

*The Institution
of Structural
Engineers*

*A threshold for the understanding of
structural engineering*

*Presentation to ACED
25th October 2013*

Dr Graham Owens,

Update on the Institution's project on:

‘Transforming undergraduate undergraduate education in the twenty-first century’^t

Content

- Introduction
- Brief summary of project background
- Work packages
- Conclusions
- Relationship with JBM

Background to project

- Deterioration in level of understanding of structural behaviour in current graduates
 - QUSB tests – David Brohn
 - Arup Foundation Report – Ian May
 - Senior members of profession - Engineering Practice Committee
- Recognition of changing environment for undergraduates
 - A levels as a preparation for engineering
 - More crowded syllabus
 - Students are different!
 - Increasing role of Computers
 - Etc
- A duty of care to improve the situation

Eleven components of overall project

(Reported in January 2011 issue of The Structural Engineer)

- Desired Learning Outcomes
- Web forum for academics
- Student forum
- Guidance on good teaching practice
- Innovative technical content
 - Content from academics
 - Third party professional material
 - Commissioned material

Eleven components of overall project - II

- Essential knowledge texts
- Award schemes for educational excellence
- 'Training the trainer' workshops
- Promotion of RAE secondments
- Greater branch engagement
- Facilitating academic membership of Institution

Modus operandi

- Supportive
- Collaborative
- Innovative
- Pluralist

Desired Learning Outcomes

- The 'what' and 'why' of educational content
- Initially developed by 2009 and 2010 Academic Conferences
- Subject to detailed review by Steering Committee - with wide range of opinions!
- Reduced emphasis on; traditional methods of analysis and matrix algebra
- Increased emphasis on: behaviour, qualitative analysis and analytical process
- Two levels of content: 'Essential' and 'Desirable'
- Framework for future review
- Available on Academics' Community

Academics Community

- Launched March 2012
- Vehicle for all project outputs
- Available to all academics through Institution web site www.istructe.org, with email registration
- Simple meta data schema for content.

Student forum

- In preparation
- Open access
- Focus on formative assessment

Guidance on good teaching practice

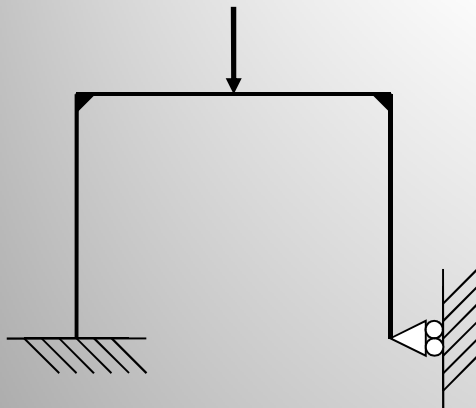
- Summaries of earlier Workshops
- Promotion of seminal texts:
 - Teaching Engineering – all you need to know about engineering education but were afraid to ask. *Peter Goodhew September 2010*
www.core.materials.ac.uk
 - Student engagement techniques – a handbook for college faculty, *Elizabeth Barkley 2010 Jossey-Bass*

Innovative technical content

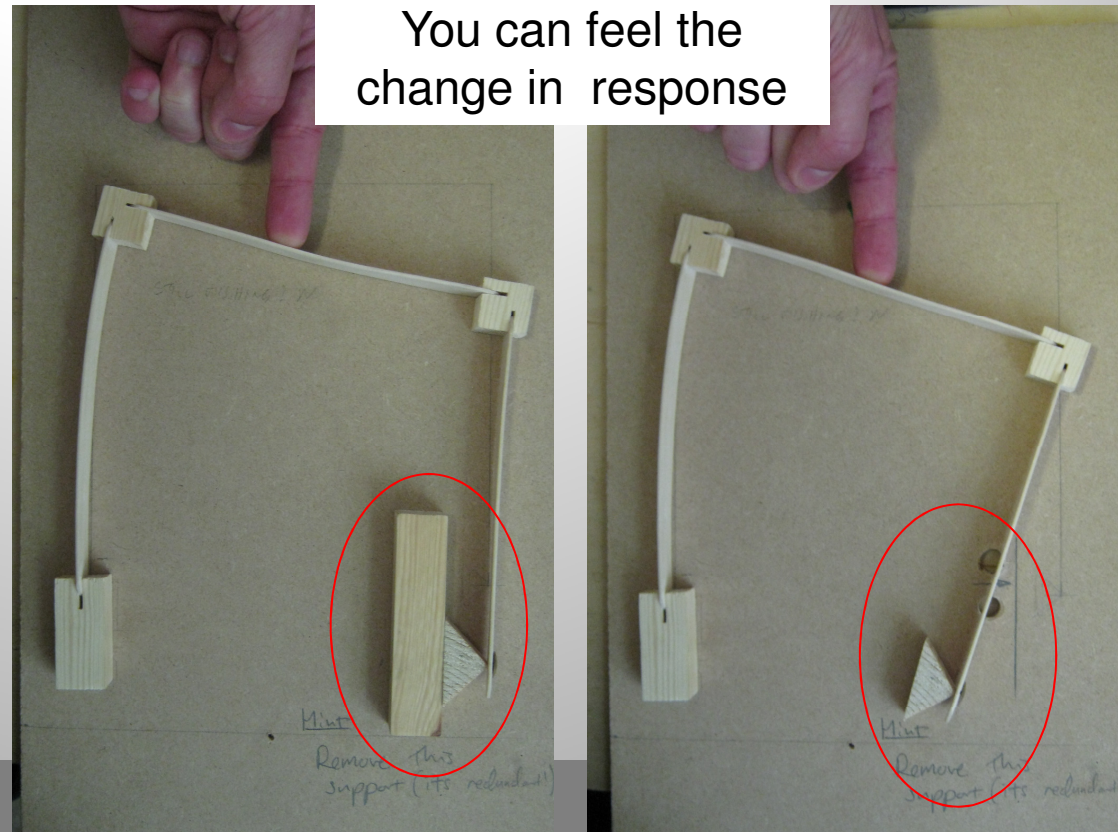
- DLOs and associated discussion thread
- Award submissions
- Essential knowledge texts
- ‘Nuggets’ of good practice
- Links, with reviews, to third party material

Physical Models to help structural understanding

- Physical models shown in classroom to demonstrate concept
- Model attached to my door for students to play with (and break!)



30 minutes in the workshop!



Coursework from Tianjian Ji, Manchester, on Structural Concepts

- Students read through the contents in the website:
www.structuralconcepts.org
- Individual coursework:
 - Design/make a physical model that can demonstrate one structural concept, or
 - Identify a real example in which any one structural concept was used creatively or played an important role.
- Read through the collection of coursework submissions and vote for the best three submissions

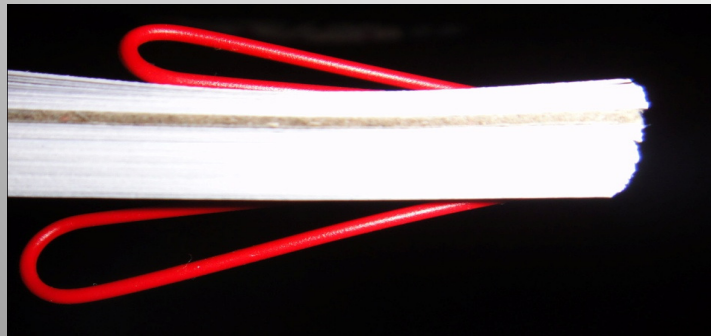
Examples of Coursework Submission



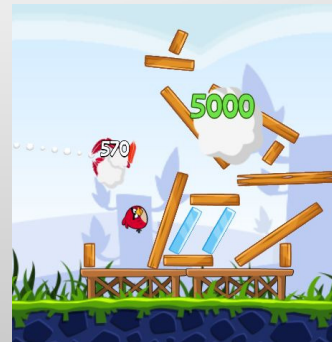
String-reinforced ice beam



Self-supporting bridge



Elastic and plastic deformation of a paper clip



Equilibrium analysis of the structures in "Angry Bird"

Essential Knowledge Texts

- Major activity in 2013
- Concise summaries of most difficult topics from DLOs
- Electronic publications for students – via Academics' Community
- Licensed for free use for education
- 19 authors commissioned and synopses agreed with Steering Committee
- 11 first drafts produced
- 6 edited and out for review
- 2 complete and signed off
- Target completion by February 2014
- NB These will support 'Positivist' teaching style

Award Scheme for Educational Excellence

- Any individual teaching structures at tertiary level
- A premier Institutional individual award
- Criteria:
 - Innovation
 - Evidence of effectiveness
 - Integration into overall learning scheme
- Award winners feted by Institution and highlighted at following Academic Conference
- All entries are posted on Academics' Community
- Selected entries published in The Structural Engineer
- Entries now sought for February 2014, its third year.

Award entries for 2013

- Evernden, M. et al, **Engaging students with e-activities.** *University of Bath*
- D'Ayala, D. et al. **Complexity and redundancy from the studio to the outdoors. Understanding structural behaviour through design and assessment.** *University College London*
- Oliver Broadbent et al, **Creative conceptual design teaching, or – it's not about rebar curtailment.** *University of Edinburgh and ThinkUp*
- Yiatros, S. **Bridging the gap: Inculcating students' understanding through integrated teaching of analysis, design and construction.** *University of Cyprus.*

Workshop conclusions

- Endorsement of overall project direction
- Strong commitment to sharing effective practice
- Student participation / engagement crucial to progress
- Some excellent examples of:
 - Media Rich Resources (MRR)
 - Innovations in course design
- Subject/topic plans must be integrated, with special emphasis on assessment
- Role for formative assessment on key concepts

Promotion of RAE secondments

- Previously targeted at research activity
- Quote from **2013 RAE Call for Industrial Secondments**

*“.....Industrial Secondments allow the awardee to gain **up to date knowledge and first-hand experience of current industry working practices**, enabling them to improve the quality and industrial relevance of their teaching.....*

.....The scheme is open to engineers from all disciplines and provides funding to cover the salary cost of the applicant paid pro-rata against the amount of time to be spent at the industry host. Awards can be for any period up to six months full-time or a maximum of one year pro rata.....”

Closing date for this call 30th September 2013

- Ideal opportunity for academics:
 - with some practical experience to prepare for CM Examination
 - With or without practical experience to improve the quality of their teaching
- Ideal opportunity for academic departments to improve relationships with Regional Groups

Greater engagement with Regional Groups

- 300 academics mapped onto Institutional regional structure
- Exhortation to Regional Groups to get involved with all Universities in Region
- 2014 Pilot engagements with three Regional Groups
- 2014 Develop handbook for RGs and SLOs.

Facilitating chartered membership of Institution by academics

- R and D route recently modified for academics in research-intensive universities
- Modified for academics in teaching environments – still unsuitable
- Board priority to development and implement new route to full Membership for experienced ‘teaching academics’
- Assessment will be the key issue

Conclusions

- Now a robust framework of support for on-going change and improvement to tertiary education in structures
- Highlights are:
 - Academic Community
 - Annual Academic Conference
 - Desired Learning Outcomes
 - Essential Knowledge Texts
 - Award Scheme
 - Education Committee
- For the foreseeable future, the Institution is going to seriously address, and commit resources to, the tertiary education of its future members.

Relationship with JBM

- The project and its successors is providing increasing support to academics and around 50% of departments are involved.
- How can JBM best support these initiatives?

Personal perspective on how this will work at future accreditation visits

- Scenarios:
 - Good quality outcomes from a department involved in these initiatives – Excellent!
 - Good quality outcomes from a department not involved in these initiatives – How can the Institution / other academics learn from this success?
 - Poor quality outcomes from a department not involved in these initiatives - Why are they not involved?