

# **ESTABLISHING AN INNOVATIVE NEW LEARNING ENVIRONMENT TO FOSTER INDUSTRY LINKS IN HIGHER EDUCATION**

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## **ABSTRACT**

The Engineering Centre for Excellence in Teaching and Learning (engCETL) at Loughborough University was founded to enhance the student learning experience by enhancing, improving and establishing links between industry and academia. engCETL is creating strong partnerships between students, academics, pedagogic researchers and support staff and between higher education and industry. This paper describes the establishment of the Centre and in particular the creation of high quality new learning spaces, with first class resources that are comparable to or exceed industry working environments and utilise the latest teaching and learning technologies. We discuss optimisation of the learning space from an end-user's point of view and the specification of facilities for a new building and, based on extensive past experience of working with industry, speculate how the new space and enhanced facilities will help a well established industry based project scheme in the mechanical and manufacturing engineering school to prosper and grow.

*Keywords: Learning environment, equipment, resources, projects, industry collaboration*

## **1 INTRODUCTION**

The benefits of formal and informal associations of universities with industry are widely agreed and accepted [1,2]. Universities are aiming to produce graduates with both a good knowledge base and a wide range of skills and abilities that will equip them for their future careers. This aligns with surveys of engineering employers [3], which show that virtues such as willingness, drive and self-determination along with strong interpersonal skills are considered just as important as traditional technical expertise. The Sir Gareth Roberts' SET Review [4] states that "(industry involvement has) the benefit of improving the attractiveness and relevance of the course to both students and employers". From the student perspective the interaction with industry during the degree programme enhances student learning by increasing student motivation and providing clear contextual relevance. UK engineering degree courses contain substantial elements of project work which aim to develop students skills for industry and to replicate elements of the industrial experience. This paper describes how, as a result of a successful funding bid, Loughborough University is developing a new engineering teaching environment, with the latest facilities, in which team design and project work will be undertaken, often in conjunction with industry.

## **2 INDUSTRY AND ENGINEERING DESIGN EDUCATION**

It is well recognised that students develop important skills by having a knowledge and understanding of the workings of industry. This is reflected by the UK professional accreditation panels which now place substantial emphasis on industrial liaison[5]. The UK Quality Assurance Agency also requires engineering students to have an “ability to operate in commerce and industry in a variety of situations”[6], which is best achieved by working with industry. A key recommendation within the Cox Review of Creativity in Business[7] is “Equipping tomorrow’s business leaders, technologists, engineers and creative specialists, through higher education, with a greater appreciation of the context in which their different skills will be applied”. This strongly suggests that the future for engineering education lies with creating ever stronger ties.

Links with industry in both teaching and research are embedded in the Loughborough University strategic plan. Extensive and wide ranging teaching links have been established across all engineering programmes, particularly in relation to design project activities, incorporating both large and small companies. These companies seek to recruit young graduates with a sound engineering background, and good interpersonal skills. Experience at Loughborough and elsewhere suggests that the cornerstone to success in providing highly employable graduates is to build ‘real world’ elements into the curriculum.

An example of such cooperation at Loughborough is a flagship scheme known as the ‘Teaching Contract’, which provides industry-linked experience. This scheme is based upon a consortium of companies who supply projects and offer external support. The scheme, which has been developed over a period of twenty years, guarantees industrially based project work for all second year mechanical engineering students and all final year (M.Eng) students in mechanical, product design and manufacturing engineering. The problems are set by the companies during an initial factory visit and the industrial staff engage in a number of progress meetings throughout the academic year. The companies influence the operational procedures through an annual advisory meeting of the consortium. Projects end with substantial written and oral reports and, in the case of finalists, with a major exhibition held at the university, however a major feature of this scheme is the need for regular meetings of some 50 teams. Over 200 students take part each year in projects provided by twelve companies. Clearly, there is a logistic problem in providing suitable meeting space as it is necessary for the teams of each year group to meet in the same slot on the timetable. Teams require a suitable environment in which to work if they are to maintain strong motivation.

While regular meetings and the interactions of teams with companies should ideally take place in small private break-out rooms there is also a need for large lecture theatre for briefings, active learning workshops and group presentations and also a large exhibition space for the end of the year. A lot of flexibility is required and the new engCETL learning space will greatly enhance the existing provision.

## **3 CENTRE FOR EXCELLENCE IN TEACHING AND LEARNING**

The Engineering Centre for Excellence in Teaching and Learning (engCETL) at Loughborough University was set up in March 2005 as one of 74 national centres created by the government funded CETL programme. It attracted recurrent funding of £2.5M over five years and a capital grant of £1.65M. The focus of this centre is linking

industry with education, it incorporated an existing support centre and links with seven core departments including Mechanical & Manufacturing Engineering.

The Centre's remit is to enhance the learning experience of students in the seven departments, then to disseminate practice across the university and finally to disseminate good practice nationally. The CETL covers the following themes; Academic Support, Learning Spaces, Pedagogical Research and Curriculum Development, all of which are aligned to the theme of linking industry with education. The initial capital funding was allocated to provide new teaching space to meet these needs and to encourage both student and industry participation. There would also be space for engCETL researchers and for the learning support staff. Instead of having to adapt existing areas, we had a rare opportunity to create a new space to fulfil the aims of the centre.



Figure 1. The Centre's logo

#### **4 NEEDS ANALYSIS**

It was essential to find out the requirements of the key stakeholders for a range of applications and contexts, as well as for anticipating new research activities within the building. To be an effective asset to the learning and teaching process the introduction of any new technology must be an integral part of the learning environment and should not dictate the design or layout of the space, or be simply an add-on to existing space.

A series of focus groups were used to discover the requirements of the potential users, identify likely activities and the most appropriate facilities for the engCETL building. Four stakeholder groups were consulted: industry professionals, current engineering students, academics, and the engCETL core staff.

##### ***The Desired Mood***

Above all the need for a sense of community and collaboration between staff, academics, students and industry emerged, where physical space and the technology functioned seamlessly with the environment. Both formal and informal areas are needed and there was strong recognition that students should have a sense of ownership in the building. Here are some of the phases frequently used in the focus groups:

- To create a 'wow' factor
- To sustain its look and feel over time
- To utilise as much natural light as possible within the building
- To have a mixture of modern and traditional natural materials
- A clean fresh area
- Pleasant inviting space
- Comfortable, easy to manage
- Creative space to inspire students in their design work.

##### ***The Focus Groups***

Academics identified the requirement for the latest IT equipment and a hi-tech feel, whilst the key student requirement was not related to the technology but was the need for accessible space on campus where they could meet and work as a group both during the working day and out of hours. They pointed out that any IT equipment must be instantly useable so must be intuitive and not over-complicated. Academics also emphasised the need for flexibility to be useful for a variety of activities and for the

ability to cope with future changes and developments and to consider widening participation in respect of accessibility.

The student focus group was very productive and came with some surprising findings. Students didn't favour large design rooms with a number of project meeting areas as these always become too noisy. The required meeting rooms, each with a board room size table. They expressed the need for quality space when presenting to industry in order to project the right image. They felt that the CETL should also offer video and telephone conferencing facilities to students working with industry as well as the more usual communications systems and thought this may well cut the requirements for additional factory visits when working on projects. They asked for flexibility in room spaces but pointed out the inadequacy of most sliding partitions. They insisted that space that is predominantly intended for independent learning will only be well utilized if it is seen as comfortable and fit for purpose.

Invited industrialists thought facilities should mirror industrial working environments, though this view would, perhaps, be coloured by their own experience. They were particularly looking for display areas, hi-tech facilities, exhibition space for both students and industry. They thought facilities for video conferencing would be helpful but they also considered that traditional low tech teaching facilities – flip charts, white boards were equally important.

Some of the key issues that emerged were:

- Thinking across the boundaries – interactions between industrial practice and activities, across disciplines within engineering and beyond.
- Forward thinking
- Promoting Interaction
- A feel of ownership when involved in projects

#### ***Core engCETL Staff***

The full and part time staff of the engCETL will be engaged in industry and academic coordination, teaching and learning resource developments, pedagogic research and dissemination. These staff will be housed in the same area. They were naturally concerned about their working conditions. They require personal space and privacy and would wish to present a professional work area. Issues common to open-plan working such as noise, natural light and ventilation were raised. Practical considerations were also built into the design such as provision of photocopiers, flexible storage, printers and kitchen areas and for accommodating the needs of staff with disabilities.

## **5 DEVELOPMENT OF THE NEW LEARNING SPACE**

The engCETL capital funding has enabled us to add a floor to a new building that was at the planning stage at the time of the bid. At the time of writing, the new 'Keith Green' building is planned for completion on 21 April 2006. The architects worked with the project coordinators using the 'needs analysis' to define the optimum use of a finite space envelope. They provided several possible layouts which were discussed by engCETL core staff and academics from each engineering department. The final design, although a compromise, was that which provided the best utilisation of available space and the portrayal of professional image.

Flexibility has driven the design including the installation of a high-quality movable wall and the purchase of adaptive furniture for variable layouts. The furniture has been

selected to distinguish areas of activity. For example, staff areas have beach effect furniture and red fabric upholstery whilst learning spaces are defined by their slate grey finish and brown faux-leather upholstery.

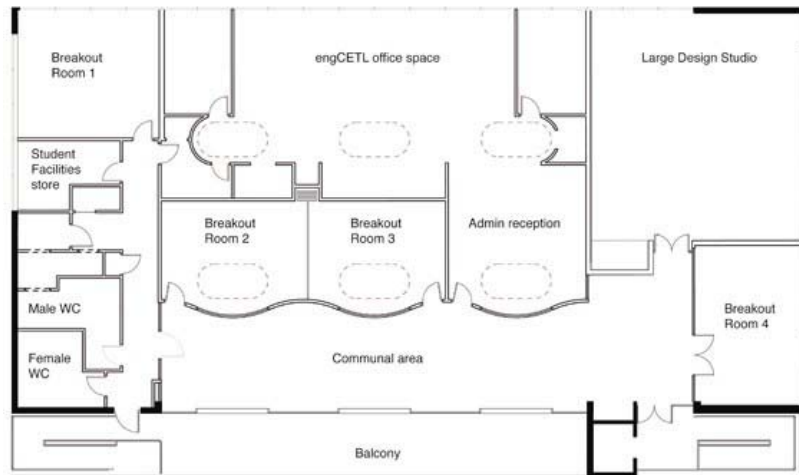


Figure 2: Agreed floorplan of new engCETL; 33m x 16m

The space will provide areas for formal and informal collaborative group work, utilising state-of-the-art technology integrated into the learning spaces to support the learning and teaching process. There is a large design teaching area, four meeting rooms and an open-plan office area which opens out onto an informal meeting area and balcony. The design allows for much of this space to be flexibly used as a large exhibition area.



Figure 3: The Keith Green Building under construction; December 2005

### Furniture

The furniture was selected with flexibility in mind: to enable rooms to be set out in a number of different configurations and to occupy minimal storage space when not in use. The chairs and tables chosen are durable and stackable and all heavy furniture is on castors which can be locked. The design and form of the furniture has been chosen to compliment the building and to offer an attractive working environment. The informal area is defined by its comfortable furniture, typical of that to be found in the reception area of a large industrial company.

## Technology

All learning and teaching dedicated areas have standard teaching and learning aids such as whiteboards and pin up areas as suggested by the industry contacts. They also have a built-in computer, data projector, interactive whiteboard. Students will be able to use mobile tablet PCs, digital cameras and video equipment on request. Naturally, the building is equipped with wireless internet facilities.

To capture student presentations and talks from invited industrial speakers, the large teaching room is fitted with audio/visual recording equipment. This has additional functionality of automatic camera angle change between a close up view and full room view. There is also audio/visual recording equipment connected to a DVD recorder in a breakout room to enable students to practice and review their presentations.

## 6 THE ANTICIPATED IMPACT OF THE NEW SPACE

The new facility will not provide sufficient space for all the student project activities but it will enable us to enhance our existing provision within departments and, in particular, to replace the older and less user friendly areas. Existing learning spaces for design project activities are variable in quality, however, it must be remembered that the courses are already running successfully. It is our hope that improved working conditions for students will play a part in improving motivation and ultimately, the standard of undergraduate work. Crucially, however such a centre will be central in maintaining and enhancing the willingness of industry to cooperate in student activities.

A few months into the project, an additional capital grant was made available and this has been distributed amongst the seven participating academic departments to update their existing design teaching areas to the same standard as the Keith Green building.

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