

# Engineering Education for a Sustainable Society

## PTAS Project Final Report

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## Award

An award for £5000 from the Principal's Teaching Award Scheme (PTAS) was made in 2012 for this project on *Engineering Education for a Sustainable Society* (EESS). The overall aim was to develop, trial and assess new and innovative ways of teaching sustainability in the undergraduate curricula of Civil Engineering Degrees.

## Original Objectives

Initially it was proposed to develop and trial materials for three distinct areas of activity within the Civil Engineering degree programmes.

Tools for Engineering Design 2 was to be a new course designed primarily in response to the lack of significant design in the second year of the programme, the perception that many students had poor skills in basic areas such as sketching, use of spreadsheets and conception of design alternatives at the basic stage. EESS was going to develop a *New Build* design project for use within this course, encompassing a strong sustainability theme.

Water Resources 2 is an established course covering basic hydrology. It was proposed to develop and trial new course work material for use in this course, associated with 'Socratic style' tutorial exercises.

Innovative Learning Week provided an opportunity for the development of a sustainability-focused activity aimed primarily but not solely at Civil Engineering undergraduates.

## Scope Change

A number of issues arose within the lifetime of this project, associated with staffing. Staff changes meant that the Water Resources 2 course which was one of the foci of the project was transferred to another staff member who was not engaged with EESS and preferred to run the course in their own way. At the same time, Dr Alison Furber, who was the employee on EESS, followed up another more permanent opportunity and left The University of Edinburgh.

For this reason, EESS has taken much longer than originally envisaged to deliver its objectives, and the trial stage of the Water Resources 2 element has not been delivered. Neither has all the money originally granted been spent.

On the other hand there has been significant further output which would not have arisen without this project, as detailed below.

## Outputs

Table 1 sets out the actual outputs of the project, both as originally intended and subsequent additional outputs resulting indirectly from the work.

### Recognition and Impact

In addition to the actual outputs as set out in Table 1, there has been external recognition of the achievements of EESS as set out in

Table 2.

## Finance

The finances of the project have been very simple. Of the original £5000 award, £3207.54 has been spent on salary for Dr Alison Furber, leaving an unspent balance of £1792.46.

As Dr Furber is no longer in the UK and no other staff member to pursue the work is available, there is no prospect of extending the project further.

## Conclusion

Although slightly diverted from its original objectives, and having taken much longer than first envisaged, EESS has resulted in a significant development of the Civil Engineering undergraduate curriculum at The University of Edinburgh, with good feedback from students and wider recognition, as well as the opportunity for wider participation through Innovative Learning Week. EESS may therefore be considered to have achieved success.

*Table 1: Outputs from EESS as envisaged and achieved*

<b>Output</b>	<b>Course/Activity</b>	<b>Original Objective</b>	<b>Output Achieved</b>
1	CIVE08020 Tools for Engineering Design 2	This was originally styled "Civil Engineering Design 2." Project materials were to be developed.	A complete new course, CIVE08020 Tools for Engineering Design 2, has just completed its second delivery, with good student feedback. Materials on a New Build project developed by Dr Furber for EESS have been used along with other materials of a similar nature developed by other tutors. Student feedback has been good.
2	CIVE08011 Water Resources 2	Course work combined with Socratic style tutorials were to be developed	A complete course work exercise and tutorial questions have been developed, but only initial trials have been carried out. The second year students did not respond well to the unfamiliar Socratic questioning approach and the new staff member now organizing this course was not prepared to follow it through.
3	Innovative Learning Week	A sustainability-based Innovative Learning Week activity was to be developed	This exercise ran in ILW 2013. A similar activity promoted by Engineers Without Borders ran in 2014, and is to be repeated in some form in 2015. In the case of the completed activities, feedback from participants was good.
4	CIVE09014 Fluid Mechanics 3 (Civil)	This was not part of the original proposal	In the light of the success of Tools for Engineering Design 2 (see output 1 above), this course has been redeveloped with a tutorial problem based around a conceptual design to which the fundamental theory taught can be related. Student feedback for the first year of this implementation has again been good.



Table 2: External recognition for EESS outputs

Output (see Table 1)	Nature of external recognition
1	The New Build project developed has been published on the expedition workshed website ( <a href="http://www.expeditionworkshed.org">www.expeditionworkshed.org</a> )
1	Special mention was received in <i>The Global Dimension in Engineering Education 1st European award for best practices for the integration of Sustainable Human Development into technology and engineering education</i> , with a proposal entitled <i>Sustainable Human Development in Mainstream Undergraduate Engineering Education</i> . ( <a href="http://practicalaction.org/blog/news/global-dimension-award/">http://practicalaction.org/blog/news/global-dimension-award/</a> )
1	A paper was presented at the 5 <sup>th</sup> International Symposium on Engineering Education 2014, Manchester, September, reporting this work – “TEACHING SKILLS FOR CONCEPTUAL DESIGN- A NEW APPROACH” by Martin Gillie, Tim Stratford, Martin Crapper and Alison Furber.

## Appendices

Appended to this report are examples of the materials developed:

1. Tools for Engineering Design Student Brief
2. Tools for Engineering Design Tutor Notes
3. Water Resources 2 Tutorial
4. Water Resources 2 Tutorial Questions
5. Innovative Learning Week Activity
6. Fluid Mechanics 3 Design Tutorial