we the curious

Opportunities for engaging young people with the space sector

Association for Science and Discovery Centres

Science and Technology Facilities Council

City Academy

UK SPACE AGENCY

Executive summary

Space research is often considered "inherently inspiring" to young people. However, this report highlights substantial ethical concerns held by young people around the space sector.

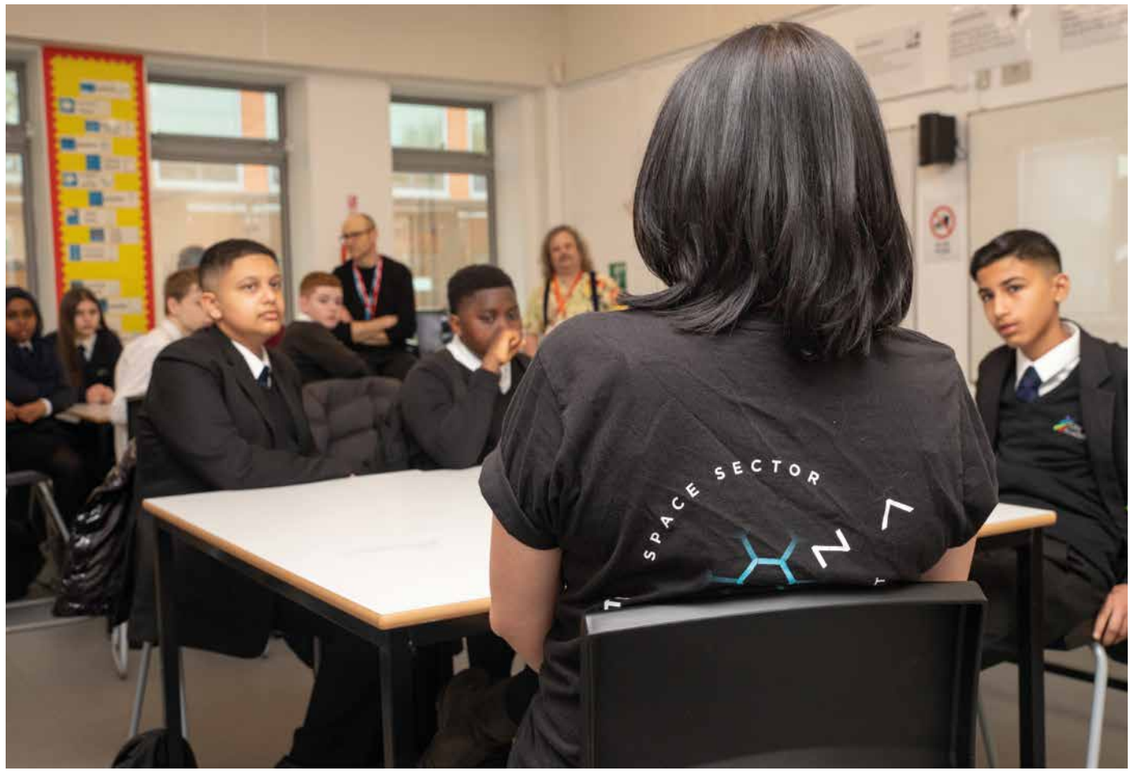
Young people's concerns arise from their desire that the space sector aligns with their global priorities, and as such, offer promising opportunities for meaningful engagement.

Young people's perceptions clustered under the themes of:

Climate change, Social justice and Curiosity

Young people feel a sense of responsibility to planet Earth, and it is clear that feeling extends to our relationship with space. While they are 'insatiably curious' about space and find it inspiring, this is tempered by the weight of that responsibility.

Engagement efforts in the space sector can no longer rely on inspiration to be enough for young people. However, by acknowledging their concerns and communicating with young people about the space issues they care about, space sector professionals could better develop a generation of people deeply invested in space and its many benefits for humanity.



Context

We The Curious (WTC) is an educational charity and science centre based in Bristol. Our aim is to make cutting-edge science relevant, accessible, and empowering. City Academy Bristol (CAB) is a mixed gender secondary school with a high percentage of students eligible for Free School Meals as well as a high proportion of students from a minoritised ethnic background.

This report will cover the findings from two projects between WTC and CAB, both run by the Association for Science and Discovery Centres (ASDC) with funding from the Science and Technology Facilities Council (STFC) part of UK Research and Innovation (UKRI). This report, including qualitative analysis of the project data, has been funded by STFC and the UK Space Agency.

The projects (involving students aged 12-15) aimed to increase young people's sense of agency and belonging in discussing STEM topics, as well as to share their perspectives with the engagement and space sectors. Both projects took an 'authority sharing' approach, in which students and experts, including researchers and space sector professionals, were invited to share their experiences in a knowledge exchange. Small group discussions were observed by WTC facilitators.

Unless otherwise stated, the quotes throughout this report are from City Academy students.

> **"While they're interested in thinking about [space], it's definitely less real to them than the struggles that they see people facing in the world."**
>
> - Reflection of collaborating researcher

Space Sector Impact on Climate Change

Planet B

Much debated was the concept of 'Planet B' – colonising other planets, especially Mars, in a bid to save humanity from climate change. Some students saw it as our only option. Others argued that we did not deserve a second planet until we had fulfilled our responsibilities to the first - 'once we fix the errors on the Earth THEN we can go…'. Only occasionally was any hope shown for Earth's situation - 'our planet is fine and we still have the chance to fix it… we shouldn't bail on our planet'.

> **"I felt the children would be excited and inspired by the space sector as a whole but was surprised to learn a growing moral view that the space sector didn't contribute to the betterment of humanity and we should concentrate on our own planet first."**
>
> - Reflection of space sector professional

FINDINGS | CLIMATE CHANGE

Earth

Students showed a high level of concern surrounding climate change and the future of planet Earth. One student's comment 'since the world is ending' was generally accepted as a fact, and generated no debate. The environmental impact of space exploration, and of rockets in particular, was a topic of significant discussion. Though some students seemed uncertain of how much the space sector might impact the environment, they consistently led the conversation towards this topic – asking such questions as, 'Do you think there will be an eco-friendly rocket ship?'.

Students were better informed about general environmental issues. Their knowledge translated to a pessimistic view of climate change. Students agreed that 'they're all relying on us to fix it all', feeling that the responsibility to solve climate change was on their generation. For this reason, some considered the environmental costs of the space sector to be unacceptable.

When compared with climate change, the argument for space science was felt to be weak. For many young people, the scientific priority is 'to make the planet look like it used to'.

> **"We could [solve climate change] if everyone worked together, but they don't"**

> **"Humans are the biggest problem on Earth"**

> **"I don't think with my morals I could excuse going to space, I'd feel so guilty I'd feel sick"**

A key question from young people is -

How do governments/ agencies justify the pollution created and money used in space exploration?

Social Justice in the Space Sector

Financial

Many of the opinions offered by students covered use of money in space science. For most of these young people, human welfare was a higher priority than space science. In an activity where students were asked to create short plays to express their views on space science, some scientist characters were portrayed taking money from homeless people to fund pointless research. While this was one dramatised view, it did reflect the general opinion that 'people on this planet are way more important than [finding] microbes on other planets'.

This sentiment often manifested as a distaste for speculative science. One space sector collaborator, commenting on the persistence of this attitude, described how 'the role of challenging their perceptions may be larger than I thought.' In a similar sense, the group was disappointed to learn about space tourism and the large amounts of money involved. Many young people held the perspective that space should only be explored where it offers tangible benefits to human lives.

"Young people today do have concerns beyond climate anxiety... their concerns about the future and what was important to them [included] cost of living crisis, poverty, war, social justice."

- Reflection from collaborating scientific funding professional

"I like curiosity but I'm always looking for practical benefits. If we know there's not going to be any practical benefits we should just stop."

"There should be a practical reason for exploring space. Earth is facing lots of issues like poverty and climate change."

FINDINGS | SOCIAL JUSTICE

Inclusion

The young people's understanding of stakeholders in the space sector was varied – some had preexisting knowledge around space sector funding, while many had not heard of organisations like ESA and NASA. Broadly, the perception was that the space sector was led by individuals. Elon Musk was brought up frequently by students, though opinions on him varied dramatically.

Some students felt the direction of the space sector should be decided by 'Elon Musk, astronauts, not us'. Others showed concern for inclusivity, arguing that 'you need to have a varied group of people studying it or you won't get a varied [and accurate] view' and that space exploration 'is a classist idea - it's not accessible'.

Students also seemed unsure how space-related innovations are shared with developing countries. Some were concerned that new technology could be exclusively controlled by commercial organisations.

Inclusion was a key issue - primarily in terms of class but gender equality, racism, and international collaboration were also raised. Young people were pleased to learn about progress in these areas, and keen that future work addresses historical inequality in science.

"I don't know much about NASA but I know about Elon Musk."

"Diversity is a good thing as well – different kinds of scientist."

"It's sad that women don't get to be the first to do these things - first female astronaut instead of first astronaut."

Key reflection from a collaborating researcher -

I wasn't aware before we started how concerned some of the students were with resource allocation. I wasn't thinking about resource allocation when I was their age.

Big Questions in Physics

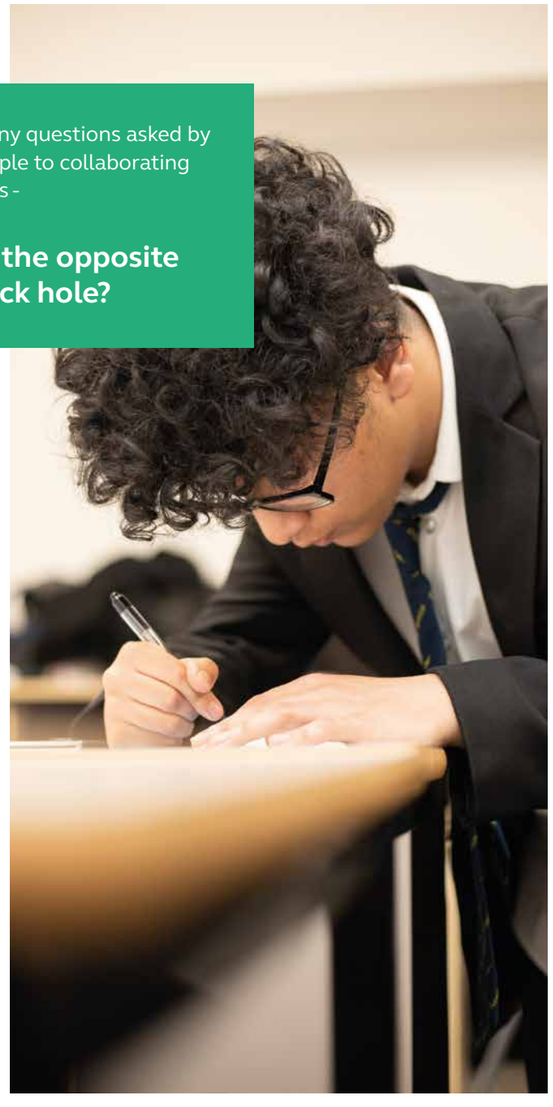
Despite the concerns raised by the students, they also showed a strong curiosity for what the space sector has to offer. Many of their questions explored complex physical concepts, such as black holes, and highlighted how excited students were to discuss these topics. This excitement appears to have been increased by the opportunity to talk to scientists. During a choose-your-own-adventure style game in one project, students were asked to decide if they would continue to fund black hole research or if they would save the money for research with more immediate practical benefits. At the start of the project, before their interaction with the scientist, **0%** of students wanted to fund black hole research. When the question was repeated at the end of the project, this figure had jumped to **71%**, despite many maintaining objections to speculative science.

Some students found value in the space sector for the less practical benefits, describing space exploration as a fundamental activity for humans to do. For some, space exploration represented our development as a species.

> **Humans want to go into space to explore and see what's out there."**

> **"We can create things we never thought we could do, as a species we can grow more intelligent."**

Curiosity Inspired by Space Science



One of many questions asked by young people to collaborating researchers -

What's the opposite of a black hole?

> **While they're interested in thinking about these [...] things, it's definitely less real to them than the struggles that they see people facing in the world."**

- Reflection of collaborating researcher

> **"Can you give birth in space?"**

> **"Why don't we explore the ocean instead?"**

Related Sciences

Their curiosity extended beyond physics. The students were fascinated by biological concepts in the context of space, asking many questions about what could happen to astronauts in specific scenarios. Students also questioned why we choose to explore space rather than focusing entirely on earth. For some 'what makes it interesting is that you don't know what's there', an enthusiasm for discovery they applied in many contexts. Multiple students returned to project activities having researched space science and developed their own theories that they wanted to share.

Science as Culture

While much of the discussion was centred on the 'big questions' of physics – black holes, alien life, exoplanets, and so on; students also brought their interests and backgrounds to the discussion. For several students, the interest lay outside 'classical science' areas – incorporating the arts, religion, and culture. One area that inspired deep curiosity was the potential for discovering alien cultures, different to cultures on Earth. One student shared that this was of particular interest to them because of their dual heritage background, so the blending of cultural ideas held particular significance to them. Perspectives like this showed the importance of listening to the specific interests and experiences of any outreach audience. The conversations sparked by such comments showed how relevant to everyday life space science can feel.

These young people were, as described by one scientist, 'insatiably curious'. This curiosity shone through in every conversation but was consistently tempered by young people's concerns. Many of their comments seemed to show space exploration as an idealistic endeavour that did not sufficiently take into account the challenges faced by Earth. However, the students recognised the potential benefits in space exploration – saying that it 'should be a balance of inspiring and logical'.

There is perhaps an over-assumed perspective in science communication that space is inherently exciting to most people. What we have learned from these projects, however, is that any excitement young people feel about space may not be enough to overcome their concerns with the sector.

Conclusions and recommendations

1 Communicate environmental impacts of space science

For two projects that were centred on space science, the student-led approach repeatedly brought the focus of discussion back to climate change. This is clearly of huge concern to the young people involved and cannot be disregarded in space outreach efforts. While there is much work going into reducing the environmental impact of the space sector, this work is perhaps not being communicated thoroughly to young people. Space-related outreach efforts should acknowledge the environmental impact of the sector - including sustainability efforts, space junk, and climate effects - and communicate with young people about how this impact is being addressed. This will be of particular importance when referencing 'planet B' theories, with young people benefiting from reassurance that humanity has learnt from its past environmental and colonial mistakes.

Space-related outreach efforts should acknowledge the environmental impact of the sector... and communicate with young people about how this impact is being addressed.

2 Celebrate inclusivity in the space sector

While young people are interested in resource allocation in the space sector, they do appear to have limited knowledge on the topic. Rather than being perceived as dull or too complex, there is evidence from these projects that young people can engage with meaningful discussion about scientific funding. The role of governments and other stakeholders in the space sector requires clarification for many young people, as they are increasingly viewing it as exclusively the domain of wealthy individuals. Similarly, ongoing work to increase the inclusivity of the space sector should be acknowledged and celebrated for more young people to feel that they have a place within it.

Work to increase the inclusivity of the space sector should be acknowledged and celebrated for more young people to feel that they have a place within it.

A key part of portraying the space sector as inclusive for young people is to reduce the perspective that it is wasteful of money. The young people involved in both projects require a clear benefit to humanity for space exploration to be worth the costs. Ensuring that the space sector has robust arguments for its use of funding, and can communicate the value of its programmes, will be essential to retaining positive public opinion.

Ensuring that the space sector has robust arguments for its use of funding, and can communicate the value of its programmes, will be essential to retaining positive public opinion.

3 Build meaningful relationships

While young people's concerns about the space sector are numerous and deeply held, there is significant opportunity for meaningful engagement work to take place. Young people are profoundly curious about space, and how it relates to humans and culture. Their connection, and sense of belonging, in the space sector can be developed by encouraging young people to bring their own knowledge and experiences to outreach activities. This effect could be significantly enhanced by bringing their input directly into space sector decision-making; responding to their concerns with open communication and actions.

The next step towards a younger generation feeling involved and invested in the space sector is to build relationships. The projects covered in this report benefitted from multiple activities between young people, science communication practitioners, scientists, and space sector professionals. The opportunity to meet real people working in the space sector remains highly valuable to young people. By continuing to build these relationships, and form new ones across the country, we can open the door for better communication, enhanced engagement, and a space sector ready for the next generation.

Young people are profoundly curious about space, and how it relates to humans and culture.

we the curious

Project video

Projects in collaboration with City Academy Bristol.
With special thanks to: Association for Science and Discovery Centres (ASDC), the Science and Technology Facilities Council (STFC) part of UK Research and Innovation (UKRI), and UK Space Agency (UKSA).
This report was prepared by project lead, Gemma Kerr.

Association for Science and Discovery Centres

UKRI Science and Technology Facilities Council

City Academy

UK SPACE AGENCY