Arm school has created these resources in collabration with CAS (on pages)

If you want to explore more projects – school.arm.com

*See sentence from Nick in Teams about not being able to use non-Arm devices*

**Physical Computing Innovation Days**

**1. What is a Physical Computing Innovation Day?**

An Innovation Day is a competition where teams of learners design, program and build solutions to a real-world problem. It’s an engaging, motivating and fun day, which demonstrates to students that working in Computing can be a creative and social experience, where teamwork and resilience go hand-in-hand with putting your subject knowledge into practice.

**2. What is the format of a Physical Computing Day?**

Teams of 3 or 4 learners meet at the beginning of the day. The venue could be a large school hall. Having more space and involving lots of teams makes for a brilliant buzz throughout the day – so more is more when it comes to number of participants!

1. **First briefing**

The day begins with a ten-minute presentation from the organising teacher, which is supported by a briefing sheet. All students are given:

* a clear understanding of the problem
* success criteria which they must work towards as a team

At the end of the day each team will make a short product pitch, where they market their design. They will also explain the design process, what they have learned, what went well, what they could have improved. Finally, they will do a live demo of their solution.

1. **Team roles and task research**

Each team is encouraged to think about roles in their team. How will the tasks be divided so that they work efficiently and fairly? For example, it’s important that each team member gets a chance to contribute to the programming of the physical computing device. There are lots of other tasks, though, including developing the branding, recording learning point and building with craft materials.

They also will begin to research the themes in the project scenario, beginning to gather their findings on a design sheet. <link>

1. **Second briefing**

It’s then time to gather everyone’s attention and to tell them about the craft materials they have access to.

1. **Planning and initial design work**

Each team now has everything they need to plan their solution.

Teams should be encouraged to use their time efficiently: using the team roles to work in parallel on aspects of the design.

They will begin to design their solutions, gathering their thoughts on a design sheet. <link> Teams should use the input-process-output model to guide their plans for the programming element of the design <link>

1. **Building, prototyping and testing**

When a team is ready, they can move on to prototyping. It’s important to emphasize the iterative nature of design work – they may begin building to a plan, only to find that it doesn’t quite work, so they need to adjust their build or start again. They might discover unforeseen problems with their design at the point of testing.

Overcoming these challenges is a combination of teamwork and resilience, which are important aspects of real-world engineering.

1. **Presentation**

Finally, all participating teams come together. Before a small group of judges, each team makes an ‘elevator pitch’ for their design (which might include a powerpoint, explaining the product title, branding and design features).

The judges should mark each presentation on the judging sheet. This is important, because it links the end of the Innovation Day to the success criteria which the teams were given at the start. It isn’t necessary to reveal scores or choose a winner, but judges should provide some commentary on each team’s product and how they overcame the challenges they faced.

**3. What real-world problem could I use?**

The Arm School Program has designed the following real-world problems, which each come with all the guidance you need to run an *Innovation Day*. Each has been inspired by a UN Sustainable Development Goal. The supporting resources have been updated in collaboration with *Computing At School*. You could use these resources to run your own Innovation Day. Or you develop your own and share them with the *CAS Physical Computing Working Group*.

**Micro:pet**

This is a great, engaging and accessible context for all ages. Learners don’t need to have had any experience with physical computing before they start. Within 2-3 hours, all teams will have a functioning solution. Learners who already have experience with micro:bits might decide they want to use two micro:bits in their build, using the radio function to enable them to communicate.

**Setting the scene**

Loneliness and isolation are a real problem for children staying in hospitals for long periods, especially in rural areas. You have been tasked with creating a digital pet that can be played with and keep people company whilst they stay in hospital.

**Success criteria**

The product must be suitable for one of the users listed below and the pet must:

* look like a friendly pet (be creative)
* be robust enough to be played with
* contain a micro:bit that users can interact with
* have a face to express emotions when interacted with
* have one or more interactions programmed so it behaves like a pet to keep the user company
* Use the speaker/mic to make your pet talk and react to touch

*Resources:* [Micropet](https://armh.sharepoint.com/:f:/r/sites/CASPCWG/Shared%20Documents/Innovation%20day/ASP%20innovation%20day%20resources/Micropet?csf=1&web=1&e=ipXvgz)

Opening presentation

Main activity

Example code solution (use only if absolutely necessary)

Micro:pet net

**Smart Cities**

This project is connected with the UN Sustainable Development Goals, Sustainable Cities and Communities. It can form the basis of a full Innovation Day of 5-6 hour in length.

**Setting the scene**

One way in which technology is improving our lives is by adding computers to everything. These computers are tiny but contain sensors that allow the computer to control a system or device. They can also transmit and receive data to and from the internet. This allows much more precise control over the device as digital sensors are more precise that analogue sensors in some applications such as temperature control.

In this project we will be designing and making a “smart” street light for a city. The city currently has traditional street lights and these use a lot of electricity and have sodium bulbs which are expensive to replace.

**Success criteria**

Design a street light that changes its behaviour depending on the local conditions

Design the body of the street light to be efficient and robust

Design the light housing to minimise light pollution

Create a program that uses the micro:bit’s sensors to make the street light smart

Create a smart street light that uses LEDs to save electricity usage

Consider how the data generated by smart street lights could be used

Suggest ways in which the data collected from the sensors in the street lights across the city could be used by other organisations

**Oil-Spill Cleaner-Upper**

This is a fun

A group of people in a room

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Setting the scene

Oil spills do untold damage to eco-systems.

A new material can absorb up to 90 times its own weight in spilled oil and then be squeezed out like a sponge and reused, raising hopes for easier clean-up of oil spill sites. <https://www.newscientist.com/article/2123391-sponge-can-soak-up-and-release-spilled-oil-hundreds-of-times/>

A group of marine scientists have asked you to develop an algorithm that could be used on a boat drone to drag around a sheet of this smart material to clean up an oil spill.

Success criteria

* Build a floating oil spill cleaner upper boat drone that starts with a button press
* The product should be able to autonomously navigate over an area
* The product should be made to clean up an oil spill by dragging a ‘smart material’

**Micro:sat**

**4. Organising an Innovation Day**

<Guide to teachers on things to consider – safeguarding, travel etc.

**Venue**

**IT**

* **Arrange a suitable space with IT facilities**
* **Ensure MakeCode is unblocked**
* **Ensure USB are functional**
* **Ensure all hardware is sourced**
* **Gather spare parts/batteries**
* **Gathering making materials**
* **Brief colleagues on the plan**
* **Plan timings for the day**
* **Power for laptops – access/extensions​**
* **Tables​**
* **Space for each team**
* **Access to WiFi​**
* **PC log in accounts**

**Safeguarding**

**Travel and food**

**Communications**

**Preparing colleagues:**

* **A familiarity with:**
  + **Micro:bit V2 features**
  + **Flashing process**
  + **Control:bit blocks**
  + **Data capture on micro:bit**
  + **Visualising data from a .csv**
  + **Simple encryption concepts**
  + **Use of Radio blocks**
  + **Error codes**

**A close-up of a logo

Description automatically generated with low confidenceA black background with blue letters

Description automatically generated**