Written evidence submitted by UK Association for Science and Discovery Centres (AST0040)

Astronomy within the sector of UK science and discovery centres

1. The Association for Science and Discovery Centres represents the UK network of Science and Discovery Centres and Museums. This national infrastructure collectively engages with over 25 million people every year.

2. Astronomy and space sciences play an integral role, if not the most important role, within a number of our sites. Examples include the Observatory Science Centre, Kielder Observatory, Armagh Observatory and Planetarium, Dark Space Planetarium, Aero Kinross/Cosmos Planetarium, the National Space Centre, Dynamic Earth, the Royal Observatory Greenwich and Jodrell Bank Observatory and Discovery Centre.

3. Science and Discovery Centres house several of the largest UK planetaria, popular visitor attractions for young and old, utilising cutting-edge, immersive technologies to share astronomy and space sciences – through awe and wonder experiences - with school children and the public.

4. ASDC led programming recognises and evidences the value of astronomy and space science to support people, regardless of ages, genders, backgrounds, abilities or experiences, to enjoy, engage and participate in science.

    4.1. Explore Your Universe initially worked across ten UK science centres and museums. Supported by STFC, it showcased astronomy, space sciences and physics. Gender equality was designed into this programme, and the large-scale evaluation demonstrated this physics programme inspired interest and positive attitudes towards STEM for boys and girls equally.[1]
    4.2. More recent iterations of Explore Your Universe demonstrate the power of astronomy, space science and physics for equitable and inclusive STEM engagement, supporting increased connection to science, confidence, enjoyment, skills, agency and ownership for young people from underserved, under recognised and under resourced communities in the UK.[2]
    4.3. Wider ASDC space-science programming (funded by the UK Space Agency) across the network has reached over 2.2 million children and adults[3] with current programming taking place across 22 of our Science and Discovery Centres and Museums[4] that headlines the value of space science for the future sustainability of our home planet Earth.
    4.4. ASDC partnered with Disney in 2022, connecting and coordinating STEM events across the country on the cinema release of 'Lightyear' and reached hundreds of thousands of people in a tight timeframe focussing on astronomy and space sciences to stimulate curiosity and imagination as young people explored the science behind the science fiction.[5]

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[1] Explore Your Universe final evaluation report (Kings College London)
[2] Evaluation Report: Relationship + Engagement = impact, DeWitt (2022)
[3] Destination Space (2015-2022)
[4] Our World From Space: exploring the relevance of UK space for the future sustainability of our home planet (2023-2025)

4.5. Some of the most impactful and equitable case studies in our sector [6] [7] utilise astronomy and space sciences as an easy point of access, interest and inspiration for diverse audiences.

Astronomy for science in society

5. The UK network of Science and Discovery Centres has a vision for a society where science is accessible, inclusive and valued by all as a fundamental part of everyday life. Astronomy sits in a unique place between science and culture and heritage, as illustrated with the high-profile new UNESCO site at Jodrell Bank Observatory and Discovery Centre[8]. At this intersection, it is an accessible point into STEM for wide, diverse and multicultural audiences[9].

6. Although astronomy is often a blue-skies research area, there are tangible outcomes and cutting-edge technology and applications that benefit society[10] and link astronomy research to relatable benefits to daily life, supporting relevance for public interest.

7. The opportunity that astronomy has in igniting curiosity and life-long learning in STEM is well known and has been utilised many times on a national and global scale. A few of these include:

    7.1. The UK National Astronomy Week[11] (Most recently Mars Encounter 2020)
    7.2. The International year of Astronomy: "The Universe, Yours to Discover".[12]
    7.3. International Observe the Moon night[13]
    7.4. International Astronomical Union initiatives and programmes[14] (including Communicating Astronomy with the Public)
    7.5. The IAU Office for Astronomy for Development[15] playing a large role in communicating astronomy and science in Africa and beyond, recognising the power and value of astronomy knowledge and skills to address the UN global sustainable development goals.

Science and Discovery Centres role in greater diversity and inclusion in STEM and public interest in science

8. Beyond career aspirations, recent research[16] highlights the role of Science and Discovery Centres in society to empower, inspire and inform the citizens for the future, providing opportunities for the wider public to use, practice and question science and its connection to the world we live in.

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[5] Case Study: Disney and Pixar's 'Lightyear' campaign across UK science and discovery centres (Summer 2022)
[6] Case studies: inclusion in science and discovery centres
[7] Valuing Inclusion report: learning about science my way
[8] UNESCO: Jodrell Bank
[9] Case study: Royal Observatory Greenwich, Astronomy and Islam
[10] From Medicine to Wi-Fi: technical applications of astronomy to society
[11] National Astronomy Week
[12] The International Year of Astronomy 2009 Final Report
[13] NASA Observe the Moon night
[14] IAU 100th anniversary celebrations (final report)
[15] Office of Astronomy for Development: Astronomy for a better world

[16] Science & Discovery Centre Futures (The Liminal Space, 2021)

9. Science and Discovery Centres culturally contribute to making science, in all its forms, relevant and accessible to UK communities[17]. They belong and contribute to the full science and technology education and industry ecosystem and constantly demonstrate their positive impact and contribution to society on multiple levels[18] [19].

10. In 2021, the importance of science and discovery centres for education, skills and broadening STEM access was championed by MPs in a Parliamentary Debate[20].

11. They are uniquely placed to open-up lifelong STEM pathways and opportunities, supporting greater and more diverse public participation in science. They do this in a number of ways:

    11.1. Leveraging in-depth, place-based knowledge and partnerships to broker meaningful connections between industry, business, research, education and the diverse public.
    11.2. Engaging with young people from an early age alongside their parents, carers, wider families, teachers and peers, contributing not only to initiating the spark of interest, but supporting the maintenance of career aspirations in space by engagement with key influencers and nurturing science capital[21] [22].
    11.3. Working closely with teachers and school students to support and enhance the understanding and attainment of Science, Technology, Engineering and Maths in the curriculum and for future careers[23].
    11.4. Adhering to the evidenced educational theories and pedagogical approaches that underpin best practice in inclusive STEM education and engagement.[24] [25] [26]
    11.5. One approach specifically focussing on higher-order thinking skills works well with astronomy content and context. Thinking Doing Talking Science[27], co-developed by Bridget Holligan in Science Oxford, has an evidence-based pedagogy that demonstrated progress on attainment and increased positive attitudes to science in primary schools. Thinking Doing Talking Science informed the development of the exceptional Explorify resource for science teaching.[28] .

12. Initiatives that leverage strong community partnerships evidence the ability of the sector to tackle persistent inequities in STEM participation. These programmes reach across socio-economic and geographic boundaries, to nurture STEM belonging, agency and identity and broaden horizons for individuals and communities facing multiple barriers to STEM engagement and participation[29] [30].

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[17] Mapping & analysis of science engagement and inequity in the UK (British Science Association, London Economics, 2022)
[18] International Science Centre Impact Study Report (Falk et al., 2014)
[19] The Value of Science Centres (The InterAcademy Partnership, 2022)
[20] Parliamentary Debate on the importance of Science and Discovery Centres
[21] Aspires (Science Capital) research (Archer et al., 2015-2023)
[22] Space scientists' reflections on career influences, paths and choices (DeWitt & Bultitude, 2017)
[23] Case Study: Glasgow Science Centre STEM Learning Labs
[24] Science Capital Teaching Approach (Godec et al., 2017)
[25] Science Capital in Practice (2021)
[26] Literature Review: what practices truly involve, excite and empower school-aged students to feel space sciences are relevant to them? (Leverment et al., 2020)
[27] Thinking, Doing, Talking Science (Wilson et al., 2020)
[28] https://explorify.uk/
[29] Valuing Inclusion (2023)

Recommendations

13. The above evidence illustrates the great current work and potential for utilising astronomy and space for a future diverse and flourishing STEM sector for the UK. Science and Discovery Centres have strategic partnerships extending far beyond their locality[31]. The impact of the network, interconnecting across all regions of England, Northern Ireland, Scotland and Wales, and operating at great breadth and depth of engagement, represents huge potential for strategic, national and meaningful STEM engagement and education across the nation: a powerful mechanism that can help define and realise the vision of the UK as a future science superpower.

14. High profile recognition and promotion of Science and Discovery Centres' contribution to society, and proactive endorsement of their relationships (e.g. with UKRI, the UK Space Agency, Learned Societies such as the RAS, and wider national partners and networks) should be encouraged. Greater facilitation of collaborative approaches across the many networks and initiatives leveraging astronomy for diversity, inclusion, science communication, education and public engagement require strategic and proactive decision making from government. ASDC has initiated a new, small-scale, cross-network quarterly opportunity for UK space and astronomy engagement professionals to connect online, sharing ideas, resources, and approaches, but this is dependent on short-term project funding. Competition over limited resource can keep excellent astronomy and space engagement initiatives artificially siloed from each other, preventing collaboration, shared learning and, more urgently, creating barriers for the individuals we serve. Young people disengaged from science can spark an interest through astronomy and space science but then fail to find wider opportunities that together nurture STEM identity and aspirations into the long term.

15. Science and Discovery Centres have charitable objects that relate to public engagement with science, the development of science capital and the education of young people (within the family setting) to encourage STEM pathway and career opportunities. Despite the great impact of Science and Discovery Centres and planetaria in the UK, most receive no long-term public funds to cover running costs, and no subsidies to support their most valuable work with underserved, marginalised and minoritised audiences (albeit with some in-country support from devolved governments). Strategic funding should be invested for organisations so well placed for this work, to not only sustain, but to grow community partnerships and engagement resource and activities to build a fairer and better future for the UK.

27 October 2023

[30] Explore Your Universe (2022)
[31] Influence map: We The Curious, Bristol (data from 2021)