

*APPLICATION FOR EXCELLENCE IN TEACHING AND/OR LEARNING SUPPORT BY A
TEAM AWARD 2018*



QUB TEACHING AWARDS

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Dr Karen Rafferty, EEECS
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Dr Sandra Scott Hayward, EEECS

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1. PREVIOUS TEACHING AWARDS (200 words maximum)

If any of the team members has ever previously won a Queen's Teaching Award, please note the year and category (eg Rising Star, Team etc) below. You should also provide a clear explanation of how the work outlined in this application differs from the work for which the team member(s) were previously recognised. No members of the team should have received a Queen's Teaching Award within the last 3 years.

No team member has received a QUB teaching award within the last 3 years.

2. CONTEXT FOR THE APPLICATION (500 words maximum)

Please provide a brief summary of your application and a context for your work. Examples of the information you should include are the subject you teach; the aims, objectives and rationale for the team's approach; the type of teaching activities you are involved in; the number of learners involved, ways in which the team has directly involved students.

Aims

Innovation is seen as a key aspect and aspiration for the UK economy and the core driver for Catalyst Inc.) which aims to establish one of the most entrepreneurial economies in the world. Queen's supplies the engineers who are in an ideal position to contribute to this drive as they can offer technical innovation - but does this entrepreneurial drive and experience exist within our graduates?

The overall aim of the module is to develop a business proposition for a new product. The module actively challenges students to identify a market opportunity, create a new product that is related to their electrical/electronic /software engineering background, and then go through all the stages of creating a company, developing a product, creating branding and also producing a detailed financial and business plan.

The Team Approach

The role of the Course Directors is to act as 'critical friends' to challenge the students to address the key issues through regular brain storming/stand-up team briefings. The students are also through a series of seminars by leading experts in innovation, finance, intellectual property, branding, marketing and investment who also provide the teams with face-to-face meetings to provide detailed advice on the progress of their product ideas.

Learners

In the 2017/2018 cohort we had 70 students enrolled on Engineering Entrepreneurship modules (separate modules are taught for BEng and MEng students). Students work in teams of five to six. Each team needs to identify a 'pain' which can then be used as a driver to form the basis of a product. This new innovative product either provides a solution to a customer pain/irritation or forms the basis of a 'vitamin' that does not necessarily address a need but which enhances the customer's lifestyle or experience. The teams have to organise their individual roles within the company by identifying who will be the chief executives, technology officers, marketing and finance personnel.

Involvement with Students

The students and team leaders are strongly interlinked within this module. The structure is more akin to a business unit where we are driving the student teams to meet their aims and objectives. We expect the teams to engage and behave in a professional manner. Which they do spectacularly well.

Ethos

Within this module we strive to enhance the soft skills of our students. This module is all about teamwork and time management. We strive to embed professional practice and conduct within our students. Within this module we aim to develop the future innovators of tomorrow. This module lives and breathes failure, but more importantly, the ability to move beyond it. This is a hard process. At the beginning of the module, the teams go through a very difficult time trying to develop a novel product idea. Most of their ideas will fail. But we guide them carefully through this process. Until that Eureka

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moment when they have an idea that will fly. The result. Stronger teams. Stronger individuals. Independent Thinkers. Professional Engineers.

3. DISCUSSION SECTION (1700 words maximum)

Module Team & Collaboration

Motivated by his efforts in setting up a successful University spin-off company, Analytics Engines Ltd, which now employs 17 people, Roger Woods acted to set up the module in 2007. Staff with considerable innovative teaching experience and/or spin-off company experience have joined the team and have helped develop the module into what it has become today. This includes Dr Karen Rafferty in 2010 who has experience in commercialisation of IP and Dr. Neil Buchanan in 2011 who had experience in setting up his own company. More recently, in 2014, Dr Sandra Scott Hayward joined the team and brought her technical and commercial experience.

The team provide a good gender, age and commercialisation experience and to address the student numbers, work in mixed pairs providing a comprehensive response in validating student suggested products. The team also provide considerable breadth of engineering expertise with many different areas of speciality. There is also a wider team in terms in the form of the invited speakers from industry.

The success of the collaborative working of the team can be measured by the numerous internal and external awards resulting from this module (see Outcomes section). In a recent correspondence, Steve Orr, Director of Connect at Catalyst Inc commented 'I have noticed the quality and the confidence of the teams develop brilliantly year on year. You guys are streets ahead of any other MEng talent pool in NI.'

Assessment and feedback: Assessment is largely based on the students' ability to create a realistic company and provide evidence of this through product feasibility prototyping and also through the development of business plans. The real measure of success is the student's ability to convince a Dragon's Den's panel of business experts in their Company Pitches that their idea is viable. The assessment breakdown is outlined:

| Title | Assessment | Percentage |
|--------------------|--|------------|
| Company pitch | Dragon's Den' panel, comprising experts from local industry, Catalyst Inc., investment organisations | 20 |
| Business plan | One of the course organiser and a member of 'Dragon's Den' panel | 40 |
| Feasibility Report | Assessed by a member of technical academic staff and a course organiser | 25 |
| Peer assessment | Peer assessment, moderated by the group progress assessed weekly by course organisers | 15 |

Feedback is delivered continually to the student teams. The course directors meet at least weekly with the teams to help guide them along the process. The teams also meet with relevant experts (marketing, branding etc.) when appropriate. Up until 2017-2018, this feedback was given orally to the students but in 2017-2018, by using a software package Basecamp (based on guidance from the Entrepreneur in Residence at QUB, Ms Helen Keys), this allows us to intuitively track progress and individual students input to the group project. It also provides the perfect platform for delivering immediate written feedback following each meeting. This has been used in a highly successfully way by terms to organise meet and interact and also to engage with the course directors and get feedback at various times.

Employability:

Employability has been defined as 'a set of achievements – skills, understanding and personal attributes – that make graduates more likely to gain employment and be successful in their chosen professions.' In the workplace, employers seek graduates who can cope with the broader demands of a rapidly

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changing environment, and who bring 'softer' skills as well as specialist knowledge. That is, employers increasingly value skills such as team-working, communicating effectively with partners and customers and being able to adapt to new situations and develop new capabilities. For the individual, the ability to continue to develop and apply skills throughout life brings the flexibility to adapt to new challenges, demands and uncertainties.

There is now a well-documented list of skills valued by employers, which are increasingly recognised as generic 'transferable' skills that need to be included in all education programmes. Less well documented, are effective methods and approaches to develop these. Assessment of 'softer' skills can be more difficult than assessment of 'harder' technical abilities, leaving individuals (and their assessors) unclear of their abilities or potential. Students can leave higher education without an appropriate awareness of what they can do and they lack the ability to consciously develop their skills further. Within this module we embed the core soft skills of communication (written and oral), ethical and sustainable working practices, teamwork, leadership, time management etc. We develop the person and the professional engineer. Actually, we are proud of the personal development journey we witness the students undertaking. We truly believe that this module is transformative in the way we educate and assess our students. However, what evidence do we have - bar looking at the individual? Students enrolled in this module are all on pathways that are accredited by the Institution of Engineering and Technology. During our recent accreditation in 2017, the accreditation panel commended this module stating: "Students are provided with the opportunity to build strong teams with clearly articulated roles and the assessment process includes contributions from other students in the team and industrialists". Informal feedback from our Professional Advisory Board has highlighted most students choose to discuss this project when being interviewed for graduate positions.

In addition, as the years have progressed we have noticed a change in mind-set. The teams that we coach are very much interested in entrepreneurship and would like to progress with their company development after graduation. "This module encouraged us to meet up with various experts such as: patent attorneys, lawyers and product designers and really allowed us to take ownership of our product. It encouraged us to believe that starting our own business really was a viable option and something to be considered when leaving university especially with all the contacts and the help which we received during the module and afterwards." CEO Snapit

Partnership:

Within this module, we strive for students to take ownership of their project. We as coordinators essentially take on an advisor or coaching role to help them along the process. As such, we view ourselves very much working in partnership with the students so that they can deliver all of the required goals. In 2014, Rafferty and Woods published a text book on the subject (details given in a later section). However, as part of this published text book it was imperative to have a student perspective on the process. Two students were asked to contribute to the book, which they happily did.

Digital literacies:

As part of the Pitch and Business plan preparation, students have to become intimately aware of the capabilities of digital technologies both when presenting the work, i.e. using specialist presentation software, e.g. Prezi, Visio, and in creating digital content, e.g. in the form of video and audio inserts as part of their presentation. In many cases, students will develop their own company webpages. The teams also need to become familiar with web development tools, software packages, embedded systems packages and programming languages. They have to demonstrate a high degree of expertise of these digital tools as they are required to create an effective prototype which they use to demonstrate their approach.

Technology:

The students have to look at using a range of social media with regard to advertising their products and in many cases includes creating high professional video clips to advertise their products, in many cases, using humour in creative ways to communicate the product they are developing. They are strongly encouraged to employ innovative marketing approaches which in many cases targets age or social

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groups so they have to become highly familiar with google ad words and other online advertising media and channels that are supported through social media.

Creative ways you have addressed a challenge, situation, problem.

This module is all about creativity. We do not know what idea or product the student teams will come up with. So we are also on a journey every year with the student teams to think innovatively to make that idea a reality with a viable business plan. Every year is a challenge! But it keeps life interesting!

Discussion on the outcomes from the team's work and how it has enhanced learning.

Examples of internal and external success of the students include.

- **Buteos** with an innovative smartphone-based product for hitching a caravan or trailer were runners up in the 2012 25k Awards;
- **Uto; The Sous Chef** developed an innovative approach to new forms of cooking and were finalists for the Santander Universities entrepreneurship awards in 2013;
- **Sleep State Labs** who cleverly puts your phone to sleep when you do, won the 2014 Dragons' Den.
- **Kairos** who have developed low cost solutions for electric car charging, were runners up in the 2014 Dragons' Den.
- **Snapit** have developed an electronic wristband which can break nasty habits and remove addictions and **Eleso** have developed a smart refuelling solution. Both were runners up in the Invent 2016 competition, with a total prize fund of £33K and appeared on prime time BBC TV's "Made in Northern Ireland".
- Two teams, **Evy** and **Kegomatic** won their respective categories in the Invent 2017 competition which challenges inventors, entrepreneurs, scientists and startups with proof-of-concepts and prototypes in science and technology to discover the commercial potential of their idea. **Evy** (<http://www.catalyst-inc.org/techwatch/evy>) won the Electronic category and **Kegomatic** (<http://www.catalyst-inc.org/techwatch/kegomatic>) won the Agri-Science category. Another team **Stringsense** and **Evy** were winners of the Dragons Den 2017.

Because we have successful team stories, this really motivates the new student intake on the module to outperform the previous years students! Competition is a great thing.

Please outline any future plans for development and/or dissemination of the team's work.

Two members of the team (Woods and Rafferty) published a subject text book of the module. (<https://www.wiley.com/en-gb/Engineering+Innovative+Products%3A+A+Practical+Experience-p-9781118757734>). Engineering Innovative Products: A Practical Experience, Roger Woods (Editor), Karen Rafferty (Editor), Julian Murphy (Editor), Paul Hermon (Editor), ISBN: 978-1-118-75773-4, Jul 2014. Prof Woods also delivered a seminar entitled 'Entrepreneurship in practice in a university setting' to over 300 students and staff at the Faculty of Engineering in the University of Liverpool on 16 October 2014. The course team will also be involved in future dissemination of the work within this module to top ranked pedagogic teaching journals.