Electronic Voting Systems “Clickers”

What are they?
Electronic Voting Systems (EVS), or “Clickers” as they are more commonly referred to, comprise a number of handheld devices used on its own or integrated with PowerPoint. The devices can communicate with the PC or Apple Mac via USB to a central PC. All the votes are collated by the software and the results are displayed to the class in a graphical format, such as a histogram via a data projector.

Why use them?
1. Increasing attendance at classworks;
2. Increasing student engagement in lectures and classworks;
3. Increasing student understanding

PHYSICS AT IMPERIAL: BIG CLASS ISSUES
The Physics Department, together with other departments, faces particular challenges due to its large undergraduate classes of over 200 students. As a result, interaction between lecturers and students is difficult and there is a culture among students of passively taking notes, rather than engaging directly with the course material and with the lecturer. This persists into later years when the classes are smaller.

As well as lectures, tutorials and problem sheets, students also have on average 3 “classworks” each week, which are effectively exercise classes taken in the main lecture theatre based on special problem sheets. Graduate students and the lecturer are on hand to answer students’ questions, providing rapid support and feedback. However, participation levels drop rapidly, particularly for the weaker students, and by term 2 they are below 50%. Students feel that classworks are effectively extra problem sheets, and many take them away and do them later.

The Physics department were looking for ways to increase attendance at classworks, as well as enhance interaction by lecturers and students is difficult and there is a culture among students of passively taking notes, rather than engaging directly with the course material and with the lecturer. This persists into later years when the classes are smaller. The students were encouraged to read this material before the next lecture, as the lecture would be devoted to exploration of the topic, discussion of numerical examples, optical demonstrations, and clicker questions.

Increasing student understanding
Increasing student engagement in lectures and classworks;
Increasing attendance at classworks;

EVALUATING THE SUCCESS OF CLICKERS
Some indicators of success are:
- Student feedback – online student questionnaire responses were largely positive
- Increased attendance at classworks – more students attended classworks when clickers were being used
- Lecturer feedback – those lecturers that used them generally considered them useful, although it is a lot of work to set up the quizzes for the first time

SYSTEM SET-UP
Once the software has been installed it is very straightforward to configure the system. A wizard will take you through the various stages as highlighted below;
1. Select the type of handset being used
2. RF handsets are required to register in a class by inputting the necessary channel number (channel 43 in this example)

MODELS OF CLICKER USE
Clickers can be used in a variety of settings and in a variety of different ways:
- In large 1 hour classwork sessions answering multiple choice questions: they were popular and increased attendance
- Fully integrated into large-class core course: see the box “CASE STUDY: OPTICS”
- Within the lectures of a large-class course, with several multiple choice questions asked at various points in each lecture
- Within several smaller option courses, as occasional quizzes
- In more informal settings.

CASE STUDY: OPTICS
This is a twelve-lecture core course on basic optics for second-year physicists. The previous approach has been a standard one, using notes uploaded to the blackboard VLE, supplemented by PowerPoint (for images, examples, complex diagrams, etc.) and practical demonstrations.

Although this approach had worked well, it was decided to completely change the delivery of the course in the following ways:

Students were given printed notes before each lecture containing all the material that would have been written in the class.
The students were encouraged to read this material before the next lecture, as the lecture would be devoted to exploration of the topic, discussion of numerical examples, optical demonstrations, and clicker questions.

Questions were designed to test understanding of the principles rather than knowledge; the multiple choice answers included possible misunderstandings of the topic. Discussion was encouraged and following display of the histogram of the results, the lecturer explained the correct answer and attempted to correct common misunderstandings. This also gave the lecturer opportunities to amend the lecture depending on the results from the ‘Clicker’ questions.

Students enjoyed this approach and the attendance and atmosphere at lectures was good. Their performance in the examination was at least as good as in previous years. However, the amount of effort required for preparation of the printed notes, the clicker questions and the PowerPoint presentations was very high and lectures had to be carefully planned to maintain momentum.