



# Robokid

PLUGGED INTO TECHNOLOGY



## Technology for primary kids

Experience has shown us that primary school children have a tremendous enthusiasm for the ideas of science and technology which seems to dissipate in the later years of education as shown by the drop in pupils taking higher maths and physics. Building on this early enthusiasm is one way to help to stabilize and hopefully build the numbers in the future. UK Plc needs a healthy science and engineering base.

The aim is to provide teachers with quality, tested project material that is "teacher friendly". For primary school teachers to take on this level of technology they require help and support.

The **robokid** project is one attempt to meet this demand. With a generous grant from EPSRC a three year programme has been setup to produce a

technology project based on the theme of Robotics. Heriot Watt University is providing the technical input while current teachers and volunteers are helping to write the classroom support material.

Teams of three pupils will be given an electronic robot kit that will form the basis of a range of experiments that will last between 6 and 10 weeks. We aim to produce about 800 kits for the schools. We are currently in year 2 and have signed up 19 schools with over 1000 pupils.

In parallel, a travelling exhibition will tour the schools to give the kids a flavour of the



## Partnerships

Our main financial backer, the Engineering & Physical Sciences Research Council (EPSRC) are funding the work through their "partnerships for public engagement" initiative which aims to build links between the science community and the general public.

We are looking to attract additional partners who see mutual benefit in supporting the **robokid** initiative.

### Benefits include

- Support of a worthwhile initiative
- PR possibilities
- Access to a running and funded program
- Easily structured to help your LOCAL schools

Please contact me to discuss how we can help to support your community programmes through the Robokid initiative.

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Heriot-Watt University  
Riccarton Campus  
Edinburgh EH14 4AS  
Tel 0131 451 3349  
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### Aims

- Enthuse the next generation of scientists and engineers
- Provide 9/10 year old kids with an interesting technology project
- Help busy primary teachers by supplying high quality packaged material
- Use theme of robotics to support a rich range of educational topics including maths, language, and art

### Timescales

- Year 1 : 2 pilot schools
- Year 2 : 20 schools
- Year 3 : 100 schools

### Pilot Schools

- Comely Park Primary School
- Bothwell Primary School

### Class material Developers

- Gillian Hepburn
- Rowena Myreck
- Tracy McHenry



Heriot-Watt University  
School of Engineering & Physical Sciences  
Electrical, Electronic & Computer Engineering

## Robokid Project Information for session 2009/10

### Introduction

The purpose of this short document is to outline the structure of the Robokid project and include some of the lessons we learnt from working with 20 schools. The overall aim is to give pupils at stages P6/P7 hands-on access to modern technology in a fun and educationally useful way. The overall theme is based around robotics and related topics. Experience has shown that robotics provides an excellent topic as it covers many areas of the curriculum in an active way (active learning).

The following information is in the form of a series of questions and answers. Please feel free to contact us with any other questions you may have. The project email is [robokid@hw.ac.uk](mailto:robokid@hw.ac.uk).

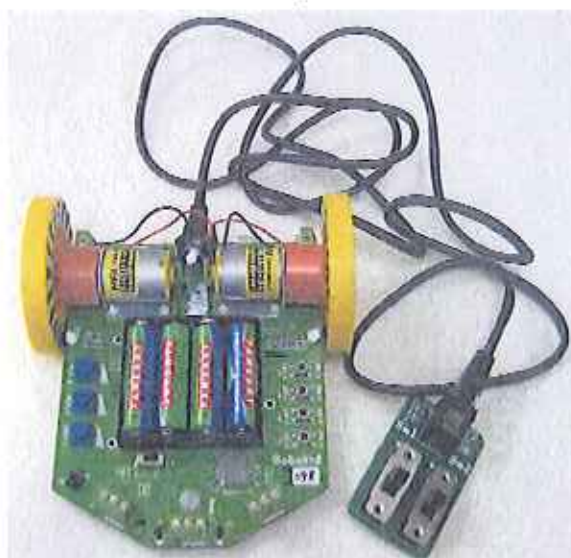
If you would like to be involved, please complete the attached form and send it to the following address

Dr Jim Herd  
Department of Electrical & Electronic Engineering  
Earl Mountbatten Building  
Heriot Watt University  
Edinburgh  
EH14 4AS

## What will the pupils get?

Your pupils should work in teams of 3 and each team will get a robot kit that they will build, test, and use in a sequence of activities.

Pupil Robot kit	One for each group of three pupils  e.g. a class of 32 pupils will get 11 kits.  Each kit is supplied in a cardboard box of size 26cm*11cm*17cm.  Storage required for these boxes	1 robot circuit board 2 motors with wheels 1 screwdriver 8 rivets to fix motors to circuit board 1 pen holder unit 1 front skid dome nut and screw 1 controller with two switches 1 cable to connect controller to robot 3 bump switches
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## What will the teacher get?

Item	Number	Kit contents
Teacher kit	One per class  Supplied in a large plastic box	One robot kit for teacher (same as pupil kit) Battery chargers (sufficient for class) Rechargeable batteries for the class 1 mains extension socket 1 set of DVD disks to cover activities 1 set of project documents 1 set of Berol pens for use with robots 2 rolls of drawing paper 4 rolls of black 19mm tape Sufficient light sensors for robots Kit of parts to allow pupils to build their own bump switches Set of spare rivets



## When can I run the project?

The project can be run during any term. The three session times are

1. October to December
2. Jan to March
3. April to June

A project request sheet is attached to this document.

## How long does the project last?

At present there are 10 activities. You may choose as many or as few activities as you like. Depending on how often you run the project in a week, the project can run from between 2 and 10 weeks.

## When will I get the class kit?

We plan to supply the full kit a minimum of three weeks before start.

## What activities will we do?

The decision is entirely up to you. The following is the list of the current activities.

If some of the following terms are unfamiliar to you, do not be alarmed, as it will be explained in the DVDs. A "session" would be between 60 and 75 minutes.

Activity	Name	Notes	Time/Room
1	Build, test and run.	<ol style="list-style-type: none"> <li>1. watch DVD</li> <li>2. get kits</li> <li>3. build</li> <li>4. run a series of tests</li> <li>5. learn how to steer robot</li> </ol> <p>Additional paper documentation will be provided to help the pupils along with a fault finding chart.</p>	1 session  Classroom + floor area
2	Cornering	<ol style="list-style-type: none"> <li>1. watch DVD</li> <li>2. experiment with cornering mode</li> <li>3. fill-in experiment sheet</li> <li>4. practice steering round obstacles</li> </ol>	1 session  Floor area
3	Art 1	Build covers for the robots based on a given specification.	2 sessions or more Classroom
4	Steering competition	Run an obstacle steering competition with robots with their covers.	1 session Floor area
5	Straight line adjust	<ol style="list-style-type: none"> <li>1. watch DVD</li> <li>2. run line adjust experiment and record results.</li> </ol>	1 session  Classroom
6	10-pin bowling competition	Using knowledge gained from activity 5 the pupils plan curved and straight moves to knock down a set of skittles.	1 session  Floor area
7.	Art 3	<ol style="list-style-type: none"> <li>1. watch DVD</li> <li>2. use black tape to create a shape</li> <li>3. run robot in autonomous mode with a felt-tip pen</li> </ol>	1 session Classroom
8	Line following	<ol style="list-style-type: none"> <li>1. watch DVD</li> <li>2. create a line following course</li> <li>3. experiment with robot adjustments</li> <li>4. do timed runs</li> </ol>	1 session Classroom + Floor area
9	Programming 1	<ol style="list-style-type: none"> <li>1. watch DVD</li> <li>2. Using the four robot switches input a sequence to move the robot through a given maze.</li> </ol>	1 or 2 sessions Classroom + Floor area

10	Bump sensing	<ol style="list-style-type: none"> <li>1. watch DVD</li> <li>2. fix bump switched to robot and experiment with different settings</li> <li>3. record results</li> <li>4. run experiment with 3 or 4 robots in the one area all bumping into each other</li> <li>5. Replace the bump switches with your own design of bump switch. Kit of bits will be provided.</li> </ol>	1 session Classroom + Floor area
11	End of project session		1 session Classroom

You may choose as many or as few activities as you would like. We plan to have some additional extension activities for teams that complete a main activity well within the allocated time. A minimum project would probably include sessions 1 to 7.

The DVD clip at the start of most activities will consist of two parts

1. A short introduction to an aspect of robotics.
  - What is a robot?, robots in dangerous places, robots in entertainment, etc.
2. A description and demonstration of the activity to be done.

## Where should I run the project?

The robot should not be run on carpet or outdoors. Parts of the project can be run in the classroom and parts in a hall or room with some clear floor space - vinyl or wood. It is difficult to generalise as classrooms vary from school to school. Competitions and driving activities really need to be done in a hall area, while construction and some of the art activities can be done in a classroom. The other factor that will influence where to run the different activities is the availability of DVD facilities. Some schools have SmartBoard facilities in each classroom which can display DVDs while others used a mobile DVD player on a trolley that could be moved to the classroom or the hall.

## How did the project run in other schools?

Many of the 20 phase II schools ran the project once per week in an afternoon slot. However, one or two have suggested that they would in future plan to run it over a shorter period with more than one session per week.

## What if things go wrong?

Our aim is to provide sufficient resources to help solve problems. These include

1. Information in the DVD about possible problem areas
2. Special software on the robot to test robot features
3. Fault diagnosis charts where applicable (e.g. with initial build)
4. Website with FAQ on common problems
  - a. A website will be available at
5. Email address for questions
6. Telephone number for emergency help

We accept that breakages occur and will provide replacements for broken units.

## How do I deal with the batteries?

Each robot kit comes with FOUR rechargeable AA batteries and access to a battery charger. On delivery, the batteries will need to be charged in time for the first session. On a full charge, the robot should work for three to four sessions. However, this is very dependent on the amount of usage and the time between sessions (batteries naturally discharge with time). The batteries should only be recharged when they are at least half discharged. There are two ways to ensure this

1. On power-on, the robot will give an estimate of the state of the batteries. Once the state is below a certain value you would organise to recharge the batteries before the next session. Again, we will provide details of this facility in the first DVD.
2. Clearly, if the motors start to go more slowly then recharging will be necessary.

Please note that the supplied batteries are high power and will take about 8 hours to recharge.

## Can I do other things with the robots?

We are very happy for you to suggest other ways in which the equipment can be used. The only requirement is that you let us know so that we can include your ideas for the future.

## **Do I have to do anything in return?**

Our project funders are very keen that we evaluate the project. The teacher's kit will include some evaluation sheets, but we would be happy for you to provide additional evaluation material that highlighted the pupils' reaction to the project and their attitudes towards technology. Any pictures and video clips would be much appreciated. We would also ask you to note the time spent on the project by the class and to pass this data to us at the end of the project.

## **How much will it cost?**

There are no costs associated with the project. All kits and materials are provided for free.

## **What happens at the end of the project?**

You are required to return the equipment to Heriot-Watt University where it will be refurbished, restocked and used in other schools.

## **Conclusion**

Finally, we hope you and your class enjoy the project and have lots of fun.

Jim Herd  
Tracy McHenry

June 2009



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PLANNED INTO TECHNOLOGY

Heriot-Watt University  
School of Engineering & Physical Sciences  
Electrical, Electronic & Computer Engineering

## Robokid Project Phase III

School \_\_\_\_\_

Address \_\_\_\_\_

Postcode \_\_\_\_\_ Telephone number \_\_\_\_\_

Head teacher \_\_\_\_\_

Email \_\_\_\_\_

Tick box

I confirm that my school would like to use the Robokid project

### List of classes

Class	Stage	Pupils	Teacher	Email
1				
2				
3				

### When would you like to run the project?

Choice	Oct→Dec 09	Jan→Mar 10	Apr→Jun 10
1st			
2nd			
3rd			

### Notes

1. ONE robot kit per 3 pupils + ONE spare kit
2. ONE teacher kit per class
3. We will try to give you your first choice term where possible.
4. Only 1 stage per school (P6 or P7 or P6/P7 composite)
5. Email contact with class teachers is very important. Please note that email addresses will not be published or passed to third parties.
6. If you have more than 3 classes per stage then please contact me.
7. For organisational purposes we would prefer that all classes in a school run the project in the same term.