Stimulating the Student Through Experimental Activity

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Overview

- Requirements

- Implementation

- Achievements

Requirements

- Combined First Year Engineering Science
- A variety of student backgrounds
- Five Different strands of Engineering

- An opportunity to create a completely new experimental activity

General Requirements

- All students take every laboratory exercise
- Laboratory lasts for four hours
- Four cohorts of 45 students
- No Power Available
- No Computers Available
- Marking completed within a week

Just For Fun

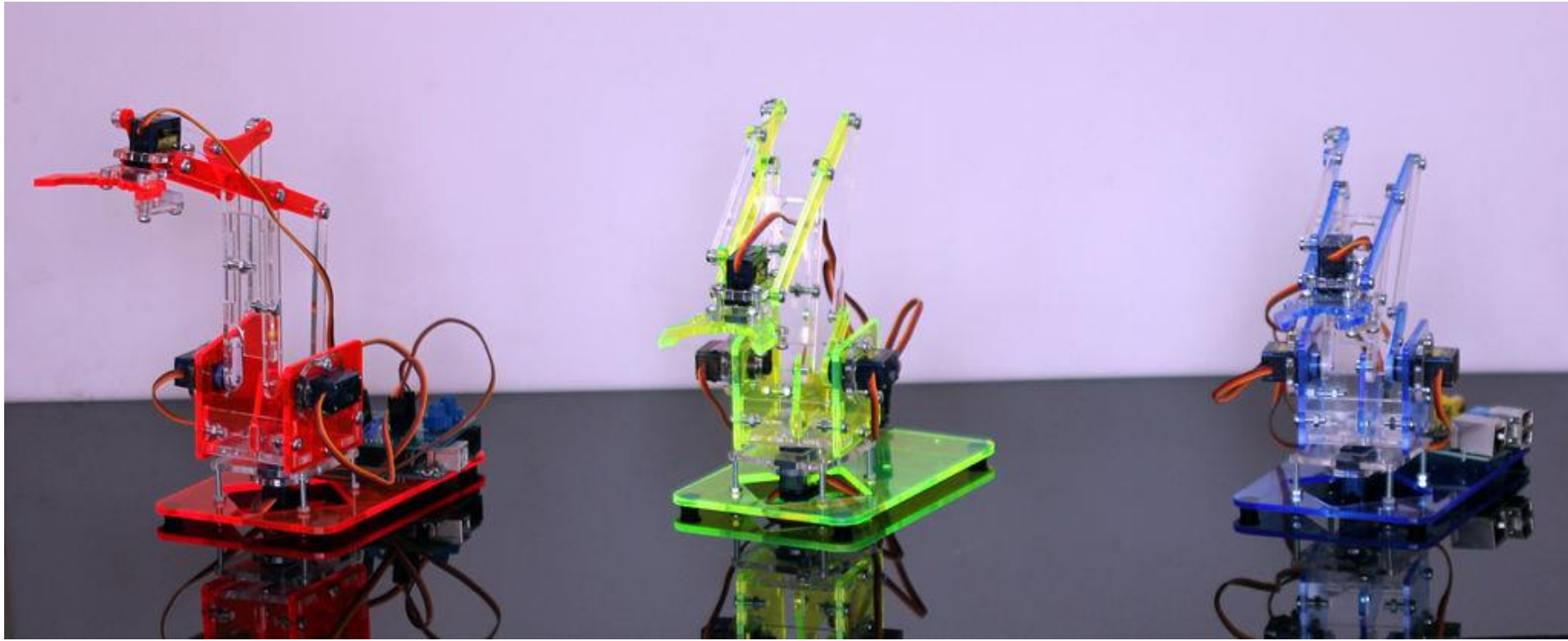**Additional Requirements**

- Each student to work individually
- Low cost
- Minimal Supervisors

The Robot Arm

- A maximum of two hours to assemble

- Minimum of tools needed

- Manufactured within the Department of Engineering Science

- Capable of useful activity

Open Source Design

User Interface and Control

- Use what the students already have (Smart Phone)
- Low Cost Communication (Bluetooth)
- Use an existing App (BlueTerm for Android)
- Simple Text Based User Interface

Arduino and Bluetooth

- Arduino servo controls
- MC06 Bluetooth interface

Assessment

- 50% - Robot Arm Assembly

- 10% - Measurements
- 10% - graph
- 10% - Discussion
- 10% - Conclusion

- 10% -YouTube
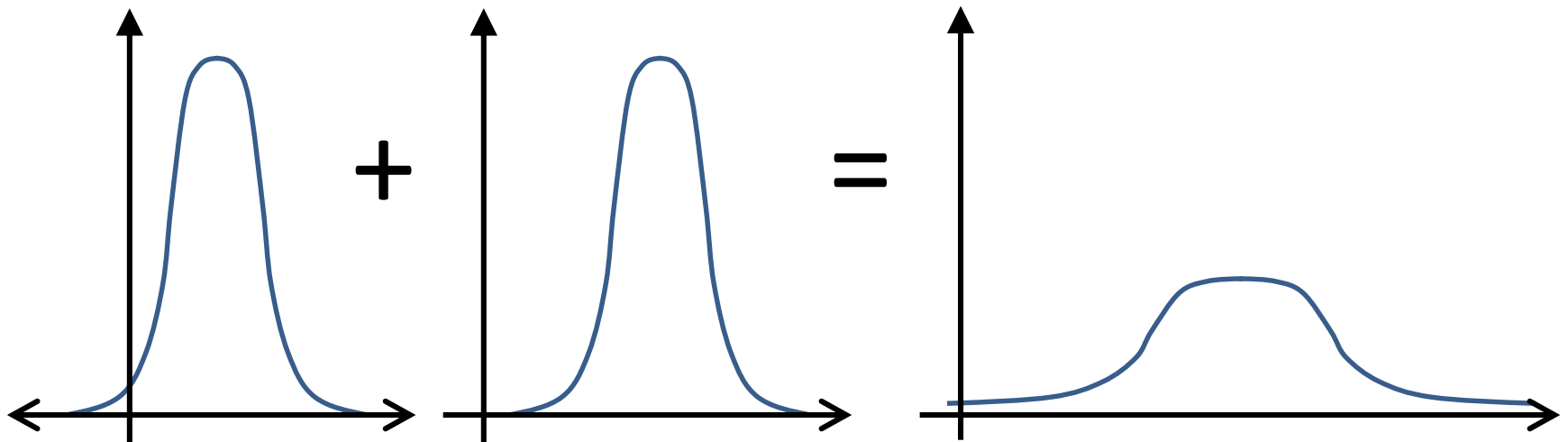
50% - Robot Arm Assembly

- Everyone would be able to produce a completed assembly within the four hours
- (Basic level of pass)

- No plagiarism

- Students engaged mentally, physically and emotionally.

Minimising Demand on the Supervisors

Normal distribution of student arrival

Normal distribution of student progress

Distributed demand for supervisor assistance

20% Experimental Activity

- Taking Measurements / Critical Views

- Data visualisation and comparison / Deliberately vague and imprecise requiring students to innovate and think

20% - Reflection and Deduction

- Providing the student with the opportunity to comment
- Encouraging the student to perform comparison and analysis between theory and reality
- Developing the higher intellectual capabilities

10% - YouTube

- Start Engaging the students with Social Media for learning purposes
- Challenge the student in a novel area
- Provide the opportunity for reflection and re-recording
- Extended the activity time-frame
- Time-Shift the assessment requirement

Assessment Outcomes

Activity	Average
Robot Arm Assembly	88%
Experimental practice	59%
Reflection	36%
YouTube	63%

Robot Arms Assembled

- Every student (except two) completed the assembly
- The majority had complete or almost complete movement
- A small number (<5%) had assembly defects

The Results of the Experimental Activity

- The majority of students struggled to obtain the correct measurements
- The majority of graphs were not correct

Reflection

- There was minimal student reflection
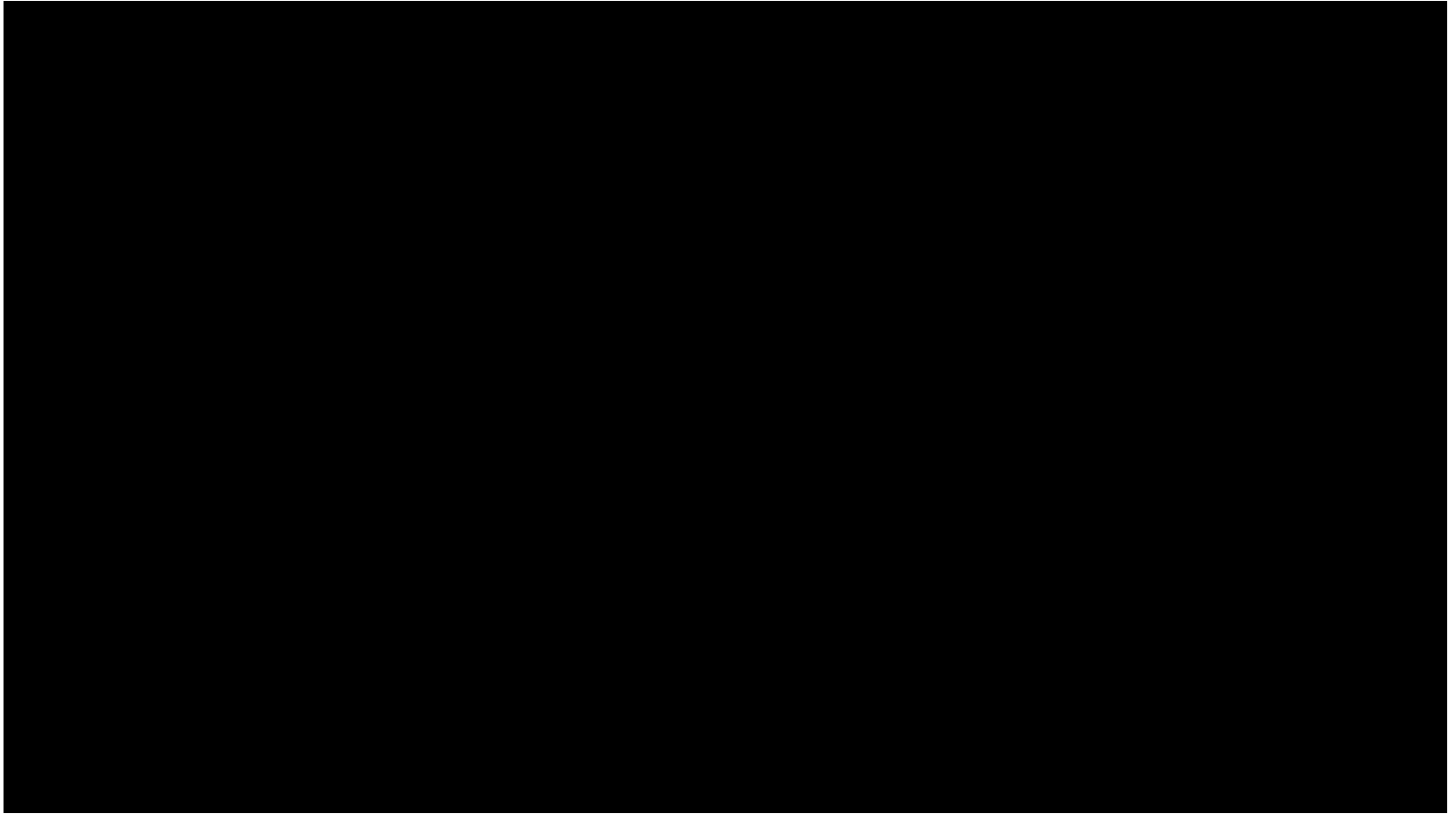- Little comparison of theory and reality

YouTube

- 89 YouTube Videos produced
- Some were innovative and creative
- A surprising number did not contain audio or visual commentary

Search for

University of Greenwich Robot Arm Experiment

Example

Conclusion

- The use of an open-source design proved to be effective
- Component costs were minimised
- Marking was achieved within a 48 hour period
- Lecturer costs were minimised

Finally

- Nearly all students were successful.
- Informal student feedback indicated that it had been enjoyable
- Their varied background did not appear to have any negative impact on the outcomes

But Mostly

I had a great time !