PRIMARY APPLICANT DETAILS

Title
Name
Surname
Tel (Work)
Email (Personal)
Address

COLLABORATOR DETAILS

Role	**Head teacher or Principal**
Title	
Name	
Surname	
Tel (Work)	
Email (Work)	
Address	

Role	**STEM partner**
Title	
Name	
Surname	
Tel	
Email (Work)	
Address	

Section 1 - Contact Details

PRIMARY APPLICANT DETAILS

Title
Name
Surname
Tel (Work)
Email (Personal)
Address

COLLABORATOR DETAILS

Role	**Head teacher or Principal**
Title	
Name	
Surname	
Tel (Work)	
Email (Work)	
Address	

Role	**STEM partner**
Title	
Name	
Surname	
Tel	
Email (Work)	
Address	

School contact details:

Please enter your School Name

Please enter your school address

Please enter your school postcode

Please select your school level from the list below:

Please select the type of school from the list below:

State-funded

If you selected other, please provide details in the box below

No Response

STEM partner contact details:

Please enter the STEM partner's organisation name

Please enter the STEM partner's organisation address

Please enter the STEM partner's organisation postcode

Please select the type of organisation from the list below:

Other (please specify)

If you selected other, please provide details in the box below

Independent Research Organisation

Section 2 - Project Overview

Project title

This must be a short and snappy question that will be the focus of your project.

aMAZEing Robots: How do future self-drive cars work?

Please select the main strand that your project falls under from the list below:

Computing

List up to 5 (max) investigations that the students will carry out as part of this project

As a school, a robot car must get from A to B autonomously. This is a school-wide project over an academic year with linked age-appropriate activities, culminating in an event where different stages of the project developed solely by one year group are assembled to try to achieve the collective goal. This activity is designed to be repeated over a number of years so as the students progress through the years they build on their previous experience. Through peer-to-peer support and peer-to-teacher learning this activity will be self-sustaining.
Scientific investigations will cover these main areas:
1) Consideration of road design: Reception will be responsible for drawing the route. Y1 will use basic micro:bit programming for road safety features e.g. traffic lights
2) How to apply logic: Y2 will receive the route plan and must break it down into logical steps (forward, turn, wait) in Scratch.
3) What car features are needed: Y3 will build micro:bit cars from a kit and input Y2 instructions, Y4 will design their own using motors, Y5 will add line-drawing capability and explore remote control

4) How to identify hazards: Y6 must develop electronic detection of objects and/or line-following capabilities.

Please provide a brief description of the equipment that you require for funding.

Equipment needed spans a broad range of years and is designed with a range of activities to keep interest high for the year-long event and beyond. In order of descending contribution to the budget, the equipment needed is:
Micro:bit starter kits (30): one per person in the class. Lower years will not need all the kit, but Y4-6 will need the electronic components in addition to the micro:bits
Amplifiers (30): this allows sound output. Will be used in the road / car design for audio warnings, and for earlier years to provide sound output for the event.
Buggy kits (15): One per pair in the class. Y3 will build and use these to test their programmes formed by the Y2 route instructions. Y4 will also use these to understand how to design their own car.
Motor driver boards (15): Used by Y4-5 to learn how to control motors.
Power board (30): This will make the microbits easier for Y1 to handle as it reduces the external power requirements, but is also safe as the coin cell battery cannot be removed without a screwdriver.
Mirobots (2): These are line-drawing robots, serving as inspiration for Y5 to build their own, but also be used for Y2 route instruction testing and upwards.
Line-following add-on board (15): Y6 will use these to explore how cars may follow routes, and to allow them to build their own versions
Other equipment needed: motors (30), wheels (60), ultrasonic distance sensors (15), speakers and small electronic components.

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 3 - STEM Partner Details

Please include the full name of your STEM partner here

Please include the job title of your STEM partner here

Relevant qualifications and/or experience

STEM partner's involvement

Please provide details on how the STEM partner will contribute to the project, by writing a short paragraph and adding details in the question below.

The STEM partner will commit 3 hours per week for the first year of the project, 1 hour per week in the second year and upon request for the third year. The project is designed to be run within a year and then be repeated during following years. Each year finishes with an event open to parents (and possibly the wider community) where either the whole school completes the challenge or learns from the pitfalls! In the first year, the STEM partner will split their time approximately 2 hours per week working with classes, and one hour per week training staff and/or engaged in joint student and parent/carer sessions.
The STEM partner will be involved primarily in teaching coding, including developing a culture of peer-to-peer support, and will help the students learn how to do basic electronic assembly. They will also assist with cross-year discussions through the [redacted]', where the school is split into small groups that include students from every year. This serves multiple purposes of looking at each aspect of this project from a different perspective, showing the students what they can look forward to in the coming years, and learning from the experience of previous years. In addition the STEM partner will assist with public dissemination of this activity by helping the school Digital Leaders to post updates on the school website and twitter account, and helping the school generate a display for the local Library.

Please enter the details of the STEM partner's activity below. Please list each activity separately, including time per session and frequency.

Specifics below are for the first year only, which will be adapted as needed in following years. The STEM partner will contribute 3 hours per week for 14 weeks in Autumn Term, 12 weeks in Spring Term and 12 weeks in Summer Term i.e. 114 hours. It is anticipated that this will comprise of:
- 9 hours spent in 3 drop-in student and parents / carers Saturday sessions at the local [redacted] Library.
- 29 hours spent increasing the expertise and confidence of [redacted] staff. This can be fitted flexibly around the teaching schedule. A minor portion may be used for in-class training e.g. implementation of the Software Carpentry post-it note help system, but this is primarily to work with staff only to ensure sustainability.
- The remaining 78 hours will be split mostly evenly between each year from Y1 to Y6 with a few hours spent with Reception in the Summer Term to do some basic micro:bit programming (adapting a programme to display a picture or message, or play some sound), and a few hours to help with [redacted] discussions.
The precise schedule cannot be determined at this stage as it depends on the teaching timetable and staff arrangements for 2018-2019, but there is a good degree of flexibility available from the STEM partner.

Has the STEM partner applied for a partnership grant before?

- ⊙ No

Section 4 - Participants

How will the students taking part in the project be selected?

Include information for core and additional participants if applicable. How do you plan to include diversity as a consideration?

This project is for the whole school, therefore no selection is required. In addition, drop in sessions will be planned for parents/carers and pupils, which they can attend if interested.

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:

- ☑ Reception
- ☑ Year 1
- ☑ Year 2
- ☑ Year 3
- ☑ Year 4
- ☑ Year 5
- ☑ Year 6

What is the total number of students who will be involved in your project?

193

What is the total number of students at your school?

193

Will any other schools be involved?

If so, please give details.

Not in the initial project, but this activity could be extended to inter school competitions.

Section 5 - Planning

Please select the anticipated start date of your project which must be no earlier than the next autumn term.

01 October 2018

Please select the anticipated end date of your project.

12 July 2019

Describe the rationale for your project, using the headers below:

a) Describe below the key learning objectives of this project.

b) How will your students benefit from participating?

c) What skills and experiences will they learn that they wouldn't ordinarily learn as part of their usual lessons?

d) Explain clearly how scientific methodology will be employed throughout this project.

Key Learning Objectives (Early years / KS1 / KS2):
1. Understand different components and capabilities of the micro:bits and how these relate to home computers e.g. accelerometer, led display, processor, memory
2. Write simple programs on a computer to control one aspect of the micro:bit e.g. sound output or led display
3. Communicate with students of different ages and learn different perspectives
4. Develop awareness of philsophical aspects and societal needs for road infrastructure systems

Key Learning Objectives (KS2):
5. Grasp basic engineering concepts through car assembly

6. Learn how to build simple electronic circuits
7. Apply logical thinking to evolve control systems

Student Benefits:
Students will learn how to program, build robot cars and enhance their skills in communicating with other year groups and with their peers.

New Skills and Experiences:
Although there is provision in the curriculum for basic programming e.g. Year 4 do simple Scratch code to check maths equations, this project will provide a comprehensive, coherent introduction to computing building from Early Years upwards. It will give the KS2 pupils an insight into electronic components beyond crocodile clips, bulbs and batteries. An important developmental aspect of this project is to upskill the teachers and give them confidence in STEM activities. This is a unique opportunity to build a project from nothing over a substantial period of time, and relies on good communication between all years and their teachers. It is not possible to predict the enormous potential effect of this activity on individuals e.g. at the [redacted] Code Club, one pupil has been so inspired he has written a scratch code to compute prime numbers. He will be a phenomenal coder in the future.

Scientific Methodology:
The following steps will be followed:
1. Questions – how do self drive cars work? What road safety considerations are needed?
2. Research – gather information, current technologies, discuss ideas in groups
3. Hypothesis – ideas of how to tackle the question of self drive cars
4. Methods – design a route, design and build a car, safety, program logical steps, such as forward, turn, stop etc..
5. Tests – each year will test their individual component e.g. draw then follow a line, stop at hazards, final event is a whole school end-to-end test.
6. Analyse – did the car follow a route correctly? Did the car deal with hazards correctly?
7. Conclusions – how did the car work, was the route appropriate, how would you change it or make it better?
8. Publish results – students will develop displays for their school and the local library, educators and STEM partner will, if appropriate, write an article for TES or equivalent.

Inital discussions and final conclusions will be discussed within [redacted]' (mixed year groups) to gain multiple perspectives.

Timeline for project

Please indicate key dates and milestones, such as when you expect students to have completed training, hypothesis testing, analyses and any dates where the project will be shared.

Date	Activity	Who involved?
05 November 2018	Research and Discussion	[redacted]
03 December 2018	Route planning	Early Years / Year 1
04 March 2019	Route Coded	Year 2
04 February 2019	Kit cars built	Year 3

03 June 2019	Designed cars built, line-following / drawing capabilities added	Year 4, 5, 6
03 June 2019	Teachers Challenge: hazard avoidance	Educators
05 July 2019	Whole school system test	All
12 July 2019	Analysis / Final discussion	[redacted]

Clearly explain why you need the equipment you have requested funding for.

At this point in time [redacted] has limited equipment and therefore class-wide training in STEM computing outside of Scratch is not currently possible. Scratch or even other computing languages are only one part of computing. Access to micro:bits will provide understanding of the components that make up a computer, motion controllers and the origin of computing communication e.g. micro:bit led display is controlled by numbers. The other equipment provides access to electronics, and motor control systems. The kits are needed to lead earlier years through to later year activities where they have to build their own. Thus funding for a range of equipment is requested in order to involve the entire school, can be used to provide further STEM learning once the year group contribution to the project has been completed, and ensures project sustainability into future years.

Please give a brief description of the legacy this project will have. For example: how will it be sustained? Can it be repeated with other students? Can it be repeated with the involvement of another school?

This is a self sustaining project, which will be held annually. Pupils will build on the skills they have learnt from the previous year adopting a concept of teaching each other. This will be in the form of peer-to-peer learning/teaching, but also pupils teaching teachers. This is essential to the sustainability of the project.

The project will be repeated in a way that each year group, as they move on will adopt the previous year's role. However, with the added experience and knowledge they will now possess, the activity they commence will be evolving, year on year.

Other schools could easily be involved. As with the [redacted], this could be upgraded to school groups investigating each stage of the activity.

Section 6 - Project costs

Period	Item Type	Item	Field	£
2018 - 2019	Project Item	micro:bit complete starter kit x30 units	Cost	£1,125.00
			Latest Cost	£1,125.00
		:move mini buggy kit x15 units	Cost	£412.50
			Latest Cost	£412.50
		Motor Driver board v2 for the micro:bit x15 units	Cost	£195.00
			Latest Cost	£195.00
		MI: power board for micro:bit x30 units	Cost	£150.00

			Latest Cost	£150.00
		Amp:bit class D amplifier for micro:bit x2 units	Cost	£450.00
			Latest Cost	£450.00
		mirobot x2 units	Cost	£120.00
			Latest Cost	£120.00
		Speaker for micro:bit x2 units	Cost	£16.00
			Latest Cost	£16.00
		Right angled geared hobby motor x30 units	Cost	£66.60
			Latest Cost	£66.60
		Wheel for geared hobby motor x60 units	Cost	£82.80
			Latest Cost	£82.80
		Line following add-on board x15 units	Cost	£100.80
			Latest Cost	£100.80
		Ultrasonic distance sensor x15 units	Cost	£36.15
			Latest Cost	£36.15
		Misc electronic components	Cost	£175.00
			Latest Cost	£175.00
2018 - 2019 Total			**Cost**	**£2,929.85**
			Latest Cost	**£2,929.85**

Total	Project Item	micro:bit complete starter kit x30 units	Cost	£1,125.00
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		Latest Cost	£175.00
Total		**Cost**	**£2,929.85**
		Latest Cost	**£2,929.85**

Justification for consumables (incl. fieldwork)

Please fully justify your request for consumables, including expenses for fieldwork.

Equipment needed spans a broad range of years and is designed with a range of activities to keep interest high for the year-long event and beyond.
Micro:bit starter kits (30): one per person in the class. These will be used for all pupils in the school. Lower years will not need all the kit, but Y4-6 will need the electronic components in addition to the micro:bits
Amplifiers (30): this allows sound output. Will be used in the road / car design for audio warnings, and for earlier years to provide sound output for the event. These will be used to provide extension learning opportunities for all years.
Buggy kits (15): One per pair in the class. Y3 will build and use these to test their programmes formed by the Y2 route instructions. Y4 will also use these to understand how to design their own car.
Motor driver boards (15): Used by Y4-5 to learn how to control motors.
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Mirobots (2): These are line-drawing robots, serving as inspiration for Y5 to build their own, but also be used for Y2 route instruction testing and upwards.
Line-following add-on board (15): Y6 will use these to explore how cars may follow routes, and to allow them to build their own versions
Other equipment needed: motors (30), wheels (60), ultrasonic distance sensors (15), speakers and small electronic components e.g. resistors

Please provide quotes for all individual items over £200

No Response

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.

Checked

Partner details

Name and Surname	
Date	14 March 2018

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

Partner details

Name and Surname	
Date	14 March 2018

Section 9 - Head Teacher/Principal Support

Full name:

Statement of support

Please provide a statement in support of the application.

Support it... aMAZEing Robots has me (and the staff involved in the brainstorming sessions [redacted]) dancing on the spot like excited children!

This project will bring together our love of science with our long standing passion for working together as a school to create something special.
For me the two 'big wins' from the proposal shared in this document are:-
1. The inherent plans to build from one class to the next - how exciting will it be to both 'hand on' the fruits of your labour to the waiting class or to 'open up' the work of those before you, knowing it is down to YOU to take the project forward and ensure success?
2. The pure pleasure/stimulation of looking to the future and shaping something for tomorrow. I think the driverless car project will capture this sense of awe perfectly.

So, for the purpose of the application, yes I'm happy to support this proposal... but from the inner child excited about what is to come... WHEN CAN WE START?

Supporting documents

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

No Response

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

Checked