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How green is your course? Understanding the impact of ICTs

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JISC

Greening Universities (and Colleges)

The present focus in HE (and FE) has been mainly on the following:

- Greening campus buildings;
- Sustainable procurement of products and services;
- Teaching *about* sustainability in the curriculum;
- Minimising the waste, energy and paper consumption of staff and students;
- Supporting sustainability action community projects.

Few studies have considered the whole system carbon-based environmental impacts of different systems of delivering HE except Roy *et al*, 2005 Factor 10 project

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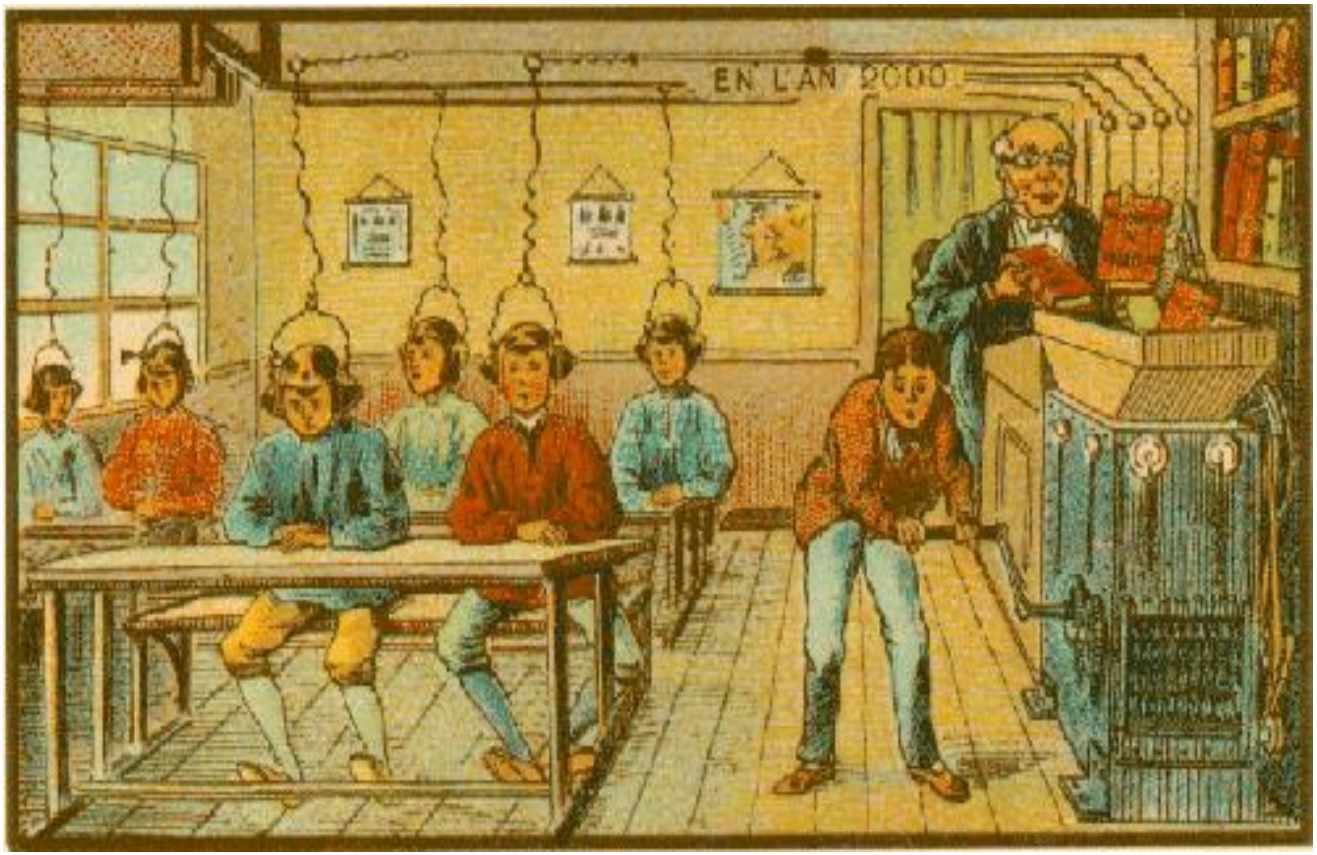
HE teaching systems use energy in a variety of ways



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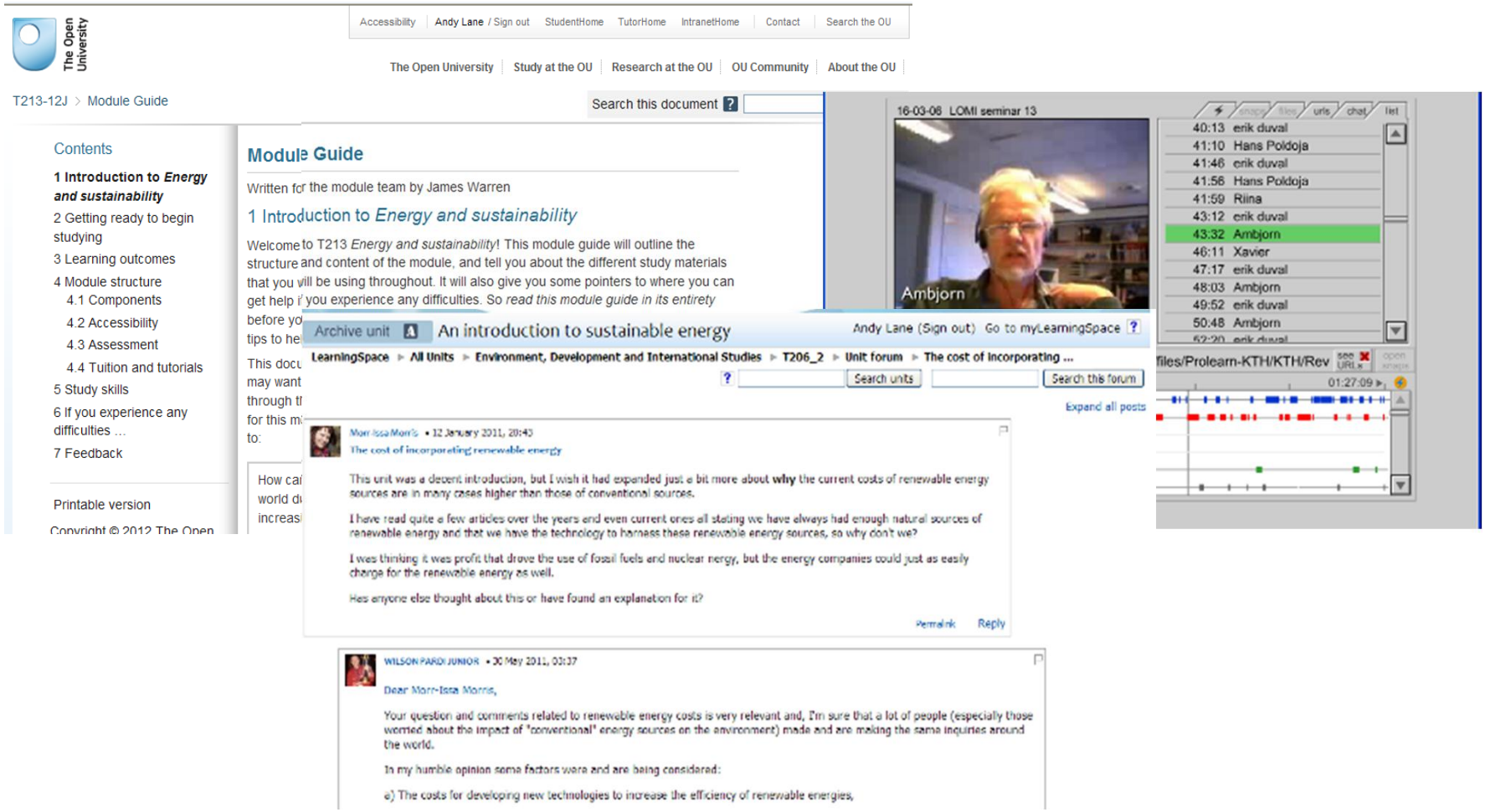
VLEs, digital resources, forums and videoconferencing



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How can ICTs reduce energy use in HE teaching alongside other factors?

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There were a number of steps involved in undertaking this environmental impact assessment of HE teaching models

- Step 1: Classifying HE teaching models using ICTs
- Step 2: Gathering primary data and accessing databases to estimate and model the environmental impacts of HE courses/ modules
- Step 3: Normalising the data collected for comparative analysis
- Step 4: Establishing measures of energy consumption and carbon conversions for assessing environmental impacts
- Step 5: Compiling data into consistent forms for calculating course/module environmental and lifetime impacts
- Step 6: Developing an environmental appraisal toolkit to model HE teaching impacts

Step 1: Classifying teaching models

- **The Face-to-Face Teaching Model**: High face-to-face teaching delivery and no ICT-enhancement. The use of teaching materials is usually not high. Higher use of student residential accommodation and campus site energy impacts.
- **The ICT–Enhanced Face-to-Face Teaching Model**: As above with some minimum enhancement by ICTs via online links to downloadable resources or with specially produced audio-visual digital resources.
- **The Distance Teaching Model**: Teaching, learning and assessment is mainly provided using bespoke print-based distance teaching materials and may have low or no ICT-enhancement. Face-to-face teaching is usually low. Campus site energy impacts are relatively low and there is no residential student accommodation.
- **The ICT–Enhanced Distance Teaching Model**: As above but is strongly enhanced by ICTs via online links to downloadable resources or with specially produced audio-visual digital resources.
- **The Online Teaching Model**: Teaching, learning and assessment is mainly provided online using ICTs and digital resources available on the university websites and Virtual Learning Environment. As students make little use of campus facilities, the site energy use is relatively low and there is no residential student accommodation.

Step 2: Gathering data

Building on the approach taken in the Factor 10 Visions study (Roy *et al.*, 2005), we identified the main sources of carbon-based environmental impacts associated with HE teaching:

- Travel to and from places where the teaching or learning takes place;
- ICT device purchase, and use for connecting to university websites and the VLE and for offline study;
- Paper, print and other educational resources;
- Student residential accommodation;
- Additional study-related home energy consumption (for heating, printing and lighting);
- Campus site energy consumption providing power and heat.

We gathered additional data using a standardised structured survey. Data analysis covered:

- 14 Higher Education Institutions (4)
- 30 courses/modules (10)
- 1551 students (112)
- 275 staff (130)

(*SusTEACH data*)

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- **Step 3: Normalising the data collected for comparative analysis**
  We adopted the UK Credit Accumulation and Transfer (CAT) system as a time-based measure for comparing the environmental impacts of courses/modules. 1 CAT credit is equivalent to 10 hours total study including writing assignments, field work, etc. This allow for inter-institutional and intra-institutional comparisons, as well as comparisons of both part-time and full-time delivery methods and impacts.
- **Step 4: Establishing measures of energy consumption and carbon conversions for assessing environmental impacts**.
  Fossil fuel energy consumption and CO_2 emissions were used as widely accepted indicators of environmental impact. The activity data gathered provided information on sources of Scope 1, 2 and some sources of Scope 3 CO_2 emissions. The collected data was converted into energy consumption, and associated CO_2 data using the latest carbon conversion factors (AEA, 2011).
- **Step 5: Compiling data into consistent forms for calculating course/module environmental and lifetime impacts**
  Data for each environmental impact was organised into consistent forms and normalised using CAT credits (or hours of study) to provide the average energy consumption, and CO_2 emissions of a course or module per student per 10 CAT credits. The analysis of impacts was widened to estimate the lifetime impacts of specific HE Teaching Models.

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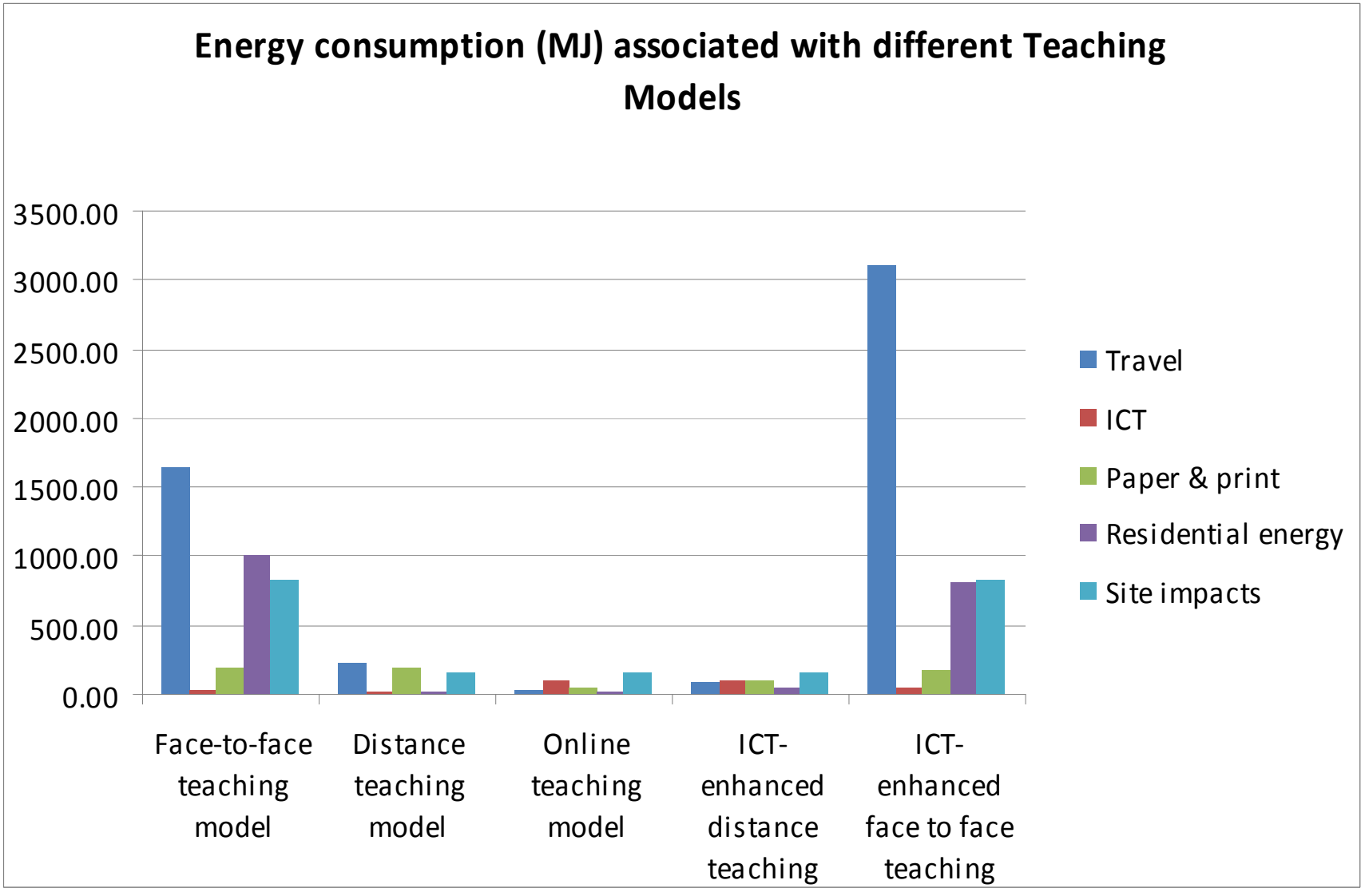

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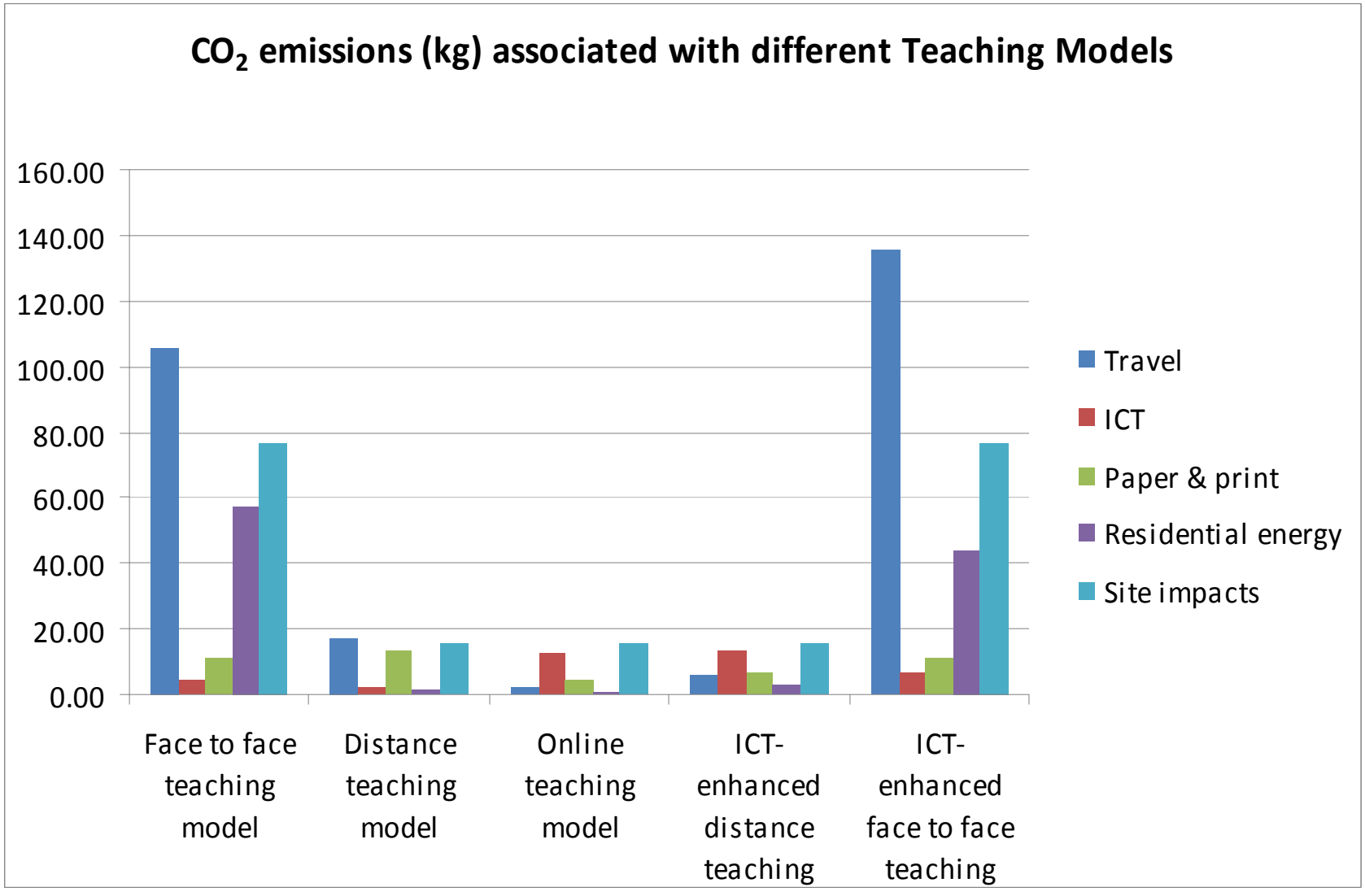

Step 6: Environmental Appraisal Toolkit development and refinement

The SusTEACH Planning Tool - an online tool which helps lecturers and academic designers to rate their teaching delivery plan to provide feedback on the likely environmental impacts associated with this plan.

The SusTEACH Modelling Tool - permits the modelling of one or several courses/modules to estimate the energy impacts associated with different HE teaching scenarios.

The SusTEACH carbon calculator - aims to help students and lecturers to calculate the carbon impacts associated with course/module-related travel, materials, purchase and use of ICT devices and both site and residential accommodation.

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