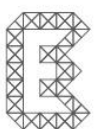




UCL

UCL Centre for Engineering Education **PROGRESS REPORT 2016**



UCL ENGINEERING
Change the world



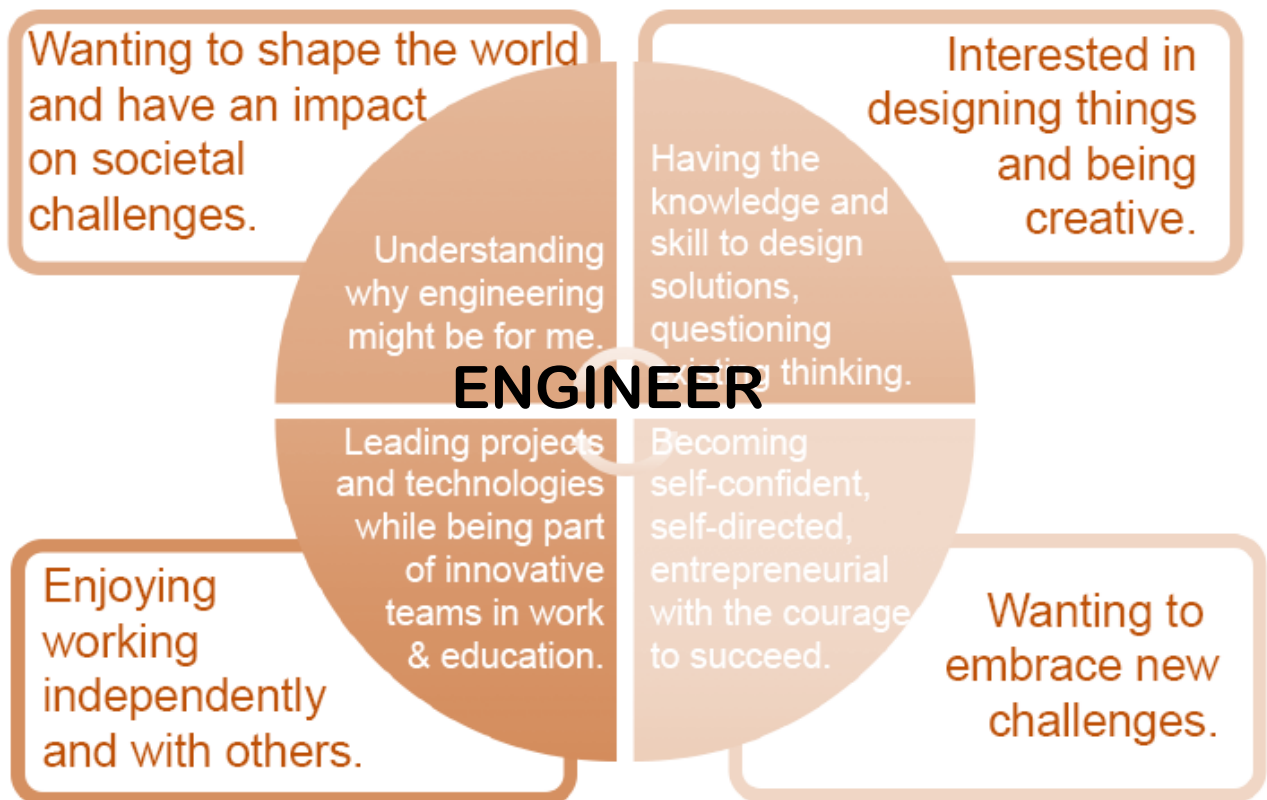
UCL Centre for Engineering Education



The Centre’s Mission	3
Summary	6
Spreading the Word	6
Looking inwards	6
Looking outwards	6
<u>Apprenticeships</u>	7
<u>New Models in Engineering Education</u>	7
<u>What Makes an Engineer?</u>	7
Making Friends	10
Expanding Our Family	12
Under 19 Engagement	13
What’s on the Horizon?	14
MSc in Engineering and Education.....	14
Formalising the Centre	17
Centre Staff	18
Prof John Mitchell.....	18
Prof David Guile	18
Paula Broome.....	18
Advisory Board	19
Contact Us.....	19

The Centre's Mission

The Centre for Engineering Education works to improve **Transitions** into and through engineering for people at different stages in their lives or careers. Both an active participant in the global engineering community and an observatory for that community, we seek to be a catalyst, partnering with others and providing a platform for debate and action to demonstrate engineering's contribution to a sustainable future.



The Centre engages with the fundamental question for *transitions into and through engineering*; at what point does a person become an engineer?



THE WORLD NEEDS MORE ENGINEERS! Partnering with others, the Centre will support and engage in projects that release the resources and world-leading capabilities of UCL to enthuse and inspire potential engineers.

Our Key Engagement Points:

We aim to create an ethos where engineering is seen as intrinsically worthwhile, relevant to people from all walks of life, promotes diversity and gender equality and above all is truly inclusive and open to all.



Engineering requires multiple skills sets; creativity, design, teamwork, practical skills, fundamentals of science and mathematics, mixed together in varying amounts depending on the task at hand. The Centre will support educators at all levels in developing these skills in the engineers of the future.

Our Key Engagement Points:

The Centre is involved in development of curricula models and content as well as the pedagogic methods and practices to develop 21st century engineers via UCL's own Integrated Engineering Programme and through the evaluation and dissemination of practice from elsewhere. Key partners include:

- Engineering Professors Council (EPC)
- European Society for Engineering Education (SEFI)
- UK & RI Engineering Education Research Network (EERN)



Successful engineers need to possess a justified self-confidence in their ability to develop innovative solutions considering feasibility, desirability and viability. This requires broad horizons of what is possible through engineering and an understanding of the characteristics of a 21st century engineer.

Our Key Engagement Points:

We aim to engage with partners throughout the lifespan of professional development. These include partnerships with Education Providers, Professional Engineering Institutions (PEIs), NGOs e.g. Engineers Without Borders and Employers.



Engineering is a team activity that draws individuals together to use their different skills in creating new things with the aim of better serving society. To meet the complex challenges of the next century, engineers need to work flexibly across cultural boundaries. The importance of diversity and inclusion are paramount, including gender, ethnicity, background, physical ability and neurodiversity.

Our Key Engagement Points:

We will identify models of innovation in engineering companies and educational programmes and assist both to learn from one another more effectively to support engineers at every stage of their development. We will continue to engage actively with issues of diversity and inclusion at all levels within our own programmes including the commissioning of research work and studies in the area.

Summary

Since the official launch in April 2015, the Centre has focused on building networks and reaching out to like-minded partners both within and outside UCL. As this has progressed, the key themes and focus of the centre have started to strengthen. These are articulated through the concept of transitions presented above.

Spreading the Word

Events are a vital way to spread the word of the formation of the Centre, and to encourage widening participation across Higher Education, which is one of our major targets.

Looking inwards

We have rolled out CEE Teaching Lunches to bring together UCL staff for an informal seminar series. Guest speakers are invited to speak and, more recently, networking lunches have been introduced to help staff come together and form more of a community, something that is lacking in Engineering Education in the UK.

Looking outwards

After the success of our launch event, we decided that a flagship event series would be a good way to carry on the conversation. We have so far held three really successful 'Conversation Series' events. Again, with the intention of building a community, we have asked external, relevant parties to host, and selected topical subjects including:



Apprenticeships

The UCL Institute of Education hosted Graham Schuhmacher MBE (Independent Skills Training Partner) and Lorna Unwin (Professor Emerita at the IoE) to discuss “Engineering Expertise for a New Technical and Management Context: Implications for Apprenticeship”. This hot topic attracted audiences from industry, HE and professional bodies alike.

New Models in Engineering Education

The Institution of Mechanical Engineers kindly co-hosted this event at their Birdcage Walk HQ. Leading the conversation, Kel Fidler (previously Chairman, Engineering Council and Vice Chancellor of Northumbria University) and Karen Usher (Co Team



Leader, New University for Herefordshire Project). We discussed the future role of accreditation, relationships with industry, fast track degrees, the emergence of private providers and the Teaching Excellence Framework.



What Makes an Engineer?

Nick Tyler (UCL) and Sara John (independent creative consultant) took on the taboo of hard hats and hammers to get to the essence of the discipline, looking at influences from both science and the arts.

Future Conversation Series topics include ‘Design in Engineering Education’, and ‘The Role of Professional Institutions in Engineering Education’.

The 8th European Convention of Engineering Deans (ECED 2016)

was hosted by the Centre at UCL's Bloomsbury campus in April 2016. ECED is the European networking event of the year for engineering deans organized by CESAER (Conference of European Schools for Advanced Engineering Education and Research) and SEFI (European Society for Engineering Education) that brings together Deans to discuss current issues in engineering education and research. ECED represents a unique and important event in the calendar of senior leaders in engineering institutions. The general theme of this 8th convention was "Schools of Engineering at the Forefront – Meeting Challenges of the Engineering Profession".

On both the operational and strategic levels there are demands on Deans to secure and develop university functions and activities. The core function of a university is to deliver educated and skilled graduates to society. Universities also conduct research and graduate PhDs with engineering degrees.

This year's convention embraced these challenges with a program that offered plentiful opportunities for debate and discussions. At its conclusion, ECED 2016 produced the first draft of an agenda – the London Agenda – which lists the most important challenges and opportunities for schools of engineering today. We hope this will help and inspire engineering Deans in carrying out their roles as leaders in both education and research whilst contributing to the advancement of engineering institutions in general.



CESAER

conference of european schools
for advanced engineering education
and research

SEFI European Society for Engineering Education
Europäische Gesellschaft für Ingenieur-Ausbildung
Société Européenne pour la Formation des Ingénieurs

International Symposium on Inclusive Engineering Education

We also ran the International Symposium on Inclusive Engineering Education in April 2016. Originally envisaged as a Conversation topic, we realised that this was a big and important theme. The Symposium looked at diversity issues in Engineering, with particular focus on gender. We brought together engineers, social scientists and policy makers to extend efforts around increasing the diversity of the engineering student population beyond simply attracting more female students. Looking more broadly at inclusivity, we looked at how we can build a culture of inclusion in the curriculum in terms of content and teaching methods.

The Symposium attracted media attention and a follow up event has already been requested. We are in the process of generating a report detailing the outcomes of the event which will be published by the Royal Academy of Engineering.

Enhancing Student Learning Through Innovative Scholarship 2016: How Teaching Focused Academics are Driving Teaching Excellence






In June we hosted a conference on Enhancing Student Learning Through Innovative Scholarship 2016: How Teaching Focused Academics are Driving Teaching Excellence. To raise the profile of teaching only academics in the research intensive climate, it is vital to shine a spotlight on the innovative learning and teaching they undertake. The best way to achieve this is through the promotion of the innovative scholarship of learning and teaching being driven by this subset of the academic community. This second meeting of a national teaching fellow network was a forum to share innovative scholarship across disciplinary boundaries and to develop a national voice for teaching focussed academics.

Global Challenges for Engineering Education Symposium

We are collaborating with the Lloyds Register Foundation to host the Global Challenges for Engineering Education Symposium in September 2016. This is an exciting opportunity to gather International talent, which will culminate in a report being published around the main themes of the Symposium.

Making Friends

We have actively sought to expand our network and build relationships across the sector, with a very positive response.

	<p>We have an increasingly good relationship with the James Dyson Foundation, including the Global Head sitting on our Advisory Panel, and offering to host a visit to the JDF's new work environment.</p>
	<p>Co-Director David Guile had a project funded by Gatsby (its inception pre-dating the Centre) identifying best practice in Level 3 Engineering teaching in FE colleges. A dissemination event for employers, engineering bodies and colleges, supported by Gatsby was held in mid-June to launch the report that was a result of the project. We have also met with Daniel Sandford-Smith and are currently exploring how we might work with Gatsby, especially around building towards UCL East.</p>
	<p>We have been asked to join the UK & Ireland Research in Engineering Education Network, which is led by Advisory Group member Robin Clark from Aston University.</p>
	<p>We have had a number of exciting conversations with Richard Green who is CEO of Design and Technology Association which we will be building on.</p>
	<p>We have good connections with the London Legacy Development Corporation. They see us as potential partners in a plan to build pathways for local people to take up apprenticeships at UCL East and Hear East.</p>

	<p>Our former Dean, Anthony Finkelstein provided faculty funds for us to sponsor Teen Tech’s City Event in December 2015. Maggie Philbin has a high profile for bringing STEM further into the public eye and we are keen to start making our presence felt in the Olympic Park, which is where the event was held.</p>
	<p>Creative Industries Federation who promote “STEAM” (the idea of the arts being part of STEM) do excellent work. Former member Sara John sits on our Advisory Panel.</p>
	<p>The Brilliant Club is one of the many great relationships formed by our head of Pre-19 Engineering Education and Engagement. The plan is to log our experiences through a researcher monitoring the process. This summer, UCL and The Brilliant Club have collaborated on an exciting range of events and activities for Year 12 students, including summer schools and the Summer Challenge programme. The events have been designed to give students a glimpse into university life and the subjects we have on offer. From learning about the latest technology doctors use to combat obesity on the Applied Medical Sciences Summer School, to finding out about medieval warriors in Norway in the Scandinavian Studies Summer Challenge, there is something to suit everyone’s academic interest.</p>
	<p>We have formed a good relationship with SEFI after hosting their 8th European Convention of Engineering Deans conference.</p>

Expanding Our Family

Starting initially with Joint Directors Paul Greening (UCL) and David Guile (IoE), the Centre sought to expand. Paula Broome joined the Centre in January 2015 as the first full time member of staff and, as Centre Coordinator, is involved with all aspects of the Centre.

Since Paul Greening moved on to Coventry in December 2015, John Mitchell, the Vice-Dean Education in the faculty has been acting Co-Director.

Ann Lahiff from the IoE has taken on a part time research role to look at work-based training in companies, including apprenticeship (Atkins in the first instance) and work-based preparation and assessment in universities and FE colleges. The outcome of Ann's work later this year will be a reader-friendly report identifying best work-based practices, and workshops to spread that practice next year.

As the Centre is a collaboration between the UCL Faculty of Engineering and the Institute of Education (then external, now a faculty of UCL) we are keen to strike the best balance between engineering domain-specific and teaching and learning expertise. Consequently, the Institute of Education are in the process of recruiting a Lecturer in Engineering and Education, whose primary role will to assist in the running of the MSc in Engineering Education which will launch with its first intake in September 2017.

Under 19 Engagement

While Pre-19 Engagement has its own identity, there is a strong synergy with the Centre. In particular, we need to work closely as we build towards having a presence at UCL East.

Pre-19 Engagement boosts more than 500 UCL Engineering staff and students developing and delivering authentic & bespoke real-world engineering projects to inspire the next generation of engineer and innovators. Key priority for our engagement activities is increasing equality and widening diversity in every sense. Through our programmes we try to change the stereotyped perceptions of suitable choices and careers in young people – both girls and boys – their teachers, parents, carers and youth workers, by raising awareness of the exciting and wide-ranging careers in engineering.

The programmes promote a love of learning, encouraging young people aged 5 -19 years old to engage with the design and make process, problem solve and give voice to both their creativity and critical thinking. Over the past year we have delivered over 134 programmes, projects, events and activities across more than 400 primary and secondary schools in London and across the UK. Our activities are always free and open to all and we insist on 50% participation of girls throughout all our programmes.



What's on the Horizon?

We are proud of how far the Centre has come in such a short amount of time. We plan to push ahead with events and relationship building to further strengthen the Centre and hopefully become the shop front of Engineering Education in the UK.

MSc in Engineering and Education

The MSc in Engineering and Education is due to launch in 2017, with one new core module forming the basis alongside existing Engineering and IoE modules. The idea behind the MSc is to offer a) existing engineering lectures (HE or FE) or engineers in companies responsible for supporting technical and graduate development an opportunity to enhance their teaching and learning expertise and b) people involved, nationally or internationally, with policy for engineering with an opportunity to look at changing skill needs and innovations in company- or education-based engineering training.

UCL Engineering has proposed a state-of-the-art facility to enable experiential learning and hands-on research to be at the heart of the new Queen Elizabeth Olympic Park development. Building on a philosophy of making, experimentation and group work being at the centre of a research-based curriculum, the hub aims to be the go-to space for UCL students, staff and the local community for practical learning and research. It joins together a number of activities to create a resource that is inviting, collaborative and flexible. Its entry point will be the Institute of Making, leading to flexible project space, specialist workshops and specialised teaching



laboratories. All this activity will be supported by the Centre, which will be situated within the hub to guide, develop and evaluate the effectiveness of these innovative teaching spaces. This proposal is all about doing things differently, led by UCL experts in Engineering, Making and Education.

The heart of this development will be the new Institute of Making facility on the UCL East campus - encompassing the notion that this will be a place where bigger and more ambitious projects can be undertaken over longer periods of time. We wish to build a space that takes the best of what the Institute of Making in Bloomsbury has done so far, expands on that and offers something truly extraordinary: a palace of process. A flexible and cross-disciplinary space for UCL that explores new methods of interacting with research, teaching, commercial companies, the public and local communities. We see it as a core facility for UCL East and a beacon of advanced learning.



The experiential learning and research hub has been developed from the Institute of Making's core philosophy, offering an inspirational environment for a diverse and changing community of users in combination with the philosophy of innovation educational practice of the Centre for Engineering Education. In particular, we will provide an environment that will dramatically enhance the experience of students on the Faculty's Integrated Engineering Programmes (IEP). We expect that hub to encourage learning and engagement with research through enquiry, experience and experimentation. It will draw experts in education together in an environment where new ideas in practice-based learning and research can be constructed, tested and broadcast. Building on the track record of the Institute of Making at Bloomsbury, we anticipate that the spaces will be busy, flexible, open and continuously evolving.

The experiential learning and research facility will be a cross-faculty hub facilitating and sharing our expertise with whole of UCL interested in engineering, entrepreneurship and public engagement. This is the ethos we have already established at the Institute of Making and we have evidence of how it adds to both the experience and the engagement in research of students from Chemistry to Anthropology, from the Bartlett to English, from the Slade to Medicine. We have already been cited by many other UCL East proposals as a key research and teaching facility in this respect.

The experiential learning and research hub will create a variety of new spaces and facilities for the UCL community and support a broad range of new activities. The hub draws heavily on the philosophies of two key elements within it; the open-access and playful experimentation of the Institute of Making and innovative teaching methods of research-, problem- and project-based education championed by the Centre for Engineering Education. This proposal will create spaces that allow a different view of how people interact with learning and research emerges, aiming to create a transformative environment without boundaries between learners, teachers and researchers.



The key aspects of the proposal are:

1. Expansion of the Institute of Making to include space for project work for both engineering student projects and other Institute of Making member projects.
2. A home for the new Centre for Engineering Education (CEE) supported by excellent laboratory and teaching space to draw in educational experts and partners.
3. Professional workshops with specialist facilities including new and enhanced material capabilities, for example metal welding and fabrication, experimental ceramics, electronic processing and polymer processing.
4. State-of-the-art teaching laboratories to support the recent and predicted growth of student numbers in the engineering faculty. Specialist areas for brewing/distilling, multiphase-flow reactors, wet and dry teaching labs for Biochemical, Chemical, Electronic and Electrical and Mechanical engineering and Vehicle assembly bays

Flexible group working space to provide for the innovative teaching techniques being pioneered in engineering through the Integrated Engineering Programme.

Formalising the Centre

We have a group of 15 senior people (see page 13) from differing parts of the Engineering Education firmament sitting on an Advisory Panel. We've held four meetings so far with another scheduled for September 2016. These are really important meetings, helping us to hone the direction of the Centre.

A small group, including the new Dean, the head of the IoE and a couple of other senior figures will meet annually to oversee the Centre when we shortly form a Governance Group.

There's a bid for the Centre to have a home in UCL East. The proposal that bears the Centre's name actually encompasses the plans to accommodate an expansion in Engineering numbers and to provide an improved experience for current students. This will be an important step in giving the Centre a physical home, which is not possible at the moment due to lack of space at the Bloomsbury site (more on page 12).

A very helpful Away Day was held in 2015 to establish a collective view of the way ahead of the Centre. We have identified an inner core of advisors different from the Advisory Panel that can provide additional perspectives.

To help create more of a sense of identity and community, we are looking for ways to launch a membership scheme. For external partners, an idea was to start with issuing Honorary Contracts to key members. Internally, we are using the Teaching Lunches to gauge interest. We worked with a brand consultant to create a fitting logo that would give the Centre gravitas. This draws on the UCL colours to form consistency, whilst giving us a sense of identity.



Centre Staff



Prof John Mitchell

John is a Professor in the Department of Electronic and Electrical Engineering, UCL and Vice Dean (Education) in the Faculty of Engineering Sciences. He is currently Acting Co-Director of UCL's Centre for Engineering Education.



Prof David Guile

David is Professor of Education and Work, Head of the Department of Lifelong and Comparative Education, UCL's Institute of Education, and a member of the ESRC Research Centre - Learning and Life Chances in Knowledge Economies and Societies, and also Co-Director of UCL's Centre for Engineering Education.



Paula Broome

Paula is the Coordinator for the Centre of Engineering Education. Her expertise lies in setting up new Centres and she has experience in Project Management, Quality Assurance and Higher Education Administration.

Paula is the main contact for the Centre and can be reached on 0207 679 5714 or by emailing p.broome@ucl.ac.uk

Advisory Board

- John Mitchell, UCL
- David Guile, IoE
- Paula Broome, UCL
- Robin Clark, Aston University
- Anne Lahiff, IoE
- Kel Fidler, Former Chairman of the Engineering Council
- Phil Davis, Atkins
- Jenny Young, RAEng
- Sarah John, Creative Consultant
- Oliver Broadbent, Think Up
- Andrew Lamb, Engineers Without Borders
- Matthew Harrison (Chair), Buro Happold
- Ann Watson, Semta
- Lydia Beaton, Dyson
- Professor Calie Pistorius, University of Hull

Contact Us

CEE is always looking for collaborators. If you are interested in our work please feel free to contact us:

- Email: centreforengedu@ucl.ac.uk
- Phone: 0207 679 5714
- Twitter: @centre4engedu