Deliverable D1.3

Evaluation report of the Advisory Board

Project acronym:
PERFORM

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Participatory Engagement with Scientific and Technological Research through Performance

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List of acronyms

AB: Advisory Board

CT: Coordination Team

DoA: Description of Action

EC: European Commission

ECR: Early Career Researchers

EUSEA: European Science Events Association

EW: Exploratory Workshops

LAC: Les Atomes Crochus

MAP: MyPerform Ambassador Programme

MoEs: Ministries of Education

MOOC: Massive Open Online Course

NDA: Non-Disclosure Agreement

PERSEIA: PERformance-based Science Education and Innovation Activity

PW: Participatory Workshops

RRI: Responsible Research and Innovation

STEM: Science, Technology, Engineering, Mathematics

TBVT: The Big Van Theory

UAB: Universitat Autònoma de Barcelona

UNESCO: United Nations Education, Scientific and Cultural Organization

UoB: University of Bristol

UOC: Universitat Oberta de Catalunya

WP: Work Package

SUMMARY

This deliverable corresponds to Task 1.3 'Scientific coordination and project monitoring', which aims to ensure a smooth coordination of the project for high quality results and implementation. It is the outcome of the PERFORM project mid-term assessment by the Advisory Board on the basis of the project achieved results and objectives during its first period, from Month 1 to Month 15 (November 2015-January 2017), and represents a necessary input to improving and adapting further development of PERFORM. The document describes the selection and recruitment process of the Advisory Board members, and how the evaluation process was designed and carried out. It also contains the Advisory Board overall evaluation and recommendations, as well as initial reflections from work package leaders on the aforementioned recommendations and further actions to be taken. Overall, the project has received very positive feedback from its Advisory Board, both in terms of improvement suggestions within the current possibilities of the project according to the DoA, and in relation to the extension of its impact through future work. Also, the Advisory Board has found work package leaders' reactions to its recommendations wholly adequate.

1. INTRODUCTION

The Advisory Board (AB) is an interdisciplinary and intersectional panel acting as an external and independent reviewer of the project. AB members of PERFORM are five independent experts on key issues underlying the conceptual and practical development of PERFORM: Responsible Research and Innovation (RRI); science, technology, engineering and mathematics (STEM) and performing arts; science learning and engagement; science programmes management; and science communication (see members list below). Members of the AB are in charge of evaluating PERFORM's progress based on the mid-term periodic technical report and the analysis of the main project outputs for its first period (November 2015 to January 2017; Month 1 to Month 15). This report is the outcome of this evaluation.

The recruitment of the PERFORM AB began at the very start of the project, coordinated by the Universitat Oberta de Catalunya (UOC). Following the AB members' profiles stated in the DoA, the Coordination Team (CT) at UOC and work package (WP) leaders (TBVT, UoB, UAB, UNESCO, EUSEA) identified potential candidates during the first and second Steering Committee meetings in November 2015 (Month 1) and April 2016 (Month 6), respectively. These profiles included science education and communication researchers, STEM education entrepreneurs, members of education agencies and experts on RRI and science education, among others. Out of these discussions, the UOC CT elaborated the AB members list according to the required expertise for the project and the available budget (see their bios at the [PERFORM Advisory Board](#) webpage):

- Roger Strand, chairman EC expert group on RRI indicators (University of Bergen, Norway).

- Daniel Erice, entrepreneur in STEM and performing arts (*Alioth Arte y Ciencia*, Spain),

- Emily Dawson, expert on science learning and engagement, science education research (University College London, UK),

- Àgueda Gras, science programme manager and expert at European level (European Schoolnet, Belgium), and

- Frank Burnet, science communication expert and artist (University of West England, UK).

AB candidates were formally contacted in April and May 2016 (Months 6 and 7), and once accepted they were asked to sign a non-disclosure agreement (NDA). All five members signed the NDA, agreements which were collected by the end of 2016.

In2017, and in parallel to the evaluation that is described in the following section, some WP leaders contacted members of the AB with specific expertise on the actions they were developing in order to ask for advice and guidance. At times, it was possible for AB members to attend the activities (e.g., Daniel Erice attended one of WP2 participatory workshops in Spain and UK).

2. REVIEW PROCESS

During the fourth Steering Committee meeting in April 2017 (Month 18) it was agreed that WP leaders would suggest two AB members to evaluate their work. As for the specific outputs in need of review, all AB members were asked to assess the progress of their assigned WP based on the **interim technical report** (first period: Months 1 to 15), as well as other specific documents (see table 1).

Table1. Summary of the reviewed outputs for each WP and AB member.

	Roger Strand	Daniel Erice	Emily Dawson	Àgueda Gras	Frank Burnet	WP Docs
WP1	√					Milestone3
WP2		√		√		D2.1
WP3			√		√	WP3 extended report
WP4	√		√			D4.1 Submitted paper
WP5+6				√	√	D5.1 PERSEIAs[1] videos

Within each WP, specific issues were suggested by WP leaders and the CT for AB members to consider:

WP1'Project coordination and management'

     ✓ **Milestone 3 'Mid-term internal evaluation'**

Specific issues to address:

- RRI self-reflection: Any RRI issue(s) to include for the on-going monitoring of the inclusion of the RRI process requirements within our project?

WP2 'Innovative science education methods based on performing arts'

[1]PERSEIA: performance-based science education and innovation activity.

- ✓ **D2.1 'Final protocol of tested methods to transform a performance-based activity into a PERSEIA'**

Specific issues to address:

- Impact evaluation of PERSEIAs: are there other indicators that we should take into account when evaluating the pedagogical impact of PERSEIAs on students?

- Scalability: are there specifications we should take into account when exporting participative methods to other European schools, beyond Spain, UK and France?

- Implementation in museums: any advice on how to implement PERSEIAs in museums?

WP3'Building science education and communication capacity for teachers and early career researchers'

- ✓ **WP3 extended report**

Specific issues to address:

- Any advice on tailoring performance based workshops/training/interventions to the needs of teachers, schools and curriculum

- Feedback and input for mechanisms fostering appetite for engagement in teachers and researchers – specifically in relation to increasing their recruitment for schools workshops and trainings, but also more generally

- Any advice on improving the contents of the researchers' trainings from the RRI perspective?

- Input and advice on the content of useful toolkits – what will actually be used and what format would work best? Given that the aim of the toolkits is to share knowledge beyond the project community, are there any other ways we can look at it, or excellent examples they are aware of that they could share?

- Expansion of trainings beyond project boundaries - how to extend the reach of the trainings to other institutions and embedding in university contexts
- Trainings good practices - any examples of excellent and well attended teachers' trainings to share?

WP4 'Impact assessment of the participatory educational process in students' engagement in and learning about science'

- ✓ **D4.1 'Research report: Methodological aspects of science education assessment'**
- ✓ **Paper submitted to the International Journal of Science Education**

Specific issues to address:

- Translation of RRI to a science education framework: Any comments or thoughts about the identification of RRI values, learning outcomes and process requirements made. Insights from other experiences? Any approach(es) to the assessment of RRI in science education that may be useful to our framework?
- Any comments or thoughts about our methodological approach in the assessment of inclusiveness and engagement during the participatory educational process?
- Any suggestions for how to approach gender critically beyond how it has already been addressed?
- Any comments or thoughts about our approach in the assessment of transversal competences? Suggestions?

WP5 'Sustainability and Policy Impact'

- ✓ **D5.1 'Sustainability plan'**

WP6 'Dissemination and Outreach'

- ✓ **6 PERSEIAs videos**

For both WP5 and WP6, specific issues to address were:

- Project sustainability: Suggestions for fostering teachers' engagement in order to guarantee the sustainability of the project?
- Project sustainability: Comments about the adaptability of 'myPERFORM' as a way to ensure the longevity of PERFORM?
- Results exploitation: Recommendations for promoting the dissemination and exploitation of the resulting PERSEIAs (e.g., scientific monologues, science busking, clown based on improvisational theatre) among researchers, teachers and other interested in science communication?
- Research process dissemination: Advice on how to communicate the research process together with the research results?

On the basis of the above-listed documents and suggested issues to focus on, the AB members provided their feedback according to a planned timing strategy. The above-described inputs and specific questions were provided to each AB member in June 2017, requesting their feedback in mid-July. On the basis of this feedback and the WP leaders reactions to it (see section 4) the UOC CT sent back the report to the AB in early September 2017. A skype meeting was held between the UOC CT and the AB in late September 2017 for the final check of the report.

The AB feedback to the mid-term progress of the project is presented in the following section.

3. OVERALL EVALUATION AND RECOMMENDATIONS

In this section we present the main recommendations of the AB organized by WP.

3.1. WP1 'Project coordination and management'

Overall evaluation: RRI inclusion within PERFORM

PERFORM has developed an admirable and exemplary approach to the integration of RRI in its own research and development practices. To an extent few other European projects can claim to live up to, PERFORM has formulated and implemented an extensive set of internal principles and guidelines for to implement and enact RRI, thus taking seriously the main message of RRI itself, namely the call for responsibility and reflexivity.

Suggestions for enhancing RRI self-reflection within PERFORM (Task 1.3)

- To address more explicitly substantive RRI aspects in addition to the more procedural ones, particularly with regard to the politics and the political economy of science; e.g., self-reflection exercises such as "What is the exact purpose of the project activities in which you are involved?" "From the perspective of which social actors might this purpose be seen as good/bad/ambiguous?" "Which social and individual agencies are promoted, and which are repressed, by these activities?" "Which values are promoted by the content of these activities?", among others.

3.2. WP2 'Innovative science education methods based on performing arts'

Overall evaluation: conducted activities and resulting deliverable

The work done and the quality of the deliverable is considerably high, and the content is very interesting. This deliverable, in particular, is an excellent example of content and writing style.

PERFORM uses a powerful tool, theatre, and can benefit most. For the next activities to be done at schools, the project would benefit by inviting an expert on theatre pedagogy in order to provide a global pedagogical vision to all case-study-related activities in the formal education context. The team of science communicators working at schools would also benefit from including theatre professionals with a scientific background. In this line, it would be very interesting to broaden the vision towards a STEAM framework by reflecting beyond what arts can offer to science but also what science can offer to performing arts in the design and implementation of activities at schools.

Recommendations to improve further work resulting from D2.1 'Final protocol of tested methods to transform a performance-based activity into a PERSEIA' (Task 2.1)

Suggestions for improving the methodology of the exploratory workshops (EW):

- To use other techniques beyond role playing, which while being very useful can make ideas generated by the activity to be superficial and poorly meditated: eliminating discourse (working with elements such as costumes, scenography, mimics, etc.), physical mapping of the group (expressing an opinion by placing oneself in the space), image theatre, structured improvisation, and/or creation theatre. These more creative techniques allow deeper concepts to arise, making the discussion much richer. However, it is important to mention that role playing and other improvisation-based techniques require previous training of participants which is not possible due to current time constraints.
- Related to this, to use non-verbal communication techniques (e.g. proxemics) during EW, which allow 'hidden' answers to arise, and to make better use of

the physical space where workshops take place in order to use the body (actions) more than language (discourse). Indeed, if students lack linguistics skills discussions will not go beyond superficial arguments, and most probably stereotypes.

- EW1: To encourage more students to use more their bodies and less their minds so as more information could be gathered from them (as argued by Stanislavski) and they could improve other expression skills than oral communication ones.

- EW2: To take care of the "focus" concept since putting the students under an intensive focus (i.e. performing a role in front of the group) without a previous training on performing arts can be blocking for many, and opinions of those more extrovert may prevail.

- EW3: To open-up the list of "innovations" of the activity to students' ideas, and to visualise and discuss some ethical deviations from the history of science.

- EW4: To contextualise the workshop in students' daily life as a way of engaging them in discussions. At this moment, contents are far away of students' reality.

- EW5: In the Spanish case study, to go deeper in the discussion about the duality '*ciencias y letras*' and to foster a more constructive dialogue on students' potential fears and concerns about STEM studies.

- EW6: To make discussions and conclusions less mediated by the project team, and to allow deep ideas to arise and to trace the origins of these ideas. To include a gender expert in the team so that gender transversally impregnates all the workshops and other WP2 activities.

Suggestions for improving the design of the PERSEIAs in D2.1:

- To prioritise recommendations included in the D2.1 for each type of PERSEIA (monologue, clown and busking) according to their own characteristics as performing arts. WP2 coordinator should work with case study coordinators

in order to identify which recommendations work better for each type of PERSEIA.

- To complement recommendations resulting from the EW with artistic recommendations (e.g., dramaturgic structures, importance of rhythm, etc.), as the objective public of the recommendations to design a PERSEIA (i.e. secondary school teachers) in principle has no knowledge about performing tools/theatre techniques.

- To define the space where the PERSEIA is represented, and its characteristics. Performers need to be aware of it because participants' perception of the activity can be considerably modified if one of these factors is changed. In this sense, comparing data obtained in performances with very different numbers of attendees is questionable when assessing deeper aspects of participants' perceptions and learning.

Suggestions on the D2.1 final protocol:

- As a general comment, and following the previous recommendations, it would be interesting to adapt the protocol to a teachers' audience, who although may have little to no theatre experience, still want to create a PERSEIA from scratch. (This suggestion is triggered by the question on whether a teacher who is already using his/her own innovative performance-based methodology will be motivated to adapt it to a PERSEIA.) This would also increase the impact (i.e. enlarge the target audience) of the method.

- To address this deliverable not only to ECRs and teachers, but also to theatre professionals with no scientific background.

- To provide a STEM definition in the deliverable.

Comments and suggestions for the scalability of EW and resulting PERSEIAs:

- Exporting these EW to other education centres requires identifying the administrations responsible for education and teachers training in the different countries. It is important that such administrations acknowledge

these activities as a formative itinerary for teachers. Training credits should be assigned to the itinerary, which are valid for competitive public examinations or for the improvement of teachers' economic conditions.

▪ For an innovative activity to be extended actions must be initiated in a double direction: establishing a solid basis of education centres and teachers requiring the project (i.e. creating a need), and pressing the administration to perceive such need and implement it at a global level.

▪ In Spain there are several ongoing programmes which can be good PERFORM allies: CaixaEscena, Educación Responsable o Escuelas Creativas. In other countries institutions with innovative education methods activities need to be identified that can boost PERFORM implementation.

▪ In terms of exporting these activities beyond the countries already involved in PERFORM we should have at least one good example in English for the three PERSEIA activities.

▪ To create an online course for teachers on the PERSEIAs creation process described in D2.1 (e.g. submit a KA2[2] project to create a MOOC).

▪ To attend the 3rd Scientix conference to present the PERSEIAs and D2.1 protocol, which will address pre-serving teacher service.

▪ To consider the creation of a PERFORM teacher ambassador (teachers trained within PERFORM acting as secondary trainers) as a peer-to-peer dissemination instrument, which is always more effective.

Recommendations for the Participatory Workshops (Task 2.2)

• To increase the use of body language techniques to promote certain skills amongst students and foster their learning of scientific issues. Also, conducting experiments *in situ* with students - can help in the process.

• To start with the first workshop from the "chaos" (brainstorming) to end up with a more guided process led by science communicators.

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[2] EC Education, Audiovisual and Culture Executive Agency (EACEA) Key Action 2: Cooperation for innovation and exchange of good practices.

- To introduce the artistic aspects of the PERSEIAs since the beginning of the workshops (e.g., first workshop).
- Even though the learning process is the most relevant outcome, to give more attention to the final product of the learning process, which is the PERSEIA to be performed by the students, so as the students felt empowered to perform it.
- To increase the number of hours of work during workshops, specifically those for the rehearsal of the PERSEIAs.

Recommendations for the implementation of PERSEIAs in museums (Task 2.3)

- The main difficulty for this natural step in project development is that museums already have their own previously-designed activities. Two strategies are suggested: i) to propose PERFORM as an external activity, and ii) to include a museum as partner in the PERFORM consortium.
- In the external programming scenario, different ideas are suggested (all activities should be short): PERSEIAS as scientific theatre activities; a cycle of students' PERSEIAs, even a contest; PERFORM participating in events such as "museums' night", "researchers' night", "the night of..."; PERSEIAs workshops in urban summer camps.
- If part of the museum's own activities design, some ideas are provided: PERSEIAs express workshop (a session for students groups to create a PERSEIA); 'PERFORM travelling suitcase' (with guidelines and material for a teacher to take it to his/her school); training workshops for museum's workers; a theatrical guided tour.
- It is recommended to go beyond science museums and explore the possibility of implementing the PERFORM project in other types of museums. Also, it might be interesting to think beyond museums (e.g. science centres, art galleries, botanic gardens, zoos, aquaria) and even non-fixed sites (e.g. festivals).

Other comments related to the evaluation of the impact of PERSEIAs in D2.1 to an audience of students

- When assessing the performance-style of PERSEIAs, consider integrating Kahoot or other response systems in order for the audience of students to comment without having to say out loud what they did not like.

- A question could be added in the post-PERSEIA survey asking "do you think you will remember this experience in 1, 5, 10, 15 years from now?" The survey could be passed on again "x" time later to students adding questions on what they remember of the performed PERSEIA.

- Evaluating the PERSEIA just after its performance may lead to transitory and non-lasting results, so the questionnaire should be conducted some time later.

- This study in time could be contrasted with the same study with a control group of students who have not worked on RRI through a PERSEIA.

- The final question to evaluate is not if the PERSEIA has an impact on youngsters' conceptions of STEM disciplines, but rather if the PERSEIA is the best way to influence such conceptions compared to traditional teaching techniques.

- The questionnaire could be complemented with reflection some time before and after the performance by using theatre techniques suggested for the EW. It could be also complemented by gathering teacher's views on the changes they have perceived in the group and in individual cases after the performance.

- A differentiation must be established between those indicators assessing the capacity to transmit RRI/science concepts through theatre; the suitability of having chosen a specific type of PERSEIA and not another; and the abilities of actors as performers.

- Purely artistic indicators could be included to evaluate the quality of the show itself (e.g. number of laughs per minute, applause duration, direct observation of public reactions during representation, etc.)

- It would be interesting to test the methodology with non-captive teenage public in non-scholar contexts. The attitude with which the audience faces a questionnaire is very particular for a captive public in school context during school time.

3.3. WP3 'Building science education and communication capacity for teachers and early career researchers'

Overall evaluation of conducted training activities

The co-development approach is best practice and leads to more useful resources for everyone involved. The report suggests PERFORM is already working with local teachers at each site, which is brilliant. PERFORM has clearly been building solid relationships with the teachers and students. At the local level, the project could further encourage drama teachers' involvement. Also, further engagement can be triggered by the attractive of the international dimension of the project.

Recommendations to improve ECRs' training (Task 3.2)

Suggestions to improve the contents of the researchers' trainings (RRI perspective):

- Be wary of the conflation of 'impact' with RRI at times in some of the ECR training. Where possible, move towards participatory forms of learning rather than lecture style, plenary sessions, especially in a project trying to train researchers and teachers in innovative teaching and learning methods. Given the feedback from ECRs, try to find opportunities for them to develop a safe space to practice and hone their performance skills where possible in the training.
- Given the fact that ECRs who are engaging with PERFORM are attracted by the opportunity to learn new ways of communicating science, contents such as the history and the philosophy of science seem to have a disproportionately large presence in the content of the sessions. Thus, the role of such content needs to

be justified and centralized in the training, or reduced in line with what participants expected/found appealing (especially where participant recruitment could have been higher).

▪ To play to PERFORM's uniqueness in the minds of this target audience and work to create ways in which an equal partnership in terms of performance exists in the classroom between teachers and researchers, rather than assigned and different roles.

Suggestions to foster engagement in ECR:

▪ To clearly state what do ECRs 'get' out of the project (as public engagement/science communication is mostly done by them (rather than established academics) but does not necessarily help in their career mobility, nor is rewarded by their institutions).

▪ To influence ECRs managers/institutions in any way to get more institutional support for their involvement in the project.

Suggestions on the content of useful toolkits:

▪ More than toolkits, the most effective way of sharing the knowledge the project generates is usually by creating an experience that invites participation and idea-sharing. Famelab is an example: while it does not produce toolkits in a formal sense, each country hosting the competition offers a free residential two-day science communication workshop as a prize to all the ECRs who reach the national final.

Recommendations for improving teachers' training (Task 3.3)

Suggestions for tailoring performance based activities to needs of teachers, schools and curriculum:

▪ The offer needs to help build a CV that will catch the attention of their seniors and colleagues.

- Be careful about selling 'arts' to teachers as a way to 'sell' science to students. Performance-based approaches to science education, as well as art-science collaborations in general, poses the risk of using the arts to 'sugar coat' science, as though to make the science education 'pill' easier for students to swallow. This is also often the way such trainings or projects is sold to schools and teachers echo the discourse too.

- PERFORM is well placed to build on emotions, narrative, affective and cognitive dimensions of learning which is an important approach to explicitly develop both in terms of how to explain PERFORM to teachers and in conducting the project. Such approach is not only a useful way to explain the value of performing arts to participants, but also to contribute to the above-mentioned risk of 'sugar coating' science.

- The activities must be clearly curriculum-linked or teachers will not consider it.

- To build good, long-term trusting relationships with the teachers, students and school management, such that if or when teachers move to a different school the project carries on (which is a major risk for such projects).

- To include primary school teachers in the next phase of the project. This suggestion is triggered by the experience in UK and Italy, where the science curriculum is less rigid in primary schools, allowing teachers to embrace novel pedagogic strategies if they wish, but much less so at the secondary level, particularly in terms of open ended experimentation and discussion.

- To check the materials of 'Meet the Gene Machine', targeted at 16-19 years old, with which the Science Communication Unit at University of West England pioneered in the area of drama triggered discussion: http://www1.uwe.ac.uk/research/sciencecommunicationunit/projecthighlights/meetthegenemachine.aspx

  An example of a similar approach to targeting primary school children and their families is 'Robot Thought' which was also devised by the SCU at UWE.

Suggestions to foster engagement in teachers:

- In the UK, to consider partnering with the national STEM learning centre in York, and/or the Association of Science Education (ASE), which can be helpful in terms of recruitment of teachers.
- Encouraging STEM teachers to involve the drama teacher in project activities, including training.
- To consider using some of the networking budget of the project to fund exchanges of key teachers between participating countries. Also consider their featuring in a show case wrap up event.

Suggestion for the expansion of teachers' trainings beyond project boundaries:

- To look at the work of Paul McRory (http://learn-differently.com/about-us/who-we-are), who has done a lot of practice and research about the use of performance and has some excellent toolkits' already.
- To design short, one-day face-to-face training sessions that are co-led with teachers, paying pay them to assist and covering their teaching time by paying the school too. Indeed, the more that are co-led with teachers, the more useful the work will seem to other teachers (and the same may be true for ECRs).

<u>Suggestions for ECR's and teachers' trainings good practices</u>

- The co-development approach is the best practice and leads to more useful resources for everyone involved. If possible, consider paying some of the teachers/ECRs as co-researchers, or finding other non-tokenistic mechanisms to get them on board.
- Suggestions for good practices would be: an element of recognition or reward for the participants (teachers and ECR), a sense of jumping aboard a "vehicle" which already has some momentum, a follow up mentoring activity.

3.4. WP4 'Impact assessment of the participatory educational process in students' engagement in and learning about science'

<u>Overall evaluation of conducted activities and resulting deliverables</u>

PERFORM has produced impressive results with respect to the methodological aspects of science education assessment, both with respect to quality and quantity. A comprehensive set of indicators for studying and evaluating science education has been produced, including a wide array of indicators as seen from the perspective of RRI. In this way, PERFORM has provided a real and valuable contribution to science education as an issue of RRI, far beyond the relatively trite understandings that have dominated the European scene so far. PERFORM has been able to develop in practical terms the crucial insight that to the extent that science education ought to be seen as an RRI issue, it is all about how it is done and which scientific content and values that are to be the object of education. As judged from the documentation, procedural aspects are handled and covered in a highly competent way.

The project makes a good case for a participatory action research process. However, a self-reflection on the actual development of such approach is suggested.

The lack of emphasis on gender in the reviewing is a significant finding.

<u>Suggestions for enhancing the translation of RRI to a science education framework (Task 4.1)</u>

▪ To put slightly more attention to science-value issues that are somewhat underdeveloped in the assessment framework. Science education has tended to reproduce certain myths about science as a value-free truth machine. It has not only done too little (simply imprinting scientific facts into young people) but also too much, in the sense of destroying and replacing sensitivities to the social and political character of research and innovation with implicitly

positivist understandings of the non-social and non-political character of science. RRI in science education would need to address this problem, and this is a matter of substance and content that goes beyond mere procedural aspects of openness and inclusion in the educational activities themselves.

- To reflect upon whether PERFORM 'really' develops as participatory action research or not at all. As for much of the work on public engagement, the use of terms that have emancipatory, transformative and empowering roots can, in practice, make very little change. For instance, do participating students 'really' have the opportunity to make changes to the project? Will students be able to change 'attitudes towards science'? Their own? Other people? In other words, how much do we really mean RRI when we do this work? How much change is possible? How might it be supported and how may it be limited?

- DBIR practices (developed by Bill Penuel) might be helpful in providing ways forward in developing an RRI approach to science education. (Designed-Based Implementation Research sets out a very specific method of feedback and development in cycles that involve all stakeholders, usually students, teachers and researchers).

Comments on PERFORM methodological approach in the assessment of inclusiveness and engagement during the participatory educational process (Task 4.1)

- (For the paper) To specify how are the specific 'bits' of RRI operationalized as understood in assessment. To clarify the findings discussion. To better explain and justify the use of statistical tests.

- (For the paper and the report) There is a risk in making RRI a 'fashionable' concept, and encounter the problem of teachers fearing time spent on anything other than drilling scientific 'facts' into students. Thus both the paper and the report need to engage more with the policy context at the national level. Without influencing national level education policies, it will be hard to make a difference to students, teachers, schools, etc.

Suggestions for the assessment of transversal competences (Task 4.3)

▪ Some clarifications are needed to understand the term, in particular when knowing that broadening out beyond 'facts' is hard for teachers to engage with because they are in a system that significantly constrains them: does 'transversal competences' mean 'skills' that can be used within and beyond science learning contexts? Does it mean something else entirely? Is there another term that already exists that could be used instead (for risk of being very jargon heavy)? How much of this is specific to science education, and what would it look like if it wasn't? (e.g. what, for instance, would it mean if applied to a different subject, such as Geography or Literature?)

Suggestions to approach gender critically from the assessment beyond how PERFORM addresses it (Task 4.4)

▪ To spell out why it is important to foreground gender. Indeed, the project's work could be strengthened by including a more explicit focus on why gender is an issue and what addressing it could do.

▪ To adopt an intersectional feminist approach, exploring the relations between gender and other social positions/structural disadvantages, not the least being class and 'race'/ethnicity. Indeed, across feminist science education and feminist science studies, intersectional approaches are amongst the most critical and most fruitful (see Gender & Education and Cultural Studies of Science Education for excellent papers on the subject).

3.5. WP5 'Sustainability and Policy Impact' and WP6 'Dissemination and Outreach'

Overall evaluation of conducted activities

The work done and the quality of the deliverable is considerably high, and the content very interesting. It is an excellent example of content and writing style.

Videos are also nice.

Suggestions for sustainability - fostering teachers' engagement (Tasks 5.1 and 5.2)

- To incorporate the EC KA2 – Strategic Partnerships as an excellent way of getting supporting funding for some complementary activities. More information on the 2017 ones to have an idea for 2018: https://eacea.ec.europa.eu/erasmus-plus/actions/key-action-2-cooperation-for-innovation-and-exchange-good-practices_en

- To have a two-page flyer with basic information for MoEs (Ministries of Education) on what the project is about and what it offers.

- To organize a discussion with Scientix for the inclusion of PERFORM in a Science Projects Workshop in the Future Classroom Lab, where PERFORM can present to 40+ international teachers and run workshops with 10 – 15 teachers (Scientix will be organizing 4 – 5 between October 2017 and June 2018).

Suggestions to improve the 6 PERSEIAs videos (Task 6.1)

- To improve the audio quality.
- To add English subtitles for non-English videos (e.g. French).
- To create a PERFORM video with good examples of the 3 types of PERSEIAs (monologues, clown, busking).

Suggestions for results exploitation (Task 5.2, Task 6.2)

- To transfer ownership from the originators to the adopters. This is a key factor in creating initiatives that are infectious in the sense that they are adopted by practitioners such as teachers from outside the devising group.

- This transfer needs to include the adopters being explicitly invited to put their own stamp on the final product of their work.

- For this to happen "toolkits" must not be recipe books, but rather starting points for the adopters own unique creative journeys. This will be particularly important in the context of worldwide dissemination through myPerform agreements. The most effective way of triggering this process is face to face encounters facilitated either live, via skype or its equivalents.
- Lessons might be learnt from the work of other nations (e.g. India, where scientists have been trained as performers for many years both in the sphere of puppetry and live drama).

Suggestions for disseminating the research process and results (Task 6.2)

- To get inspiration from the example of "Day in the life" contributions, designed to trigger discussion about scientific research and society.
- To get inspiration from the example of the US based Science Fair initiative, which challenges school students to conduct and report on experiments that test the validity of interpretation of everyday experiences.

4. ADDRESSING THE RECOMMENDATIONS

In early September 2017, the UOC CT forwarded the AB members suggestions and recommendations to the WP leaders, and asked them to provide a general explanation for how these could be addressed within the activities of their corresponding WP during the second period, if feasible according to the DoA. In this section, we present the aforementioned proposals and reflections.

All WP leaders highly appreciate AB members taking the time to provide feedback on their work and reports, providingconcrete recommendations to frame the redevelopment work they are engaged in. Indeed, this evaluation process represents an opportunity to further and critically reflect about some relevant aspects of PERFORMresearch.

4.1. WP1 'Project coordination and management'

(Addressed by Isabel Ruiz-Mallén, UOC)

Regarding the recommendation for enhancing RRI self-reflection within PERFORM, we find it very helpful for improving our efforts to integrate RRI in our research practice. We will address it by including a self-reflection exercise in the next Steering Committee to be held in November 2017. WP leaders will be invited to answer and discuss some of the suggested questions on the purpose of the project activities, actors represented and their perspectives on this purpose so as to collectively reflect on the politics of our research.

4.2. WP2 'Innovative science education methods based on performing arts'

(Addressed by Sergio Villanueva, Oriol Marimon and Helena González, TBVT)

Regarding the recommendations to improve further work resulting from D2.1 'Final protocol of tested methods to transform a performance-based activity into a PERSEIA', we appreciate all AB feedback. In the future Exploratory Workshops (EW) protocols, as well as in the Participatory Workshops (PW) in Task2.2, we will incorporate proxemics perspective, describing better spaces and space uses, as well as many more dramaturgic techniques. For instance, we will incorporate role playing techniques in the new PW on Gender, which will also serve to re-elaborate the corresponding EW. Following this insight, we are planning to introduce improvisation techniques to some of the PWs in which the ECR will also be involved.

Regarding the recommendations for the Participatory Workshops, we also appreciate AB suggestions on how to better introduce ECRs and teachers in our activities. For doing so, we will develop specific activities for them to know better each other and foster their collaboration through performing techniques such us

role playing. In this sense, we really appreciate AB suggestion on developing a teachers' training course online. We will explore with WP3 leader to apply for a KA2 project within the Erasmus+ programme. In addition, we will get in contact with the Spanish programmes suggested in order to share knowledge and explore possible linkages in our activities. We have also collected PERSEIAs videos from each case study in order to build a repository of videos that we can share with other programmes and related institutions.

Finally**, regarding the recommendations for the implementation of PERSEIAs in museums,** we are very thankful for AB recommendations, as this activity is already under development. We will explore with some Spanish museums the possibility of performing a theatre contest with scientific content among Spanish students, and to participate in events such as the museums' night or the researchers' night with activities that link young students with ECR in informal education environments.

4.3. WP3 'Building science education and communication capacity for teachers and early career researchers'

(Addressed by Vivienne Kuh and Mireia Bes, UoB)

Regarding the recommendations to improve ECRs' training, in the reflection on and redevelopment of both participatory workshops (WP2) and ECR training (WP3), we have brought the training in Spain more in line with that in the UK and France, by increasing the participation and limiting the taught element. As the work of WP2 and WP3 is now better integrated and form a more coherent package, ECRs will gain far more performance/communication experience in all three case studies. We are working to more clearly articulate to ECRs the benefits to them of participating in the project, and will be encouraging them to reflect on the ways in which they can frame this as a valuable addition to their skill set in the context of RRI and challenge driven science. We have been inspired by the PEST (**P**erformer**E**cr**S**tudent**T**eacher) alliance concept designed by L'Atelier de Jours À

Venir, and the practical aspects of the ECR training will prepare our ECRs to work with teachers and performers to create a co-creative and participatory environment in schools.

Regarding the recommendations to improve teachers' training, we appreciate the feedback, as much of this work is still in the design phase. We take very seriously the risk of using performance to "sell" science to young people. We are very inspired by the work of Paul McRory, and the concept of emotional engagement. This approach has been influential in the development of the performance-based teacher training in the UK, and will be shared with partners in France and Spain. We have taken efforts to engage teachers in a reflective process about the training we have provided in phase 1, and their feedback will influence the development of phase 2. In Bristol we made the teachers honorary fellows of the university in order to bring them more formally in to collaborate on the project as co-researchers and to reward their involvement in a way that will hopefully enhance their CV. In Spain, our training is formally accredited by the Institute of Education at UAB. We are interested in the idea of training to be co-led by teachers and can see the benefits in the engagement of other teachers – this is certainly something we will be looking in to for the second phase of training.

Regarding the suggestions on the content of useful toolkits, we are conscious of the need to involve teachers in the specification of resources for them, we are using the opportunity of training workshops, specific sessions at conferences aimed at science educators (such as ASE), and contacts in school consortia in the UK to seek their input. Similarly with ECRs, as part of the reflexive process of training we have sought their input and collaboration with developing resources to share the work we have done on the project. In all case studies, the use of the cohort model and close mentoring has led the researchers to be happily engaged, willing and excited to contribute to the development of future training and resources. We are particularly inspired by the suggestion that we look for ways to "create an experience that invites participation and idea sharing". Whilst we do not have the

resources within this project to arrange face-to-face activity in place of toolkits, we are looking in to using video to prompt reflection on particular aspects we have covered in our training in teachers and ECRs. For example, we will ask experts who have presented a talk as part of our training to make a 5 minutes video talking about the content of their talk, which ends on a question. Supplementary documentation will then explain how to use the videos in making a reflexive journey to explore the issues around RRI and science education. This format, we hope, will also address the issue of time in the use of resources by teachers – they will be bite sized and can be used as and when time allows.We will look in to opportunities for fostering cross-country collaboration with our colleagues in WP5 – sustainability.

4.4. WP4 'Impact assessment of the participatory educational process in students' engagement in and learning about science'

Regarding the suggestions for enhancing the translation of RRI to a science education assessment framework, we will work on redesigning and refining the assessment methodology in the next months. In this sense, the assessment framework was conceived as an evolving framework intended to improve through empirical experience and the reflections generated during the first implementation round. Such redesign will pay more attention to the exploration of the RRI values embedded in PERFORM's scientific content shared with students a core and challenging aspect of the project. Acknowledging that the current operationalization of indicators has prioritized procedural aspects over content ones, we further reflect on and identify assessment indicators related to science values (e.g. indicators associated to the criteria, *Understanding of the nature of science (NOS), Connecting scientific topics with values*), and will test them through implementation in the second round. Such a work will be intimately connected to WP2 re-development of the scientific contents approached through the Participatory Workshops activities. Furthermore, through such redesign, we also expect to

emphasize the weight of formative evaluation in the implementation of the assessment, which we consider of enormous potential both for the participatory process and the operationalization of RRI values within science education. We are currently discussing with WP2 leader adeeper integration of formative evaluation in the PWs. Formative evaluation would enhance the opportunities of students' participation in the project by better incorporatingtheir feedback throughout the learning process and by making them part of self-reflective cycles about their scientific learning process and engagement with RRI values –similarly to Penuel's DBIR practices.

Regarding the suggestions for the assessment of transversal competences, a clarification of the term "transversal competence" will be provided in order to avoid the confusion suggested by the term (adopted by the EC) and its relation to other terms already used in science education (e.g. skills). Furthermore and as an insight of the first conducted assessment, we will further tailor the three categories of skills identified to the pedagogical approach of PERFORM and the skills put in practice by students.

Regarding the suggestions to approach gender critically in the assessment beyond how is addressed by PERFORM, as part of the assessment redesign we would like to enrich and further expand our analysis framework in relation to gender. **Adopting an intersectional feminist approach** is an excellent suggestion that we will incorporate in our assessment strategy. Our assessment tools and school selection criteria already identify several aspects (i.e. socio-economic level) that could be further connected to gender within our analysis, in addition to other intersectional data. We are eager to explore the literature recommended on feminist science studies to further identify other aspects currently missing that can be relevant to our gendered analysis in PERFORM. Such a gendered approach to the assessment could, indeed, also contribute to enrich PERFORM's global approach to gender and emphasize the relevance of this dimension in the exploration of new methodologies enhancing students' engagement with science and scientific careers.

Finally, **regarding the general suggestion to engage more with the policy context at the national level,** this is indeed a crucial aspect that should be reflected upon while generally framing the implementation of RRI in science education and while specifically assessing concrete science education activities and their potentialities and limitations. Related to this, WP4 in coordination with WP leaders will produce in Month 36 a deliverable in the form of a policy brief. This policy brief, provisory entitled "*Effective science and arts-based education approach*" will critically contextualize the assessment of the project within European and national science education policies.

4.5. WP5 'Sustainability and Policy Impact' and WP6 'Dissemination and Outreach'

(Addressed by Alex da Silva and Casimiro Vizzini UNESCO, and Leonardo Alfonsi, EUSEA)

Regarding suggestionsfor sustainability-fostering teachers' engagement:

- By creating and launching my PERFORM, as a direct continuation of the PERFORM project, UNESCO as WP5 leader, with a) the established PERFORM consortium, and b) selected partners and donors are working together to:

  (i) Expand the established PERFORM concept to other regions worldwide.

    - "myPERFORM" will first be piloted in selected regions, with the ultimate aim to achieve its global implementation to foster science education worldwide and actively promote young individuals' entry into STEM-related career fields.

    - "myPERFORM" will focus on various SDG, including SDG4: Quality Education, SDG5: Gender Equality, SDG10: Reduced Inequalities and SDG13: Climate Actions.

  (ii) Ensure project adaptability by boasting a tailored project agenda conducive to the daily realities and environment of the final beneficiaries.

- "myPERFORM", beyond its scientific educative agenda, will also address issues pertinent to the individuals of targeted participatory regions of implementation, i.e. by developing tailored, so-called PERSEIAs that will take into account local resources, individual circumstances, cultural as well as environmental realities.

(iii)   Foster early scientific engagement amongst youth by extending the project's scope towards beneficiaries in primary school education.

- "myPERFORM" will take actions to reduce the distance between young people and science and to overcome the unidirectional model of scientific knowledge transfer.

- "myPERFORM" will target all education levels from primary school to secondary school. Age-tailored PERSEIAs will boast 3 types of performances, including busking (primary school, ages 6-9), theatre (secondary school, ages 10-15), and stand-up comedy (secondary school, ages 16-18).

(iv)   Map the field and foster project sustainability by empowering local stakeholders via the myPERFORM Ambassador Program (MAP) initiative.

- "myPERFORM" will be implemented in a 2-stage process and the associated launch of the MAP will ensure effective project growth and sustainability.

- The MAP initiative ensures that local stakeholders (teachers, educators, researchers, students) will become trained, empowered and incentivized by UNESCO and partners to subsequently train their own and other communities at adjacent national and regional levels.

- Ambassadors will be encouraged to share best practices amongst their MAP regional network through regular meetings and IT solutions (intranet, virtual seminars, etc.).

- **ECKA2**: Fantastic. We are more than happy to explore this source of funding

within WP5 in order to ensure the long viability of PERFORM and its sustainability beyond October 2018.

▪ **To have a two-page flyer with basic information for MoEs (Ministries of Education) on what the project is about and what it offers:** Good idea. A booklet presenting PERFORM is already available in hard copies and online here. We intend to translate that booklet in several languages– including Arabic, French, Spanish, Russian and Portuguese, to support our advocating and lobbying actions in promoting PERFORM among UNESCO's Member States and especially among their MoE. For "myPERFORM", we are also working on several communication tools: a one-page flyer was drafted along with a dedicated Power Point presentation. Based on this format and your recommendation, we will also prepare a one to two pages for PERFORM. Finally, as part of UNESCO's responsibility as WP5 leader, the research results of the PERFORM project will be translated into two policy briefs to Member States for widespread policy adoption beyond the three pilot countries.

Based on this suggestion, it is possible for WP6 leader to plan two documents addressed not only to MoEs but also to headmasters of schools and policy makers involved in innovation in education: (a) A first two-page flyer produced in autumn 2017 containing a brief description of the project and highlights on the first findings can be also used to advertise for the final conference. (b) A second two-page flyer produced and distributed during the final conference in June 2018 with highlights of the main findings of the project.

▪ **To organize a discussion with Scientix for the inclusion of PERFORM in a Science Projects Workshop in the Future Classroom Lab**: Discussions are ongoing between WP5 leader and the CT and Scientix. PERFORM will be presented during the 12th Scientix Projects' Networking Event on December 5th 2017 through a workshop co-organised with Scientix and another European project, GEDII. The workshop will focus on "Gender and Innovation

in STE(A)M Education". 20 to 25 participants, including experts and projects working on the topic, as well as researchers, teachers, policy makers, SME and other interested education practitioners will be in attendance.

Following this line WP6 leader will explore with WP5 leader the following policy for dissemination of results: (a) Inviting teachers participating into the Scientix workshops to take part into the final conference sessions held at UNESCO in June 2018; (b)Discussing with the Scientix team the possibility of including a session in the final conference to actively involve these teachers can be discussed with the Scientix team.

Regarding the suggestions to improve the 6 PERSEIAs videos:

- **To improve the audio quality**: This suggestion will be considered in future video developments because it is not possible to improve the quality in these ones.

- **To add English subtitles for non-English videos** (e.g. French ones): WP6 leader will add them after the second round of Participatory Workshops in 2018.

- **To create a PERFORM video with good examples of the 3 types of PERSEIAs** (monologues, clown, busking): WP6 leader will discuss with partners the development of a video explaining the differences between these three types presented by the performers themselves. This will be implemented after the second round of Participatory Workshops in 2018.

Regarding the suggestions for results exploitation, coherently with these suggestions a strategy was discussed in June 2017 by the CT and WP6 leader to publish the work in progress of the toolkits design and development. This is a first step to present the toolkit as a living document. To reinforce this message we can ask the partners involved in the toolkits' design to involve teachers, researchers and students they already have worked with to witness on which needs and rationales the toolkits are based. From a communication point of view this would mean to

highlight the voices of final users. However this process must be standardized and discussed with partners since it will require efforts not completely foreseen in the original plan.

In August 2017, the Deliverable 2.1 describing the first results of the project was published on the PERFROM webpage. Starting from September 2017 exploiting the start of the new school years a series of pills of information will be published on social media to describe the preliminary results and experiences developed within the project during the first period of activities. These pieces of information will also be used to increase the communication actions towards the final conference.

Regarding the suggestions for disseminating the research process and results, if possible, (according to available financial and time resources) the students, the researchers and the teachers already involved in the project will be invited to join science events in the three countries (e.g. science festivals, researchers' nights in 2018, open days in the universities and research centres and other science events involving teachers and secondary school students).

After a discussion with the CT, WP6 leader will be involved in identifying events in UK, France and Spain interested to involve school teachers, secondary school students and early career researchers already involved in the project.

We would suggest to avoid the creation of brand new events or happenings but to include PERSEIAs in the already exhibiting events both to disseminate the PERFORM project results and to actively involve the stakeholders already involved in the project.

Regarding the Final Conference date, after some cross checking among partners it has been decided to hold it on 14-15 June 2018. This takes into account two main elements: (a) avoiding overlaps with other international conferences involving the same stakeholders (e.g. ECSITE annual conference 7-9 June 2018), and (b) the calendar of the French schools that are the audience who are most likely to be

involved.

5. CONCLUSIONS

The PERFORM project has received very positive feedback from the AB. It is a shared statement among the AB members that the project is progressing very well, and according to the DoA. In addition, the AB has found WP leaders responses to its suggestions wholly adequate. Furthermore, the project has received not only very good suggestions on how to extend the work carried on so far, but also in the context of extending the impact of the work pointing to the need of new actions. Indeed, as general recommendations, the interest of going beyond the current localized boundaries of the project (i.e. its partners, its study cases) has been highlighted in order to reach a wider audience. Also, to further exploit performing arts (and more widely, arts-based methodologies) in the work with ECRs, and expanding its impact working with professionals outside of the science field (e.g. performing arts pedagogues).