

SPACE[◉] awareness

Space Science: The view from European school students

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Pupil Survey Summary

A survey of European pupils' views of space science was conducted in 2016 and early 2017 as part of the Space Awareness project. This summary report provides an overview of the survey and its main findings, particularly with regard to age, gender and country. Additional details of the data and analyses are included in the [technical annexe](#).

In compiling this report we wish to acknowledge the very important contributions of the various partners and nodes who managed the data collection processes at local level, as well as the teachers who willingly managed their pupils' involvement, and of course the pupils themselves. Your efforts have been a tremendous help in providing this view of European pupils' perspectives on space science, and offer a valuable contribution to space science teaching throughout Europe and beyond. Thank you.

1. Survey overview

One of the key aims of the Space Awareness project was to foster enthusiasm for space science, and to increase pupils' interest in careers related to space science. While there has been substantial research around attitudes to Science, Technology, Engineering and Mathematics (STEM) more broadly, little is known about the attitudes towards space science of pupils who are in the target populations for the Space Awareness activities. This baseline survey was a way of addressing this gap.

The focus of the survey was on areas that previous research suggested were most likely to be influenced by participation in Space Awareness activities. The focus was almost entirely on space science, rather than science more broadly, in order to keep the survey length reasonable. In addition, the survey items were mapped to the Space Awareness project outcomes related to pupil learning, to provide a baseline indication of pupil attitudes and perceptions. In particular, the survey contained items related to attitudes towards space science, perceptions of careers in space science and of those who work in that field, interest in activities related to space science, and aspirations towards future study or careers in space science.

The survey was created online and translated by the project nodes into the languages relevant for their countries. The survey was available in 13 different languages and was completed online. Project nodes were responsible for recruiting pupils in the appropriate age ranges (described below and in the [technical annexe](#)), generally via schools with which they already had contact. The survey was open for completion from February 2016 through March 2017, though some countries achieved their target numbers sooner.

2. Participating students

Over 8000 students from 17 countries completed the survey.

Overall, the survey had a target age range of 11-14, which corresponds to late primary/early secondary school in most European countries. This range was chosen as it is at these ages during which aspirations continue to form and solidify, when young people continue to develop images of who does/does not (or can/cannot) work in science (see for example Archer & DeWitt, 2017). Additionally, in most countries, these ages are also when students begin to have to make decisions about their educational paths (e.g. around how much science to take within their educational studies).

In order to cover the target age range and have sufficient numbers for analysis, we aimed for 500 students from each country, at the following ages:

- Age 10: 50
- Age 11: 100
- Age 12: 100
- Age 13: 100
- Age 14: 100
- Age 15: 50

In the actual implementation of the survey, the age range of participating students was 9-16. Because the target age range was 10-15, ages 9 and 10 were combined for analysis, as were ages 15 and 16 (Figure 1).

Of the participating students, 4739 (51.5%) were female and 4397 (47.8%) were male (66 students did not respond to this question, Figure 2).

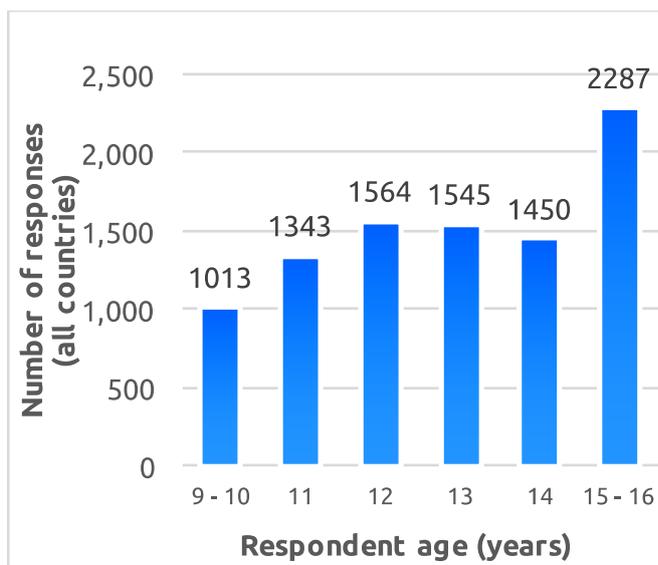


Figure 1 - Participating students, by age

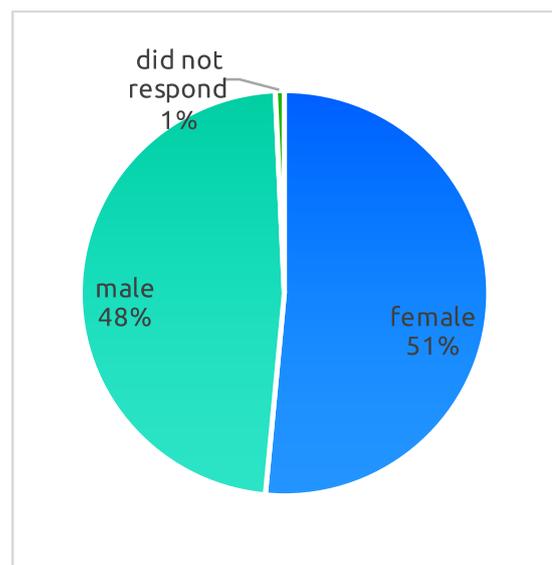


Figure 2 - Gender distribution

The number of students participating from each of the 17 participating countries is displayed below (Figure 3). For country-level analysis, the UK and Ireland were combined (to achieve a sufficiently large sample for analysis) and non-European countries were excluded, as were countries with insufficient numbers of students (Belgium, Norway, Netherlands).

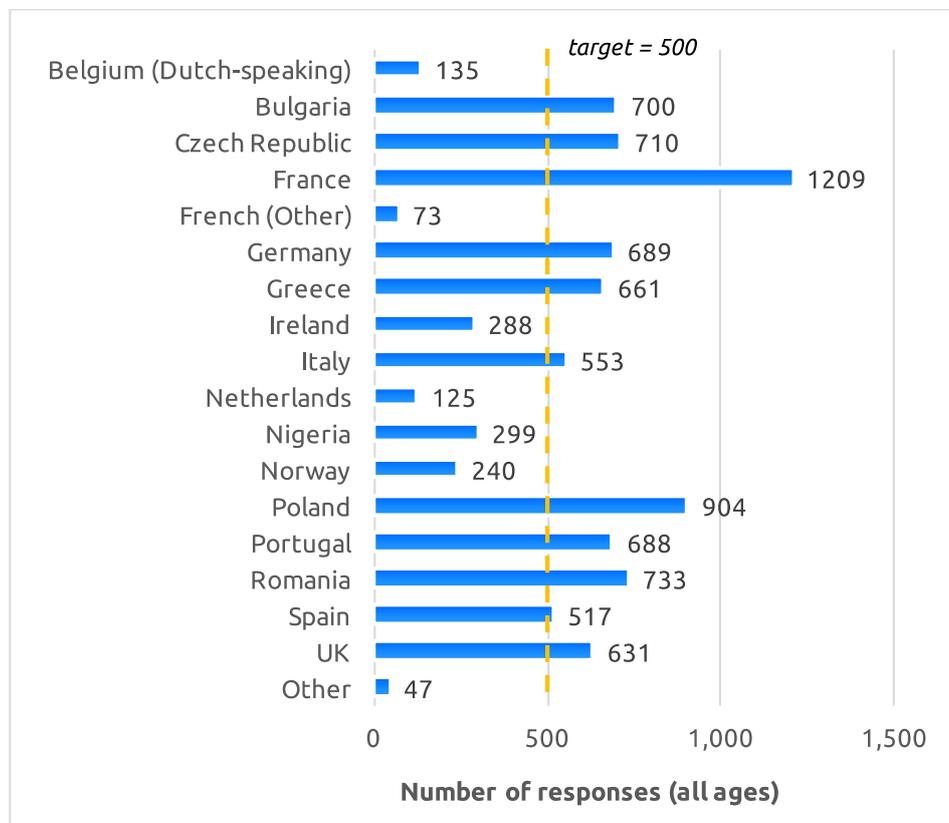


Figure 3 - Participating students, by country

3. Findings

Overall, the survey findings reflected that pupils seemed to have quite positive perceptions of space science, regardless of gender, age or country. More specifically, pupils evidenced quite substantial interest in space-related activities. In particular, over half of respondents indicated they would be interested (responding 'very much' or 'some') in watching a TV programme about space (60.7%) or looking through a telescope/going star gazing (68.1%) in their leisure time. Additionally, attitudes to space science would seem to be incredibly positive, with close to three-quarters of respondents agreeing or strongly agreeing that they enjoy learning about space science (70.9%), would like to find out more about space (73.1%) and that space science is interesting (73.8%). However, fewer than half agreed that they had friends or family interested in space.

In addition to holding positive attitudes about space science, students also tended to value space science and its contribution to society. For instance, over 2/3 felt that it is important to learn about space and that understanding about space is important to society. Furthermore, nearly 80% agreed that discoveries in space science can help society in

general. However, far fewer (about 50%) agreed that discoveries in space science can make their own daily lives better.

The survey also contained items related to perceptions of careers in space science and individuals who work in that field. Responses suggest that pupils' perceptions of work in space science are fairly open-minded and positive, with a clear emphasis on valuing contributions across cultures, backgrounds, skill sets and genders. For instance, 81.2% agreed that 'people from different countries work together to make discoveries about space' and over 70% agreed that it is important that people from different cultures and that both men and women work in jobs related to space science. Students also felt that there are many kinds of jobs in space science. However, although over three quarters believed that important discoveries in space science had been made by individuals from many different cultures, only a third agreed that such discoveries had been made by women (although a similar proportion also agreed that space scientists were usually men).

Not surprisingly, the survey also highlighted that pupils tended to perceive work in space science as strongly related to science, as well as requiring a long period of intense preparation. In particular, 74.2% agreed that people who work in space science always have university degrees, while 80.4% agreed that they had to study for many years to get their job.

Although a substantial proportion of respondents were interested in engaging in space-related activities in their spare time and the majority held positive perceptions of space science and work in space science, noticeably fewer could envision space science in their own future, particularly in terms of careers. Over half agreed or strongly agreed that they would like to find out more about careers related to space, that studies in space science can be helpful in getting a range of jobs and that jobs in space science use skills they learn in school. Despite this, only around a third felt people like them worked in jobs related to space (30.7%) or wanted to have a job related to space (31.5%). That said, that proportion does contrast positively with the proportions of pupils interested in 'becoming a scientist' in the ASPIRES studies (Archer & DeWitt, 2017), which tended to hover around 18%.

3.1 Findings by gender, age and country

Analyses began by investigating which items on the questionnaire grouped together into categories, with the following six 'composite' categories (each consisting of multiple individual statements from within the questionnaire) identified:

- Interest in space-related activities
- Positive attitudes to space science
- Valuing space science
- Perceptions of work in space science
- Preparing for work in space science
- Space science and my future

Please see the [technical annexe](#) for a list of the items each category included.

Next, statistical tests were used to analyse each category by age, gender, and country in order to investigate how these categories may differ by respondent background. These analyses are summarised in Table 1 below.

Category	Gender	Age	Country
Interest in space-related activities	X	* 9-10 higher	* Romania higher UK/Ireland lower
Positive attitudes to space science	X overall (* some at country level: males higher in France and Spain; females higher in Romania and Greece)	* 9-10 higher	* Romania higher
Valuing space science	X	* 9-10 higher	* Portugal higher
Perceptions of work in space science	* Females higher (Poland, UK/Ireland and Greece) Males higher (Portugal)	* 12 year olds higher	* France higher Poland lower
Preparing for work in space science	X	* 15-16 less agreement	* Germany lower
Space science and my future	* Males higher (France, Germany, UK/Ireland, Portugal and Spain)	* 9-10 higher	* Romania higher Germany & Czech Republic lower

Table 1 – Summary of differences in responses by the background variables of age, gender and country. Note: a * means a statistically significant difference was observed, an X means one was not found. For instance, for Interest in space-related activities, there was no gender difference (girls and boys did not differ statistically in how they responded to the questions in this category) but there was an age difference, with children age 9-10 more likely to agree with the items in this category (compared with older children). More details about all of these analyses are found in the [technical annex](#).

Key findings are summarised in the sections below, but it is also interesting to note that, overall, there seem to be more age-related and country-related differences, than differences related to gender.

3.1.1 Key findings by gender

- Although initial analyses revealed no differences by gender in interest in space-science related activities, once other variables were controlled for, girls were actually slightly more interested in space-related activities than boys.
- Overall, girls and boys evidenced equally positive attitudes to space science. However, within individual countries, boys had more positive attitudes to space science in some countries (France and Spain) while girls had more positive attitudes to space science in others (Romania and Greece).
- Across the sample, girls were more likely than boys to agree with items in the category 'Perceptions of work in space science' (e.g. about the importance of people from different cultures and genders working in space science). However, this was not the case within each individual country. More specifically, although girls were more likely to agree with these items in Poland, UK/Ireland and Greece, boys in Portugal were more likely than girls in that country to agree with these items.
- The item on which the greatest gender differences appeared (across the sample) was: 'It is important that both men and women work in jobs related to space science' (83% of girls and 75% of boys agreed).
- Despite the positive perceptions of and interest in space science among girls (and boys), girls were significantly less likely to see a future for themselves in space science, as evidenced by their lower agreement, compared with boys, on items about working and studying space science in the future. However, it is also noteworthy that although this difference held true for France, Germany, UK/Ireland, Portugal and Spain, there was no significant gender difference in Bulgaria, Czech Republic, Poland, Romania, Greece and Italy. This suggests that for some countries (notably those in northern Europe), boys are more likely to aspire to careers in space science than girls.

3.1.2 Key findings by age

Congruent with other research around attitudes to science more broadly, younger pupils tended to be more positive than older ones on most measures. More specifically:

- Interest in space-related activities is higher at younger ages (particularly age 9-10), and then decreases with age.
- Younger students (particularly age 9-10) also had more positive attitudes to space science than older ones. However, attitudes to space science were quite positive across all age groups (younger students were just even *more* positive).
- Likewise, 9-10 year olds were more likely to agree with the items in the category 'valuing space science' (e.g. items related to the importance and benefits of space science). However, once other variables are taken into account, the differences between ages became quite minimal, suggesting valuing of space science across multiple ages.
- Although 12 year olds were more likely to agree with statements in the 'Perceptions of space science' category, the differences among ages were overall quite small.
- As students got older (15-16 year olds in particular), they were less likely to agree with statements in the 'Preparing for work in space science' category. However, given the nature of these items (about needing to study for many years and obtain

a university degree to get a job related to space), this may reflect an increasing perception of the diversity of routes to jobs in this sector as students get older.

- Younger students (and those aged 9-10 in particular) were more positive about space science in their future (e.g. careers) than older pupils.

3.1.3 Key findings by country

While some differences were apparent among respondents from different countries, it is important not to place too much emphasis on them, due to the limited control available over sampling and because relatively limited information is available about the samples. Nevertheless, some intriguing findings did emerge.

- Romanian students were higher than their international peers in three of the six categories, and were generally very positive about space science overall.
- Conversely, pupils from Germany, the Czech Republic, Poland and the UK/Ireland were often less positive about space science.

4. Conclusions and recommendations

Despite some variations by age, gender and country, students were generally quite positive about space science as a field and those who work in it. Indeed, looking at the categories of 'positive attitudes to space science', 'perceptions of work in space science' and 'valuing space science', the majority of students tended to agree or strongly agree with the statements included. Moreover, for 'positive attitudes to space science', once other variables are taken into account, gender, age and country seem to have a negligible role to play. That is, regardless of gender, age or country, students within our sample had positive attitudes to space science. Likewise, across the board, analyses highlight that individual differences (e.g. related to personal experiences, other attitudes etc) are more important than background (whether gender, age or country) in driving attitudes to space science.

However, despite these positive attitudes and interest, substantially fewer students were interested in pursuing a career in space science. Although this chimes with other research around aspirations in science generally (e.g. Archer & DeWitt, 2017), it also highlights important challenges and implications for the field. More specifically, it emphasises that simply focusing on students' attitudes to space science – or trying to increase interest in space-related topics – is likely to be insufficient to increase the numbers, or diversity, of individuals aiming for careers in that field. It also highlights that targeting 'girls', or '14-year-olds', even within a particular country, as homogenous groups with a one-size-fits-all solution is unlikely to improve the situation. Rather, drawing on the survey data as well as other research on aspirations and choices, we would encourage initiatives that try to connect with young people's individual experiences and interests and support them to see the links between their aspirations and space science. Relatedly, other research around aspirations also points to the value of highlighting the way that studies in space science or related subjects can be useful for a range of jobs – both in and from science. In so doing, however, it is also helpful to be as specific as possible in noting what those jobs are and in making efforts to emphasise links between space science and aspirations that young people (e.g. in a classroom) actually hold.

Another survey finding with implications for practice concerns age-related differences. Younger students (particularly ages 9-11) expressed more positive attitudes to space science, were more interested in activities related to space science and were more likely to aspire to careers in space science, compared with older pupils. Considered in light of other research suggesting that attitudes to science form at quite young ages, it would seem important to reinforce these attitudes – perhaps by linking them to more specific future careers and providing information about pathways to those jobs – whilst pupils are still in primary school.

The survey findings also suggest that other recommendations for encouraging equity, including gender equity, in science more generally (and in the physical sciences in particular) are likely to be applicable to space science as well. That is, pupils in the survey tended to agree that space scientists ‘had to study for many years to get their jobs’ and ‘always have university degrees’, suggesting a perception of a profession which is challenging and requires many years of study to enter. Whilst this may be true, it also serves to reinforce perceptions of space science as difficult and of people who work in the field as exceptionally intelligent. Again, whilst this may be the case, it is likely to lead many pupils – particularly girls – to conclude that it is too difficult and thus ‘not for me’. Although we would not encourage promoting a misleading image of the field of space science, our findings chime with much previous research around perceptions of physical sciences in recommending that efforts be made to emphasise the human side of the field and those who work in it, enhancing the possibilities that young people may connect with those scientists and come to see them as ‘like me’. Such perceptions make it more likely that young people can envision a future for themselves in space science, which, in turn, would support making educational choices that lead to such a path.

Finally, while there are challenges in encouraging more individuals – and particularly individuals from more diverse backgrounds – into space science, the survey highlights that the field does seem to have a relatively positive starting point. In particular, not only are students interested in the topic but proportionally more seem to hold aspirations towards space science, compared with science more generally, and particularly the physical sciences.