Embedding Sustainability into Computer Science teaching

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Why and how long?

- I have been doing this since 2007, having become aware of it through the (former) subject centres (MSOR and ICS)
- Partly motivated by an interest in how to contextualize the ethical, professional, social and legal aspects of computing (as per the BCS accreditation requirements)
- In 2007 I developed a case study on embedding SD in computing
- In 2008 I led a HEA funded project looking at student views of sustainability and how that related to career development
- In 2010 I developed a set of RLOs for SD in computing (with colleagues at Leeds Becket)
- In 2011 I developed CPD for the HEA STEM subject group on “the sustainable practitioner”
- I have developed various examples, case studies and publications on how sustainability can contextualize ethics and social awareness within teaching
- ....
Aims
● to provide a framework for student’s legal, social, ethical and professional awareness of computer science.
● to encourage students to work collaboratively, with a focus on environmental and societal problems, and the scope for solutions, from the domain of computer Science.
● Students develop their research and independent learning skills, alongside communication and team working, as they investigate issues
Topics include

- we consider professional practice, ethics and the SDGs.
- We begin by exploring ideas of responsibility and associated morality, then the British Computer Society’s aims to make IT good for society: which align closely with SDGs, especially SDGs 3, 4, 8 and 9.
- We look at how all of the SDGs may be addressed through computing technologies
- We also consider how these also linked with relevant UK government plans for achieving some of the SDGs
Integration and development

- This was a stand-alone module on Sustainable Computing
- Now developed as a key theme within our new professional development module
- Approach based on a framework for embedding Sustainable Development


Computing as an enabler

Using software, computer research and new technological techniques we can help: improve pollution, save energy, promote reuse and tackle other problems.
## Examples...

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<thead>
<tr>
<th>Reduce Computer Generated Pollution</th>
<th>Reduce non-computing pollution</th>
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<tbody>
<tr>
<td>Improve usage models (standby modes, auto switch off)</td>
<td>Improve logistics (less wasted journeys)</td>
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<tr>
<td>Upgrade code to boost efficiency, maximise maintainability of software</td>
<td>Virtual meetings (video conferencing)</td>
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<tr>
<td>Virtualise/emulate to prevent the need to have lots of different devices</td>
<td>New manufacturing models and efficient designs (e.g. 3D printing, 3D modelling)</td>
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<tr>
<td>Improve efficiency of components</td>
<td>More efficient buildings / intelligent buildings</td>
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<td></td>
<td>Smart Grid (smart electricity production and sharing)</td>
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### Wider Examples...

<table>
<thead>
<tr>
<th><strong>Raise Awareness</strong></th>
<th><strong>Improve the World</strong></th>
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<tbody>
<tr>
<td>Create apps that help people track their sustainability</td>
<td>Develop smart AI to help others (e.g. healthcare, finance, safety)</td>
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<td>Introduce timers and in-game alerts to help gamers identify how long they’ve been playing</td>
<td>Improve security to minimise the risks of illegal activity</td>
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<td>Facilitate research (e.g. big data analysis) to help understand the problems/risks</td>
<td>Encourage positive societal impact (e.g. facilitate free speech, help people to share)</td>
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<td>Open access to data (e.g. councils)</td>
<td>Develop technologies to help ensure financial viability of companies/individuals</td>
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Impacts

- Student awareness
- Student acceptance
- Student awards
- Case studies
- Publications

- Campus impact: strategic plans
- National impact: work with AdvanceHE
- International impact: supporting colleagues elsewhere, citations show the value in other disciplines and areas
Barriers and solutions

- Students: needing to understand why
- Colleagues: don’t see the need; failure to be flexible in what we teach; reluctance to step outside of comfort zone
- Curriculum: considered overfull
- Quality processes: changing curricula or assessments can be a problem

- Provide context and rationale
- Explain benefits and provide support and resources
- Link with curriculum
- Be innovative and persevere

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