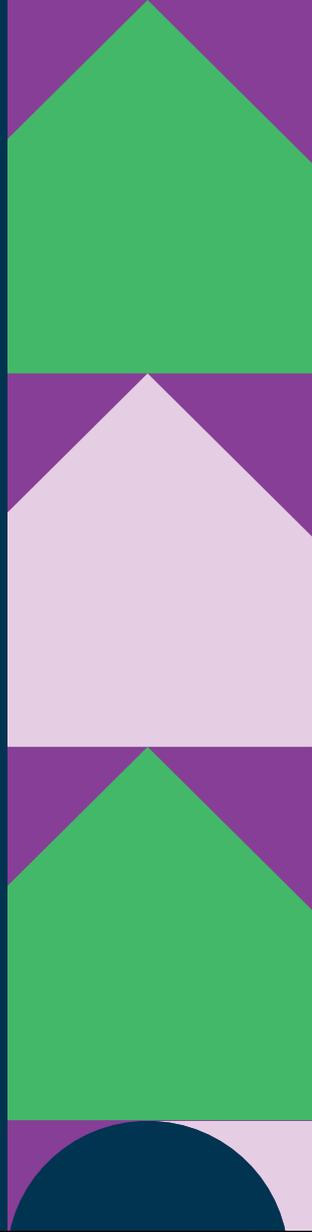


Institute of Education

An Evaluation of the DIAS Dunsink Observatory Space Crafts Programme

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*"I always thought of being like, a fashion designer.
But I could be a space explorer!"*



Executive Summary

This report provides an overview of a commissioned, independent evaluation of DIAS Dunsink Observatory's *Space Crafts* programme, conducted by researchers at Dublin City University (DCU)'s Institute of Education. The programme, which was developed with funding from Science Foundation Ireland (SFI), consisted of eight collaborative science & arts workshops delivered to groups of fifth and sixth pupils from DEIS schools in north west Dublin, between May 2024 and November 2025.

A mixed methods pre-, post-, follow-up approach was employed, combining quantitative measures of pupils' science-related attitudes and knowledge with qualitative data from open-ended questionnaires and focus groups with participating pupils and interviews with their teachers. Linear mixed-effects models indicated that the workshops were associated with sustained improvements in pupils' self-confidence in science. Short-term changes were also observed in terms of reduced anxiety towards science and increased recognition of its societal value, although these were not maintained at three-month follow-up. Thematic analysis of the qualitative data identified the place-based nature of the workshops, combined with the emphasis on creative and hands-on engagement as key strengths. Pupils' suggestions for enhancing the workshops, particularly those regarding a desire for a stronger focus on science alongside the creative elements, provide potentially valuable insights for future iterations, and are also of interest in light of the broader discourse relating to integrated learning at primary level.

Whilst the evaluation did not incorporate a control group and therefore cannot establish causality, it nonetheless provides evidence of the potential of combining active, experiential learning with the purposeful integration of science and the arts in supporting the engagement of children from socio-economically disadvantaged backgrounds in science.



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List of Acronyms and Abbreviations

DCU	Dublin City University
DEIS	Delivering Equality of Opportunity in Schools
DES	Department of Education and Skills
DEY	Department of Education and Youth
DIAS	Dublin Institute for Advanced Studies
mATSI	Modified Attitudes Towards Science Inventory
PBE	Placed-Based Education
SFI	Science Foundation Ireland
SPSS	Statistical Package for the Social Sciences
STEAM	Science, Technology, Engineering, Arts and Mathematics
STEM	Science, Technology, Engineering and Mathematics



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Chapter 1: Programme Context

Background and Rationale

Improving children’s engagement with science, technology, engineering and mathematics (STEM) from an early age has become a global educational priority (Broderick et al., 2025). Although the rationale for this is often framed in economic terms, Irish educational policy also emphasizes broader societal objectives, highlighting the importance of STEM in equipping young people “to be active citizens, to engage with modern communications and media in a critical way, to ensure personal well-being and to make informed choices about many aspects of their lives” (DES, 2017, p.10).

Notably, participation in STEM is unevenly distributed across socio-economic groups, with those from working class backgrounds chronically underrepresented. In relation to science specifically, the concept of “science capital” (Archer et al., 2015) has been proposed as a key factor underlying these patterns. Science capital refers to a constellation of various forms of economic, cultural and social capital that specifically relate to science. It includes basic knowledge and skills in science alongside science-related dispositions (*e.g.*, having a cultural appreciation of science), science-related behaviours and practices (*e.g.*, consuming science media, participating in informal science learning such as visiting science museums or going on nature walks), science-related social capital (*e.g.*, knowing people with science-related jobs or qualifications, having opportunities to talk to others about science), and an understanding of the value of science-related qualifications for future employment within and beyond science. Science capital is concentrated in more privileged social groups and is associated with a stronger science identity (*i.e.*, a view of oneself as, or a belief that one is recognized by others as being “a science



person”) and also with aspirations to study or work in science (Archer et al., 2015).

In Ireland, the DEIS (Delivering Equality of Opportunity in Schools) programme aims to address educational disadvantage, through the provision of intensive supports (e.g., smaller pupil-teacher ratios, Home School Community Liaison Services) to schools with the highest concentrations of students from socio-disadvantaged backgrounds. Encouragingly, data from large scale assessments indicate that, at fourth class level, attitudes towards science are broadly similar across students in DEIS and non-DEIS schools. However, the science achievement scores of students in DEIS schools are significantly lower than their counterparts in non-DEIS schools, and at second year level, a larger proportion of students in DEIS schools report negative perceptions (lower levels of liking, confidence or perceived value) of science (Denner et al., 2025). This trend highlights the importance of early interventions (*i.e.*, at primary level), that may bolster achievement levels and/or foster more positive attitudes and engagement before such disparities emerge.

The integration of STEM subjects with the arts (often referred to as STEAM) represents a potentially promising strategy for fostering an inclusive culture and opening up alternative pathways into science engagement. As noted by Rinne et al. (2011), arts-infused pedagogy typically involves multiple modes of learning and facilitates activities such as rehearsal, elaboration, generation, emotional arousal and pictorial representation, all of which have been associated with improved retention, as evidenced across a range of cognitive psychology studies. These effects may be particularly pronounced for those with lower academic preparedness, or for those who do not necessarily see themselves as “science people” but are drawn to the arts. For example, in a randomized controlled trial comparing arts-integrated and conventional science instruction, Hardiman et al. (2019) found that students with the lowest



levels of reading achievement benefited the most from arts-infused methods, demonstrating significantly greater long-term retention of science content than those who experienced conventional methods. Crucially, the study also found that more proficient readers demonstrated similar levels of retention regardless of instructional method, which may reassure those concerned that arts-based approaches risk detracting from learning in some instances. On the whole, findings such as these suggest that arts-infused approaches may be particularly well suited to interventions aimed at broadening participation in science, especially for learners from groups traditionally underrepresented in STEM.

Although arts-infused pedagogy is often inherently “hands-on”, experiential learning more broadly also includes active experimentation, manipulation of materials and direct exploration of scientific concepts. Notably, in a recent study examining the science self-efficacy beliefs of upper primary students in Ireland, children reported lower self-efficacy in relation to performing scientific skills compared with answering questions. Furthermore, although mastery experience predicted higher self-efficacy in these procedural skills, children also reported infrequent opportunities for independent investigations in the classroom (Carroll et al., 2024). The redeveloped Irish primary science curriculum, which foregrounds the importance of “child-led inquiry and design” (DEY, 2025 p.5) may go some way towards addressing this issue, but it is clear that there is scope for more opportunities for Irish primary children to engage directly with scientific phenomena through hands-on exploration.

One way in which such opportunities can be provided is through out-of-school learning experiences and targeted interventions. “Place-based education” (PBE), in particular, *i.e.*, experiential, community-based and contextual learning, has been recognised as an effective way of allowing students become “proactive investigators” of their environments (Yemini et al., 2025, p.641). It should also be acknowledged, however, that short,



one-off interventions are limited in the extent to which they can have lasting impact, and ideally, STEM engagement activities should involve sustained engagement, and consider young people’s “wider learning ecologies”, *i.e.*, peer group, parents and the wider community (Archer et al., 2021, p.67).

Programme History and Aims

DIAS (Dublin Institute for Advanced Studies) Dunsink Observatory has been a hub for space science research and public engagement since its founding in 1785. In recent years, there has been a particular emphasis placed on the growth of educational initiatives in the observatory. Initially, these were offered to post-primary students only, but in 2023, DIAS were awarded funding under the Science Foundation Ireland (SFI) Discover Programme¹ to develop Space Crafts, a series of structured onsite STEAM workshops aimed at late-stage primary students from local DEIS schools. The workshops were delivered in partnership with *Superprojects* and a group of Irish artists, and were designed to achieve the following aims:

(i) cultivate positive attitudes towards STEM

By introducing scientific concepts through the lens of space and art, the Space Crafts programme aimed to increase accessibility and engage young people from socio-economically disadvantaged backgrounds who may have previously faced barriers towards or had limited opportunities for involvement in STEM. By immersing them in the observatory, amongst its historic artefacts and ongoing astrophysics research, the workshops were intended to spark the children’s curiosity, to develop their sense of ownership over a local scientific facility, and to challenge any negative perceptions or

¹ Now the Research Ireland Discover Programme



stereotyped views that might deter them from pursuing STEM pathways in post-primary school and beyond.

(ii) increase participants' scientific knowledge and skills

Through interactive science talks, demonstrations and hands-on art-infused activities, the workshops aimed to provide a unique and impactful out-of-school learning experience for pupils, and specifically, to develop their knowledge and understanding of a range of Earth and Space Science topics.

(iii) promote STEM awareness and engagement in the local community

The programme also aimed to extend its impact beyond participating pupils. Artwork created by the children during each workshop was displayed in the observatory's public exhibition space, with families and other members of the public invited to view the pieces at Public Visitor Nights and other events. Through this approach, the programme aimed to raise community engagement with the facility, to increase parents' awareness of the opportunities that STEM can provide, and to encourage them to support their children's ongoing engagement with STEM. By forging connections with the participating schools, the programme also aimed to foster sustained engagement with these schools and the wider community into the future.

Programme Design and Overview

Each workshop was three days in duration, with one 5th or 6th class group from a local DEIS school participating on each occasion. This timeframe was chosen to ensure that the pupils were immersed in the topics to a much greater extent than would be the case during an invited talk at the school or a short tour of the observatory. The intention was to allow sufficient time for them to build confidence to ask questions and engage

with the facilitators, to revisit the ideas they encountered across the three days in a cumulative fashion, and to engage in supported reflection on their learning.

Eight workshops were held between May 2024 and November 2025. Each was focused on a different topic of space science and different art mediums, but all shared the same overall structure across the three days (see Table 1), with the mornings focused on space science content, led by Dunsink’s Education and Public Engagement Officer and the afternoons on art workshops inspired by these scientific themes, led by the collaborators.

Table 1. Structure of the workshops

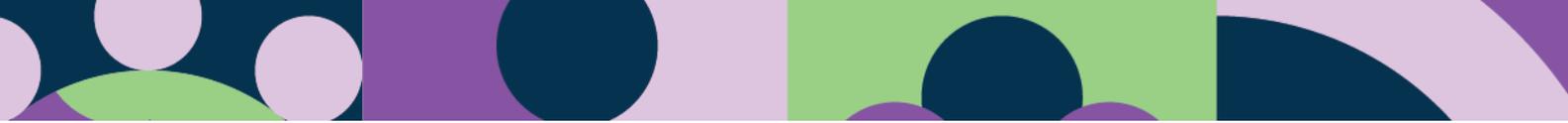
<p>Day 1 Students brought to the South Dome of the observatory, introduced to the planned activities, and given a guided demonstration of the Grubb telescope. Students receive a talk on the focus topic for the workshop, after which they begin their artwork.</p> <p>Day 2 Students invited to the Hamilton Room to learn about the previous director of the observatory, Sir William Rowan Hamilton, his significance in creating quaternions, and their importance for space flight. Students receive a second talk on the focus topic, reflect on their artwork from the previous day, and continue to work on the piece.</p> <p>Day 3 Students introduced to the Grubb Eclipse Mirror and the phenomena of eclipses and the Aurora (Northern Lights), which is tied to the solar physics research taking place on site. Students receive a final talk on the focus topic and then complete their arts projects. Workshop concludes with dedicated time for students to present their work and reflect on their learnings.</p>
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A range of topics were explored across the workshops (Table 2). These were selected to reflect content areas from the Junior Cycle Earth and Space strand, as well as themes from SFI’s Creating Our Future initiative.²

² The Creating Our Future initiative was a consultative process held between July and November 2021 that invited members of the public to submit ideas about what researchers in Ireland should explore to create a better future. Sixteen themes were identified from over 18,000 submissions received. See: <https://www.creatingourfuture.ie/2022/08/you-were-asked-to-create-the-future-this-is-what-you-said/>

Table 2. Details of the Workshops

Workshop	Detailed description of content
Workshop 1 May 2024	This workshop focused on planetary science and specifically the internal structure of the planets. Pupils were introduced to the concept of terrestrial planets as well as gas and ice giants. After exploring light and texture on these planets, the students created their own imagined exoplanets based on what they learnt. These planets were then brought to life on circular canvasses using acrylic paint and a variety of mediums to add texture and detail.
Workshop 2 June 2024	This workshop focused on celestial movement, including the movement of planets and moons in the solar system. Students were also introduced to the movement of spacecraft in the solar system after launch, using ESA JUICE as an example of how a spacecraft will orbit and flyby many planets before reaching its destination. The pupils created many large-scale drawings both individually and in groups using charcoal and pastels to illustrate the spirals and movement in the solar system. Pupils were also shown the spiral nature of galaxies which is also reflected in nature, which further inspired many of their drawings.
Workshop 3 November 2024	This workshop focused on solar physics and space weather, inspired by the work being done by a research group in the observatory. Pupils were introduced to the sun as our host star, and to the concepts of solar storms, flares and sun spots. It was also explained that the result of these phenomena are the northern lights or Aurora Borealis, as well as communication and infrastructure issues that can arise. To explain the Aurora Borealis fully, pupils were also introduced to magnetism, with demonstrations using magnets and iron filings, as well as explanations of the composition and importance of the atmosphere. Based off this learning, the pupils made aurora flags on cotton fabric using layers of ink and paint to build up compositions of aurora on their flags.
Workshop 4 February 2025	This workshop was a refined version of workshop 3, with the science content being roughly the same. In this case, however, pupils' cotton and ink pieces were attached to wooden frames which acted as light boxes which could be lit from behind to show additional detail in their pieces. This allowed for further exploration of the effects of light.
Workshop 5 March 2025	This workshop focused on a comparison between Mars and Earth looking at environments at both planets, atmospheres and the resulting colours in the daytime sky and sunsets. In order to explain the refraction of light that results in different colours at sunset, the composition of white light and the spectrum that results from the reflection and refraction of that light was explained to pupils. Pupils created multiple paintings on paper, focusing on daytime and sunsets on both planets, and even used mirrors as paint pallets outside to try to match their paint colour to the colour of the sky. Then, having made multiple paintings, the paintings were cut into strips and arranged into collages to combine the images on firm boards.



Workshop 6 May 2025	The focus of this workshop was on cyanotypes as an art form. Pupils were introduced to the electromagnetics and the idea of UV light from the sun. The chemical reactions that take place which are responsible for the colour changes when using cyanotypes were also explored. Pupils then made small paper cyanotypes using items they found on the grounds of the observatory and worked together with the artists to construct a large-scale fabric cyanotype. The movement of the sun in an analemma shape was explained, and this was included on the cyanotype using stones to mark out the sun's path. The phenomenon of a solar eclipse was also explored as a parallel for blocking light from the sun on the cyanotype sheet.
Workshop 7 September 2025	This workshop was inspired by the work of solar physicist Annie Maunder. She was used as an example to show pupils the work of a solar physicist, both in terms of the solar physics she worked on, including sun spots and solar eclipses, as well as expeditionary science and how expeditions have changed from the early 1900s to today. Pupils were also introduced to the concept of magnetism using magnets and iron filings to demonstrate magnetic field lines. Each pupil worked on an image in a box frame over the course of the workshop. The first layer was ink on paper, reflecting what they had learnt about the northern lights and sun spots. They then used iron filings in small plastic bags to create patterns, which they copied onto their pieces in permanent marker. Finally, they used gauche paint to add details to their pieces and were provided with mirrors and black paper to create shapes which were used to illustrate eclipses and infinite mirrors in their pieces.
Workshop 8 November 2025	This workshop focused on space exploration and the machines used to learn about the solar system. The solar system and the planets were first introduced to pupils, after which they had the opportunity to explore objects used to learn about the universe such as telescopes, rovers and satellites. Focusing on rovers, pupils looked at the components needed for a rover to function, such as a central computer, camera, solar panels, temperature controls etc. Pupils were also shown the JWST and JUICE missions to show what other spacecraft can look like and learnt about the discoveries made by each of these spacecraft. This led to the students creating their own rovers, starting with nets of geometric shapes used to make a 3D shape which became the base of their piece. They then added components as they learned more about the making of spacecraft. At the end of the workshop the pupils' rovers were loaded onto prepared remote-controlled cars so that they could drive their creations around the site like rovers on another planet.

Chapter 2: Evaluation Methodology

Design and Procedure

A mixed-methods pre-test, post-test, follow-up design was implemented, comprising the collection and analysis of quantitative data through pupil questionnaires and qualitative data through post-workshop pupil focus groups and teacher interviews. This approach was selected to enable investigation of the impact of the workshops in terms of measurable outcomes, whilst also providing a richer understanding of impact beyond these outcomes and insights into participants' experiences (Fetters & Molina-Azorin, 2020). The design also incorporated multiple informants (*i.e.*, pupils and teachers) to enhance data triangulation and credibility of the findings. Finally, the follow-up stage facilitated the assessment of whether any changes in pupils' science-related attitudes or knowledge observed following the workshops were sustained over time. Sustained change can be thought of as an example of intervention effectiveness, *i.e.*, an outcome with real world significance, as opposed to mere efficacy, *i.e.*, change observed in a controlled setting (Gilleece & Clerkin, 2025, p.452). The following specific questions guided the evaluation:

- (i) Is there a change in pupils' attitudes towards science after participation in the Space Crafts workshops?
- (ii) Is there a change in pupils' scientific knowledge and skills after participation in the Space Crafts workshops?
- (iii) From the perspective of pupils and teachers, what are the main strengths of the Space Crafts programme?
- (iv) According to pupils and teachers, are there any aspects of the programme that could be improved or amended?



The evaluation design was agreed with the developers and approved by DCU's Research Ethics Committee in June 2024 (DCUREC/2024/116, see appendices for evaluation agreement and ethics approval documentation). Seven of the eight workshops (workshops 2-8) were included in the evaluation. Approximately 1-2 weeks before each workshop, the evaluators made contact with the classroom teacher and a set of participant information sheets and informed consent forms (for children, their parents/guardians and for the teacher themselves) was posted to the school. The workshop developers did not play any role in these communications.

Upon arrival at the observatory on the first day of the workshops, pupils were taken to a conference room and introduced to the independent evaluators. Pupils were reminded of the purposes and procedures of the evaluation and given an opportunity to ask questions. The separation between the workshop facilitators and the evaluators was articulated and the facilitators were not present in the room. All pupils for whom parental consent was obtained and who also provided assent completed a pre-workshop questionnaire comprising measures of science-related attitudes and knowledge.

Upon completion of each workshop, the pupils completed a post-workshop questionnaire comprising the same attitude & knowledge measures, alongside additional items focused on their experiences of the workshop. A small sub-sample of these pupils (n ranged from 4 to 6 across the workshops) were also randomly selected to participate in an on-site focus group, facilitated by the two independent evaluators, to further explore these experiences. Six of the seven class teachers (who had, in all cases, been present for the duration of the workshop) participated in a semi-structured online interview with one of the evaluators approximately one week afterwards. The focus groups and interviews each lasted 15-20 minutes.



Three months after each workshop, follow-up questionnaires were posted to the school, where they were administered to pupils and subsequently collected by the evaluators. Copies of the pre-, post- and follow-up questionnaires, along with the interview and focus group schedules, are all provided in the appendices.

Instrumentation

Attitudes towards science

The pre-, post- and follow-up questionnaires each comprised a copy of the modified Attitudes Towards Science Inventory (mATSI, Weinburgh, 2000). The mATSI is a 22-item psychometric instrument designed to measure children's attitudes towards science across four distinct subscales: anxiety (e.g., "I feel nervous when someone talks to me about science"), perceived value to society (e.g., "It is important to know science if you want to get a good job"), self-confidence (e.g., "No matter how hard I try, I cannot understand science") and desire to do science (e.g., "Science is something that I enjoy very much"). Responses are provided using a 5-point Likert scale from 'strongly disagree' to 'strongly agree', with reverse scoring applied where appropriate. The instrument has been designed for use with children aged 10-14 (the U.S. middle school age range) and it has been associated with robust reliability indices and validity evidence (Weinburgh, 2000). Minor wording changes were made to some of the mATSI items to achieve closer alignment with the Irish primary school context and terminology (e.g., "I like the challenge of science assignments" replaced with "I like the challenge of science work at school"). Repeated administration of the mATSI at pre-, post- and follow-up was used to facilitate the investigation of whether pupils' attitudes towards science changed following the workshops (evaluation question i), with qualitative data from the pupil focus groups and teacher interviews collected to provide additional context for interpreting these findings.

Scientific Knowledge and Skills

A pool of basic astronomy knowledge items was compiled from publicly available educational quiz materials, with items selected to ensure coverage across key topic areas addressed in the workshops (*i.e.*, planetary science, celestial movement, space exploration). From this pool of items, three 10-item parallel forms were constructed, with one form administered at each time point. Items were scored as either incorrect (0), partially correct (0.5) or correct (1) and summed to yield total scores. The forms were designed to be comparable in terms of item content and difficulty; mean item difficulty was highly similar across forms (pre-workshop $m = .56$, post-workshop $m = .55$, follow-up $m = .56$). Internal consistency (Cronbach's alpha) was also acceptable for each form (pre-workshop $\alpha = .74$, post-workshop $\alpha = .72$, follow-up $\alpha = .72$). The purpose of these tests was to assess whether pupils' levels of knowledge changed following the workshop (evaluation question ii). The development of science-related skills and competencies that could not be captured by the knowledge test alone was explored through the pupil focus groups and teacher interviews.

Pupils' and Teachers' perspectives

Pupils' perspectives on the workshops were captured through nine closed-response items (*e.g.*, "I enjoyed the Space Crafts workshop), two open-ended items ("My favourite thing about the Space Crafts workshop was..." and "if I could change one thing about the Space Crafts workshop, it would be...") and a rating scale ("out of 10, I would give the Space Crafts workshop a score of...") included on the post-workshop questionnaires, as well as through the focus groups. Teachers' perspectives were elicited through the semi-structured interviews. These data were intended primarily to address evaluation questions (iii) and (iv), whilst also providing additional context potentially relevant to evaluation questions (i) and (ii).

Participants

One hundred and fifty seven pupils (53% male), ranging in age from 10 to 13 years ($m = 11.01$, $sd = .67$) participated in the evaluation, representing 89% of all of those who participated in the seven workshops. The majority (89%) indicated that they spoke English as their first language. Thirty-three children (42% male) participated in the focus groups and six teachers (50% male) participated in the post-workshop interviews.

Data Analysis

Quantitative data arising from the questionnaires were analysed using SPSS v30. Descriptive statistics for all relevant variables were first computed and examined. To investigate changes in children's attitudes and knowledge over the course of the workshop and beyond, a series of linear mixed-effects models was conducted. This approach was selected as, unlike more traditional methods (e.g., repeated measures ANOVA), it does not require complete data at all three timepoints. Therefore, pupils from three schools who did not return follow-up questionnaires ($n = 82$) were still included in the analysis. The model does not impute missing follow-up scores; rather it makes full use of the data provided, ensuring that the findings reflect the experiences of all participating schools and pupils as accurately as possible. In each case the linear mixed-effects model was fitted with time entered as a categorical fixed effect and a random intercept included to account for repeated measurements nested within pupils. The model was estimated using restricted maximum likelihood (REML) and used a variance components covariance structure.

Qualitative data from the open-ended questions, the pupil focus groups and the teacher interviews were transcribed and this corpus of text was analysed using an inductive thematic analysis approach (Braun & Clarke, 2017). Pupils' and teachers' names have been replaced with pseudonyms in this report protect their identities.

Chapter 3: Findings

Anxiety towards Science

Descriptive statistics for pupils' levels of anxiety towards science observed before, immediately after and three months after the workshops are displayed in Table 3.

Table 3. Descriptive statistics for pupils' anxiety towards science over time

	<i>m</i>	<i>sd</i>	<i>n</i>
Pre-workshop	2.15	.68	148
Post-workshop	1.96	.68	145
Follow-up	2.00	.71	73

Note: Scale ranged from 1 (low anxiety) to 5 (high anxiety)

Results of the linear mixed-effects model indicated that the overall effect of time on anxiety was not significant, $F(2, 363) = 2.93, p = .055$. Pairwise comparisons using the LSD (least significant difference) adjustment revealed a significant decrease in anxiety from pre- to post-workshop, $M = 0.187, SE = .080, p = .020$. No other pairwise differences were significant. This indicates that pupils' anxiety towards science decreased significantly immediately following the workshops, but that the reduction was not maintained by the follow-up point.

Reductions in anxiety towards science immediately after the workshops were also evident in pupils' reflections during the focus groups. One pupil noted that her experience at the workshops "made science a lot more, like, easier than what I used to think science was" (Amy, workshop 5 focus group). Others drew attention to the supportive, low-pressure environment: "everyone there is super, like, kind and nice, and there's no rushing or anything... you have time" (Rosie, workshop 5 focus group) and how this yielded a felt sense of psychological safety and reduced fears of negative evaluation: "if you get something wrong, they explain it to you again instead of, like, screaming at you 'cause you didn't do something right" (Amy, workshop 5 focus group).

Self-Confidence in Science

Descriptive statistics for pupils' self-confidence in science measured before, immediately after and three months after the workshops are displayed in Table 4.

Table 4. Descriptive statistics for pupils' self-confidence in science over time

	<i>m</i>	<i>sd</i>	<i>n</i>
Pre-workshop	3.46	.69	148
Post-workshop	3.70	.68	141
Follow-up	3.61	.69	72

Note: scale ranged from 1 (low self-confidence) to 5 (high self-confidence)

Results of the linear mixed-effects model indicated that the overall effect of time on self-confidence in science was significant, $F(2, 358) = 4.33, p = .014$. Pairwise comparisons revealed a significant increase in self-confidence from pre- to post-workshop, $M = .236, SE = .081, p = .004$. No other pairwise differences were significant. This indicates that pupils' self-confidence in science increased significantly immediately following the workshops, and although it dipped slightly between post-workshop and follow-up, the initial gain was largely sustained.

Improvements in science self-confidence were occasionally evidenced in pupils' comments during the focus groups ("I know a lot more stuff than I thought I did"; Caroline, workshop 2 focus group), although most pupils tended to articulate growing confidence in relation to the art-based element more so than the scientific content specifically. These reflections indicated increased self-assurance within the learning environment, expressed through greater willingness to take risks ("I stepped out of my comfort zone"; Kiera, workshop 2 focus group) and a growth mindset: ("I made loads of mistakes. But I think what I'm saying is, it's good. If you make mistakes, you can also make it...better"; Sarah, workshop 2 focus group).

Perceived Value of Science to Society

Descriptive statistics for pupils' perceived value of science to society measured before, immediately after and three months after the workshops are displayed in Table 5.

Table 5. Descriptive statistics for perceived value of science to society over time

	<i>m</i>	<i>sd</i>	<i>n</i>
Pre-workshop	3.78	.49	147
Post-workshop	3.91	.60	147
Follow-up	3.75	.67	73

Note: Scale ranged from 1 (low perceived value) to 5 (high perceived value)

Results of the linear mixed-effects model indicated that the overall effect of time on perceived value of science was not significant, $F(2, 364) = 2.81, p = .062$. Pairwise comparisons revealed a significant increase from pre- to post-workshop, $M = -.132, SE = .067, p = .050$, and a significant decrease from post-workshop to follow-up ($M = .165, p = .046$). This suggests that the workshop produced a short-term increase in pupils' perceived value of science, but this improvement was not maintained at follow-up. In the post-workshop questionnaires, one pupil commented that they had "learned about stuff that we'll use in life", revealing an awareness of the value of scientific knowledge and skills outside the classroom.

Desire to do Science

Descriptive statistics for pupils' desire to do science measured before, immediately after and three months after the workshops are displayed in Table 6 overleaf.

Table 6. Descriptive statistics for desire to do science over time

	<i>m</i>	<i>sd</i>	<i>n</i>
Pre-workshop	3.31	.71	143
Post-workshop	3.38	.77	145
Follow-up	3.30	.75	73

Note: scale ranged from 1 (low desire) to 5 (high desire)

Results of the linear mixed-effects model indicated that the overall effect of time on desire to do science was not significant, $F(2, 358) = .420, p = .66$. Pairwise comparisons were also non-significant, indicating that pupils' desire to do science remained stable across pre- post- and follow-up timepoints. In the interviews, however, several teachers mentioned the possibility for the programme to have influenced pupils' future choices such as secondary school subjects and career paths. One explicitly mentioned the role the observatory staff played in broadening pupils' awareness of scientific careers ("some of them were like 'oh that's kind of cool that you do that for a living'"; Teacher 6), and in making these seem "very real and very achievable" for them (Teacher 4). Another expressed the belief that the workshops would impress upon girls in particular that science is an option for them as much as it is for their male peers. This was also reflected in pupils' own comments ("I always thought of being like, a fashion designer. But I could be a space explorer!"; Lisa, workshop 5 focus group).

Knowledge and Skills

Table 7. Descriptive statistics for knowledge over time

	<i>m</i>	<i>sd</i>	<i>n</i>
Pre-workshop	5.63	2.24	155
Post-workshop	5.51	2.05	155
Follow-up	5.47	2.18	73

Note: knowledge test scores ranged from 0 to 10



Results of the linear mixed-effects model indicated that the overall effect of time on pupils' astronomy knowledge was not significant, $F(2, 376) = .191, p = .83$. Pairwise comparisons were all non-significant, indicating that pupils' knowledge test scores remained stable across pre- post- and follow-up timepoints. In the focus groups, however, many pupils articulated specific facts they had learned over the course of the workshops:

“I didn't know that Mars' sunsets were blue and the sky's actually red. And like, how, like no one has ever explored Mars... and like how far Mars is, like all of that” (Zara, workshop 5 focus group)

“The most interesting thing I learned was probably the way the little dots on the sun when you look into the telescope, like, they look tiny. But really, they're massive storms that could fit thousands of Earths inside” (Peter, workshop 6 focus group)

Pupils also made reference to practical *skills* that they had developed through the workshops. On some occasions, these were explicit (“I think I learned a lot about observing as well”; Alex, workshop 6 focus group), whilst others revealed emerging scientific curiosity (“What if there are other solar systems?”; Billy, workshop 5 focus group). One teacher also differentiated between the development of knowledge vs. skills, expressing the belief that the impact of the workshops would be “short term, in terms of retention of information (but) long term in terms of incorporating new skills learned over future learning experiences” (Teacher 6).

Strengths of the Programme

A high level of satisfaction with the workshops was evident amongst participants, with pupils giving them a mean rating of 8.8 ($sd = 1.5$) out of 10 on the post-workshop questionnaire. In relation to what worked well, four overarching themes were identified from pupils' and teachers' accounts of their experiences provided through the focus groups, open-ended questions and interviews, namely: (i) the place-based nature of the learning, (ii) the opportunities for engagement through active and creative tasks, (iii) the emphasis on pupil-led enquiry and (iv) the supportive and welcoming learning environment.

Place-based nature of the learning

Pupils greatly appreciated the observatory setting. The main building garnered significant interest, with pupils commenting on its history, how it was funded, and how it has been maintained for over two centuries. Their curiosity was piqued by the various artefacts displayed throughout the site, the opportunity to see scientific equipment firsthand, and anecdotes about the building shared by the workshop facilitators:

“Wherever we were going, they were showing us parts of the observatory. They were always telling us... about all the pictures, all the machine things, who they're made for and who invented them”
(Clara, workshop 6 focus group)

“The dome, it had a huge telescope inside and it could open one little piece of the ceiling and then it could turn around which is really cool” (Sophie, workshop 4 focus group)

“She told us a story about one of the days he was out on a walk with his wife. And then, he thought of maths equations and he didn't have his notebook or his pencil. So then, he got his



pocketknife and carved it out on a wall, it's the picture behind you"
(Caroline, workshop 2 focus group)

Teachers similarly highlighted the value of the workshops being delivered in an authentic scientific setting:

"Kids love leaving the classroom. They love going to another building, especially when you're going somewhere that has, like, the telescopes where they could look around them and just – science all around them!" (Teacher 2)

"Obviously, three days of it with an absolute professional who can answer all their questions rather than me, being like 'let's Google that', you know? That was really good." (Teacher 3)

Appreciation for the setting was also evident in pupils' desire to spend more time at the observatory ("maybe we should come back to school maybe an hour late because of how interesting it is"; Lisa, workshop 5 focus group; "can this be my new school please?"; post-workshop questionnaire) and expressions of gratitude for the opportunity to visit ("not a lot of people get to do this, so we're really lucky to get [chosen] to come here"; Yusuf, workshop 4 focus group).

Opportunities for engagement through creative and active tasks

Pupils especially enjoyed aspects of the workshop that allowed them to be creative or active in their learning. Specifically, they valued opportunities for personal expression:

"It wasn't like we had to do this certain thing for the art, we could just do really whatever we wanted" (Saoirse, workshop 4 focus group)



“We got to do a big page each and we all expressed our feelings through the picture” (Caroline, workshop 2 focus group)

They also reported strong enjoyment of activities involving hands-on engagement, physical movement and playful participation:

“We got to, like, do physical stuff. Like, move the dome and open where you can see the telescope outside.” (Keira, workshop 2 focus group)

“It was really fun, especially when we got to go outside and march with our flags” (Conor, workshop 3 focus group)

“The best bit of the workshop was when we rode our rovers around the observatory” (post-workshop questionnaire)

One of the teachers also commented that the “physicality” of the workshop was its major strength, and that pupils from disadvantaged backgrounds often “react well to physical movement and things that aren’t just kind of looking at a book or listening to something for too long” (Teacher 1) or “anything that’s a bit active and a bit interactive” (Teacher 3). The integrated approach was also viewed as positively contributing to engagement:

“For those who weren’t as interested, like, they still had the art. So, there was plenty there for kind of the majority of interests” (Teacher 3)

“If you don’t like science or art, or if you like art but not science, you should maybe try. Because... if you come here and you spend some time here, you can have a whole different perspective... and you may like the subjects” (Kiera, workshop 2 focus group)

Emphasis on pupil-led inquiry

Both teachers and pupils commended the pedagogy used in the workshops, in particular, the use of scaffolding approaches and the time given to pupils' questions:

"They didn't always tell the kids the answers... kind of like...slowly bridged it towards where they'd kind of get the aha moment... which is very good" (Teacher 1)

"I like the way, like, they go step-by-step, instead of saying everything very fast" (Amy, workshop 5 focus group)

"She allowed them to ask as many questions as they like, without ever kind of shutting them down or stopping them... they felt so valued" (Teacher 3)

"We could ask anything that we wanted, whenever we wanted" (Clara, workshop 6 focus group)

The extended length of the workshops was also viewed as something that facilitated this approach:

"Sometimes a taster isn't enough. Again, it's good, and it's better than nothing. But that was definitely the most comprehensive workshop I've ever done... if they had questions they could come back and ask them the following day that they kind of thought of" (Teacher 3)

Supportive and welcoming environment

The supportive environment provided by the workshop facilitators was highlighted by both pupils and teachers as crucial to the success of the workshops. As one teacher remarked:



“You can have the best idea ever, but if you don’t have the right people who are able to engage properly with children, it can just create a different atmosphere” (Teacher 1).

Pupils commented that the observatory staff were “really nice and kind” (Clara, workshop 6 focus group), “treated me nicely” (post-workshop questionnaire), and “helped us when we needed” (Zara, workshop 5 focus group). Teachers also noted how they were “very accommodating to all the different needs in the class” (Teacher 5).

Improvements/Amendments

Greater emphasis on science within the integrated model

Across all of the focus groups, and in the post-workshop questionnaires, it was evident that although the integrated approach was positively received, many pupils perceived the scientific dimension of the workshops as comparatively less prominent and expressed a desire for a stronger emphasis on this aspect:

“ ‘Cause I feel like there was a lot of crafts, which I love. But I feel like it could use a little more science” (Zara, workshop 5 focus group)

“Yeah, I do like art. But I wish we got to do more about the science and astronomy” (Senan, workshop 2 focus group)

“Like, there wasn’t really anything bad, it was just the cyanotypes... got a bit repetitive...and like, I kinda wanted to learn more about what happens with space and stuff” (Daniel, workshop 6 focus group)



“But erm, it was mainly... the art more than anything. So I think like, maybe a tiny bit of art and more actual learning science... researching space” (John, workshop 3 focus group)

Whilst some expressed this as a desire for more scientific *content* (“we could have random facts, like more facts”; Zara, workshop 5 focus group), others revealed a preference for more active, hands-on scientific engagement:

“It would have been really cool if she, like, made us do, like some science experiments” (Sarah, workshop 2 focus group)

“Also, like, kinda let us, like even like, look through the telescope” (Luke, workshop 7 focus group).

Pupils also discussed practical constraints or offered suggestions of how a more balanced representation of science and art could be achieved:

“I say we had enough science... I think it was just the length of time we had that made it difficult to have more and more” (Joshua, workshop 2 focus group)

“I think that they should do, like, different rooms, like different things. Like, if you wanted to do art you go to one room. If you wanted to do like more research, you go to one room. You wanted to do more actual science and history itself, you go into another room” (John, workshop 3 focus group)

“I think... they should, like, do groups of different levels, cos some people probably knew a lot of things... so if they were talking about, so like, whoever knows the most, they should get split into different groups” (Conor, workshop 3 focus group)



Although the desire for more science was prominent, it is also worth noting that, in response to the question “If I could change one thing about the Space Crafts workshops, it would be...”, a substantial number of pupils responded “nothing”. Some others drew attention to practical issues, in particular, dislike of the boiler suits that they were required to wear during the workshops was evident. Some responses evidenced a desire for the workshops to be “longer”, or the inclusion of more interactive elements (e.g. “if we could change when one of the people that were explaining like rockets and how they work, into like a game like they ask a question and give us answers that we could pick”; post-workshop questionnaire).

Chapter 4: Discussion of Findings

The purpose of this evaluation was to examine the extent to which the DIAS Dunsink Observatory Space Crafts programme succeeded in achieving its stated aims, with a particular focus on its impact on pupils' science-related attitudes, scientific knowledge and skills, and whether any observed impacts were sustained over time. In addition, it aimed to identify the programme's particular strengths and areas for improvement, from the perspectives of participating pupils and their teachers. Overall, the workshops were associated with sustained improvements in pupils' self-confidence in science, alongside short-term changes such as reduced anxiety towards science and an increased perception of its societal value, although these were not maintained at the three-month follow up. Both pupils and teachers highlighted various aspects of the programme as having worked well, most notably, the placed-based nature of the learning, and the emphasis on creative and active engagement. In terms of potential improvements, although pupils enjoyed the integrated approach, there was also evidence of a perceived imbalance within this integration, with several pupils seeking a stronger emphasis on science.

The sustained enhancement of pupils' self-confidence in science three months after their participation in the workshops is a particularly noteworthy finding. As Archer et al. (2015) outlined, although many aspects of science capital (e.g., behavioural components such as tendency to consume science-related media and social components such as contact with those in science-related careers) are fairly fixed and difficult to change, attitudinal aspects, such as confidence in one's own science capabilities, may be amenable to intervention. With this in mind, a central purpose of the Space Crafts programme was to make science feel more accessible to children who might not otherwise view it as being 'for them'. Confidence is a key psychological gateway to that sense of accessibility, and it would appear that a meaningful increase in pupils' self-confidence in science was indeed achieved. Furthermore, given that class-related disparities in self-



confidence in science emerge sometime between upper primary and lower secondary level (Denner et al., 2015), interventions that can boost students' confidence during this period may be particularly valuable.

Other attitudinal factors, namely anxiety towards science, and perceived value of science to society, showed short-term shifts only, with levels returning roughly to baseline levels at follow-up. These findings suggest that there were some limits with respect to the longer-term impact of the workshops. This is not necessarily a criticism, however. It may simply be a reflection of the systemic roots of these deeper attitudinal constructs, which reinforces the need for ongoing, embedded support to achieve more lasting change, as previously highlighted by Archer et al. (2021). Of note is that the qualitative data provided some additional context to consider in this regard. For instance, the workshops took place over the course of three days, which is considerably longer than the typical duration of informal science learning interventions, and teachers explicitly recognized this as a particularly positive aspect of the programme that supported deeper pupil engagement. Furthermore, certain aspects of the workshops (e.g. displaying the pupils' art in the observatory afterwards), were intentionally designed to trigger sustained patterns of engagement within the wider community, and although this evaluation was limited in terms of its ability to measure this aspect of impact, one teacher did mention having received several positive emails from parents after the programme, providing evidence of reach beyond the pupils themselves. Similarly, although pupils' self-reported desire to do science as measured by the mATSI remained unchanged, the qualitative data provided clear evidence that the workshops broadened pupils' sense of what science involves and who can participate in it, which, when combined with increased self-confidence, could plausibly lead to sustained engagement with science into secondary school and beyond.



In terms of scientific knowledge, no increases in pupils' scores on the astronomy tests were observed following the workshops. This suggests that the workshops did not have an impact on students' knowledge as measured by these assessments. It should be acknowledged, however, that these tests provided a relatively crude indicator of knowledge in this domain, and they may not have been sufficiently well aligned with the specific content and learning experiences of the workshop to detect meaningful changes. Again, the qualitative data revealed clear instances of meaningful learning, with many pupils describing in detail what they had learned from the programme. Crucially, these learnings were not limited to knowledge acquisition, but included the development of scientific skills and a more inquiry-oriented mindset. Teachers' accounts reinforced this interpretation, suggesting that the underlying skills learned would be the most noticeable impact of programme in the longer term.

In terms of the specific strengths of the programme, its place-based nature was clearly recognised by both pupils and teachers as a distinctive element that was central to its impact. Many pupils expressed a sense of awe around the history of the observatory, and took great pride in retelling stories about the building and the individuals associated with it that had been shared with them by the workshop facilitators. This resonates with several aspects of the PBE literature, particularly the idea that “local communities store intergenerational knowledge” and the positioning of the teacher as “translator, storyteller and mediator between the students and the place” (Yemini et al, p.641). Pupils who participated in the Space Crafts workshops clearly valued the opportunity to learn in a novel setting and to engage with science professionals, both of which set the workshops apart from their typical classroom experiences with science.

Other strengths of the workshops noted by both pupils and teachers included the incorporation of creative and active approaches and the emphasis on pupil-led inquiry. Teachers commended the participatory



aspects of the workshop as being well-suited to their pupils, and pupils themselves frequently mentioned these as their favourite part of the workshops. Both valued the space afforded to pupils' questions.

A particularly striking finding was that pupils identified a stronger focus on science as the main way in which the programme could be improved. Some expressed a desire simply to learn more factual information, and to spend more time discussing astronomy specifically, whilst others expressed a desire for more active experimentation and hands-on manipulation of scientific equipment, which resonates with Carroll et al.'s (2024) finding that Irish primary school children currently experience infrequent opportunities to engage in such activities.

Some pupils offered suggestions regarding how more science could be incorporated, with one proposing a more differentiated approach involving ability-based groupings, and another advocating explicitly for segregation of the different subjects. These observations are especially interesting in the context of the broader discourse around curricular integration at primary level. Indeed, concerns have been raised regarding a potential loss of content depth when integrated approaches to learning are used (Burke & Lehane, 2023), and this aspect may be reflected in these pupils' accounts of the workshops. At the same time, the integrated approach may have supported learning at a more unconscious level. Pupils consistently reported that they enjoyed the hands-on elements of the workshops, and this creative engagement may have contributed to greater knowledge retention (Rinne et al., 2011), even though they may not explicitly recognise this themselves. Aside from this, the infusion of art and science was also designed to provide a "way in" for students who may otherwise not have had the confidence to engage with the scientific content, and given the sustained improvements in science self-confidence that were observed, it seems that this aim may have been achieved. Taken together, these findings suggest that future iterations of the Space



Crafts programme could consider rebalancing the science and arts components, yet they also demonstrate the value of *purposeful* cross-curricular integration (Burke & Lehane 2023), as opposed to integration for its own sake.

Alongside the findings, it is important to reflect briefly on the evaluation methodology. As the design did not incorporate a control group, it is not possible to draw firm causal conclusions about the impact of the workshops. This could only have been achieved through use of a randomized controlled trial (RCT). Despite their methodological strengths, however, RCTs are not always feasible in educational contexts (Gilleece & Clerkin, 2023). In this instance, the incorporation of a true control group would have proven too disruptive to normal school routines and thus the pre-test, post-test, follow-up design was selected as a practical alternative, whilst still facilitating the monitoring of change over time.

The use of mixed methods was a notable strength. As noted by Fetters and Molina-Azorin (p.131), “the road of funded interventional studies is... congested by the remnants of null trials, where often the only information gained, or reported was no effect”, and with the exception of the gains observed in students’ science self-confidence, a purely quantitative approach to this evaluation might have yielded similarly limited insights. The qualitative data from the post-workshop questionnaires, focus groups and interviews, however, offered additional insights in relation to these constructs, providing a more complete and nuanced picture of pupils’ and teachers’ experiences.

Overall, the findings of this independent evaluation suggest that DIAS Dunsink Observatory’s Space Crafts programme appears to have succeeded in lowering perceived barriers towards science amongst children from socio-economically disadvantaged backgrounds, and helped them to feel more capable of engaging with the subject. The place-based



nature of the workshops, combined with their emphasis on creative and active engagement, were identified as key mechanisms supporting these outcomes. These findings are significant in light of the documented class-related disparities in science capital and STEM participation.

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Appendices

Evaluation Agreement



Agreement for Evaluation of the *Space Crafts* arts & science workshops at DIAS Dunsink Observatory

This Agreement is between the Dublin Institute for Advanced Studies (DIAS) And DCU

DIAS has obtained funding from Science Foundation Ireland, under the Discover Programme Call, to undertake a project, called Space Crafts: a STEAM initiative at DIAS Dunsink Observatory.

DIAS is seeking to carry out an evaluation to assess the extent to which the *Space Crafts* STEAM initiative is achieving its stated objectives. This Evaluation is designed to provide DIAS with information about the efficacy of the programme and about participants' experiences of the programme. It also aims to identify recommendations for how the programme could be improved, amended or further developed.

Evaluation.

The Evaluation will be carried out in the manner outlined in the Evaluation Proposal Document, over the course of 7 workshops total. The evaluation will be conducted by the two team members from the School of Human Development, Institute of Education, Dublin City University specified in the proposal document. The data required to undertake the evaluation will be collected by way of questionnaires and focus group exercises to be completed by participating pupils in the manner described in the Proposed Methodology section of the proposal. The data will be analysed in the manner set out in the Methods of Analysis & Dissemination section in the proposal documents. The Data from each evaluation will be combined and a formal report of the evaluation findings will be submitted to DIAS, by February 2026.

Duration

The engagement of services will commence on Monday 17 June 2024. Work will be undertaken over the period of 20 months, with data being collected until November 2025 and will cease upon the completion of the final report in February 2026.

Child Safeguarding.

The Evaluation Exercise must be conducted in a manner which complies with all applicable child welfare and safeguarding law and/or guidance.

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Cathaoirleach | Chairman: Dr John Hegarty FJNST.P MRIA.
Claraítheoir & POF | Registrar & CEO: Dr Eucharía Meehan MRIA.



DCU Research Ethics Committee Approval Letter

Ollscoil Chathair Bhaile Átha Cliath
Dublin City University



Dr Darina Scully
School of Human Development

26th June 2024

REC Reference: DCUREC/2024/116 (Expedited Review)
Proposal Title: Evaluation of the Space Crafts arts & science workshops
Applicant(s): Dr Darina Scully, Alice Benbara Da La Cruz

Dear Colleague(s),

Thank you for your application to DCU Research Ethics Committee (REC). Further to its review by the committee and resting on the assumption of information accuracy and completeness, DCU REC is pleased to issue ethical approval for this research project. Please include reference to this approval in all materials used to recruit research participants.

Researchers are responsible for ensuring that the research project to which this ethical approval refers is carried out as specifically described in the application form. Should modifications to the research project be required at a later stage, researchers must submit a research amendment application form to REC for approval, prior to the implementation of modifications.

Please note that it is the responsibility of the PI to ensure that any other DCU compliance requirements relevant to the research project, such as those related to data protection, insurance, health and safety, or legal issues, are fully met in advance of initiating the project.

As part of DCU REC's ongoing monitoring process, a research progress report may be required. DCU REC will request this report from the PI as appropriate.

DCU REC wishes you every success in your research.

Yours sincerely,

Dr Melrona Kirrane
Chairperson
DCU Research Ethics Committee



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*Note: Please retain this approval letter for future publication purposes.
Research students should include this letter as a thesis appendix.*



Pre-Workshop Questionnaire

Pre-Workshop Questionnaire for Pupils

Name: _____

School: _____



7. Sometimes I read ahead in our school science book

strongly disagree disagree not sure agree strongly agree

8. Science is helpful in understanding today's world

strongly disagree disagree not sure agree strongly agree

9. I usually understand what we are talking about in science class

strongly disagree disagree not sure agree strongly agree

10. No matter how hard I try, I cannot understand science

strongly disagree disagree not sure agree strongly agree

11. I feel nervous when someone talks to me about science

strongly disagree disagree not sure agree strongly agree

12. I often think 'I cannot do this' when science seems hard

strongly disagree disagree not sure agree strongly agree

13. Science is very important for a country's development

strongly disagree disagree not sure agree strongly agree

14. It is important to know science if you want to get a good job

strongly disagree disagree not sure agree strongly agree

15. I like the challenge of science work at school

strongly disagree disagree not sure agree strongly agree

16. It makes me nervous to even think about doing science at school

strongly disagree disagree not sure agree strongly agree



17. It scares me when I have to do science at school

strongly disagree disagree not sure agree strongly agree

18. It is important to me to understand the work we do in science class

strongly disagree disagree not sure agree strongly agree

19. I have a good feeling toward science

strongly disagree disagree not sure agree strongly agree

20. Science is one of my favourite subjects

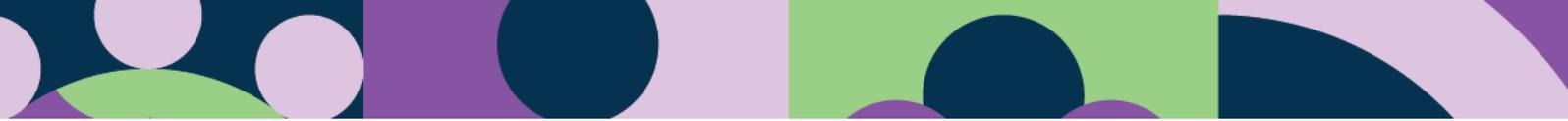
strongly disagree disagree not sure agree strongly agree

21. I have a real desire to learn science

strongly disagree disagree not sure agree strongly agree

22. I do not do very well in science

strongly disagree disagree not sure agree strongly agree



Now, one more thing! We would like to ask you a few questions about space and the planets. Try your best to answer the questions. Don't worry if you don't know all the answers!

1. What is the closest planet to the Sun?

2. What planet is known as the red planet?

3. What is the name of the second biggest planet in our solar system?

4. Can humans breathe normally in space as they can on Earth?

5. What is the name of a place that uses telescopes and other scientific equipment to research space and astronomy?

6. What was the name of the first satellite sent into space?

7. Is the sun a star or a planet?

8. Earth is in which galaxy?



9. Ganymede is a moon of which planet?

10. Olympus Mons is a large volcanic mountain on which planet?

Thank you very much for answering all these questions!

Please make sure your name is on the front page and take a few minutes to make sure that you are happy with all your answers.

We will see you again at the end of the Space Crafts workshop.

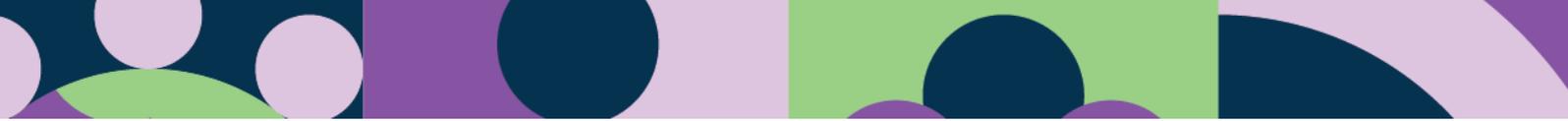


Post-Workshop Questionnaire

Post-Workshop Questionnaire for Pupils

Name: _____

School: _____



We would like to ask you again what you think about science again. Your answers to these questions might be the same as the last time, or they might be different – that’s okay! Just circle the answer that is right for YOU.

1. Science is useful in helping to solve the problems of everyday life
strongly disagree disagree not sure agree strongly agree

2. Science is something that I enjoy very much
strongly disagree disagree not sure agree strongly agree

3. I would like to do extra reading in science outside of school
strongly disagree disagree not sure agree strongly agree

4. Science is easy for me
strongly disagree disagree not sure agree strongly agree

5. When I hear the word science, I have a feeling of dislike
strongly disagree disagree not sure agree strongly agree

6. Most people should study some science
strongly disagree disagree not sure agree strongly agree

7. Sometimes I read ahead in our school science book
strongly disagree disagree not sure agree strongly agree

8. Science is helpful in understanding today’s world
strongly disagree disagree not sure agree strongly agree

9. I usually understand what we are talking about in science
strongly disagree disagree not sure agree strongly agree



10. No matter how hard I try, I cannot understand science

strongly disagree disagree not sure agree strongly agree

11. I feel nervous when someone talks to me about science

strongly disagree disagree not sure agree strongly agree

12. I often think 'I cannot do this' when science seems hard

strongly disagree disagree not sure agree strongly agree

13. Science is very important for a country's development

strongly disagree disagree not sure agree strongly agree

14. It is important to know science if you want to get a good job

strongly disagree disagree not sure agree strongly agree

15. I like the challenge of science work at school

strongly disagree disagree not sure agree strongly agree

16. It makes me nervous to even think about doing science at school

strongly disagree disagree not sure agree strongly agree

17. It scares me when I have to do science at school

strongly disagree disagree not sure agree strongly agree

18. It is important to me to understand the work we do in science class

strongly disagree disagree not sure agree strongly agree

19. I have a good feeling toward science

strongly disagree disagree not sure agree strongly agree



20. Science is one of my favourite subjects

strongly disagree disagree not sure agree strongly agree

21. I have a real desire to learn science

strongly disagree disagree not sure agree strongly agree

22. I do not do very well in science

strongly disagree disagree not sure agree strongly agree



Now, some questions about space and the planets again! Again, just try your best to answer them and don't worry if you don't know the answers.

1. What is the hottest planet in our solar system?

2. What planet is famous for its big red spot on it?

3. What planet is famous for the beautiful rings that surround it?

4. Have human beings ever been to Mars?

5. What is the name of the force holding us to the Earth?

6. Who was the first person to walk on the moon?

7. Does the sun orbit the Earth?



8. What is the name of NASA's most famous space telescope?

9. What is the name of Saturn's largest moon?

10. Is the planet Neptune bigger than Earth?

LAST THING! Please answer these questions about the Space Crafts workshop. Again, there are no right or wrong answers, just circle the one that's right for YOU.

1. I enjoyed the Space Crafts workshop

strongly disagree disagree not sure agree strongly agree

2. The workshop was good fun

strongly disagree disagree not sure agree strongly agree

3. The workshop was boring

strongly disagree disagree not sure agree strongly agree

4. I learnt lots about science at the workshop

strongly disagree disagree not sure agree strongly agree

5. The activities we did in the workshop were too hard

strongly disagree disagree not sure agree strongly agree

6. The activities we did in the workshop were too easy

strongly disagree disagree not sure agree strongly agree

7. Most of my classmates enjoyed the workshop

strongly disagree disagree not sure agree strongly agree

8. I would like to do more activities like this workshop

strongly disagree disagree not sure agree strongly agree

9. I would like to visit Dunsink observatory again some time

strongly disagree disagree not sure agree strongly agree



My favourite thing about the Space Crafts workshop was...

If I could change one thing about the Space Crafts workshop, it would be...

Out of 10, I would give the Space Crafts workshop a score of... (please circle)

1 2 3 4 5 6 7 8 9 10

Thank you very much for completing this questionnaire!
Please make sure your name is on the front page and take a few minutes to
make sure that you are happy with all your answers.



Pupil Focus Group Schedule

1. What did you think about the Space Crafts workshops?
2. What was the best thing about the workshops? Why?
3. Was there anything about the workshops that you didn't think was very good? Why?
4. Can you think of any ways that the workshops could be better?
5. Did you learn anything new at the workshops? What was the most interesting thing that you learnt?
6. If you were talking to one of your friends in another school who hadn't done these workshops, what would you tell them?



Teacher Interview Schedule

1. Approximately how many years have you been teaching?
2. Have you much previous experience teaching
 - (i) 5th/6th class and
 - (ii) in a DEIS school?
3. Can you describe your experiences of teaching science in this context?
4. How did your school become involved in the Space Crafts Programme?
5. What were your prior expectations of the programme beforehand?
How did the programme compare with these?
6. From your experiences observing the workshops, can you describe any particular strengths or weaknesses of the workshops?
7. Are there any ways that you think the workshops could be improved?
8. Do you think these workshops will have an impact on your pupils' attitudes towards and engagement with science (i) in the short-term and (ii) in the long-term?
9. Do you think initiatives such as the Space Crafts programme are important for pupils attending DEIS schools?
10. Have your pupils ever participated in any other similar initiatives?
How did the Space Crafts workshops compare with these?
11. How did you find the integration of art and science in the programme? Did you think was helpful/ useful?



Follow-Up Questionnaire

Follow-Up Questionnaire for Pupils

Name: _____

School: _____



Hi, it's Darina and Alice from DCU here. Hope you are well! We met you back in November when you participated in the Space Crafts workshops in Dunsink observatory, and you answered some questions for us. We'd like to ask you some more questions now if that's okay!

First, we want to ask you what you think about science. Remember, there are no right or wrong answers. Just circle the answer that's right for YOU!

1. Science is useful in helping to solve the problems of everyday life

strongly disagree disagree not sure agree strongly agree

2. Science is something that I enjoy very much

strongly disagree disagree not sure agree strongly agree

3. I would like to do extra reading in science outside of school

strongly disagree disagree not sure agree strongly agree

4. Science is easy for me

strongly disagree disagree not sure agree strongly agree

5. When I hear the word science, I have a feeling of dislike

strongly disagree disagree not sure agree strongly agree

6. Most people should study some science

strongly disagree disagree not sure agree strongly agree

7. Sometimes I read ahead in our school science book

strongly disagree disagree not sure agree strongly agree

8. Science is helpful in understanding today's world

strongly disagree disagree not sure agree strongly agree

- 
9. I usually understand what we are talking about in science
strongly disagree disagree not sure agree strongly agree
10. No matter how hard I try, I cannot understand science
strongly disagree disagree not sure agree strongly agree
11. I feel nervous when someone talks to me about science
strongly disagree disagree not sure agree strongly agree
12. I often think 'I cannot do this' when science seems hard
strongly disagree disagree not sure agree strongly agree
13. Science is very important for a country's development
strongly disagree disagree not sure agree strongly agree
14. It is important to know science if you want to get a good job
strongly disagree disagree not sure agree strongly agree
15. I like the challenge of science work at school
strongly disagree disagree not sure agree strongly agree
16. It makes me nervous to even think about doing science at school
strongly disagree disagree not sure agree strongly agree
17. It scares me when I have to do science at school
strongly disagree disagree not sure agree strongly agree
18. It is important to me to understand the work we do in science class
strongly disagree disagree not sure agree strongly agree



19. I have a good feeling toward science

strongly disagree disagree not sure agree strongly agree

20. Science is one of my favourite subjects

strongly disagree disagree not sure agree strongly agree

21. I have a real desire to learn science

strongly disagree disagree not sure agree strongly agree

22. I do not do very well in science

strongly disagree disagree not sure agree strongly agree



Finally, we want to ask you a few questions about space and the planets. Try your best to answer them and don't worry if you don't know all the answers.

1. How many planets are in our solar system?

2. What is the largest planet in our solar system?

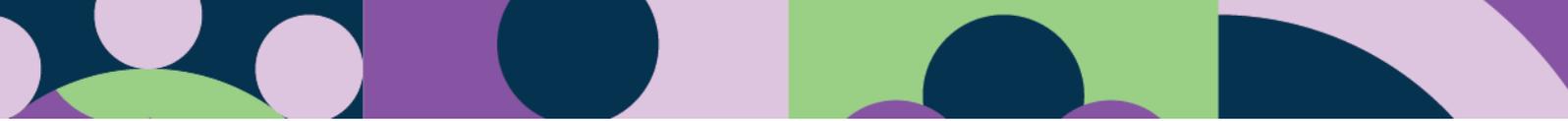
3. Which two planets are known as the 'gas giants'?

4. Is the moon a planet?

5. What is it called when the moon blocks our view of the sun?

6. What was the name of the first person to travel to space?

7. What do planets in the solar system orbit around?



8. What is the name for scientists who observe the skies?

9. Distances in space are measured by light-years. What is a light-year?

10. The solar system is in which galaxy?

Thank you very much for completing this questionnaire!

Please make sure your name is on the front page and take a few minutes to make sure that you are happy with all your answers.

