How Authentic Does Authentic Learning Have to Be?

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Why Authentic Learning?
Authenticity?

- Often aligned with PBL (Johanssen 2000)
- Authentic, real-world problems unlike traditional academic exam/text book ‘problems’
- Real-world problems are often ill-structured, ill-defined, complex, not entirely ‘solvable’ and interdisciplinary....as are the Engineering Challenges
- Associated with developing ‘employability’ and/or wicked competences (Knight 2007)
- More robust pedagogy needed - we begin with exploration and classification of one of our own authentic learning programmes
UCL Engineering - What is Different?

• Learn *authentic engineering* work place practices through several project opportunities

• Learn to work with engineers from other disciplines from the start

• Develop skills that will help you turn your theoretical work into real solutions

• Learn to develop and pitch your ideas, and yourself, to make the most of your education & future career
The Integrated Engineering Programme

Year 1
- Engineering Challenges, Design & Professional Skills, Mathematical Modelling & Analysis
- Scenarios
- Minor Introduction
- How to Change the World
- Interdisciplinary and Multidisciplinary Minor
- Interdisciplinary Projects
- Accredited Degree

Year 2

Year 3 BEng

Year 4 MEng

Fields of Study:
- Chemical
- Electronic & Electrical
- Computer Science
- Civil
- Mechanical Inc. Business Finance
- Management Science
- Biochemical
- Biomedical

How to Change the World
**Year 1 (Approach)** Introduce engineering problems starting in Year 1, and bring the math and science (and communication, economics and ethics) in context of the problems and the projects – *Felder, 2012*

- IEP Mathematical Modeling & Analysis
- IEP Design & Professional Skills
- Discipline Specific Introduction

2 x 5-week 'Challenges' = PBL/PjBL

1. Teach
2. Practice
3. Reflect
The *Design* Challenges
The Challenges

• Challenge 1
  • Need, brief, conceive...
  • Two formats Sustainable Energy for Homes in 10 Countries or Research the Researcher

• Challenge 2
  • Conceive, test, specify, conceive, test....
  • Global health – vaccine production in sub-Saharan Africa
Authentic Assessment in The Challenges

- Design Progress and Integrated Engineering meetings
- Peer Assessment
- Reflective writing & E-portfolios
- Presentations
- Reports, not essays
- 65% group assessment; 35% individual assessment
- External inputs – Industry, research and community partners
• ...provide opportunities for collaborative learning
• ...provide ways of learning that align with the way knowledge is used in the real world
• ...develop ‘soft skills’ – creativity, communication skills, critical thinking, design skills
• ...allow students to develop ‘wicked competencies’ (Knight 2007)
• “A set of achievements – skills, understandings and personal attributes – that makes graduates more likely to gain employment and be successful in their chosen occupations...”

   HEA (2012) Pedagogy for Employability

• “Employability is more than about developing attributes... just to enable a student to get a job, or to progress...[their]...career. It is about learning and the emphasis is less on ‘employ’ and more on ‘ability’...”

Analysing Authenticity

• Context Authenticity – content is or resembles real world (eg: data/problem is real)
• Task Authenticity – process/activities resemble real world activities (eg: design, research, teamwork)
• Impact Authenticity – outputs are or resemble real world (reports not essays, presentations, pitches)
• Personal/Value Authenticity – close to personal life and values of students

The Challenges - Learning Outcomes

1. Improved ability to communicate the role and the value of your chosen discipline to others
2. Improved ability to learn through your own research and enquiry
3. Greater understanding of a human-centred design approach
4. Improved ability to identify and define the requirements, constraints and design parameters of a project
5. Improved ability for creative problem solving and critical thinking …
6. Improved technical knowledge and understanding of your own discipline
7. Greater understanding of cross-functional design processes and interaction between multi-disciplinary teams working on a single project
8. Improved ability to spot and take leadership opportunities
9. Improved ability to work effectively within a team in terms of task-based roles and team-based function
A: Improved ability to communicate the role and the value of your chosen discipline to others
B: Improved ability to learn through your own research and enquiry
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F: Improved technical knowledge and understanding of your own discipline
G: Greater understanding of cross-functional design processes and interaction between multi-disciplinary teams working on a single project
H: Improved ability to spot and take leadership opportunities
I: Improved ability to work effectively within a team in terms of task-based roles and team-based function
• students asked “what did you like most about the challenges?”

• 248 responses analysed

• 207 and mentioned and were coded for authenticity

• aim to find out what kinds of authenticity the students recognise in The Challenges

• very few students mentioned impact or personal values – reflects student population and stage
## Analysing Authenticity

<table>
<thead>
<tr>
<th>Impact</th>
<th>Personal/value</th>
</tr>
</thead>
<tbody>
<tr>
<td>insight into how engineering was involved with society</td>
<td>helped my self-esteem</td>
</tr>
<tr>
<td>a project with implications for society</td>
<td>strangely satisfying</td>
</tr>
<tr>
<td>presenting our work to other departments</td>
<td>a happy feeling</td>
</tr>
</tbody>
</table>
## Analysing Authenticity

<table>
<thead>
<tr>
<th>Context</th>
<th>Task - Practical</th>
<th>Task - Soft Skills</th>
</tr>
</thead>
<tbody>
<tr>
<td>real world, real life, real problems, real life situation</td>
<td>Lab sessions, practical work</td>
<td>leadership</td>
</tr>
<tr>
<td>see what engineers do in their day to day working life</td>
<td>physical experiments</td>
<td>collaboration, cooperation with others</td>
</tr>
<tr>
<td>being able to see what the full design process</td>
<td>practical application of what we were learning</td>
<td>learning from each other, sharing ideas, communication, improved social skills</td>
</tr>
<tr>
<td>a project that can be implemented</td>
<td>doing one experiment, using its results to plan and execute the next</td>
<td>freedom to use any method to come up with good designs</td>
</tr>
<tr>
<td>realistic working environment</td>
<td>doing physical stuff, building models,</td>
<td>meeting people from other disciplines, leveraging strengths of all team members</td>
</tr>
<tr>
<td>integration of technical knowledge to create a working product</td>
<td>compiling information and analysing it</td>
<td>variety of points of view and backgrounds</td>
</tr>
<tr>
<td>practical application of knowledge</td>
<td>practical components</td>
<td>help me understand my strengths and weaknesses</td>
</tr>
<tr>
<td>applied things we learned in real world contexts</td>
<td>designing and testing prototypes</td>
<td>organising skills</td>
</tr>
<tr>
<td>help me understand what components in the circuit does in real life</td>
<td>applying code to drive the motor and get information from the sensors</td>
<td>something future employers will be looking for</td>
</tr>
<tr>
<td>tackling a real problem in Africa</td>
<td>physical outcomes of computer code e.g motor spinning</td>
<td>trains us to handle the workload and stress expected of an engineer</td>
</tr>
<tr>
<td>solve a real and important problem</td>
<td>the technical part of it and how we were introduced to a totally new domain</td>
<td>creative problem solving</td>
</tr>
<tr>
<td>how to integrate knowledge with other disciplines to create an overall design</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
## Analysing Authenticity

207 authenticity mentions in answer to “what do you like most...”

<table>
<thead>
<tr>
<th>Category</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Context</td>
<td>19%</td>
</tr>
<tr>
<td>Task – practical</td>
<td>16%</td>
</tr>
<tr>
<td>Task – soft skills</td>
<td>64%</td>
</tr>
<tr>
<td>Impact/Value</td>
<td>1% (BUT they were asked what they <em>liked</em> the most)</td>
</tr>
</tbody>
</table>

No difference between - sustainable homes challenge or research the researcher
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Employability

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HEA (2012) Pedagogy for Employability

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• students asked “what is the one thing you would change on the challenges?”

• 233 responses analysed – 8% ask for changes that reduced authenticity of the task
  • more structure and more guidance
  • can we choose a topic of our own
  • more extensive information required
  • there was too much assumed knowledge
  • more discipline specific topics
  • teaching team should allocate tasks to team members

• *Freedom to work may have been detrimental in some cases...*
The Integrated Engineering Programme

Year 1 – context
- task practical
- task soft skill

Year 2 – context
- task practical
- task soft skill
- impact

Year 3 BEng

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What I liked the most is also what I disliked the most in challenges. The minimum guidance given was a great freedom that pushed each one of us to do own research and explore and justify our creative processes, however...as a student I felt needed validation in terms of what was expected from us. [ie: feedback or guidance at crucial points]