

Organisation: [REDACTED] Applicant: [REDACTED]
Funding Sought: **£2,983.45**
Funding Awarded: **£3,000.00**

PG/S2/24/1019

How can we best use our recycled plastic bottles as 3D printing ink?

PG/S2/24/1019

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Section 1 - Contact Details

PRIMARY APPLICANT DETAILS

Title
Name
Surname



COLLABORATOR DETAILS

Role Head teacher or Principal

Title
Name
Surname



Role STEM partner

Title
Name
Surname
Organisation



The University of Manchester

School contact details:

Please enter your School Name



Please enter your school address



Please enter your school postcode



Please choose your role at school from the list below

Support staff (e.g. technician, STEM coordinator, SENDco, careers advisor etc.)

Please select your school level from the list below:

Secondary

In Stage 2 we will require the name of a second staff member who can support you with this project and take over as lead if required. Please tick to confirm this is being considered

Checked

Please select the type of school from the list below:

Non fee paying

Is your school part of a multi-academy trust?



Yes

Please state the name of the multi-academy trust that your school belongs to

[REDACTED]

Will your project involve students with special educational needs and disabilities (SEND)?

No

How did you hear about the Partnership Grants scheme?

Other

Please provide some simple further details about how you heard about the scheme

Royal Society website

Has your school applied for a partnership grant before?

Previous recipients of partnership grants may apply for further funding, as long as the new application is made one year or more after the previous application.

However, you must make sure that your new project is not a simple extension of your previous one.

No

Section 2 - STEM Partner Details

Please include the full name of your STEM partner here

[REDACTED]

Please include the job title of your STEM partner here

Senior Experimental Officer for the Digital Fabrication Centre

STEM partner contact details:

Please enter the STEM partner's organisation name

The University of Manchester

Please select the type of organisation from the list below:

Higher Education Institution

Please provide the highest level of education held by your STEM partner

PhD

Why is this individual a suitable partner for the project?

[REDACTED] is the Senior Experimental Officer for the Advanced Materials and development platform at the University of Manchester, which is a world leading hub for the development of new materials, housing a state of the art digital fabrication facility. With over 17 years of experience in digital manufacture, [REDACTED] expertise in additive manufacture and 3D printing inks brings knowledge and examples of additive manufacture to share with our students, along with essential guidance on the setup of our additive manufacture suite at The Discovery Academy. With her world leading skills, experience and facilities, she is the perfect partner.

Will your project involve working with any other STEM partners?

No

Has the STEM partner applied for a Partnership Grant before?

No

Has the STEM partner been previously funded by the Royal Society through other grant opportunities

No

Section 3 - Project Overview

Project question

How can we best use our recycled plastic bottles as 3D printing ink?

Please select the main strand(s) that your project falls under from the list below (please choose a maximum of 3):

- Engineering
- Physics
- Technology

Please provide a short descriptive summary of your project, clearly explaining what the students will be investigating in this project (max 150 words).

Our aim is to develop a 3D printing studio which uses discarded plastic bottles as 3D printing ink.

In an average week, our school consumes 4,000 single-use plastic bottles, which are currently sent for recycling. Instead, we propose to use this waste as a resource for 3D printing. Our students will learn about the properties which make polymers such useful materials, and which would make the best ink for our printer. We will set up our bottle chipping, extruding and 3D printing apparatus and, as a community we will collect, clean and sort our bottles. The students will learn about methods of additive manufacture and see examples of novel 3D printed products. Finally, they will learn how to use computer aided design software and 3D print their own items. We currently do not have a 3D printing facility, so setting this up will leave a lasting legacy for our school.

Section 4 - Participants

Will there be a selection process to choose the students taking part in the project?

No

Please select your school region from the list below.

England

Please select which student year(s) will participate in your project from the list below:

- Year 7
- Year 8
- Year 9
- Year 10
- Year 11

What is the total number of students at your school?

1,458

How many students will be impacted by the project?

1,458

How many of the students impacted by the project will be taking part in the core investigative work and regularly interacting with the STEM partner?

32

Please provide the name for a second member of staff from your school who will support you with the project and can take over the running of the project if under any circumstances you are no longer able to act as the lead on the project

[REDACTED]

Please provide the job title for this second member of staff

Teacher

Will any other schools be involved?

No

Section 5 - Planning

Please select the submission deadline you are aiming for?

End of April 24

Please select the term when you plan to start your project.

Autumn term (October 24 onwards)

Please state how many terms you expect your project to run for.

2.0

If you will be working with additional STEM partners alongside your lead STEM partner, please provide some simple detail about who the additional STEM partners are.

no additional STEM partners

In the table below please provide details about your project plan. Please note, each project should have several investigations which all link together and help the students answer the overall project title.

Project element description	Please provide some detail about what the students will be doing	Please detail what equipment will be needed for this element. If no equipment will be needed please state N/A.	Please clearly explain how the STEM partner(s) will be involved with this element and how they will engage with students. If the STEM partner(s) will not be involved please state N/A.
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Please select the project element	<p>Science club (which is open to all students) will be introduced to what 3D printing is and what can be done with it. Students will look at a range of 3D printed items and see videos of how 3D printing works to gain understanding of the process and capabilities. Students will then be encouraged to think of designs that they would like to 3D print (which we will eventually print at the end of the project).</p>	N/A	<p>Examples of 3D printed items and materials borrowed from STEM partner. Videos of 3D printing in action provided by STEM partner.</p>
Please select the project element Careers talk from your STEM Partner	<p>██████████ will deliver a talk to science club students about careers within 3D printing and within materials science, the route to working in this field, and what it is like working in this field.</p>	N/A	<p>██████████ will deliver the careers talk to students.</p>
Please select the project element Background research session	<p>Science club students will bring in a wide range of washed plastic bottles which they have collected throughout the week from school and home. We will learn how to find out what material the bottles are made from (by checking the resin identification code) and we will find out if the material can be used as an ink for our 3D printer. 6 bottle types (of different materials and colours) will be selected for further investigation, which students will collect over the coming week.</p>	N/A	N/A

<p>Please select the project element</p>	<p>Washed bottles collected by the students (see "background research session" section) will be brought to the session. Students will sort bottles & remove labels to produce enough material for extrusion and 3D printing of test samples of our materials.</p>	<p>N/A</p>	<p>N/A</p>
<p>Please select the project element</p>	<p>(Action by the organiser) Each of the 6 bottle types collected by students will be used to produce 3D printing filament, and 3D printed material samples will be produced from the bottles (3 replicates of each of the 6 selected materials) and also from commercial 3D printing filament. A demonstration of the extrusion and 3D printing process will be shown to the science club students.</p>	<p>3D printer. Plastic extruder setup. 3D printing filament & support material</p>	<p>Technical expertise provided by [REDACTED] to help support the practical side of setting up equipment and producing 3D prints.</p>
<p>Please select the project element</p>	<p>Science club students will investigate the properties of our 6 3D printed materials and the commercially printed filament. Students will find out the stiffness, surface roughness, clarity/opacity, density and thermal conductivity of our materials, working in groups over several sessions.</p>	<p>N/A (we already have the required equipment to conduct these tests)</p>	<p>[REDACTED] will be available for advice and support on materials testing.</p>

<p>Please select the project element</p>	<p>Science club students will learn how and why we use statistics to analyse data. Looking at our data from the investigation of material properties the students will calculate the mean of the 3 replicates, and will plot graphs to represent our data. We will evaluate our materials, discuss their relative merits and select the plastic bottles which we will use as our 3D printing ink going forward.</p>	<p>N/A</p>	<p>N/A</p>
<p>Data handling and evaluation session</p>			

<p>Please select the project element</p>	<p>In assembly to the whole school, science club will present our project as a team. We will reveal our new 3D printing setup and share what we have learnt about the materials from different plastic bottles. We will appeal to the whole school and wider community, recruiting them to collect and wash lots of our selected bottles. We will also launch our 3D printing club, available to all students who wish to design and print 3D items</p>	<p>N/A</p>	<p>N/A</p>
<p>Project presentation</p>			

Please select the project element

Other

A 3D printing club will be set up, whereby students will be taught how to produce 3D models on the computer for 3D printing, where to source free models available online, and how to scan models. Students will be able to attend these sessions to design their 3D models. Models will then be checked by a member of staff and printed for the students using our 3D printing setup.

3D printer. Plastic extruder setup. 3D printing filament & support material. 3D scanner.

██████████ will be available for advice and support on computer aided design for 3D printing.

Please detail how you will share the work carried out through your project and what legacy it will have.

The project is designed to provide a lasting legacy to ██████████ Academy by setting up a 3D printing suite. By using waste plastic bottles as 3D printing ink this will allow the running of our facility at minimal cost, enabling us to maximise use out of the facility. This will be a great asset to the science and technology departments at our school as we currently do not have a 3D printer. Further, we will set up a 3D printing club, whereby our students can be trained in computational design for 3D printing, and print their own items, increasing opportunities and engagement in STEM within our school. We will also be able to loan the equipment to ██████████ Academy, a secondary school within our trust, to run the proposed project again at a later date within their science club.

Section 6 - Project costs

Are you applying for a £1,500 or £3,000 grant?

£3,000

Budget heading		2024 - 2025	Total
		2024 - 2025	
Project Item			
bottle stripper and filament extruder setup. www.FIXstruder.eu	Cost	£1,240.70	£1,240.70
	Latest Cost	£1,240.70	£1,240.70
3D printer. Bambu Lab X1-Carbon 3D Printer	Cost	£1,099.00	£1,099.00
	Latest Cost	£1,099.00	£1,099.00
3D printer filament. PLA CMYK Lithophane Bundle x3	Cost	£220.77	£220.77
	Latest Cost	£220.77	£220.77
3D scanner - Revopoint Inspire 3D Scanner	Cost	£357.00	£357.00

Budget heading		2024 - 2025	Total
		2024 - 2025	
	Latest Cost	£357.00	£357.00
3D printing support material - support for PLA x2	Cost	£65.98	£65.98
	Latest Cost	£65.98	£65.98
Partnership Grant award top-up	Cost	£0.00	£0.00
	Latest Cost	£16.55	£16.55
Project Item Total	Cost	£2,983.45	£2,983.45
	Latest Cost	£3,000.00	£3,000.00
Grand Total	Cost	£2,983.45	£2,983.45
	Latest Cost	£3,000.00	£3,000.00

Section 7 - Lead Applicant Declaration

Declaration

I hereby declare that the information provided in this application is true and correct to the best of my knowledge.

Checked

I understand that all reports must be submitted in a timely manner otherwise the Royal Society retains the right to reclaim grant money. Details about the reporting requirements can be found [here](#).

Checked

I understand that if I have funding left at the end of my project it must be spent in one of the following ways:

- To pay for teacher cover for the teachers involved to embed the learnings from the project in the school.
- To replace consumables so that the project can re-run.
- To purchase equipment to develop and extend the original project.
- To run a session or showcase the project work at a conference.
- To produce teaching resources or guidance documents about the project which could be shared with other schools to run a similar project.
- To pay for a school trip which relates to the work the students carried out through their project.
- To produce a video, blog or podcast about the project (and share with the Society).

Checked

Name and Surname

[REDACTED]

Date

22 April 2024

Section 8 - Collaborating Applicant Declaration (STEM partner)

Declaration

I hereby declare that the information provided in this application is true and correct to the best of my knowledge.

Checked

Name and Surname

[REDACTED]

Date

29 April 2024

Section 9 - Head Teacher/Principal Support

Full name:

[REDACTED]

I confirm that the school is aware of this grant application and gives their full support to the lead applicant to run the project.


Checked


I understand that the Royal Society retains the right to reclaim grant money if the lead applicant does not submit the required reports in a timely manner.


Checked


Supporting documents

Please upload any documents (PDF), that you feel may support this application.

 [Royal Society - Principal Approval](#)

 06/05/2024

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