



Evaluation Findings

~ Executive Summary ~

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"I enjoyed that I got to participate, share, get inspired, learn so much, communicate such interesting things, try new practices in class, challenge my views and learn from teachers and scientists." (Greek primary school teacher)



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Executive summary

This document summarises the main findings of the Space Awareness project [Final report on evaluation](#). Building on a [Theory of Change](#) approach using pre-identified [intended participant outcomes](#), the evaluation effort was designed to help create a sustainable legacy that will long outlive the duration of the project. There were four key aims:

- Formative evaluation to shape the project's activities to ensure that they met the aims of the project and the audiences' needs, with a spirit of continuous improvement.
- Report and measure the impact of the project in a way that is consistent across all activities and paying particular attention to any differences associated with intended career choice, gender, ethnicity and socio-economic status.
- Provide evidence of the project's successes and areas for improvement and help communicate these findings to policymakers, funders and others working in science education and engagement.
- Establish a baseline dataset regarding existing attitudes and opinions towards space science, as well as developing an approach for determining longitudinal impacts of the programme in the future.

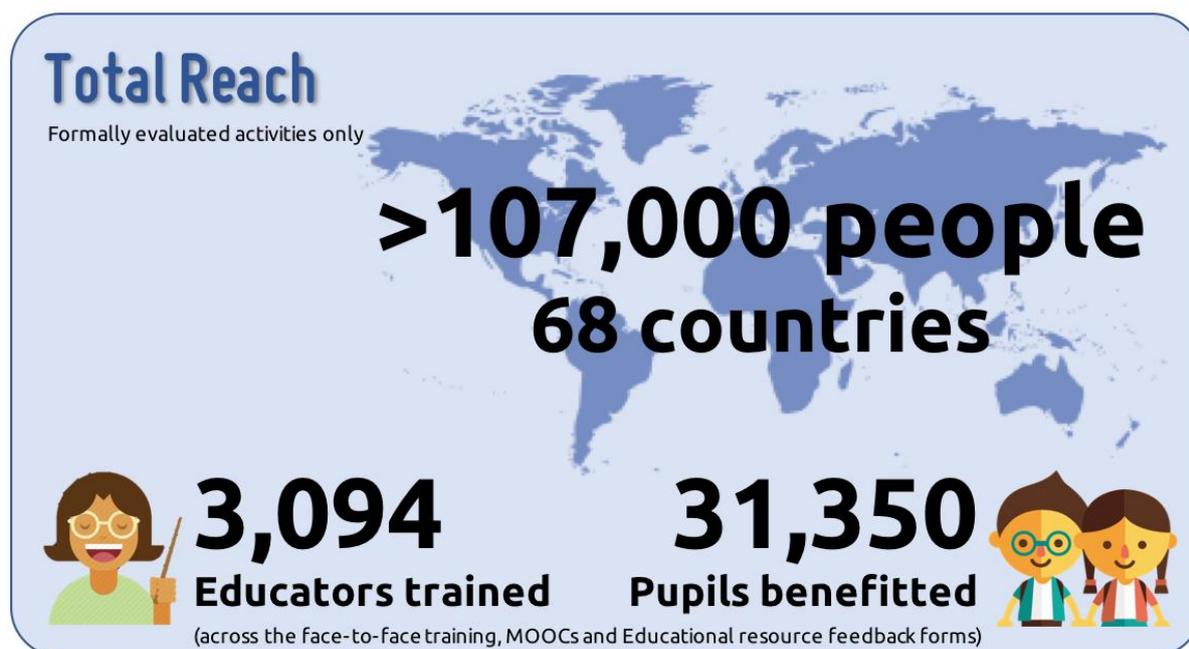
Our approach

Emphasis has been placed on school-aged students and school teachers, as this is where the bulk of the activity development and effort within the Space Awareness project was focused. Much of the evaluation data collection was conducted by the [project partners and dissemination nodes](#) as they distributed the Space Awareness resources to local teachers and other educators, based on protocols and tools developed within the [project evaluation framework](#). The combination of a centralised framework and distributed data collection has resulted in consistent and comparable data collected from across Europe and beyond regarding key activities such as the [Educational resources](#) for use by teachers in the classroom, [face-to-face teacher training workshops](#) and the [Massive Open Online Courses \(MOOCs\)](#). Additionally, a complementary qualitative fieldwork strategy, combined with dedicated online efforts and an [international teacher competition](#), allowed a more in-depth exploration of specific issues. For example, through these more qualitative approaches we were better able to investigate the impacts of the Space Awareness activities on specific target groups such as girls, ethnic minorities and those from socioeconomically disadvantaged backgrounds. Separate to the formal evaluation efforts, teachers and other educators were also provided with their own [assessment tools](#), consisting of both formative and summative techniques, to help assess pupil learning in engaging and informative ways. All evaluation procedures were conducted according to appropriate ethical guidelines.

This report synthesises the evidence collected in the various [individual activity reports](#) to identify over-arching patterns at a holistic project level in terms of reach, participation and perceived quality, and the project's successes in achieving the Space Awareness intended outcomes. For the benefit of future similar projects, strategic and practical recommendations have been developed based on the evidence from Space Awareness in order to inform future policy in space science education within Europe and beyond.

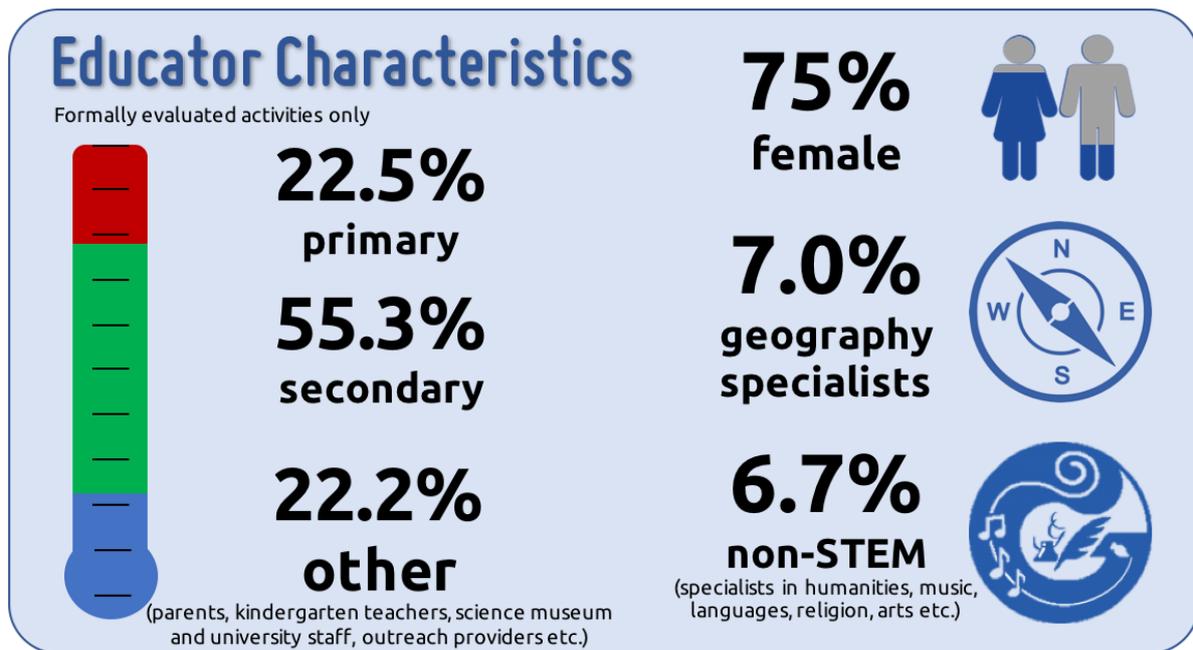
Participation

Overall, we have detailed evaluation evidence of the main Space Awareness activities having reached over 107,000 people throughout Europe and beyond. This included 3,094 educators who attended the teacher training workshops and MOOCs and/or trialed the Educational resources, as well as at least 31,350 pupils who directly benefitted from their teachers' implementation of Space Awareness activities within their classrooms. A further 8,283 pupils were also involved in completing the baseline pupil survey, which provides pioneering insights into European students' perceptions of space science.



There is no doubt that Space Awareness achieved a very wide area of influence, involving at least 68 different countries, including every member state of the EU except Luxembourg. Representation was particularly strong from southern and eastern Europe, and although there were some exceptions, in general there was a noticeable lack of participation from western European countries.

In terms of the educators who participated in the various evaluated activities, Space Awareness appears to have been very successful in reaching many of its key target audiences. **Primary school** teachers accounted for just over a fifth of the overall cohort, and there was good success in reaching out beyond traditional STEM (science, technology, engineering and mathematics) subjects: 7.0% of educators were **geography specialists**, whilst a further 6.7% were from **non-STEM backgrounds** (such as religion, history, languages and other humanities and arts subjects). The strong involvement of female teachers (approximately three-quarters of the overall cohort), and the frequent high ratings provided by females (see below) indicate that Space Awareness has made positive steps in **supporting female participation** in space science. It was also noticeable that the Space Awareness activities and resources tended to attract **highly experienced teachers**: for both the MOOCs and the teacher training workshops more than half the participants had taught for at least 15 years.



It proved impossible to accurately and reliably gauge socio-economic or minority status for the quantitative evaluation elements within the scope and resourcing of the present project (see section 2.2 of the [main report](#) for further details). However, the complementary qualitative fieldwork efforts provided evidence of key successes in **impacting positively on girls as well as socio-economically disadvantaged and/or minority groups**; specific Examples have been included as case studies throughout section 4 of the [main report](#).

Key findings

The **overall ratings are extremely positive**: over 70% of respondents gave the top rating of “Very good” (or a score of 8, 9 or 10 for the Educational resources) for each of the main formally evaluated activities (the MOOCs, face-to-face training workshops and the Educational resources). This rose to 99.3% of combined “Good” or “Very good” for the teacher training workshops, and likewise 97.8% for the MOOCs. It is clear from these ratings that the resources and activities were overall received very positively, and were considered to be of high quality by those who accessed them. Indeed, converting the ratings to a 5★ average (where the lowest score is 1★ and the highest rating is 5★) shows that the average user rating for all three major Space Awareness activities was over 4★, reaching to more than 4.6★ for both the MOOCs and face-to-face teacher training workshops. Over 97% of participants indicated that they would recommend the course to a colleague, whilst 99% would participate in a similar course again themselves. Both these very high ratings are persuasive indicators that **participants valued the courses and felt they were worth committing the time and resource to attend**.

At least three quarters of people who tested an educational activity agreed or strongly agreed that the majority of the teacher-related intended outcomes had been achieved for them, rising to over 90% for aspects relating to the helpfulness of the content and extent of information provision. Statistical analysis also suggested that the educational resources were particularly effective in supporting primary teachers. This is excellent news for the Space Awareness project, as primary teachers were a key intended audience.



Compared to their wider cohorts, **geography** and **female teachers** attending the face-to-face teacher training workshops **provided particularly positive overall course ratings**, suggesting that they found the courses well-suited to their needs. Female MOOC participants were also statistically more likely than male participants to agree with the statement “I would like to participate in another similar course again” ($p=0.006$), suggesting that those courses achieved their aim of supporting women’s participation in space science.

Table 1 and Table 2 provide a visual summary of **which pre-identified intended learning outcomes were achieved within the Space Awareness programme**, categorised according to the main themes: *Feel, Value, Understand, Do* and *Skills*. The final columns serve as a “traffic light” indicator of the extent to which the evidence gathered supported whether each outcome had been achieved for each major area of project activity¹. Specific supporting evidence and case study Examples showcasing the richness of participant experience around key achieved impacts are also included in section 4 of the [main report](#).

It is clear that there was strong evidence (albeit sporadic in places) that all of the intended outcomes were achieved within the Space Awareness programme. In brief: the Space Awareness activities were considered **interesting** and **useful** and participants also expressed a range of other positive emotions associated with their teaching and/or learning of space science. They reported **greater appreciation of the relevance and diversity of space science contributions** and **gained substantial factual knowledge** relating to the specific topics covered. The **interdisciplinary relevance of space science** was highlighted by many participants as one of the aspects they liked most about the activities and resources, and found most stimulating within many of the training sessions.

¹ In addition to teachers’ self-reported responses to direct statements (see section 4 of the [main report](#)), these judgements have been based on a synthesis of qualitative comments received. The key to the colour scale used is included at the bottom of the table.

Space Awareness Intended Outcomes		Space Awareness activities			
		Educational resources	Face-to-face training workshops	Teacher MOOCs	Competitions
<i>Priority outcomes are listed below; X indicates that outcome was a target for the specified activity. Grey writing indicates additional outcomes of slightly lower importance</i>					
Feel <i>Enjoyment, inspiration and creativity</i> = MAJOR PRIORITY CATEGORY					
Find Space Awareness activities interesting	X		X		
Enjoy learning/teaching about space	X		X		
Feel confident teaching space topics	X		X		
Feel inspired by space science	X	X	X		
Feel positive about space science	X	X	X		
Aspire to space science careers (students)	X				
Value <i>Values and attitudes</i> = MAJOR PRIORITY CATEGORY					
Value the diverse contributions of many different cultures to space science	X	X	X		
Value the contributions made by both women and men to space science	X		X		
Value trans-national European and Global citizenship	X		X		
Appreciate that space science contributes to everyday life	X		X		
Appreciate that school science is relevant to space science	X	X	X		
Appreciate that people who work in space science are real people		X	X		
<i>Strong evidence this outcome was achieved</i>	<i>Strong but sporadic evidence this was achieved</i>	<i>Some evidence this outcome was achieved</i>	<i>Evidence this outcome was NOT achieved</i>	<i>No evidence either way</i>	

Table 1 Summary of achieved outcomes: Feel, Value²

There is no doubt that the majority of teachers were able to **access and use the Space Awareness activities confidently**, including adapting or creating their own related content, and that they – and their pupils – were inspired to learn more about space science. There was a real energy from both teachers and their students around **sharing** their improved understanding of (and enthusiasm for!) space science with others, including colleagues, friends, family and/or the wider community. Teachers also indicated that they had actively **encouraged their students to pursue careers** in space science or related areas, **especially girls and ethnic minorities**.

² Note that the “MOOCs” column incorporates evidence from both the survey data and a qualitative analysis of the *Navigation Through the Ages* MOOC, whilst the “Competitions” column combines international evidence from the pupil-oriented *Space Scoop Comic Contest* as well as the *Celebrating Excellent Space Science Teaching* competition. Blank boxes indicate outcomes that were not a focus for that activity.

Space Awareness Intended Outcomes		Space Awareness activities			
		Educational resources	Face-to-face training workshops	Teacher MOOCs	Competitions
<p><i>Priority outcomes are listed below; X indicates that outcome was a target for the specified activity. Grey writing indicates additional outcomes of slightly lower importance</i></p>					
<p>Understand <i>Knowledge and understanding</i></p>					
Highlights of space science (<i>Our Wonderful Universe, Our Fragile Planet and Navigation Through the Ages</i>)		X		X	
The impact of space science on society and everyday life				X	
Space science can be used for teaching in many disciplines including cross-disciplinary contexts and non-science subjects		X	X	X	
Space science career opportunities are diverse, rewarding and highly accessible (particularly to girls and ethnic minorities)			X	X	
Space science needs an interdisciplinary approach		X		X	
Space science is a global/European endeavour			X		
Career opportunities in space science and technology at all levels			X	X	
Relevant pathways to these career opportunities				X	
<p>Do <i>Action, behaviour and progression</i></p>					
Access and use Space Awareness activities confidently		X	X	X	
Create own content and additional activities on the same or related topics				X	
Want to learn more about space science		X		X	
Choose or consider choosing, or encourage others, to study and pursue careers in space science and engineering or science and engineering more widely, especially girls and ethnic minorities		X		X	
Share their understanding of space science and technology with learners, peers, family and/or their community		X		X	
<p>Skills</p>					
Learn how to carry out scientific or technical activities themselves		X		X	
Develop inquiry-based skills for teaching/learning about space science		X	X	X	
Learn how to use IT to teach/learn about space science		X	X	X	
Learn how to be more inclusive while teaching, particularly for girls and minorities		X	X	X	
<i>Strong evidence this outcome was achieved</i>	<i>Strong but sporadic evidence this was achieved</i>	<i>Some evidence this outcome was achieved</i>	<i>Evidence this outcome was NOT achieved</i>	<i>No evidence either way</i>	

Table 2 – Summary of achieved outcomes: Understand, Do, Skills²

The main skills-related areas of focus within the Space Awareness programme were also well covered: participants reported developing their skills in **inquiry-based learning, using ICT** to teach about space science and **inclusive teaching strategies**. Of particular note is that even teachers who were already familiar with some of these aspects reported having further developed their skills in these areas.

For the lighter green outcomes, there was again evidence that these were achieved, but either the corresponding numbers were comparatively small, or the evidence related to anecdotal feedback. For these reasons, we could not assume that such outcomes were representative of the cohort as a whole. In the case of the amber (orange) or grey coloured outcomes in Table 1 and Table 2, there was either no evidence either way, or the evidence collected was inferential rather than direct. We did not see any evidence that they were NOT achieved, but within the scope of the current evaluation we were not able to report on them further. In many cases (especially regarding careers aspirations) these outcomes will require further longitudinal follow up with teachers and pupils to ascertain their success.

The operation of the Space Awareness project was also considered from a holistic perspective in order to identify over-arching success factors, as well as the key challenges encountered, as listed below. See section 5 of the [main report](#) for further details.

Success factors for Space Awareness Challenges encountered by Space Awareness	
Outstanding quality of content	Limited uptake by some audiences
Innovative reach to diverse audiences	Devolved project delivery and strong reliance on good will
Support for women (and girls)	Adjustments to intended project plan
Specific strong demographic patterns	Aspects beyond the resourcing available / scope of the project
Project design and development	Specific perceived weaknesses at resource / activity level

Recommendations

There is no doubt that many young people throughout Europe and beyond were greatly inspired by their involvement with the Space Awareness programme. There is also evidence that it had a profound impact on their likely future aspirations and career-related decisions. Projects like Space Awareness also play a fundamental role in ensuring teachers remain up-to-date, effective and enthusiastic, and have a wide influence long after the project ceases. Such projects should continue to be funded. In particular:

- 1) Space Awareness itself offers a unique opportunity for robust longitudinal follow-up due to the development of a baseline of pupils' attitudes and experiences, as well as a cohort of 180+ educators located throughout Europe who have registered their contact details for potential follow-up work.
- 2) There appears to be a gap in current provision regarding offering international-level support to trainee and newly qualified teachers. Further opportunities to work with national-level teacher training / accreditation organisations would be particularly complementary to the audiences already reached within the programme.

Further, more detailed, recommendations are provided in section 5.3 of the [main report](#) for the purpose of informing the development of future similar programmes.