Interactive Screen Experiments (ISE's)



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Project aims and benefits

This project aims to develop ISEs in physics, chemistry and biology for foundation students.
The benefits of this are:

- **Improve student familiarity and confidence with laboratory equipment.**
- **Improve understanding and engagement.**
- **Encourage greater discussion.**
- **Reduce time required to explain how to set up and use equipment.**
- **Reduce likelihood of accidents.**
- **More effective usage of laboratory time.**
- **Support for students unable to attend a session.**

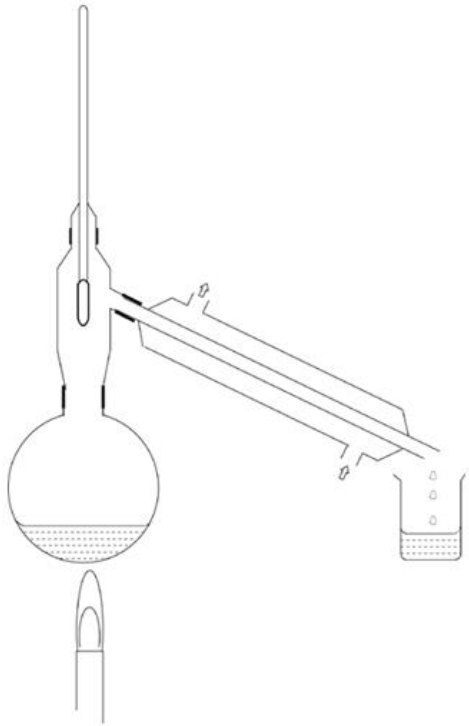
What are They ?

- **Inspired by ISEs developed at the Open University**

P.A.Hatherly et al, Eur.J.Phys. 30, 751--762, 2009.

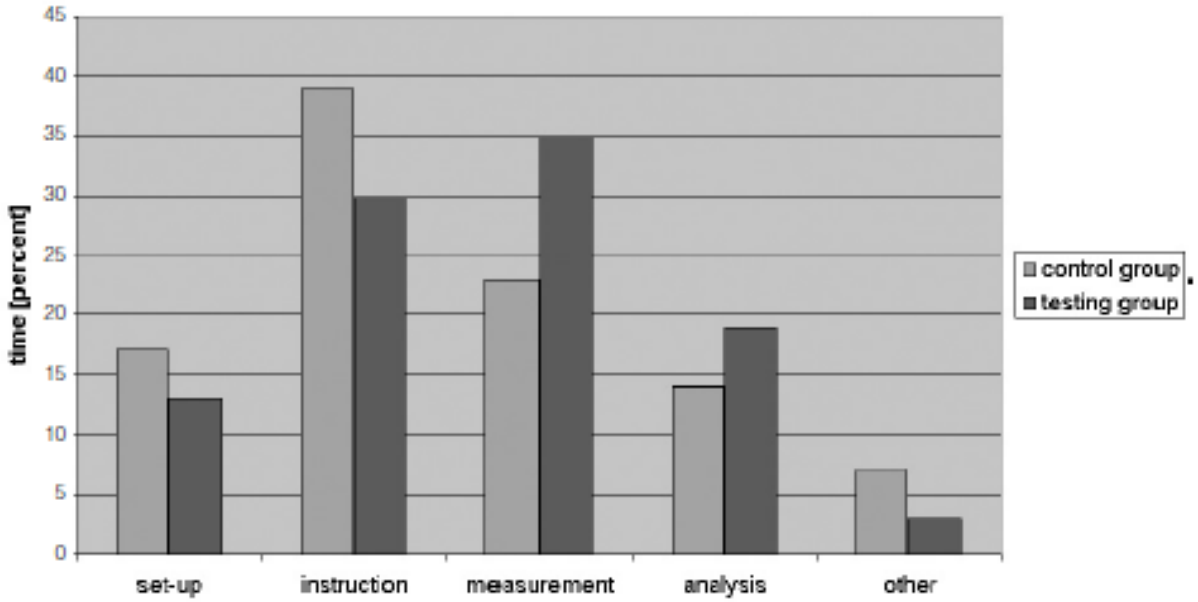
"a highly interactive movie of an experiment filmed as that experiment was being performed."

User interacts with movie as if carrying out the experiment



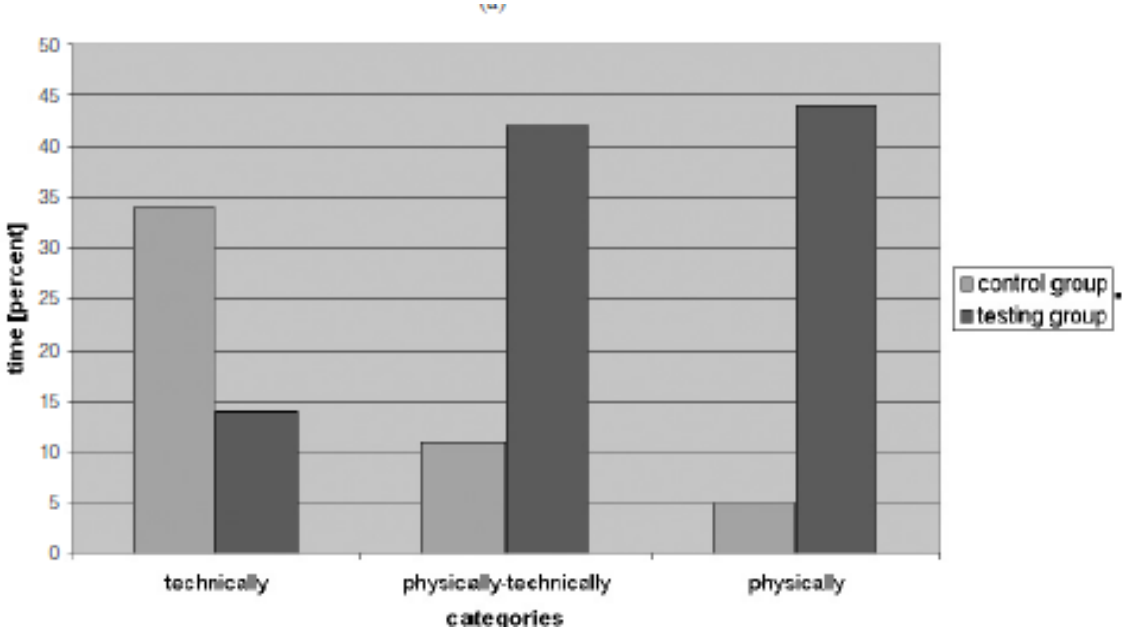
Previous Results

- **Work of Kirstein (2009) deployed ISE prior to a laboratory session, and split the 58 students into two groups**
  - Test Group – used the ISE & read the script
  - Control Group – read the script
- **Result 1:**



Previous Results

- **Work of Kirstein (2009) deployed ISE prior to a laboratory session, and split the 58 students into two groups**
  - Test Group – used the ISE & read the script
  - Control Group – read the script
- **Result 2:**



Previous Results

- **Results suggest that:**
  - Testing group spent less time on reading the script or setting up the experiment.
  - The testing group discussed their results easily whereas the control group did not.
- **Suggests that**
  - As a pre-laboratory task ISEs are beneficial.

As a Teaching Tool

- **Laurillard (2002) identifies a conversational framework for teaching, which a good e-learning tool would hope to meet, and suggests a good framework is identified as one which:**
  - Must operate as an iterative dialogue between teacher and student
  - Must be discursive, adaptive, interactive and reflective
  - Must operate at the level of descriptions of the topic
  - Must also operate at the levels of action within related tasks
- **We'll return to these points at the end and discuss the ISEs within this context**

Designing an ISE

Durham University

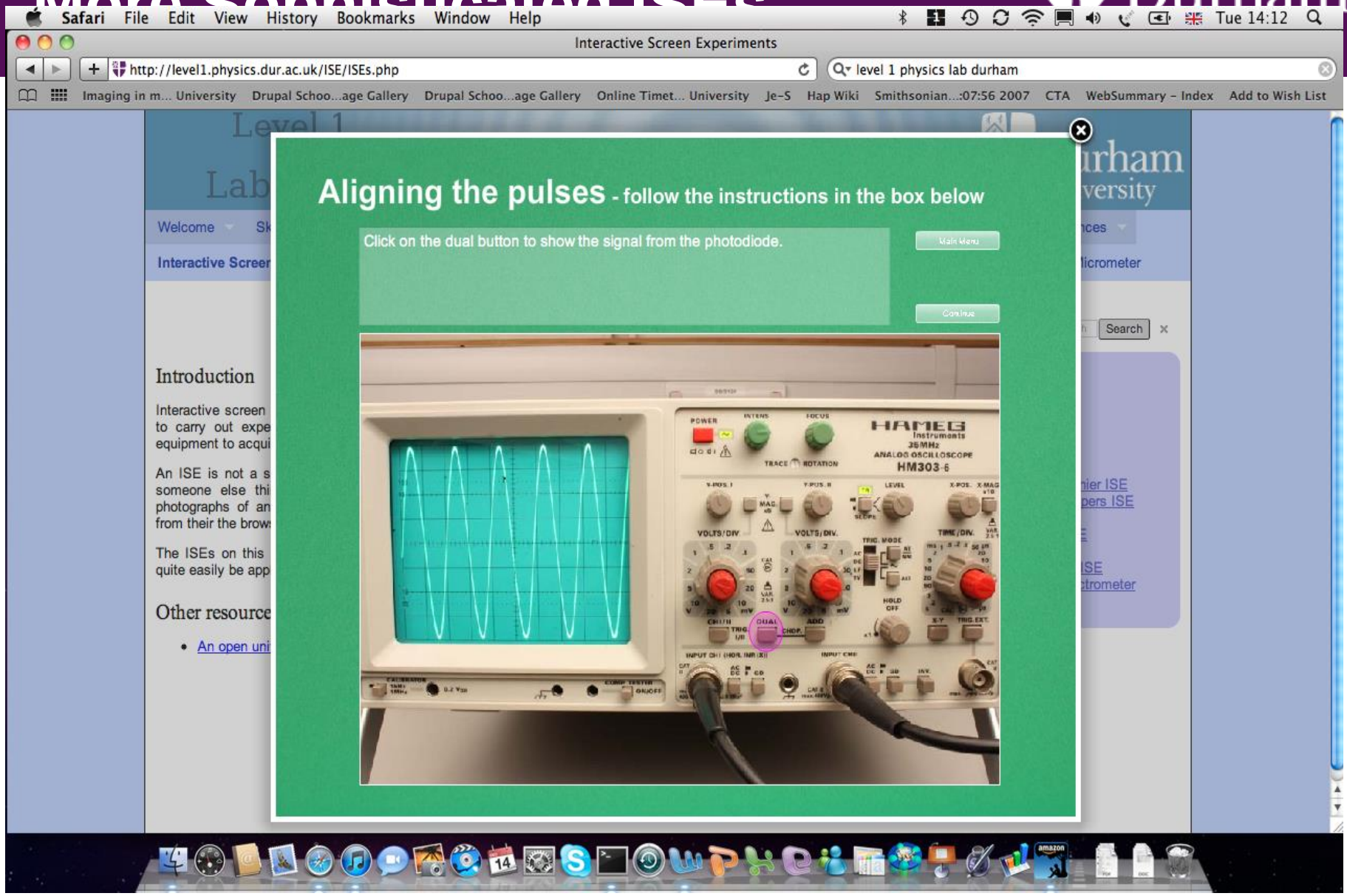
- Setting up the optical equipment
- Taking many photographs
- Developing Flash code to link the photographs together
- Turning the code into a teaching tool
- Redesigning the website

An example

Durham University

http://level1.physics.dur.ac.uk/ISE/Callipers.php

More Sophisticated ISEs



Did they help ?

- **Qualitatively - Yes**
  - Many students commented on the helpful nature of the ISEs and wished more experiments could have them
  - Staff found students more at ease with the equipment

- **Quantitatively - ?**

How do they help ?

- **Student Perspective**
  - Allow students to gain a familiarity with equipment prior to the lab session
  - Allow students to develop questions based on the equipment for the lab session
- **Staff Perspective**
  - Lessen the need for an explanation of the equipment prior to beginning
  - Change the nature of the initial explanation from transmission of information to discussion
  - Allow use of the ISE as a tool for explanation

How do they help ?
Educational Perspective

Durham University

Recall conversational framework of Laurillard, a good conversational framework for teaching:

1. Must operate as an iterative dialogue between teacher and student
2. Must be discursive, adaptive, interactive and reflective.
3. Must operate at the level of descriptions of the topic
4. Must also operate at the levels of action within related tasks

1) Iterative Dialogue

- **Do ISEs successfully simulate the dialogue between teacher and student?**
  - Yes – Student can read through information in ISE and try out their solution to a problem
  - No – ISE can't answer every question
  - But – Student can come to lab with more directed questions
- **The ISEs have been designed to be constructive in that with each task, the problem given has key components similar to the previous problem, and new elements in addition.**

2) Be discursive, adaptive, interactive and reflective

- **ISEs are by their nature discursive, adaptive and interactive as they allow interaction between student and equipment virtually.**
- **Students then have time to reflect on their use of the ISE before being confronted with the real version in their next laboratory session.**

3) Operate at level of descriptions of the topic

- **ISE is really task-linked if taken in isolation.**
- **Luckily as the laboratory itself focuses on the larger subject specific aim, if taken as part of a greater whole the ISE is balanced in both topic and task.**

4) Operate at level of task

- **ISEs are all task-based**
- **Learning is built constructively**
  - with tasks getting more sophisticated
  - with real lab equipment used after completing ISE

Conclusion & Future Plans

- **ISEs have been demonstrated to have benefits for students and teachers.**
- **Develop a range of experiments for Foundation students and investigate their impact.**
- **Seek to share expertise in ISEs with other departments at Durham and elsewhere.**