

Liverpool Constructionarium

Liverpool University Constructionarium

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Outline of the presentation

- **Introduction**
- **Pre-Constructionarium**
- **Constructionarium Week**
- **Learning outcomes**
- **Associated difficulties and recommendations**
- **Conclusions**

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Introduction

- One of the core CDIO principles is to encourage students to take active control of their own learning
- Conceive and Design aspects can be included in civil engineering teaching relatively easily
- It is difficult to provide effective civil engineering projects which are relevant to the profession and give a realistic learning experience in the 'Implement' due to large scale nature of real structures
- the Constructionarium project is a real construction experience for Second Year students
- This project is designed to link the world of academic theory with contractors and consultants from industry.

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- A typical Constructionarium teaching project runs for a whole working week, on a full-time residential basis.
- Participation at all levels of the construction process
- Liverpool University was the 3rd University in the U.K. to participate in the Constructionarium
- Participates – all 2nd Year students
- Pre- & post-Constructionarium activities and debrief
- Learning curve

2. Pre-Constructionarium

In 2007 the University of Liverpool launched its first Constructionarium activity

Industrial partners were:

Contractor - Edmund Nuttall Ltd

Consultants - Mott MacDonald

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Pre-Constructionarium sessions

- Introduce the Constructionarium and compulsory PPE
- Pre-Constructionarium questionnaire
- Introduce team roles and form teams
- Setting out using a Total Station and use of LM80 layout manager
- Health and safety
- Project management
- Introduction of contractor team and consultants
- Introduce risk assessment, method statement and project planning

Roles and responsibilities

Project manager (1)

Planner/Cost Manager (1)

Assistant Planner(1)

Assistant Cost Manager(1)

Safety Manager(1)

Assistant Safety Manager (1) (hand tool)

trained hand tool operators (5)

Assistant Safety Manager (1) (general)

Site Manager(1)

Engineer(1) (assisting with setting out)

Roles and responsibilities

Fabrication Engineer (1) (assisting with setting out)

Setting out Engineer (1)

Construction Engineer (1) (assisting with setting out)

Environmental Engineer (1) (dealing with waste materials and site clean)

Operational & Portfolio Manager (1)

Assistant Portfolio Manager (1)

Liaison Officer (1)

Team Leaders:

- 1. Project manager (chair of team leaders and other routine duties)**
- 2. Planner/cost manager**
- 3. Safety manager**
- 4. Site manager**
- 5. Portfolio manager**
- 6. Liaison officer**

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- 83 second year students – entire undergraduate cohort
- Working in March ... inclement weather?
- Students worked in teams of 20-21
- Student groups carefully selected for mix of:
 - Experience
 - Ethnicity
 - Gender
 - Overall ability

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Projects:

- Ravenspurn oilrig
- Kingsgate Swingbridge
- Millau viaduct
- Naples airport-subway entrance shaft and roof canopy

forward

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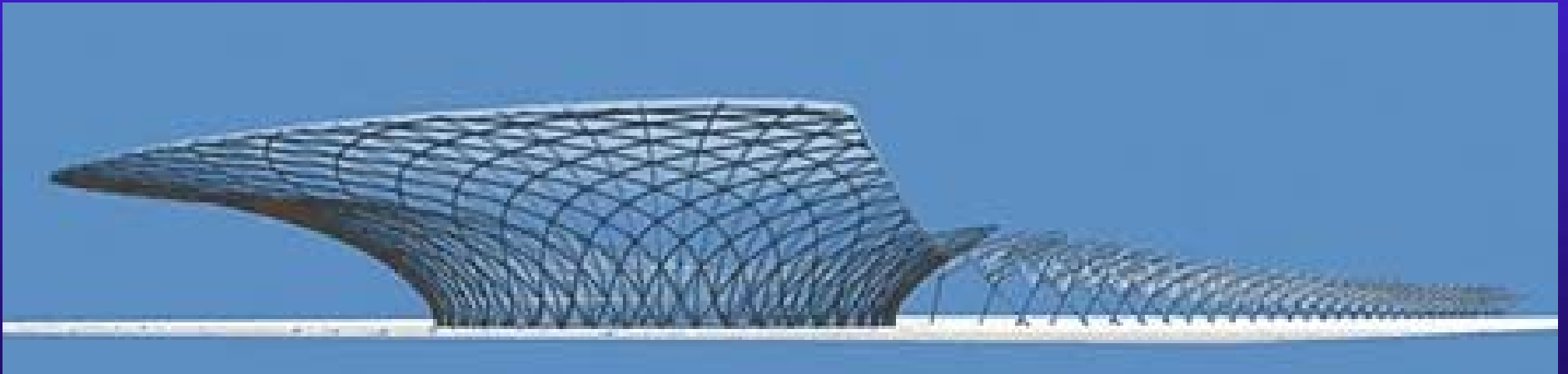
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Assessment

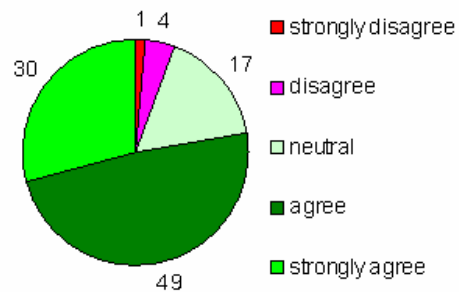
- Preliminary report
- On-site performance
- Post site report

Feedback

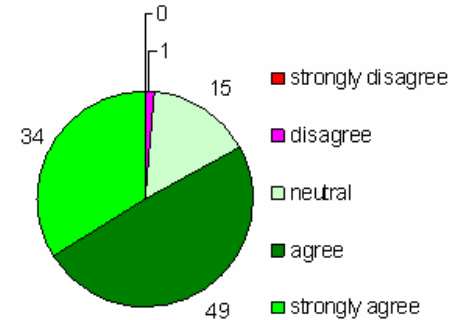
- Before
- After

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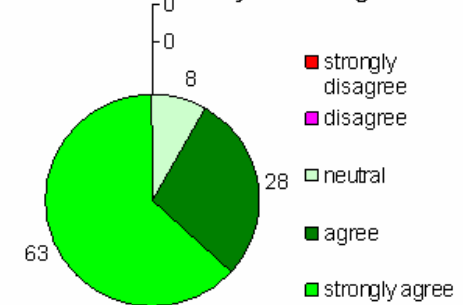
The course build-up is well organised



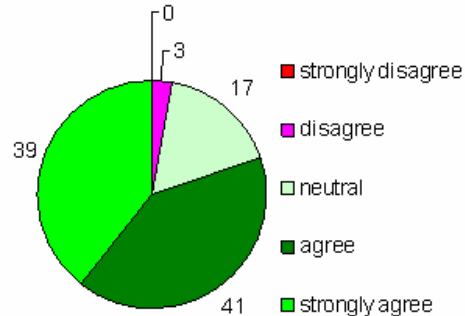
The aims of the course are clear



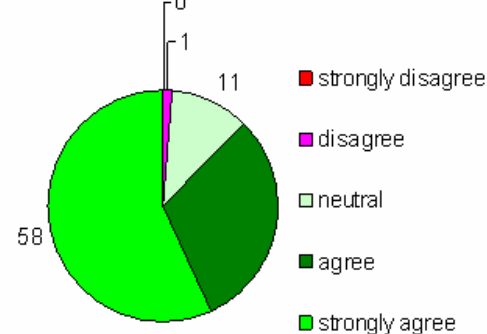
The course is very interesting



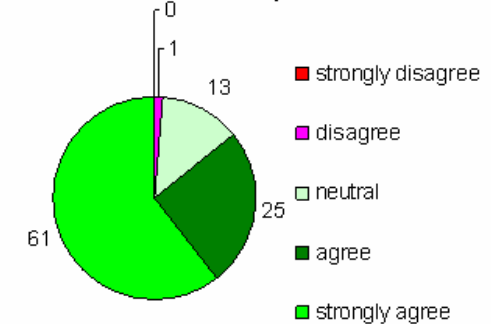
The course materials are useful



The course is very relevant



I have complied with all pre-constructionarium requirements



Student feedback...before

3. The Constructionarium Week

Daily activities:

- a. Approval of method statements and risk assessment before start any activities
- b. Morning & afternoon construction activities
- c. Meet with contractor
- d. Meet with academic staff

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Weather was GOOD ! 😊



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Students ALL participated



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Students ALL enjoyed the experience

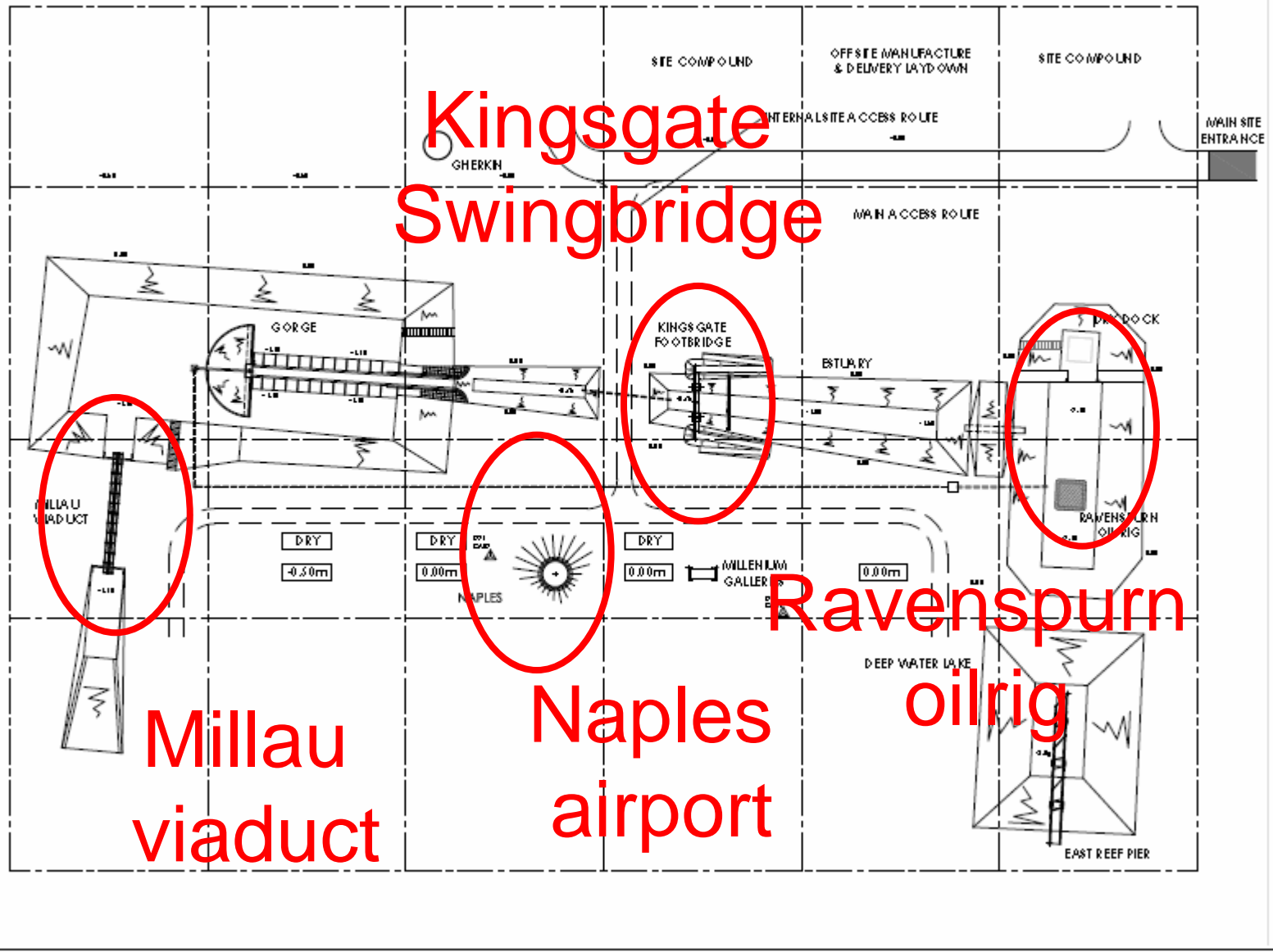


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Training of operationists

Students who have received the training can use power tools





Constructionarium site

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The site

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Oil rig



Naples canopy



Swing bridge



Millau bridge

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Setting out

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Students in action

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Students in action

Liverpool Constructionarium



Students in action

Liverpool Constructionarium



Ravenspurn oil rig

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Naples roof canopy

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Millau Cable-stayed Bridge

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Kingsgate Swingbridge

Health and safety hazards?

- Trip hazards
- Working with tools
- Lifting hazards
- Height hazards
- Water hazards
- Earthwork hazards
- ... and many more

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Liverpool and previous Constructionarium 'near-misses'

- Finger injury from hammer use
- Finger injury from handsaw use
- Eye injury from flying debris
- Back injury from a rope break
- Power saw misuse
- Safety barrier misuse

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Burning trousers by hot metal saw dust

4. Learning outcomes

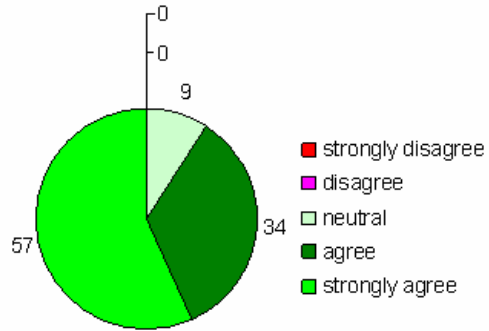
Students learnt a lot about construction practice through the one-week Constructionarium activities.

Steep learning curve

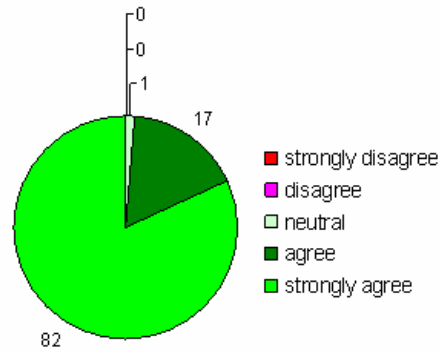
The Constructionarium offers unique UK opportunities for overseas students to get hands-on high standard UK construction practice.

- 1) PPE**
- 2) Health and Safety, including environmental hazards**
- 3) Restricted rules on the method statement, risk assessment and work planning.**

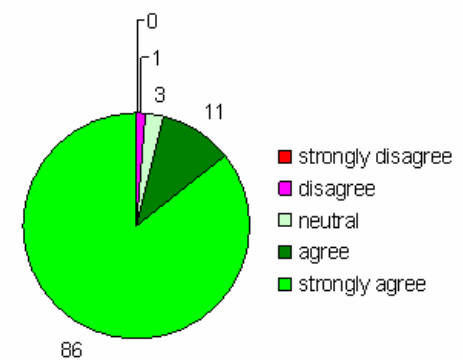
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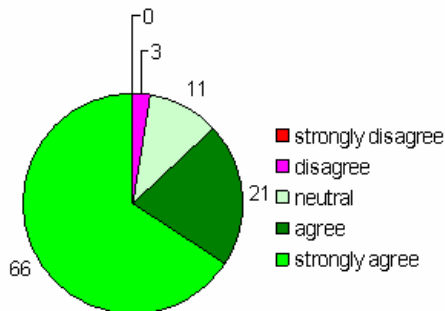
the aims of the course were met



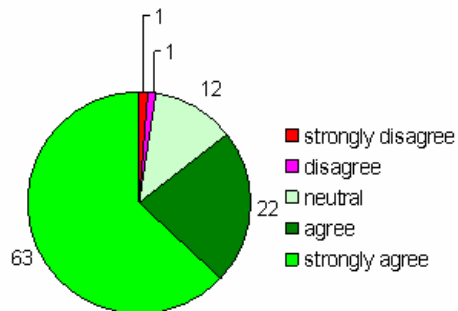
the course was very interesting



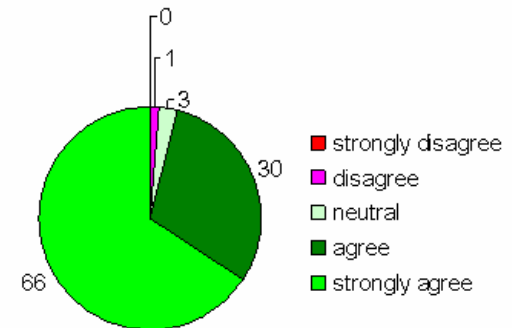
it was a good experience



I have learned a lot



I am now more confident on site



the course helps a better understanding of civil engineering

Student feedback...after

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**There is a significant increase (40%) of students who
Have transferred from BEng to MEng this year and this
has been attributed to participating
the Constructionarium Week**

5. Associated difficulties and recommendations

**Familiarisation with layout manager - *Trimble LM 80*
(setting out instrumentation)**

- **Setting out and position control problems
(e.g. Naples columns)**
- **Preparation of Method Statement**
- **Late arrival of PPE on site**
- **Ambiguities on drawings**
- **Communication & management inefficiencies between students caused problems for one of the project teams**
- **Integration of individual members into the group**
- **Maximisation of individual input**

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Students' feedback and recommendations to improve future Constructionarium

- **Use Constructionarium projects as part of the design coursework in other modules**
- **Election of the project manager or devise a better way than self-selection**
- **Create a new role of Environmental Manager**
- **Develop a better understanding of the project before the Constructionarium week and share views & personal previous construction experiences**
- **Provide more guidance on the preparation of a Method Statement**

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- **After the Constructionarium, introduce a follow-up meeting with the Contractor and Consultant**
- **Invite 2nd year students to give presentations of their Constructionarium experiences to 1st year students**
- **Complete the Health & Safety and pre-costing forms before Constructionarium**
- **Arrange group meeting on Pre-Constructionarium training**
- **Arrange post-Constructionarium seminars**

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Conclusions

The Constructionarium experience has proven to be an invaluable site activity for civil engineering students, which fits well into the CDIO learning and teaching methodology. It is almost impossible for all civil engineering students to take part in a relevant summer vocational experience. The Constructionarium is an alternative way of giving students the necessary pre-career practical experience and to inspire enough confidence to carry out future civil engineering work. The Liverpool Constructionarium demonstrated a successful site learning practice, from which all of the students participating benefited.

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<http://www.liv.ac.uk/engdept/constructionarium07>



Any questions ?

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