E-LAB

IN

INSTITUTE OF TECHNICAL EDUCATION (ITE)

Chua Wee Seng

Ong Chao Xiang
In times of unforeseen events

2014

2010 Fire at Dover Campus

2009 H1N1 Outbreak

2003 SARS Outbreak
PROJECT OBJECTIVES

Offer opportunities for distance learning / remote learning, anywhere anytime

Solve the problems of laboratory shortage

Allow auto-marking with feedback features and generate class or individual report
When the campus is closed...

Students need to stay at home

Self-learn via the E-learning system

Only theoretical lesson in our E-learning system
The ASPIRE Committee recommends that the Polytechnics and ITE:

- **Increase their use of online learning** to make it easier for individuals to learn anywhere and anytime
  - Learning no longer needs to confine to a specific place or time
  - Online learning can reduce travel time and allow CET students to learn flexibly based on their work and family schedules

- **Online learning can enhance learning** for individuals
  - Online modules can cover both skill-refresher and skill deepening content that support both graduates and students
Master Plan for ICT in Education

Stage I

Stage II

Stage III

THE ICT CONNECTION
By Teachers, For Teachers

Ministry of Education
SINGAPORE
The Ministry of Education has developed the third Masterplan for ICT in Education (2009 – 2014). The third Masterplan (mp3) continues the vision of the first and second Masterplans to *enrich and transform the learning environments of our students* and equip them with the critical competencies and dispositions to succeed in a knowledge economy.
• With reference to the paper on Authentic Learning for 21\textsuperscript{st} Century by Maryilyn M. Lombardi

• Authentic learning may be more important than ever in a rapidly changing world, where the half-life of information is short and individuals can expect to progress through multiple careers.
Five of the Ten attributes of the Design Elements

- Real-world relevance
- Reflection
- Multiple sources and perspectives
- Collaboration
- Integrated assessment
Our design of e-Lab matches five attributes of the design elements.
<table>
<thead>
<tr>
<th>Design Elements</th>
<th>E-Lab Design</th>
</tr>
</thead>
<tbody>
<tr>
<td>Real-world relevance</td>
<td><strong>Online simulation</strong> for bread boarding was created for students to practice critical skills needed for circuit wiring.</td>
</tr>
<tr>
<td>Multiple sources and perspectives</td>
<td>Students have to <strong>identify the relevant components</strong> to be placed on the simulation board.</td>
</tr>
<tr>
<td>Collaboration</td>
<td>The online experiment provides <strong>auto marking feature</strong> and provide multiple attempts for the students to do. Students starts to collaborate and discuss during their second or third attempt.</td>
</tr>
<tr>
<td>Reflection</td>
<td><strong>Conclusion questions</strong> are designed to facilitate student’s reflection. Auto marking feature is provided so that students will know if their reflection is moving towards the correct direction.</td>
</tr>
<tr>
<td>Integrated assessment</td>
<td>At the end of the experiment, <strong>overall marks</strong> will be given to provide a feedback on how well the student has done for the experiment.</td>
</tr>
</tbody>
</table>
Also, quoting our Minister of Education Singapore by Mr Heng Swee Keat at the International Conference of Teaching and Learning with Technology (iCTLT) on April 9 2014, he said that:

- **Assessment for learning is one area that we are looking at.** There are emerging **technologies** that can **diagnose students’ mastery of concepts**, or recommend the most useful digital resources. We can better **cater to individual students’ learning style, pace and interest.** ICT can enable teachers to improve teaching and learning, and we can **help every child to succeed.**

- **e-Lab** is an online experiment with auto-marking feature with fast feedback.
Overview of online practical experiment

Server @ ITE CW

Remote Users

Internet
Or
Intranet

Take Real-time voltage and current measurement

Display real-time voltage and current
Overview of online practical experiment

Server @ ITE CW

Remote Users

Sends real-time measurement

Capture student’s measurement

Take Real-time voltage and current measurement

Display real-time voltage and current
Mobile Integrated Unit

Features
- 3 x Independent DC supply
- 6 x voltmeter
- 6 x ammeter
- Built-in Oscilloscope
- LCD Display
- USB connection to PC/Server
Mobile Integrated Unit
Mobile Integrated Unit
Mobile Integrated Unit
Online Practical Experiment

Welcome PETER LIM of Class QC1404N

Analogue Peripheral Application

Please choose the following exercises to practise

Exercise 1  Exercise 2  Exercise 3
Online Practical Experiment
Online Bread Board Simulation

To connect the resistor network, drag each component and link from the list to their correct positions marked on the breadboard.

Kirchhoff's Law...
E1 = 4V
E2 = 2V

Proceed only when you have completed exercise.
Online Practical Experiment
Bread Board Simulation

Students have to choose the correct resistors and correct wire lengths to place them on the breadboard. Students are given three attempts to try and better their understanding.
Online Practical Experiment
Online Multi Meter

Please press the button to show the real time measurement

Reading for VB

Reading for VB: 

Next
Online Practical Experiment

Online Multi Meter

**Final Reading**

<table>
<thead>
<tr>
<th>Reading for VB:</th>
<th>Reading for V4:</th>
<th>Reading for V3:</th>
<th>Reading for V2:</th>
<th>Reading for A1:</th>
<th>Reading for A2:</th>
<th>Reading for A3:</th>
</tr>
</thead>
<tbody>
<tr>
<td>2</td>
<td>0.75</td>
<td>0.9</td>
<td>0.7</td>
<td>30</td>
<td>6.5</td>
<td>35</td>
</tr>
</tbody>
</table>

**Try Again**

<table>
<thead>
<tr>
<th>Reading</th>
<th>V4 (V)</th>
<th>V3 (V)</th>
<th>V2 (V)</th>
<th>A1 (mA)</th>
<th>A2 (mA)</th>
<th>A3 (mA)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Your Measurement</td>
<td>0.75</td>
<td>0.9</td>
<td>0.7</td>
<td>30</td>
<td>6.5</td>
<td>35</td>
</tr>
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</table>
Online Practical Experiment
Theory conclusion

Actual Correct Reading

<table>
<thead>
<tr>
<th>Reading</th>
<th>V4 (V)</th>
<th>V3 (V)</th>
<th>V2 (V)</th>
<th>A1 (mA)</th>
<th>A2 (mA)</th>
<th>A3 (mA)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Your</td>
<td>0.75</td>
<td>0.9</td>
<td>0.35</td>
<td>30</td>
<td>5.2</td>
<td>35</td>
</tr>
<tr>
<td>Actual</td>
<td>0.75</td>
<td>0.93</td>
<td>0.34</td>
<td>29.66</td>
<td>5.97</td>
<td>35.28</td>
</tr>
</tbody>
</table>

Conclusion

Q1. Does the algebraic sum of the currents obtained experimentally verify Kirchhoff's Law? [Yes] [No]

Q2. Is the Emf equal to the sum of voltage drops in loop bcdf? [Yes] [No]

Q3. Determine the value of current in each resistor if resistor R3 were open circuit (in mA)?

Q4(i). Determine the value of current in the resistor R3 when R1 is open circuit (in mA)?

Q4(ii). Determine the value of current in the resistor R3 when R2 is open circuit (in mA)?

Check Answers
Online Practical Experiment
Theory Analysis

Actual Correct Reading

<table>
<thead>
<tr>
<th>Reading</th>
<th>V4 (V)</th>
<th>V3 (V)</th>
<th>V2 (V)</th>
<th>A1 (mA)</th>
<th>A2 (mA)</th>
<th>A3 (mA)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Your</td>
<td>0.75</td>
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<td>0.35</td>
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<tr>
<td>Actual</td>
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<td>0.93</td>
<td>0.34</td>
<td>29.66</td>
<td>5.97</td>
<td>35.28</td>
</tr>
</tbody>
</table>

Conclusion

Q1. Does the algebraic sum of the currents obtained experimentally verify Kirchhoff’s Law?  
Yes  No

Q2. Is the Emf equal to the sum of voltage drops in loop bcdfe?  
Yes  No

Q3. Determine the value of current in each resistor if resistor R3 were open circuit (in mA)?  
0.024

Q4(i). Determine the value of current in the resistor R3 when R1 is open circuit (in mA)?  
0.018

Q4(ii). Determine the value of current in the resistor R3 when R2 is open circuit (in mA)?  
0.14

Check Answers
# Online Practical Experiment (Tabulation of marks)

![Image of online practical experiment interface]

<table>
<thead>
<tr>
<th>S/R</th>
<th>NRIC</th>
<th>Name</th>
<th>Item 1</th>
<th>Item 2</th>
<th>Item 3</th>
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<tbody>
<tr>
<td>0</td>
<td>0</td>
<td>NG WENG HENG</td>
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<td>100</td>
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<tr>
<td>2</td>
<td>2</td>
<td>JONATHAN TAN YONG CHUN</td>
<td>100</td>
<td>100</td>
<td>55</td>
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<tr>
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<td>3</td>
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<td>100</td>
<td>100</td>
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<tr>
<td>4</td>
<td>4</td>
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<td>100</td>
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<td>100</td>
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<tr>
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<td>5</td>
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<td>9</td>
<td>NAZIRUL RAZIQ B RAZALI</td>
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<td>100</td>
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<tr>
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<td>10</td>
<td>CHANG SOO ZHENG</td>
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<td>100</td>
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<tr>
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<td>11</td>
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<td>100</td>
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<tr>
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<tr>
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<td>ANTHONY QUEK ZHONG HOW</td>
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<tr>
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<td>KELVIN LOY CHEE YEAN</td>
<td>100</td>
<td>100</td>
<td>20</td>
<td>76</td>
</tr>
</tbody>
</table>
Beta test of the online practical Experiment. (Survey Results)

- User Friendliness of the system
- Clear and easy to follow instructions
- Auto-Marking effectiveness

- Electronics
- Rapid Transistor Technology
Beta test of the online practical Experiment. (Survey Results)

- e-Lab makes me understand the topic better
- This form of online practical lesson should be conducted more often.
- I would prefer eLearning week including e-Lab practice

**Bar Chart:**
- X-axis: Survey Results
- Y-axis: Percentage
- Categories: e-Lab makes me understand the topic better, This form of online practical lesson should be conducted more often, I would prefer eLearning week including e-Lab practice
- Colours: Blue (Electronics), Red (Rapid Transist Technology)
Beta test of the online practical Experiment. (Results)

Results of the students

- <50
- 50-80
- >80
Conclusion

e-Lab in Institute of Technical Education

Mobile Integrated Unit

Bread Board Simulation

Online measurement meter

Online Theoretical analysis

Provide students with more self-learning Programmes.
Thank you
Any Questions