills to available jobs)	Discovering young people's skills in relation to current and future STEM careers is a particular focus of the proposal, with a direct relevance to gender. A set of activities will be directly devoted to this, including the Find Your Skills card game.

**Table 1: Expected impacts and how Hypatia proposes to meet them**

In order to ensure that the expected impacts have been achieved, an evaluation framework becomes imperative. This is important in order to understand whether the expected impacts in the call have been met or not. As such, the evaluator's will use the listed expected impacts as a check list to assess whether Hypatia has achieved its goal of meeting the GERI-1-call expected impacts.

### **6.1.2.2 Suggested Approach**

These are the approaches that will be employed in the evaluation process. In this case, the proposed evaluation approaches will be in the countries where the toolkits will be implemented by third parties. These approaches will include observations and interviews. These are discussed in more detail in sections 6.2.1 and 6.2.2.

### **6.1.2.3 Evaluation Criteria**

Evaluation criteria is the benchmark upon which Hypatia's work and agenda with regards to attitudes and gender inclusion of STEM will be assessed during the evaluation. Table 2 below describes the evaluation criteria by looking at what criteria will be used, its description and which expected impact is the criteria targeting.

<b>Criteria</b>	<b>Description</b>	<b>Targeted expected impact from Table 1</b>
Activities	What toolkit activities and guidelines were developed and delivered and to whom	1 and 5
Representativeness	How many boys and girls are using and engaging with the toolkits	2 and 4
Geographical coverage	How many countries Hypatia's activities have reached and how effective have they been implemented	3 and 4
Usability, usefulness and effectiveness	How usable are the toolkits and how useful	1, 2 and 3

	and effective have the activities been in reducing the gender gap in STEM	
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**Table 2: Criteria for evaluating targeted expected impact**

**6.1.2.4 Indicators of Success**

During evaluation, it will be necessary to have indicators of success which will show whether Hypatia has reached its impact or not. Using Table 1 which tabulates how Hypatia intends to achieve the expected impacts, the evaluation will endeavour to assess the outcomes of the tabulated potential achievements as indicators of success. Specifically, the evaluation will seek to understand;

- Whether Hypatia’s toolkits have been adopted
- Who has adopted them (boys and girls/research institutions)
- How well the tools have been received by those that have adopted them
- What sort of activities have been developed
- How the activities have been received

Below is Table 3 summarising the evaluation framework.

<b>Expected Impact</b>	<b>Suggested Approaches</b>	<b>Evaluation criteria</b>	<b>Indicator for success</b>
Change in the way science is communicated	<ul style="list-style-type: none"> <li>• Observations</li> <li>• Interviews</li> <li>• Document analysis</li> </ul>	<ul style="list-style-type: none"> <li>• Activities</li> <li>• Representativeness (gender, geographical location)</li> <li>• Quality of information (gender sensitivity, relevance of information to realise gender inclusivity, use of language that is easy to understand so that STEM is not seen to be intimidating or seen to be too technical such that it ‘scares’ away young girls)</li> </ul>	<ul style="list-style-type: none"> <li>• Adoption of toolkit (number of institutions and stakeholders using new tools).</li> <li>• Usefulness of Hypatia’s proposed guidelines (what do the guidelines cover, who was involved in coming up with the guidelines, do guidelines address gender issues and how to overcome them in STEM)</li> </ul>
Increase in the participation and interest of girls in STEM	<ul style="list-style-type: none"> <li>• Observations</li> <li>• Interviews</li> <li>• Document analysis</li> </ul>	<ul style="list-style-type: none"> <li>• Representativeness (gender proportionality)</li> <li>• Openness (What activities are open and inviting to girls to encourage involvement in STEM)</li> </ul>	<ul style="list-style-type: none"> <li>• Degree of involvement (extent to which girls are integrated into STEM processes e.g. Hyaptia’s research activities)</li> <li>• Information accessibility (extent to which girls access appropriate information and materials on STEM)</li> <li>• Inclusion (extent to which girls are included and represented in STEM activities)</li> </ul>
Encouragement in	<ul style="list-style-type: none"> <li>• Interviews</li> </ul>	<ul style="list-style-type: none"> <li>• Participation (who is collaborating, how</li> </ul>	<ul style="list-style-type: none"> <li>• Creation of hubs ( How many hubs have</li> </ul>

sustainable collaboration among schools, science museums, research centres on gender equality and science	<ul style="list-style-type: none"> <li>• Document analysis</li> </ul>	<p>representative is the collaboration, how relevant do collaborating partners feel their participation is and/or appreciated)</p> <ul style="list-style-type: none"> <li>• Resource accessibility (Exchange of information, information accessibility, contribution to required information)</li> <li>• Stakeholder representation)</li> </ul>	<p>been created, where have the hubs have been created and how are they impacting gender inclusivity in STEM, how are the hubs encouraging collaboration)</p>
Contribution towards European Research Area objectives (increase female researchers in Europe)	<ul style="list-style-type: none"> <li>• Interviews</li> </ul>	<ul style="list-style-type: none"> <li>• Representativeness (gender representation)</li> </ul>	<ul style="list-style-type: none"> <li>• Look at Hypatia’s proposed different perspectives on STEM careers (what are the different perspectives, how different are they from traditional perspectives e.g. attitudes to STEM)</li> </ul>
Contribution to the Innovation Union Objectives (better match skills to available jobs)	<ul style="list-style-type: none"> <li>• Interviews</li> </ul>	<ul style="list-style-type: none"> <li>• Accessibility of information with regards to available skills</li> </ul>	<ul style="list-style-type: none"> <li>• Look at Hypatia’s proposed activities that have a gender focus on building STEM skills (what were the activities and how were they directly relevant to gender)</li> </ul>

**Table 3: Evaluation Framework**

## 6.2 Evaluation Approaches in Detail

As touched on in section 6.1.2, this section gives more details of the approaches that have been adopted for the evaluation. As evaluators, we suggest two approaches that can be used easily, efficiently and effectively for evaluating and therefore meeting the expected evaluation outcomes. These two approaches should not be too onerous to implement particularly by partners and third parties who are expected to play a significant role in implementing the evaluation process. The two elected approaches are observations and interviews. As the development and implementation of STEM toolkits is central to this project, particularly in terms of engaging teenagers in STEM, it becomes imperative to observe how teenagers are engaging with STEM activities in addition to how institutional hubs are supporting the toolkit implementation and subsequent adoption.

To get an in-depth understanding of the implementation and adoption of the toolkits, interviewing relevant stakeholders in addition to observations becomes a necessity. As evaluators, we recommend that each third party conducts at least 1 observation at one of the hubs they are hosts at when one of the modules is implemented. In addition to the observations and as a way of complementing and strengthening the observations, an additional set of interviews will be carried out by the third parties. These interviews will be with any of the following stakeholders involved with ensuring that the implementation of the toolkits comes to fruition in their respective institutions: head teachers, teachers, museum coordinators, industry representatives. In this respect, the third parties will choose who they prefer to interview. Further to this set of interviews will be another set of interviews specifically with some of Hypatia's partners and third parties. These will be conducted by the evaluators via Skype.

### 6.2.1 Observations

The suggested observations will be used to assess the usability of toolkits, toolkit user numbers, the effectiveness of the toolkits and the engagement with the toolkit activities. Therefore, the observation will look at the following;

- i) How the toolkits will be used



This will help us to understand the usability of the toolkits. The main aspect that will be looked at here will be understanding whether the toolkits are usable for the intended users and by default, whether the users actually find the toolkits usable. This will indicate whether they are being effective for the purposes for which they are intended.

ii) Who is using the toolkits

This will help us to gauge whether the intended users are actually using the toolkits. For instance, we would like to know whether the selected institutional hubs such as museums and schools are using them and whether by extension, teenage girls are engaging with the toolkits

iii) How often are toolkits used

This will help us develop our knowledge of how often the users use the toolkits since being implemented.

iv) How effective the toolkits are

This will help us assess how effective the toolkits are in encouraging teenagers to engage with STEM activities.

With regards to conducting observations there are different types of observations. One is where the observer is detached from the subject matter being observed while the other is where the observer is more involved in the subject matter being observed. In the detached one, the observer merely looks at activities taking place without any meaningful interaction with the observed. In the other type where the observer is more involved there is meaningful interaction with the observed. This means that the observer will talk to the subject, perhaps be hands on with the activities in an attempt to cultivate more understanding of a situation. In our case, we recommend the latter in that as the third parties conduct the observations, they will also have some level of interaction with the subject being observed.

With the above in mind, we recommend that observations be conducted in the countries being represented by third parties. However, if a country has two representatives, the evaluators will only select one representative to implement the evaluation design. In addition, if there is more than one hub created in a country, we will leave it to the third party implementing the toolkits to decide the most ideal hub to conduct the observations. This is because the third parties will have the relevant knowledge of where the hub will have been created as well as



how easily accessible it will be in their respective country. As evaluators, we would however recommend that third parties make observations in museums. This is because we feel that it would be easier to access participants who come to museums merely because museums are usually more open and do not necessarily need lengthy and protracted accessibility permissions compared to schools for instance. As a re-cap and in addition to the four areas that will need to be observed which are outlined above, third parties are expected to observe the following:

- i) How the toolkits are implemented in relation to the toolkit guidelines: e.g. third parties will look at whether the guidelines were adequate enough for toolkit implementation to be robust
- ii) How teenagers are engaging with modules
- iii) The number of girls and boys engaging with the toolkit activities over a period of time. Preferably this observation should be from the implementation month up to two months following the implementation. So for example, if a third party implements a module in month 23, the recommendation is that there should be an observation period of two months which will end in month 25. During the observation period, partners are expected to make weekly observations of the usability of the toolkit in relation to whether there is an upsurge or dwindling of usage of the toolkit by both girls and boys. This will help us assess whether there are any gender differentials in the uptake of the toolkit and indeed whether the toolkit is proving effective and of interest. The observations will also help us gauge how the toolkits are influencing how science is communicated.

## **6.2.2 Interviews**

There will be two sets of interviews, one during the implementation of the toolkits to support the observations. The other set of interviews will be undertaken in order to understand some aspects of the development process as well as that of implementation.

### ***6.2.2.1 First Set of Interviews***

In order to support the observations, we suggest that the first set of interviews be conducted by 5 out of the 9 third parties with a view to cultivating more in-depth knowledge of how users are engaging with the toolkits. The third parties will conduct interviews with stakeholders from the hubs that they will be observing. As indicated in section 6.2, the third



parties have a choice of stakeholders who might include head teachers, teachers, museum coordinators, industry representatives. In this case, we propose that the first set of interviews by the third parties be from the following countries: Ireland, Austria, UK, Poland and Greece

The expectation is that aside from conducting observations with teenagers, third parties will conduct interviews with the said select stakeholders from the same hubs where the observations will be conducted. The aim of the interviews will be to:

- i. Look at the success or challenges of the toolkits implementation and adoption.
- ii. Assess whether the toolkits are improving how girls view science and other STEM subjects.
- iii. Understand how toolkits are improving the way girls view science, assuming that this will be the case.
- iv. Understand the level of usage by teenage girls and boys.
- v. Evaluate the activities of the hubs for instance by comparing and contrasting the activities of the hubs in order to assess whether certain activities draw more girls and encourage their engagement with STEM.
- vi. Gauge the usefulness of the activities that are implemented within the hubs.
- vii. Gauge the usefulness of the guidelines that will be provided to toolkit users.
- viii. Ascertain the interests of the teenagers by looking at how the activities affect the interests of the teenagers.
- ix. Draw the interviewees into sharing what has been working well within their hubs and what could be improved and how.

#### ***6.2.2.2 Second Set of Interviews***

The second set of interviews will be conducted by the evaluators. These interviews will be conducted with work package leader from MUST (Toolkit development) and a with work package leader from Experimentarium (Toolkit implementation). In addition, we will conduct interviews with the remaining 4 third parties from the following countries: Estonia, Serbia, Spain and Sweden.



The second set of interviews will be during the toolkit development and implementation phases. The aim of this second set of interviews will be to;

- i) Understand the successes and challenges of module development.
- ii) Understand the successes and challenges of the module implementation.
- iii) Assess the chosen module activities in order to understand why they were chosen.
- iv) Consider whether there was any input from teenagers in the toolkit activities and whether such input was taken into consideration.
- v) Gauge how toolkit developers went about engaging the teenagers in toolkit activities.

The aims of both sets of interviews outlined in sections 6.2.2.1 and 6.2.2.2 should be seen as indicative interest areas from which the interview questions will be developed. Therefore, the specific question and observation guidelines will be sent to the respective third parties in month 18. This is because as indicated in section 6.1.1 the toolkit production would have started in month 15 and between this month and the expected start of the implementation in month 23, third parties would have had adequate time to sort out implementation logistics. As such, sending the specific questions at that time will mean that third parties will have enough time to prepare and subsequently implement the implementation process.

### **6.2.3 Translation and Transcription**

Since the observations and interviews will be conducted in different countries, we understand that they may be conducted in the local language of respective countries. Therefore, the expectation is that the third parties will translate the observation and interview results to English so that the evaluators are able to analyse the results and give appropriate feedback and recommendations. In addition, it is expected that all observations and interview data will be transcribed by third parties prior to sending the collected data to the evaluators. To standardise the process, we will send a template that will detail the format of how data should be sent back the evaluators in month 18.

### **6.2.4 Document Analysis specifically through use of Basecamp**

We will use document analysis to gain an understanding of the multiple aspects of the Hypatia project such as background information and progress of the project through looking



at some reports/deliverables that specifically relate to the development and implementation of the toolkits.

### 6.3 Data Analysis

Data analysis will be a mix of qualitative interpretive and quantitative analysis. Responses from questions will be subjected to a thematic data analysis where words and phrases with similar meaning will be grouped together into themes and presented narratively. As part of the analysis we will use Nvivo data analysis software to analyse qualitative data.

### 6.4 Summary of Evaluation Approaches

Approach	Who is doing it	Where	When
Observations	All 9 third parties	In their respective countries	Month 25 - 27
First set of interviews (5 third parties conduct interviews with stakeholders of their choice from the hubs that they will be observing)	Science Gallery	Ireland	Month 25 - 27
	NOESIS	Greece	Month 25 - 27
	ScienceCenter--- Netzwerk (SCN)	Austria	Month 25 - 27
	The UK Association for Science and Discovery Centres (ASDC)	UK	Month 25 - 27
	Experyment	Poland	Month 25 - 27
Second set of interviews (Evaluators conduct	Museo Nazionale della Scienza e	Skype	Month 15



<i>interviews with 2 partners and the remaining 4 third parties)</i>	della Tecnologia (MUST)		
	Experimentarium	Skype	Month 25
	Science Centre AHHA Foundation	Skype	Month 25
	LA CAIXA Foundation	Skype	Month 26
	Center for the Promotion of Science (CPS)	Skype	Month 26
	Teknikens Hus	Skype	Month 26

## 6.5 Ethical Consideration

Considering the nature of the project and what ethical implications could arise, we will expect all parties involved in the evaluation to ensure that the ethical approval form (Appendix 1) has been duly completed prior to any evaluation activities that are part of this evaluation strategy. It is inevitable that the ethical approval process will vary from country to country and may also depend on the institutional context of where the evaluation will be conducted, therefore all parties involved should follow the process that is applicable and feasible for them.

## 7 Activities Timeline

### 7.1 Interim Report in Month 18

- i) Document analysis
  - *Specifically focussing on aspects to do with hub creation, where the hubs will be, number of hubs.*
- ii) Interviews by evaluators with work package leader for MUST in **Month 15**.
  - *This will be during the piloting phase of the development task*
- iii) Send out the observation and interview protocol guidelines in **Month 18**



- *This will give third parties enough time to sort out logistics e.g. who they will interview, where they will observe.*
- iv) Submission of Interim Report in **Month 18**
- *The report will include;*
    - *Findings from document analysis and 1 partner interview*
    - *Observation and interview protocols with detailed guidelines and questions*

## 7.2 Final Report in Month 36

- i) Interviews by evaluators with work package leader for Experimentarium in **Month 25**
- ii) All 9 Third parties begin observations in **Month 25 to 27**
- iii) Third parties conduct Interviews (see selected 5 third parties in section 6.2.2.1 ) between **Month 25 to 27**
- iv) Evaluators conduct interviews with Third parties ( see selected 4 in section 6.2.2.2) between **Month 25 -27**
- v) Third parties send evaluators collected observation and interview data in **Month 29**
- vi) Submission of Final Report in **Month 35**

## 8 Conclusion

This report has covered the evaluation strategy for the Hypatia project. It has described the objectives of the evaluation strategy which has touched two evaluation approaches. This has been in addition to evaluation methodology covering the evaluation design and evaluation guidelines. In addition to this, the report has given a detailed evaluation framework covering such elements expected impact, suggested approaches, evaluation criteria and indicators of success. Finally, the report has given a timeline for the next evaluation activities that are part of the evaluation strategy.

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