piCETL
Physics Innovations
Centre for Excellence in Teaching & Learning

Interactive Screen Experiments: A New Resource for Experimental Physics

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The Open University
University of Leicester
University of Reading

Three evaluations were carried out…

- SXR103 Sussex – Practising Science
  - Vernier and Spectrometer activities

- SXR207 Durham – Physics by Experiment
  - Virtual Oscilloscope activity

- Open University User Labs
  - Vernier and Spectrometer activities

Purpose of evaluations

Primary objective:

- Fitness for purpose
  - How well do the ISEs help the students to achieve the learning objectives for which they are designed ?

Secondary objectives:

- General usability
  - Are students able to interact effectively with the ISEs ?
- Design of activities
  - Do the activites guide the students adequately through the ISE ?
  - Can the activities be completed in a reasonable length of time ?
- Software testing
  - Usual testing objectives: discovery and reporting of bugs, etc.

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SXR103 Evaluation

- Evening sessions during residential school
  - 8 Students took part
  - Students able to do activity before lab
- Vernier and spectrometer ISEs
  - Changes to guidance in script based on feedback from IET user labs
- Effectiveness assessed verbally
  - "… I knew what the spectrometer was doing…"
  - "… knew what I was doing when taking the actual measurement in the lab… "

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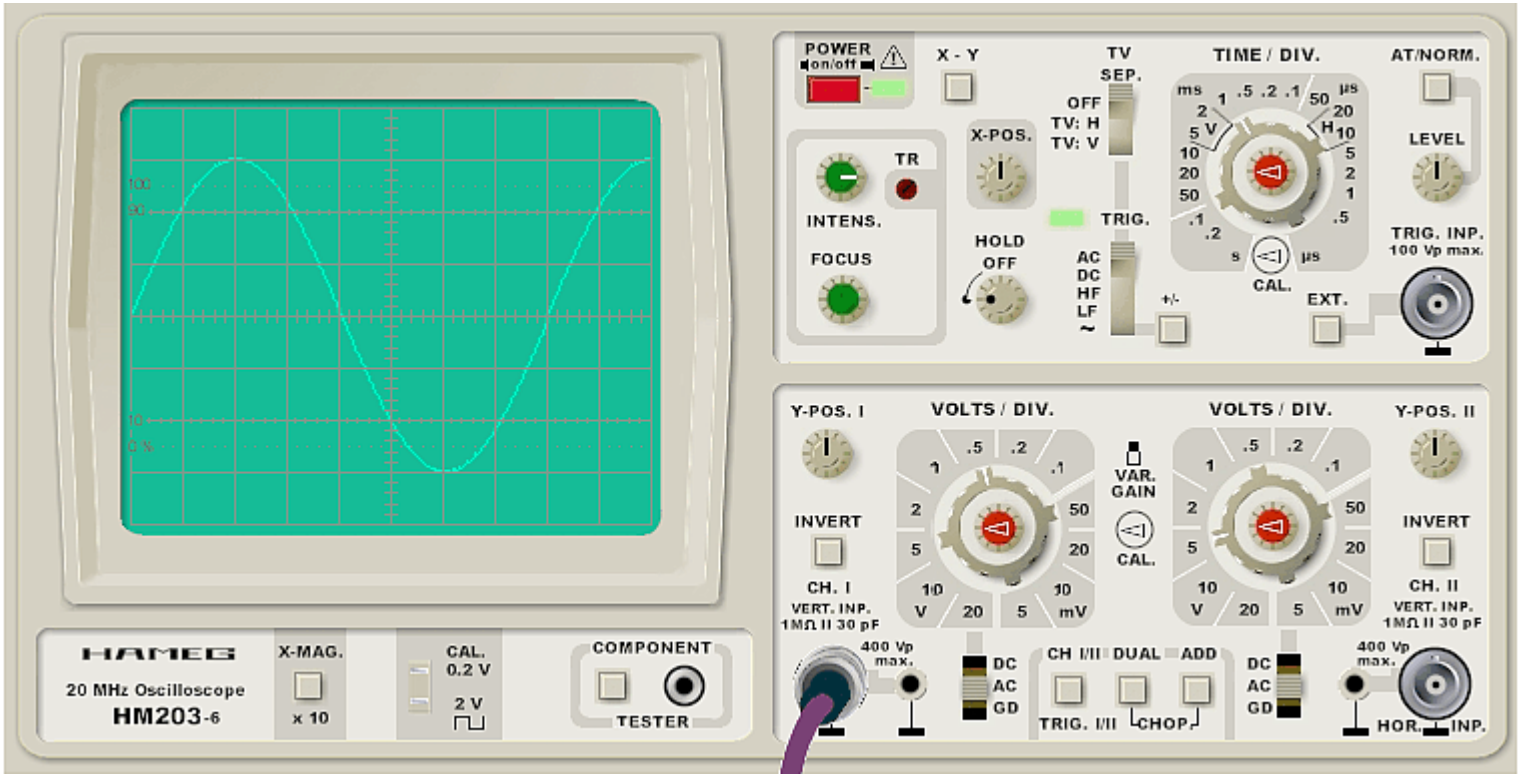
SXR207 Evaluation



www.virtual-oscilloscope.com

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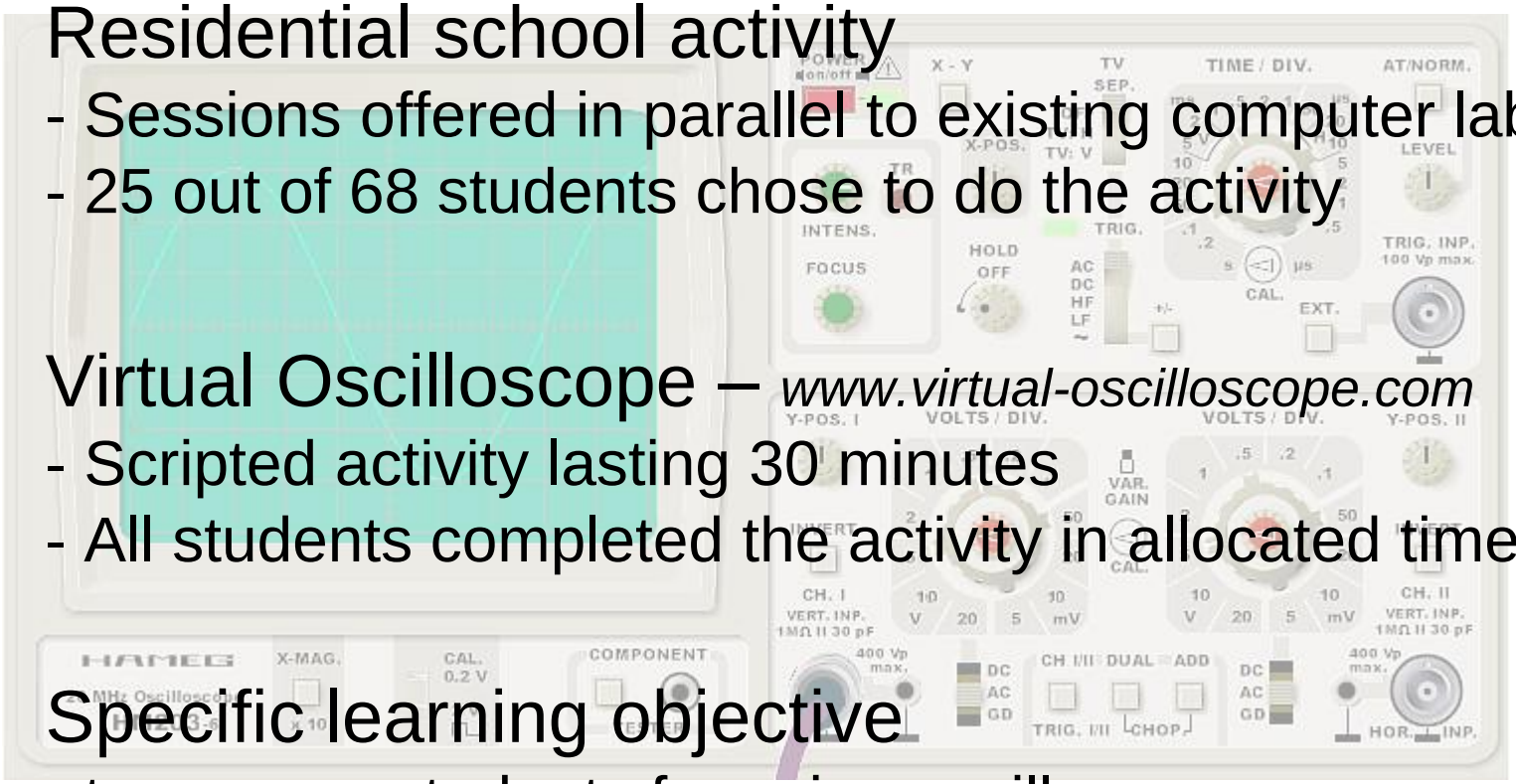
SXR207 Evaluation

- Residential school activity
  - Sessions offered in parallel to existing computer lab
  - 25 out of 68 students chose to do the activity
- Virtual Oscilloscope – *www.virtual-oscilloscope.com*
  - Scripted activity lasting 30 minutes
  - All students completed the activity in allocated time
- Specific learning objective
  - to prepare students for using oscilloscope in electronics laboratory activity

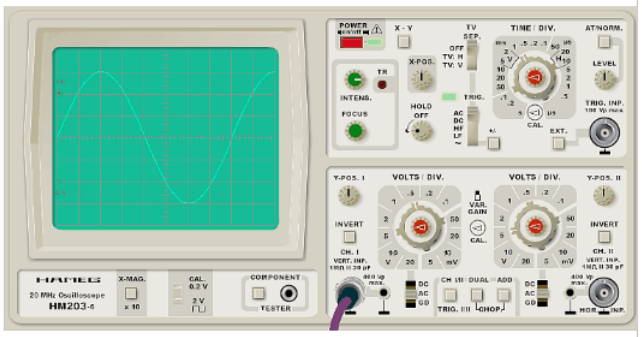


SXR207 Evaluation

SXR207 Physics by Experiment | Supplementary Activity

Interactive Screen Experiment – Oscilloscope

Durham, July 2008



Introduction

This activity is intended as preparation for the Electrical Oscillations lab, where you will be making measurements of signals in an electrical circuit using an *Oscilloscope*, which is an instrument that allows you to measure and view electrical signals that are varying with time, such as oscillations and waves. The oscilloscope displays a signal on a screen with calibrated time and voltage axes, allowing you to make measurements such as the amplitude and period of a waveform.

This activity will allow you to familiarise yourself with the controls and operation of the oscilloscope and to practice making measurements on a variety of signals similar to those you will encounter in the lab.

The activity should take no longer than 30 minutes to complete. After completing both the activity and the lab you will be asked to complete a short survey on how useful you found the activity and how well it prepared you for the labwork.

Getting Started

SXR207 Evaluation

SXR207 Physics by Experiment — Supplementary Activity

Interactive Screen Experiment – Oscilloscope

Durham, July 2

Introduction

This activity is ir
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to make measure

This activity will
to practice makir

The activity shou
the lab you will b
prepared you for

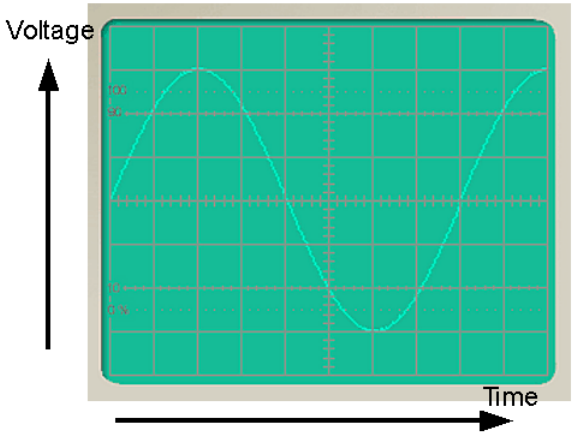
Getting Star

Interpreting the display

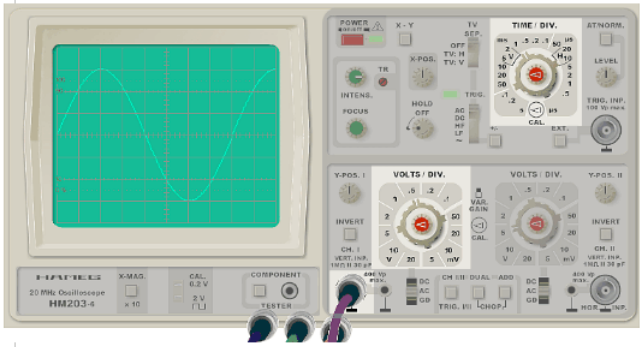
The trace on the screen is essentially a graph of voltage against time, plotted on the screen.

The horizontal axis represents *time*, and the vertical axis represents *voltage*. Each large square corresponds to the units set on the rotary controls.

As the signal oscillates, the screen is repainted repeatedly. Electronics inside the oscilloscope start the trace at the same point in the cycle each time, ensuring a steady display.



Effects of controls



You can now experiment with the time and voltage controls.

The TIME / DIV. control changes the scale on the horizontal (time) axis.

The VOLTS / DIV. control changes the scale on the vertical (voltage) axis.

Note: the controls on the oscilloscope only affect the way that the signal is *displayed* – the signal itself is not affected by changing any of the oscilloscope controls.

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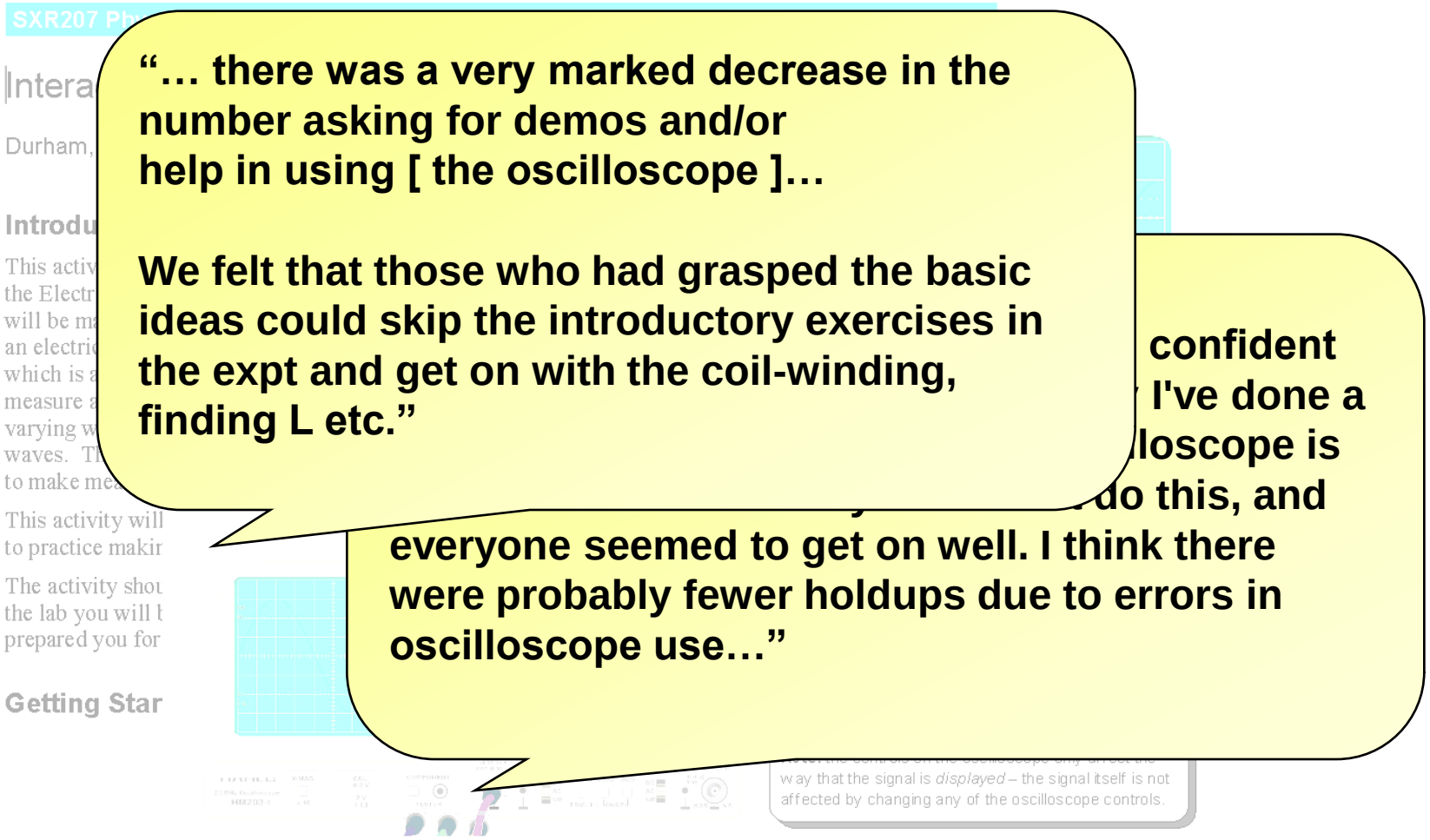
SXR207 Evaluation



"… there was a very marked decrease in the number asking for demos and/or help in using [the oscilloscope]…

We felt that those who had grasped the basic ideas could skip the introductory exercises in the expt and get on with the coil-winding, finding L etc."

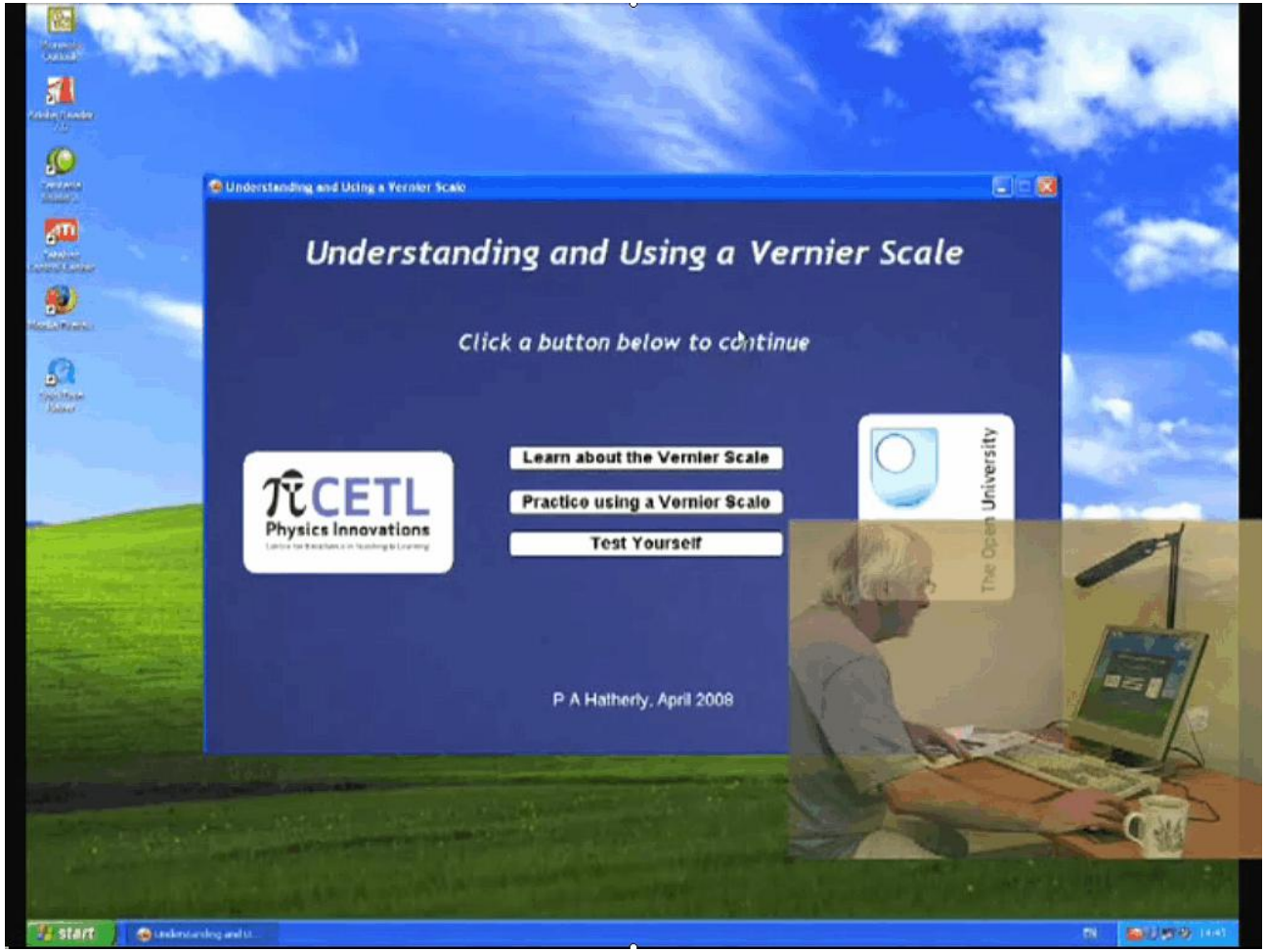
confident
I've done a
lloscope is
do this, and
everyone seemed to get on well. I think there were probably fewer holdups due to errors in oscilloscope use…"

User Lab Observation

- Observed sessions in IET User Labs at the OU
  - Observation suite with video recording and screen capture
- Evaluated three ISEs
  - Vernier scale
  - Spectrometer (2 activities)
- 2 Students and 4 members of staff took part
  - Sessions recorded for review and analysis

S104 Evaluation – User labs

- Vernier Activity



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S104 Evaluation – User labs

- Spectrometer Activity

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Overall conclusions

- Meet clearly defined learning objectives
- Exploration vs. guidance ?
- Objective evaluation better than subjective
- Design of activities

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Open University Course Teams:

- S104 Discovering Science
- SXR103 Practising Science
- SXR207 Physics by Experiment

IET Research Lab

- Dave Perry

University of Reading

- Wes Charlton (ISE Production)

Heinrich-Heine-Universität, Düsseldorf

- Dr Dieter Schumacher

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