The Art of Science Learning

WP4 EVALUATION RESULTS INTERNAL SUMMARY

Author:
Morgan Jenatton (UOC)
Co-authors:
Isabel Ruiz-Mallén (UOC) & María Heras (UAB)

This project that has received funding from the European Union's Horizon 2020 research and innovation programme

SUMMARY OF WP4 EVALUATION RESULTS

This document is a summary of the data analysis of the second implementation round in Bristol, conducted as part of **WP4 assessment** led by UAB. It shows data from Bristol Free School (BFS), Castle School and Bridge Learning Campus, collected through systematic observations of every workshop, 2 students' surveys (one before and one after the project), formative evaluation exercises, focus groups with selected students from each school and interviews with teachers and researchers (ECRs) participating in the project.

The document has been organised according to the four analysis dimensions of the assessment framework implemented: i) RRI process requirements integrated in the workshops (design and facilitation); ii) contribution of the workshops to train transversal competences; iii) contribution of the workshops to enlarge students' perceptions of science; and iv) contribution to foster scientific vocations and interest towards STEM careers. Before that, we introduce the general characteristics of PERFORM's educational approach implemented in the case study of Bristol.

The Bristol case study

General Methodological Approach

Science Busking was used in Bristol schools. Throughout four workshops, students developed short sketches using demonstrative props combined with humour, theatre, music and magic to inform passers-by about scientific topics that were principally based on the research area of a mentoring young scientist. PERFORM busking performers and experts in public engagement facilitated these workshops that were often split between reflective activities and busk-developing sessions, both involving a strong contact between students and the early career researchers.

Composition of the groups

In all three schools, the choice of participating students was left to teachers, who took different approaches to composing the participating groups. In two out of three schools (BFS and Castle), teachers sought out students from across the school, with the result that the participating students all volunteered to participate in the project and willingly dedicated extracurricular time to it. This fact also impacted the composition of these participating groups in several ways: 1) They came from different "tutor groups"[1] and even school years, and so often did not know each other before starting the project. 2) The gender composition of the groups was essentially random, but actually ended up being a mostly equal gender balance, with slightly more girls than boys.

In the third school (Bridge), the participating group was composed of a specialised science class that was selected as a whole to participate, because teachers thought its students could afford to "lose class time" as they were farther ahead than other non-specialised classes. As a consequence, not all of the students were initially interested in the project and several regularly left workshops an hour early, at the scheduled end of the school day. The gender composition of this group was also much less balanced than the other schools, with a greater proportion of boys, due simply to the composition of the selected class. However, as all students worked together throughout the year, they knew each other well before the start of the project.

[1] A group of students that meet together every day with a reference teacher and thus know each other well.

Because teachers received few precisions as to how to select the participating group, they often chose classes or targeted students that were already oriented towards the sciences. By consequence, almost all students at Bridge and BFS already had a science profile and were already engaged in additional science activities or material. The group at Castle school was the most "mixed profile" group, with many not particularly oriented towards STEM subjects.

1. RRI DESIGN: PROCESS REQUIREMENTS

Initial research efforts were put in the design of **science education participatory workshops** in which different **RRI values** could be embedded into an **inquiry-based approach integrating the performing arts.** Three different RRI values were highlighted while designing PERFORM's educational approach: ensuring participants' **inclusiveness and engagement**, integrating the **social and human dimension** of science (ethics integration) and fostering **critical thinking** among students.

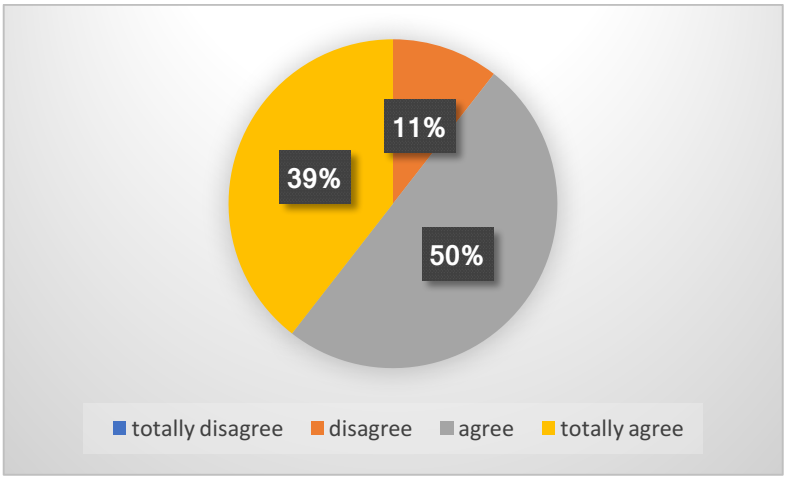
This dimension of the analysis approaches the integration of such values, which we identify with process requirements that are integrated in the workshops. It is based on researchers' systematic observations of every workshop and interviews to students', teachers and ECRS.

INCLUSIVENESS AND ENGAGEMENT

The combination of different types of activities within the session (i.e. plenary activities and small group work, reflection activities and busk creation) facilitated the **inclusiveness of different profiles** of students, both in terms of personality and of interest towards science. Significant time was devoted to group work and consequently much student-to-student interaction happened in relative autonomy, notably with the presence a single ECR. The composition of these small groups and the profiles of the students – e.g. extro/introversion, science knowledge, gender, nature of relationships (friends or not) – thus played a role in the types of interactions within these groups. In certain groups, students themselves worked to include a diversity of ideas from different group members, but in others a particularly strong personality ultimately dominated the group and idea generation. No clear patterns of gender difference emerged in these spaces – in some groups girls were strong leaders and idea generators, in some groups boys dominated, while in most contributions were balanced. Personality seemed to be a bigger factor than gender.

These **small group sessions** proved to be a key part of the design. By working in these groups towards the **concrete objective of creating a final performance**, students were encouraged to **actively participate** and explore ideas together. Indeed, when asked in the survey about the workshops, almost 90% of the students reported they had actively participated during PERFORM sessions:

I actively participated in all the group activities during workshops



Aggregated results from all schools. N= 38

During the workshops, different facilitation elements were observed to promote students' participation and dialogue:

- **Facilitators from SMS and UoB complemented each other.** Facilitators from SMS were more animated and comical, engaging students physically and visually through more performative presentations, primarily in plenary moments; while UoB facilitators (including ECRs) connected with students more individually and engaged in intimate exchanges. Through these different approaches, a larger portion of students' personalities and learning styles were addressed: those that were more animated and confident, as well as those that were more reserved and quiet. In BSF, an example of such students are two older girls, whose participation was limited and facilitators consciously strove to encourage their participation.
- **Using students' previous knowledge and experiences**. In plenary discussions, facilitators asked students to provide examples of some of the key concepts that were presented (for instance, global issues), giving them the opportunity to ground the larger ideas of the PW in their previous knowledge.

In terms of challenging aspects, the role of facilitating the small groups often fell to the referent ECR, who themselves had varying aptitudes at facilitation and pedagogic guidance. Therefore, the value and richness of student exchanges and autonomous exploration of STEM topics depended strongly on the facilitative skill of the ECR. As this may be a challenging skill for ECRs to acquire prior to PWs, even in trainings, it seems important to have an outside facilitator (or teacher) circulate through the groups to help with pedagogic guidance.
Furthermore, students were placed into their working groups during PW1, selected mostly randomly by where they were sitting. Given the value and central place of small group work in the PWs and the importance of group composition to the functioning of these groups, it may be helpful to have a clear design strategy for the formation of these groups. Factors taken into account could perhaps include: gender balance, personality types, previous relationship, or subject affinity.

SOCIAL AND HUMAN DIMENSION OF SCIENCE: ETHICS INTEGRATION

Science issues in the PWs were consistently presented in regards to their "impact on the world":

1) In presenting their research, ECRs repeatedly connected it to "real world issues" and emphasised how it could be applied in society. They did this both in their initial busk presenting their research and in small group discussions one-on-one with students

2) Facilitators strived to frame small group discussions in societal challenges by referring repeatedly to three guiding questions: "*what is the research trying to solve, where might it take us in the future, and what might be controversial about it*." They asked students to include at least one element from these questions in their busks, which was accomplished in a few cases, namely at Castle.

Over the workshops, discussion of these questions with students became mostly centred around questions of research applicability and controversy in science.

CRITICAL THINKING

Encouraging critical thinking was addressed through formal activities and in small group discussions with ECRs:

1) An activity looking at various news articles about scientific subjects encouraged student to sceptically question science information and news sources.

2) The use of facilitators three guiding questions also provided a framework for analysing social issues and conflicting points of view in science.

Again, the role of guiding these discussions often fell to ECRs, who were varyingly suited to this task. Facilitators often circulated through groups and worked to integrate and steer these reflections into discussions with ECRs.

2. TRANSVERSAL COMPETENCES

LEARNING AUTONOMY AND REFLECTIVE THINKING

In all schools, students were often given time to reflect and comment on each other's presentations, and adults usually contributed as well. Castle and Free students were already very skilled at autonomous learning at the beginning of the workshops. The work of developing a busk allowed them to put these skills into practice, mostly by engaging in high-level but open discussions of science topics with their referent ECR. They were allowed to ask many questions and they made the most of this opportunity. They commonly dug deeper into ideas together and learnt about complex subjects by building on each other's ideas, until a subject had been looked at from multiple angles. It is important to note that some students identified this process themselves as valuable to their learning. See for instance the following quotes:

"[What I liked in the PWs was] working in a group with my friends and being able to freely ask scientific questions about the busk"
(23103, post-survey)

"Cause it wasn't like...A teacher didn't ask a question and then we answered it, it was [the PWs were] more like an open discussion. So it wasn't so direct, it was kind of just like free flowing and we could say what we wanted."
(23101, FG)

"[In the PWs] you were kind of exploring the bits that you wanted to look at, you weren't just focusing on one bit that everyone else was looking at, you were looking at bits that actually interest you." […] [This is helpful because] "like, if something's more fun, you're more likely to want to learn more about it and like explore it."
(22101, FG)

"MJ: So it sounds like you're saying you have the freedom to get to talk about what you want [in the PWs], without being told off, for being off topic. Is that that it?
23108: Yeah, kind of like not really off topic, but on a different page of the thing that you're doing. So it wouldn't be you only talk about one certain bit of that topic, you could talk about the whole bit. And different bits about it."
(23108, FG)

One student also connected these discussions with being exposed to divergent ideas from her classmates, and that this was also a valuable learning tool:

"Because you're exploring things from different people's perspectives. And you can see a problem or an idea from a different angle. [This is good because:] So that you can understand it. Have a deeper understanding and also understand how you could go about learning about something."
(22101, FG)

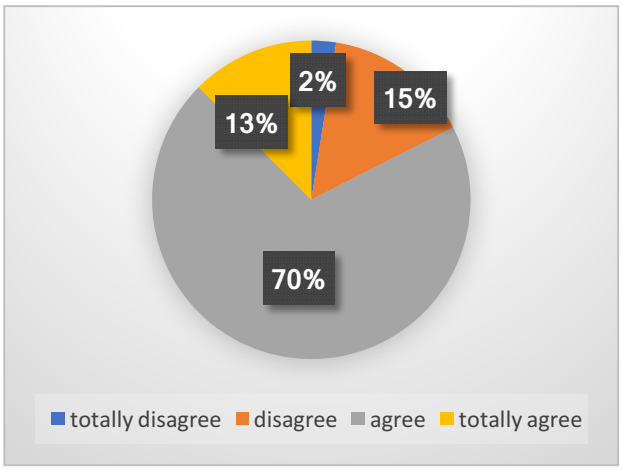
Bridge students, by contrast, were consistently more distracted and had difficulty concentrating on the task at hand in independent discussions. Some key leader students worked diligently to maintain focus of the group, but had difficulty. Interventions from ECRs and facilitators was required often.

Furthermore, although many students across the schools thrived in these open discussions, they were more challenged by the task of crafting this curiosity into a coherent presentation, as were ECRs. **Intervention and guidance by facilitators becomes crucial** for this second phase. They help keep students on task for accomplishing the concrete goals of the PW, but also provide artistic input for the transformation of their science interests and discussions into performance.

COMMUNICATION AND PERFORMING SKILLS

After the final PERSEIA, in focus groups and in post-surveys, students across schools self-identified that the PWs helped improve their oral communication skills. As shown in the figure below, 83% of the students agreed to the statement '*During the workshops, I could improve my communication skills*'. They also reported that in their answers to an open question in the survey about their learning:

During the workshops, I could improve my communication skills'



Aggregated results from all schools. N= 40

[I learned] "How to talk and communicate better out loud" (23106, post survey)

[I learned] "How to busk and how to use our body and our voices in different ways" (23109, post-survey)

"I learnt communication skills and how to busk" (23117, post survey)

A large part of this gained confidence in personal expression seems to have come from having done the PERSEIA itself and the need to repeatedly do a performance in front of an audience. But Bridge teachers also expressed that the more intimate setting of small busk groups perhaps allowed quieter/shier students to more openly express their thoughts and ideas, without being lost among more dominant/vocal students:

"I also think 22101 [benefitted from PWs] cause she's like really quiet and kind of timid. But she really does think about that stuff [complex science subjects] and she has got quite a lot of things to say. And I think she was really good in that small group cause she felt she could say these things." (Teacher Free)

One of the quietest and most reserved girls at Free, expressed in the FG that "talking to new people" was a skill she acquired in the PWs, and that she became more comfortable with this because of the PWs.

COLLABORATIVE SKILLS

Sense of teamwork and collaborative skills varied greatly at the onset of workshops, mostly based on individual students' personalities. Generally, however, observations revealed that Castle and Free students were more collaborative than Bridge students and more easily built on each other's ideas towards a common goal. Examples of this collaboration came up in activities where students needed to work together - in relative autonomy - to accomplish a task, such as: a short presentation, small group discussion, or the longer-term project of developing their busk. Most students respectively listened to each other and built on each other's ideas. Bridge students encountered more difficulties in collaborative work. There were a greater number of disruptive students, and they impeded the discussions and work of other students. Some of the more diligent students did manage to address this disruption through positive communication and thus maintain a certain amount of productivity. An example is 21103, who was loudly interrupted at one point by 21124, and directly and firmly asserted that she was speaking and would like to finish without being interrupted.

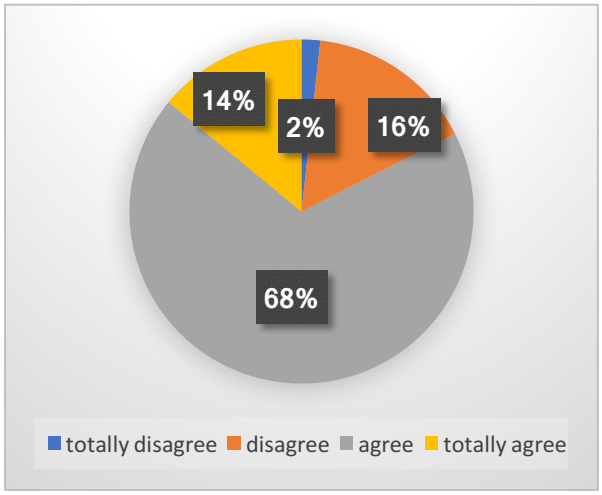
In focus groups and post-surveys, many students underlined the collaborative nature of the PWs as a highlight to their experience, both in terms of enjoyment and in improving their learning experience:

"I learnt that it is better to be in a team and help each other than be alone with no one to help me [...] I could do more with a team than me alone that is what I learned."
(21107, post-survey)

"It's kind of like stepping out of your comfort zone and doing something that you're not always comfortable with, but by talking to someone else it improves your social abilities as well as like gives you another perspective on the working world […] Because when you work later on, it's like you wouldn't...You don't get to choose who you work with and who your boss is and who your colleagues are – those are all there. And so by practicing those skills now, then it helps us for later on in life."
(23101, FG)

"When you're like working in a group, sometimes different people have different ideas and you've got to come up with one that is kind of a compromise for everyone […That is helpful] Because you're exploring things from different people's perspectives. And you can see a problem or an idea from a different angle […That is good] so that you can understand it [better]. [You can] have a deeper understanding and also understand how you could go about learning about something."
(22101, FG)

We equally shared tasks during the workshops



Aggregated results from all schools. N= 40

A teacher at Free also highlighted the small working groups as a PW element that helped foster collaborative sentiment. He said:

"What I liked about the sessions is that it felt like a very safe space, the kids could say just what they wanted. Without fear of any kind of negativity from any other kids. Something about it felt like there was…everyone else in the room was respecting everyone's opinion. Something you don't always get in a classroom."

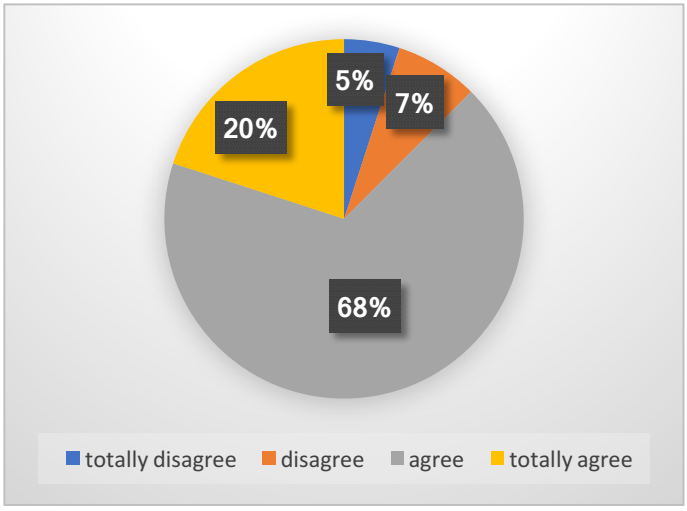
SENSE OF INITIATIVE AND CONFIDENCE

Another element that is highlighted by students as something the PWs allowed them to work on is confidence. Much like communication skills, they mostly connect an increase in their confidence to the busk itself, and the challenging task of performing it front of an audience:

"Yeah, [repeating the busks] helps to gain a bit of more confidence, at the start of the bit [we were] a bit rusty on it. But yeah, I got into it, I managed to sort of become a bit more confident and a bit more enthusiastic about it every single performance I did."
(23108, FG)
"MJ: What was different [the second time you performed] than the first time, that made it more enjoyable? 21106: Made it more confident. MJ: Where do you think that [confidence] comes from? 21106: By doing it like over and over and like learning from your mistakes."
"[Participating in the project] was very self-confidence building. Having to like stand up and speak in front of everybody."
(23101, FG)

This was also reflected in the post-PERSEIA survey, in which almost 90% of the students reported feeling confident during the project:

I felt confident during the workshops

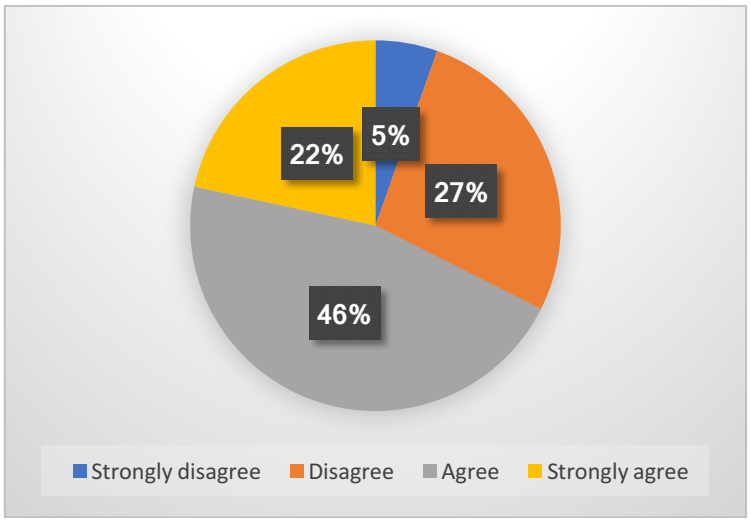


Aggregated results from BFS, Castle and Bridge schools. N= 40

3. STUDENTS' PERCEPTIONS OF SCIENCE

Generally, surveys across schools show little changes in most items reflecting students' perception of science. However, when directly asked if the PWs helped them to think differently about things they previously believed to be right or true in science, the majority of students across schools responded in the affirmative (68%):

'This project helped me to think differently about things that I previously believed to be right/true in science'



Aggregated data from BFS, Castle and Bridge schools. N= 37

When this question of changed perspectives was explored in FGs and open survey responses, a principal element to emerge related to students' very conception of what science is. A recurring reflection was of students "realising" that science was more than just clearly defined categories in a textbook, or in school subjects:

"I never really thought about what science is [before PWs]. I just thought that the topics [science topics] were like, I don't know: biology, physics, chemistry."
(22105, FG)

"Yes [my perception of science changed] because I was able to learn things from lots of different branches of science that I didn't even know existed."
(21101, post-survey)

21117: "Yeah, [I realized] that there's more to science than what you think. Like it isn't just..." Other students: "Wearing coats." "Chemicals." "Einstein." 21117: "...biology and the periodic table, there's like more to it." 21106: "Like more detail." 21117: "Yeah. There's more topics." 23108: "[The project] also helped me to see that...When I looked at how in depth certain jobs were, like for example the...our researcher, Grace, she was researching on mitochondria, which is.... Because I want to become a biologist when I'm older and you kind of think there's just one thing, you know where there's just biology. But there's so many different things and so many different small aspects of biology that you can go into. That people nowadays just don't think of it, they think of it as just "biology" and stuff like that."
(FG)

22101: "I didn't know there were so many aspects of science to explore. I mean, I knew there were lots but I didn't realise quite the scale, like the differences between all of the different subjects you could look at. […] Like how enormous the range of different things is." […] 22104: "That they all kind of fit together. Like, someone did like finding medicine, and someone else did, they analyse it and make sure it's safe. So yeah, it's kind of jigsaw, it kind of fits together in a way."
(FG)

As these examples illustrate, many students' conception of science was enlarged to include a much broader field of topics than prior to PWs. But furthermore, students also reflected on the more philosophical and abstract nature of science. A phrase that reoccurred independently in all three schools was students expressing the realisation that "everything is science." That is, not only is science not just a categorization of facts found in a textbook, but it is a way of seeing the world:

'21124: Science isn't just sitting at a desk and writing. […]
21117: Yeah, that there's more than just chemicals and blowing stuff up. Like, I had no idea trains had anything to do with science and stuff, I thought it was just trains and that's it.
21106: Like engineering.
21124: just like 'trains' and they appear. […]
MJ: Right, so if science isn't just like sitting behind a desk or like chemicals, then what is science? […]
21106: Things that you can make
21117: Everything is science.'
(FG)

"[The project] made me think that science can be anything, not just space, acids/alkali but that almost anything is science."
(23111, post-survey)

"I think science things that we learn about in school and stuff like that, it's kind of just another word for discovering things really. Cause nothing really is a category, it's all a bit random and they're just trying to find a place to put them. But [science is] just more learning about the world really."
(22101, FG)

"[My perception of science changed] a bit because I hadn't realised how much philosophy went into science or how many different things it was possible to research as a scientist."
(22101, post-survey)

'Yeah, it was easier [to think about abstract ideas in the PWs], because in a classroom its very like black or white, it's either right or wrong. But here we kind of like expressed our ideas and it wasn't so...yeah, it wasn't just right or wrong, it was like every idea had an aspect that was right about it.'
(23101, FG)

As this notion was raised independently in all three schools, it seems reasonable to assert that the workshops created a space in which reflections about the nature of science could be broached freely, with students debating and learning openly from each other and adult mentors (ECRs and facilitators). In some schools', namely Free and Castle, students debated passionately the nature of science, with

some expressing nuanced philosophical reflections on the subject. Nonetheless, for other students the concept of "science is everything" seemed foreign and too abstract – they felt more comfortable with science being a categorical school subjects or a "white coats in a laboratory" image.

A teacher at the Castle school reflected that part of how students' perception of science changed was through interactions with ECRs and having science "be made real" for them:

> *"In the workshops I can remember certainly some students being really engrossed by what the researchers were doing, asking really good questions, 'how is this useful, why do you do this,' and I think it made the science kind of real for them. So yes they learn it in the classroom but [in the PWs] they can see that actually it* is *used and how it's used, and how it's applicable."*
> (Teacher Castle)

In terms of perceptions about the social value of science, one of the central elements emphasised by UK facilitators was the role of science in society, and they referred often to the question of "*what is the [ECRs'] research good for*" when orienting students in their busks.

Although ultimately busks rarely included reflections on these larger topics, some students seemed to respond to the above question and included commentary about it in self-reflective activities (pokeballs). In answering the written question "*What do you think are the most important things for scientists to think about when doing research?,"* many included answers relating to the role and risks of science. For example:

> *"I think it's important for researchers to know the consequences and outcomes of their research" (21105)*

> *"Improving society. Teaching others about things. Change peoples lives for the better. Getting evidence." (23101)*

> *"Does it harm anyone. Would it be controversial. Would it be considered 'offensive.' Would it benefit the world." (22106)*

> *"How this will help people of the world and will it be useful" (22107)*

> *"What scientists should think of is if they are doing experiments is that it should be fair." (23103)*

> *"To think about what they think before they do the research and what they think after and maybe if it changes the way they think about it." (23111)*

However, these reflections remained mostly within the framework of this explicit question in the reflective activity. FGs rarely touched on questions regarding the value of research or science, aside from one example. A student at Free raised that something she thought about more during the PWs was the role and influence of artificial attendance (the subject of her ECRs research): MJ: "What are some of the things that could be used for or against?" 22105: "If it's going to be helpful to people, is it actually useful for the world."

4. SCIENTIFIC VOCATIONS

All data sources – observation, surveys, and FGs – indicate that **students generally derived much enjoyment from the workshops**. During sessions, students were often smiling and laughing, particularly in more active activities such as busk creation, and during FGs almost universally express that they enjoyed the PWs. One important element to highlight is that many students connected their enjoyment of the sessions with increasing their learning ability and interest in science:

"Yes, as it showed me a different way to learn science in an exciting way."
(23112, survey post-PERSEIA, open question about changed perceptions)

"Yes it made me enjoy science more because you are active."
(23110 survey post-PERSEIA, changed perception
)
"It made me more interested in science and how to understand it more."
(23117, survey post-PERSEIA, changed perception)

"Yes, because it showed me that you don't have to learn science in a boring classroom but you can learn it in a fun way by creating a busk or listening to a busk."
(23119, survey post-PERSEIA, changed perception)

"I learnt a lot about science. Previously I occasionally found science boring but I now know there are lots of aspects of science and I really liked what my researcher was doing." (23101, survey post-PERSEIA what learned)

"Yes, because I thought that science wasn't very fun and know it is extremely fun"
(22106, post changed perception)

A student at Bridge expressed in the FG that she gained an increased appreciation and interest for her ECRs' research subject – trains – over the course of the workshops. She said this increased interest steamed directly from learning more about the subject: *"Cause like, when it's trains* [before PWs, on the subject of trains] *all I think of is some rusty old thing going to Weston, I don't care about that. But like, I didn't really think much about trains, didn't really know much about trains. But obviously I learned stuff,* [and] *it was more interesting as I'm learning." (21117, FG)*

An unexpected, but important, reflection to emerge was the notion that students greatly enjoyed being able to share their knowledge with others. This element of transmission, of sharing what they had learnt, was one of the key elements for some students:

"[I liked most] performing the busk [..] and showing what we had learnt. All the research we did was shown and it was satisfying to see others learning from and enjoying the busks we performed."
(23101, post survey)

"[I enjoyed] seeing how the [primary school audience] children enjoyed it [the busk]"
(21103, post)

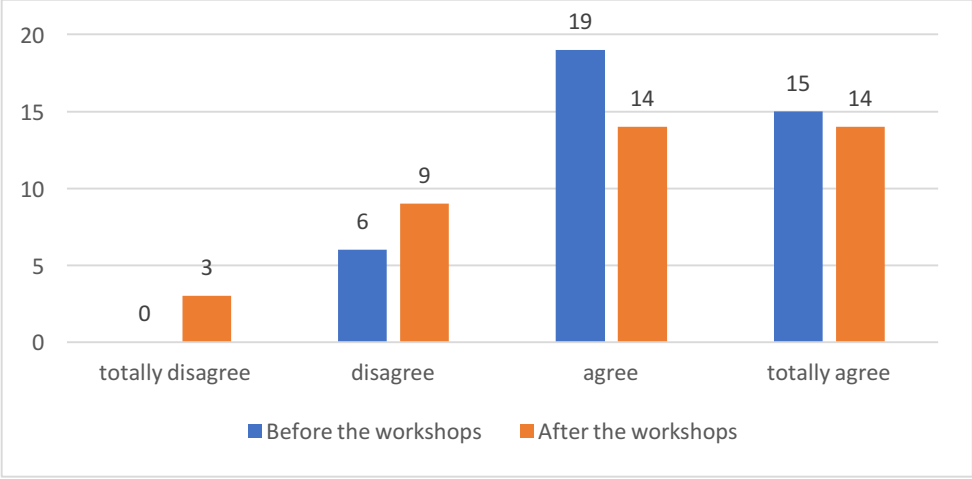
"[I liked] performing a busk that I can understand the science. I understand my researcher's work and that helps because you learn and it makes you feel good when someone asks a question."
(23111, post survey)

"Cause it's one thing to like experience something yourself, but it's like it's nice to share it with other people and see like their reactions and how they find it just as interesting as you did."
(23101, FG)

Through the performance, students were able to transmit new knowledge to others, and they often connected this with not only a sense of enjoyment, but improved learning. Being able to teach others made them happy, but also helped solidify the elements that they had learned. Participants thrived in the opportunity at being able to move from the role of student to teacher. A teacher at Bridge also mentioned the value of this role reversal, saying that one of the principal elements she feels she could apply from the project was using students to teach difficult subject to other students. For her, in this way material is introduced to new students while simultaneously being reinforced in the presenting students. She believed the that material performed by the students would be better retained for national exams (GCSEs) in the upcoming years.

Despite the general enjoyment of the workshops, our data showed a **differentiated impact of PERFORM's approach in encouraging scientific vocations**; that is, in making the leap from enjoying science learning to then be willing to study science careers.
As shown in the figure below, even though students were overall positive towards studying a scientific career, their pattern of response was slightly more negative after the intervention. However, these changes were not statistically significant.

'I would like to study a career involving science'



Aggregated data from BFS, Castle and Bridge schools. N= 40

When students' attitudes towards scientific vocations were further explored in the FG, students' interventions pointed to very mixed opinions about the relevance of science to their own lives and their ability/desire to pursue a career in STEM areas. Many students were already science oriented before the project and PERFORM opened their ideas to the range of science topics that exist, as well as more abstract notions of science (see above). Others viewed science more practically, and were primarily interested in school subjects that would help them professionally after school and science did not always figure into this vision:

> *"And I think that's why I don't find a lot of things* [in science] *interesting, cause I just feel like some of the stuff that we learn we don't actually need it, like we're not going to use it in everyday life, so I think that's why sometimes when we're learning stuff, I don't really take it seriously, cause I'm not going to, you know, just go home and dissect something."*
> (22105, FG)

Another student expressed that he was interested in learning principally what was necessary for academic and professional advancement:

> *"I'll probably do like what you need to be a presenter* [his expressed career interest]*, so I'll just look it up on the internet. Cause when you do the like…when you sign up for a university, they say, "Oh, you need this this this and you need to get AA, A or B"* [high marks in British grading system] *or something like that. So, I'll probably just look it up* [to plan what I want to study later]*."*
> (22106, FG)

However, the above opinions were expressed generally and not in correlation to the PERFORM project. Contrastingly, two students at Bridge stated that the project helped them better see the professional value of science and the role of science in post-school careers:

> *"[I learned] that certain jobs need science and there are jobs that I didn't know were real."*
> *(21132, post-survey)*

> *"That there are way more jobs involving science than I thought."*
> *(21101, post-survey)*