The Microwave Racing Video
(Companion to the Teleporting Robot activity)

Age group: 7 – adult
Abilities assumed: Nothing
Time: 5 minutes
Size of group: 1 upwards

Focus
Computational thinking: about people
Human-computer interaction
Interaction design and human error

Syllabus Links
This video can be used as a general introduction to human computer interaction (HCI) from KS2 upwards and in particular why so many gadgets are harder to use than need be.

Summary
You show a video where people race different microwave designs to see which is easiest to use to do a simple task. Some are seen to be far more complicated than others. Design does make a difference and it is important that interfaces are evaluated to check they are easy to use.

Technical Terms
Interaction design, human-computer interaction, usability, usability evaluation.

Materials
The video available from youtube: http://www.youtube.com/watch?v=Bzy5hVvbei8
or via the Teaching London Computing Activity Area http://teachinglondoncomputing.org/
What to do

The Grab:
If people struggle to use a gadget, are they just being stupid? Or can the people who design gadgets make a difference?

This video naturally follows the teleporting robot activity (see related activities below), which can be used as its grab. The change blindness activity (see related activities below) could also be used. Both introduce the idea that people do not see everything that is there to be seen and that we must design computer systems to allow for this. With the teleporting robot it shows that if there is too much clutter, too much there to be seen, then we can fail to see things that are important.

The activity:
One way to find out if design matters is to take a series of different designs of the same gadget and race them. This video shows some students from UCL doing just that. They took 4 different microwaves with completely different human computer interfaces – different panels of buttons, knobs and screens. Microwaves have been around a long while, so manufacturers have had a long time to make them easy to use. You wouldn't expect there to be problems would you?

Play the video, explaining that the people involved are all PhD students – really bright people. The difference is in the different designs – point out how they are very different. Explain all will be given the same task to do – the totally basic thing you need to do with a microwave: cook something on full power for a given time – (e.g., cooking some frozen peas). As the first microwave image goes black point out they have finished already, then the next one has too. Those microwaves were really easy to use. With the others the person is still struggling … and struggling. Eventually the third person finishes. The fourth though is still having problems. At one point the video shows there is a chaos button – ask why does a microwave need a chaos button!?! The screen blanks but they are still going as they try and find the right buttons. Listen carefully and you can hear them saying they end up with a number 10 times too big. The problem is that the interface is really complicated. There are so many very similar buttons it is hard to find the ones you need to do even basic tasks.

The Explanation
There are lots of ways a gadget can be harder to use than necessary: too many buttons, more button presses than need be, lots of menus to get lost in, too many special key sequences to forget, poor labelling, easy opportunities to make mistakes, no obvious feedback to tell you what it's doing...

What is clear from Microwave racing is that some gadgets really are easier to use than others. Does it matter? Perhaps not if it's just an odd minute wasted here or there cooking dinner.

Would it matter to you more though if the device in question was a nuclear power plant controller and the person struggling was someone trying to shutdown the reactor in an emergency? Or perhaps it would matter if it was a medical device that will keep you alive as long as it is quickly and correctly set up. There are lots of such gadgets: infusion pumps, for example. They pump life-saving drugs, nutrient rich solutions or extra fluids directly into a patient via tubes. If the nurse makes a mistake setting the
rate or volume then it could make you worse rather than better. You want the device to help the nurse get it right not hinder them.

While the consequences are completely different, the core task in setting an infusion pump is actually very similar to setting a microwave: "set a number for the volume of drug and another for the rate to infuse it and hit start" versus "set a number for the power and another for the cooking time, then hit start".

The same types of design solutions (both good and bad) crop up in both. Nurses have to set such gadgets day in day out. In an intensive care unit, they will be using several at a time with each patient. Do you really want to waste lots of minutes of such a nurse's time day in, day out? Do you want a nurse to easily be able to make mistakes in doing so?

What the microwave racing video shows is that the designers of gadgets can make them trivially simple to use. They can also make them very hard to use, especially if they focus more on the looks and functions of the thing than ease of use.

Usability Consultant’s don’t do microwave racing as such to evaluate devices though they do something similar. For example, they get people to use a device (ideally an early prototype of it) and attempt key tasks. The consultants record what they do and note any problems, so the design team can try to fix them.

Microwave racing may not be the best way to do it (follow the further reading links below to explore more about actual ways professionals evaluate devices), but next time you are out looking for a new gadget check how easy it is to use before you buy ... especially if the gadget is an infusion pump and you happen to be the person placing orders for a hospital!

**Variations and Extensions**

**Real Microwave Racing**

You can do a real variation of this if you can gather several different microwaves. Have students take it in turns to try to do the simple task of cooking popcorn with each microwave. Take the average time taken for each. Also record any points of confusion or wrong buttons pressed. Discuss the trade-off between speed and ease of use. (You can end up with popcorn everywhere and it needs to be done somewhere where smoke alarms will not be set off so you need a suitable kitchen.)

**Alarm clock Racing**

A less messy variation of the above is to race alarm clocks (or mobile phone alarms). Set the task of making the alarm ring 2 minutes from the current time. Again take the average time and record points of confusion or wrong buttons pressed. Discuss the trade-off between speed and ease of use.

**Further Reading**

**CHI+MED: Making Medical Devices Safer (magazine and web portal)**


Also download an issue of cs4fn magazine on the topic from there.

**Evaluating usability (web portal)**

Links to other activities

Microwave Racing

*Show a video of people racing microwaves.* Four different microwave designs are raced to see which can be most quickly used. Demonstrates how interaction design can make a difference both in how easy a task is to complete and how easy it is to make mistake. Make things too complicated and people will struggle.

The Four Aces

*Teach a trick where the Aces are stolen from a perfect hand without anyone seeing.* You do a magic trick where the audience try to keep track of the Aces. To their surprise the person who had all the Aces turns out to have nothing. You the magician have the perfect hand. How do you steal the Aces with no one noticing? Magicians design systems so everyone makes mistakes, computer scientists have to design them so no one does. This is a memorable way to show that computing is about more than just technology. It is about understanding people too.

Teleporting Robot

*You put together a jigsaw that has 17 robots, but then put it together again and now it only has 16.* This trick shows how apparently simple things can be too complex for our brains to take in. An important design principle is that interfaces should be clear and simple, not cluttered. It also illustrates aspects of computational thinking such as simplifying the problem and the importance of understanding people.

Change Blindness

*Show images where something appears and disappears – can the class see the change?* A powerful way to motivate the importance of human-computer interaction and the need for user-centred design. Just because something is there to be seen doesn’t mean it will be seen, however hard people look.

Live demonstration of this activity

Teaching London Computing give live sessions for teachers demonstrating this and our other activities. See [http://teachinglondoncomputing.org/](http://teachinglondoncomputing.org/) for details. Videos of some activities are also available or in preparation.