Report

Intellectual property in the engineering syllabus – a model for integrating key but not core concepts across the disciplines

A project funded by the Engineering Subject Centre and the UK Centre for Legal Education and authored by Professor Jim Roach and Professor Ruth Soetendorp, Bournemouth University

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Executive summary

An understanding of intellectual property rights (IPR) is key to the working life of engineers and related creative professions. At the same time, IPR is not seen as core and can, therefore, be perceived as marginal, within the constraints of the curriculum. In this collaborative project the interaction between lawyers and engineers has been considered through analysis of the current body of literature and project surveys. The activities of international bodies, educational requirements of commercial organisations and curriculum development within university departments have been highlighted. The project has shown that cross-disciplinary working can be positively embraced to the benefit of students and that an understanding of IPR can contribute to commercial success in the engineering sector.

The key achievements have been in three areas. Firstly, two workshops have brought together interested parties from both disciplines to discuss, at an international level, the role of IPR. This has resulted in further networking events and a combined response to the Treasury Review of Intellectual Property (Gowers Review, 2006). Secondly, a model assignment (the 'Advice Letter') has been developed within Bournemouth University. It allows self managed learning to take place between groups of students from different disciplines (law and engineering). There are good indications of future take-up in both other disciplines at Bournemouth and other institutions. Thirdly, a growing resource has been amassed, currently available at www.engsc.ac.uk. An interactive website is in production which will be available at www.engsc.ac.uk and www.ukcle.ac.uk.

This project has a lasting outcome - showing that cross-disciplinary working can be positively embraced by all parties to the benefit of our students and for commercial success in the engineering sector.

Introduction and background

This project has its roots in informal dialogues between academics who, whilst deeply engaged in their respective disciplines, share an enthusiasm for the scholarship of 'learning and teaching'. The project team comprises intellectual property lawyers Ruth Soetendorp and Bill Childs and engineers Jim Roach and Rob McLaughlan (see Appendix 1). Bill and Rob are based at the University of Technology, Sydney, Australia. Ruth and Jim are at Bournemouth University, UK. We are all aware of the importance of university based IPR education across the disciplines as key to achieving successful graduate and postgraduate employment and enterprise career paths. The project team is a unique blend of engineering academics and law academics, committed to a research based approach to the advancement of learning and teaching. In 2004 the Higher Education Academy Subject Centres of Engineering and Law agreed jointly to fund a small project to investigate the extent of intellectual property law education in non-law faculties and to suggest ways of developing the engineering curriculum to accommodate it.

Aims and objectives

The need for increased higher level entrepreneurship skills amongst higher education graduates is well recognised. Intellectual property competence was explicitly recognised within the UK-SPEC 2004 (Engineering Council UK) engineering accreditation criteria. In order for graduates of engineering, science and technology to be able to participate in enterprise they need to have acquired fundamental skills in working with intellectual property (IP) during their studies. There are barriers to integrating the study of IP into engineering

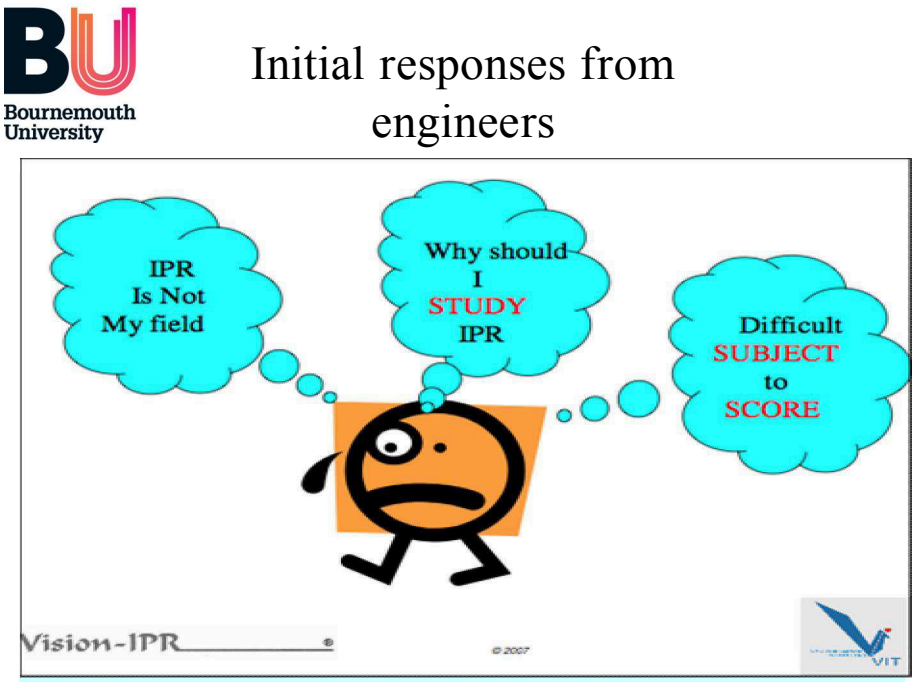
curricula. Those we had identified include:

- engineering academics' belief that IP content is not as important as other engineering content
- the engineering curriculum is already overcrowded and could not support any new subjects
- no established pedagogy for creating well planned, integrated, sequenced and cumulative learning experiences to integrate relevant material from other disciplines into the core engineering curricula.

We were looking to develop resources and materials that supported 'integrating intellectual property' as:

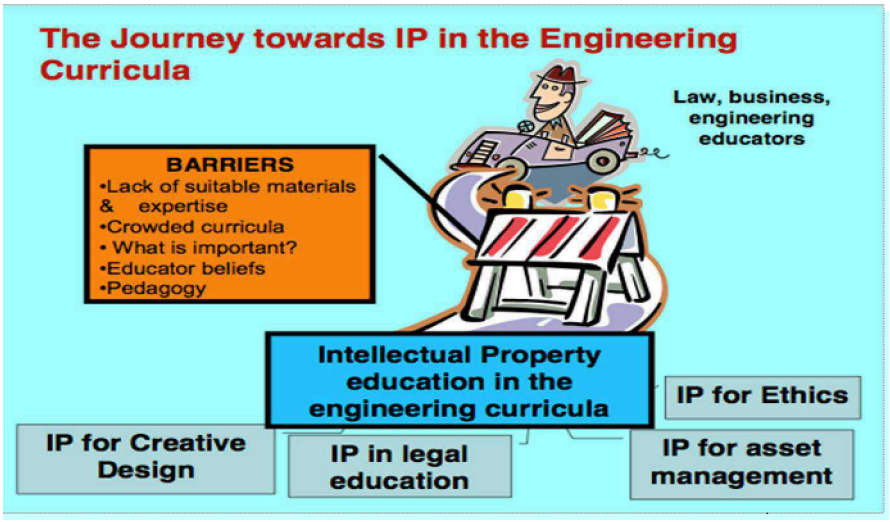
- a significant strand of enterprise education
- a model for delivery of other areas of law/regulation/compliance to non-lawyers
- a model for developing a pedagogy that will facilitate the inclusion of other non-core key topics into the syllabus

This is an important aspect of understanding the context of how IP education is likely to happen in the engineering curricula. By trying to address some of these fundamental questions through an extended literature review into existing practice and collecting relevant information, we expected to be able to provide a foundation to help develop both multi-disciplinary engineering education and the pedagogy of intellectual property education for non-law students.



1

(Slide presented at workshop on 17 May 2007 by Prof Abhyankar, Vishwakarma IT, Pune, India)



(Slide presented at workshop 10 October 2005 by Dr. Rob McLaughlan, University of Technology, Sydney)

Methodology, findings and results

Literature search

A search of the literature revealed some evidence of intellectual property teaching to engineers, often in combination with business management, ethics, finance or design, which has been collected and made available through the online resource at www.engsc.ac.uk. The World Intellectual Property Organisation has published intellectual property education papers and comparative curricula on its website at www.wipo.int. The Canadian Intellectual Property Office has conducted an 'environmental scan' of intellectual property education in Canadian universities and colleges. The objective of the first phase of this new strategic initiative was to facilitate the integration of IP and its strategic use into the undergraduate and graduate curricula of engineering and science faculties at Canadian universities and colleges. Its findings revealed a growth in interest in IPR education but instruction directly related to IPR issues appeared to be minimal, often a one to two hour lecture with a business focus. However, one person interviewed supported the concept of better and more comprehensive exposure to issues related to IPR. The European Patent Office has held a series of roving workshops discussing dissemination of IP knowledge in universities.

At the EPO Academy Helsinki roving workshop a number of papers described attempts by universities and national intellectual property offices to introduce intellectual property programmes and units to university courses. The "Patent Engineering" programme at the University of Applied Sciences Amberg Weiden was presented by the director Prof. Dr. Jur. Andrea Klug at the October 2007 workshop (see slide below).

The programme "Patent Engineering"

Fachhochschule Amberg-Weiden
Hochschule für Technik und Wirtschaft
University of Applied Sciences

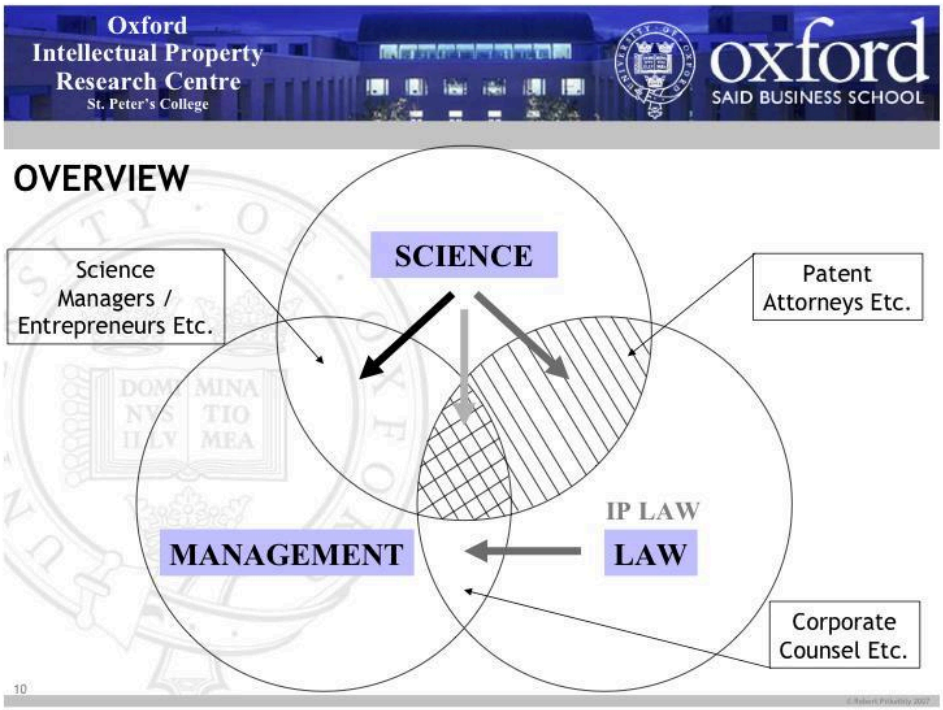
The programme in numbers

Date: winter semester 2007/2008

Start of programme	Winter semester 1999/2000
Total number of students **Freshmen**	108 30
Gender distribution	35,2 % Female 64,8 % Male
Graduates	37 (Status: October 2007)
Average duration of study	9,86 semesters
Rate of unemployment	0 %

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Suggested content for IP programmes for people working with intellectual property rights, as engineers, managers or legal advisers, was described by Dr Robert Pitkethly, Said Business School, Oxford University (unpublished). The paper by Prof Soetendorp (unpublished) describing the 'IP and Engineers' work at Bournemouth (described herein this report) was the only paper to explore how IP can be integrated in existing engineering curricula.



The World Scientific and Engineering Academy and Society (WSEAS) and Australasian Association of Engineering Education (AAEE) are two engineering education conferences that have been interested in receiving papers on the topic 'IP and Engineers' (Soetendorp, 2005a and McLaughlan, 2005). Interdisciplinary endeavours are not popular with academics for three reasons. Firstly, the outcome of interdisciplinary work does not rate highly in the UK's Research Assessment Exercise. Secondly, it is not a natural contributor to career progression. Thirdly, single discipline academic departments find it difficult to 'manage' interdisciplinary enthusiasts. Because of the perceived aversion amongst academics to interdisciplinary endeavours, we have considered it imperative to share our work in fora that recognise the importance of interdisciplinary work that combines educational scholarship with disciplinary scholarship.

A search of the UK's University and Colleges Admission Service (UCAS) database for courses that offered intellectual property opportunities to undergraduates on engineering programmes revealed a zero response - even where the team knew that IPR learning **was** available on engineering programmes offered by specific institutions.

Attitudes of engineering academics to IP education in UK and Australia were researched in conjunction with a paper commissioned by the World Intellectual Property Organisation. (Soetendorp, 2005b). Attitudes of students had been measured through questionnaires completed by students of many disciplines in a research project sponsored by the UK Patent Office in 1996 (see Appendix 2). Interviews with recent graduates expressed similar opinions - that intellectual property is not relevant to the student's course but is perceived as relevant to the student's future career.

For attitudes of small and medium size enterprises, and industry in general, we drew on the recent UK Intellectual Property Awareness Survey undertaken by the DTI and the UK Intellectual Property Office. Findings of the survey (Pitkethly 2007) reveal low levels of awareness amongst micro, small and medium sized enterprises. For example, 11.2% of micro-enterprises with up to nine employees know that publishing before filing will invalidate a UK patent application. The Economist Intelligence Unit report 'The Value of Knowledge' (2007) found IP is no longer regarded merely as a protective shield for inventors but also as a strategic tool for value generation.

We contributed to the Gowers Review of Intellectual property (2006), but were disappointed to note that there was no mention of 'positive' IP Education (i.e. how to use IP for commercial success), only 'negative' IP education (i.e. how to avoid rip-offs and counterfeits). The Sainsbury Report, 'The race to the top' (2007), is a report on the government's science and innovation policies which devotes a chapter to educating a new generation of young scientists and engineers:

> *A leading member of the engineering profession should be asked to set up a working group of experts from academia and industry to review current approaches to engineering education. The group should develop, with a number of leading engineering universities, an experience-led engineering degree which integrates technical, operational and business skills.*

Surveys and questionnaires

During 2002-2003 a questionnaire was conducted amongst engineering faculties as part of Professor Ruth Soetendorp's National Teaching Fellowship project. Her fellowship enabled

her to investigate the differences in intellectual property education in the UK, Australia and Japan. The findings of this research influenced the proposal to the Law and Engineering Subject Centres to develop interdisciplinary education of engineers and lawyers. The findings are included as Appendix 1 to this report. In 2005, when the HEA Subject Centre funding had been approved, Professor Jim Roach conducted some additional enquiries amongst contemporary engineering academics which are included in the 'snapshot' below.

IP in Engineering Education		
1	Your name (optional)	
2	Your institution	
3	Your Faculty/School/Department/etc.	
4	In which Faculty/School/Department is the primary location for IP teaching and research?	
5	Does IP feature in the curriculum of your Faculty/School etc.?	Yes/No
6	Is it a separate unit or is it embedded in a unit?	Separate/Embedded
7	At what level is it taught? Undergraduate? Postgraduate? Professional?	
8	Who teaches IP? Lawyer? Engineer? Technologist? External speaker? Other?	
9	What resources are used? Teaching material? Games? Case studies? Other?	
10	Is this part of an assessed programme? If yes, how is it assessed?	Yes/No
11	What resources are used? Teaching material? Games? Case studies?	
12	Are there any entrepreneurial activities or other extra-curricular activities? (For example, see http://www.start-now.co.uk/)	

There is no consistency in how IP education is delivered on non-law courses. A small project team of engineering and intellectual property academics (Soetendorp, 2005a) is currently engaged in a research project to identify a pedagogy and resources that will facilitate the integration of intellectual property into the non-law curriculum. A number of engineering faculties in the UK and Australia had been surveyed to identify whether IP features on their courses, and, if so, how it is taught and by whom. Additional engineering colleagues were surveyed in 2005. Here is a ‘snapshot’ from responses received to date:

Providing IP education for engineers (UK):

- We do a day course. The university lawyer does the general IP material and I give a summary of some of my experiences in starting two commercial companies. I have done a lot of the IP work with the lawyers and I wanted the students to share my experiences. I have developed a set of PowerPoint slides which I use in conjunction with a model collaborative agreement.
- We do some IP teaching, using a lawyer and a patent agent as visiting speakers.
- IP is embedded in taught units and is assessed as part of an overall project where students have to write a business plan and address the issue of IP.
- IP is embedded in taught units, and delivered by an engineer and a visiting patent agent. Resources used include games and case studies. Understanding of IP is assessed through entrepreneurial projects and assignments.
- This is covered in all engineering undergraduate courses but the level and detail is not high. The work is assessed, but the focus is unlikely to be on IP.
- IP is integrated into activities covered by the Knowledge Transfer Centre, it doesn't feature in the curriculum, it isn't assessed. Guest speakers provide guest lectures on some courses.

Providing IP education for engineers (Australia):

- It's a small part embedded in 4th year unit *Introduction to Management*. We invite external speakers, a lawyer and a specialist lecturer from Australian Technology Park. On undergraduate Software Engineering there is an IP compulsory.
- It is present, but not well developed in 4th year Management. We want to develop a stronger IP presence. Engineers teach, using IP Australia handouts and case studies. We used IP Australia experts, until the service was suspended. Sometimes we use Senior Patent Attorney.
- IP is embedded in several topics. It's a small presence, probably not consistent. We plan to do more.
- It is taught by an engineer as a separate part of a discrete final year business management unit.
- It is taught by a visiting lawyer in the final year entrepreneurship unit.
- Doesn't really feature in the curriculum – addressed ad hoc fashion in some design subjects.
- Not addressed explicitly; implicit in some of our design subjects.
- Touched upon in several subjects, taught by an engineer, sometimes with an IP academic from Law Faculty.

The Australian responses include reference to engagement with IP Australia, the national intellectual property office, whilst none of the UK academics referred to the UK Intellectual Property Office, formerly the UK Patent Office. Whilst Bournemouth University has enjoyed long standing support from the UK-IPO, the UK-IPO has focused more on educational projects with schools and SMEs than with higher education institutions.

Where IP is taught at all, it is embedded in another unit, often 'business' or 'management', often in the final year. Collaboration that involves participation from the law faculty is rare. Collaboration that involves a non-law academic inviting an IP professional to deliver a guest lecture is more common. There is no clear pedagogy for delivering a course element that is cognitively disparate from core content.

UK respondents indicated that IP featured on their courses, but several commented 'not at a high level'. They suggested 'a general awareness'. Most popular delivery was by external speaker (lawyer or patent agent) in conjunction with a member of the engineering faculty (60%). Some use staff from the university technology transfer centre (about 30%). No-one mentioned working with the law faculty. IP featured as a small element of summatively assessed work in about 30% of responses. Case studies and lecture notes are the most popular resources. One identified games, none mentioned web based resources. One university runs a Masters in Research in Clean Chemical Technology, which includes a unit on 'IP, Business Opportunities and the Impact of Environmental Legislation'.

An Australian engineering academic commented, "I believe what stimulates undergraduate interest in IP is the fact that in my experience every student has a dream to create something that will make them a millionaire. There appears to be an inherent awareness that IP means more." This contrasts with research undertaken at Massachusetts Institute of Technology (Sawhney, 2003) with postgraduate engineering design students. It showed them to be wary about patents, which some saw as 'unethical' or 'mystifying'. They were interested in patenting whilst at university because it is 'cool' to achieve the 'recognition' of a published patent. They appreciated the 'control' a patent gives in being able to influence how ideas are utilised by others. The institutional setting and support (implicit or formalised) had the greatest influence on the nature of IPR adopted.

The resources used most frequently in IP classes on engineering courses are as follows, with the most frequently used first:

- Lectures
- Course notes prepared by individual academics
- Australian Graduate School of Management text
- Case studies
- Teaching materials and resources other than individual notes
- IP Australia (one)
- Games (one)

There was no mention of interactive or customised resources, nor of databases or other internet based materials.

The 'IP and Engineer' workshops

The two workshops held on 10 October 2005 and 17 May 2007, with thanks to the generosity of the UK Intellectual Property Office at their Harmworth House, London WC1 premises, were the most valued outputs of the project to date. From feedback received from participants, we understood the truly unique nature of the encounters we facilitated.

Intellectual property law academics who had never before discussed their work with engineers (i.e. creators of IPRs) debated with engineering academics who had never before discussed their understanding of patents and other IPRs with IP lawyers. The papers presented to the workshops reflect good practice from both engineers and lawyers.

International participants at the workshop, 17 May 2007, UK-IPO

We were delighted to welcome representatives of industry to the two workshops, namely Dids MacDonald, founder of Anti Copying in Design (ACID); Robin Philips, Director of ARM plc, Mandy Haberman, the well known inventor of the 'Anywayup' ® cup, and Philip Robinson of Zorin, a new company founded by Philip and based on the intellectual property he had developed from his final year product design project at Bournemouth University.

Examples of progress in delivery of IPR to engineers can be seen in edited feedback received from workshops:

Jim Yip (Huddersfield):

All the department's students who are on accredited courses leading to MEng undertake HNM2402 (Project Management, Quality Management and Intellectual Property). The intellectual property aspects of this course are taught by Tina Hart, a principal lecturer in the university's law department and author of the standard text in this area "Intellectual Property Law" (Palgrave Law Masters), ISBN: 9780230006331. The teaching and assessment in this area ensures that we comply with UK SPEC.

Pete Lewis (Open University):

We have developed a new course which includes a substantial amount of IP content (mainly about patents) and taught in an engineering context. It is presented at postgraduate level to engineers and scientists working in industry, and also deals with failure analysis (T839, Forensic Engineering). The course was developed in collaboration with London Metropolitan University (where it is a component part of their MSc) and supported by EPSRC in an Integrated Graduate Development Scheme (IGDS) funded to about £0.5 million. The course currently attracts 60-80 students pa, with a course fee of £1050, and an optional weekend school at £300. The final exam includes two IP questions, one involving analysis of a patent provided to the students, the other a registered design.

Following the workshop in early 2006, I presented a paper describing our work to the engineering education conference in Liverpool in the autumn (the paper is posted on the web at ee2006), and also invited Ruth Soetendorp to the Open University for discussion of ways to improve IP teaching. One outcome was that IP teaching was introduced into a Business School course B223, Business and Entrepreneurship.

I found the workshop of good value for meeting colleagues with similar interests and ideas. Later, I suggested that a distance learning course be prepared between interested universities, with funding from ESPRC, but the project has yet to be fulfilled. There is a clear need for teaching material in this key subject, and I have, for example, chaired two seminars at the Open University, also involving a team from the Patent Office.

David Orozco (Kellogg Business School and Michigan Technological University)

As part of my teaching duties I have launched the course 'Intellectual Property, Technology, Innovation and Society', Michigan Technological University School of Business and Economics (cross-registered with School of Social Sciences, 18 undergraduate students), Fall 2007. Half of the students are engineers. I've attached the syllabus for the course. I am enjoying teaching this course a great deal and I find the students very interested in the subject matter! (David Orozco's course syllabus can be found in the web resource area of the project web site)

Attendance statistics also give insight into the interests and backgrounds of workshop participants:

Expressing interest in 2005 and/or 2007

Sectors	Actual	%
Academic Law	9	8
Academic Engineering	26	25
Academic Not Known	7	7
Business Law/IP	7	7
Business Engineering	9	8
Student Law	5	5
Student Engineering	1	1
Gov/Other Bodies	28	26
KT/Commercialisation (HE)	14	13
	106	100

Attending 2005 and/or 2007

Sectors	Actual	%
Academic Law	9	9
Academic Engineering	25	25
Academic Not Known	7	7
Business Law/IP	7	7
Business Engineering	7	7
Student Law	5	5
Student Engineering	1	1
Gov/Other Bodies	27	26
KT/Commercialisation (HE)	14	14
	102	100

What has been achieved - (1) IP and Engineer Networks

The two workshops have generated informal networks, which we hope to maintain and grow.

The whorl internet resource has a section for contributions from interested parties, including academics, industry players, and practitioners. It is difficult to anticipate how the ongoing network will be maintained with current resources. Hopefully, the network will be seen to be a project worthy of support through engagement of a network management.

As a result of the network, we were able to respond to the call made by the Gowers Review of Intellectual Property (2006) for suggestions as to how UK intellectual property policy might be changed. Thirteen academics and industry players, representing engineering and IP law, signed a response to the government's Gowers Review of Intellectual Property, calling for a stronger emphasis on the inclusion of intellectual property education in the curriculum of engineering, science and technology programmes.

The 'IP and Engineer' workshop model was adopted for a two day seminar organised in January 2007 by the Ministry of Education, Karnataka State, India and the World Bank. As a result, three engineering academics from India presented their work to the 17 May 2007 workshop in London.

A small group of workshop participants have discussed publication of an 'IP and Engineer' text.

Cross faculty work involving the IP Advice Letter is developing through workshop participants, including academics from IP and engineering in other universities and academics from other disciplines at Bournemouth.

What has been achieved - (2) the 'Advice Letter' model

Barriers to cross disciplinary working are both cultural and operational. Traditionally engineers find subjects such as law and business difficult and a distraction from the main

business of engineering and design. As graphically shown below, engineering faculties do not fully engage interprofessionally. Lawyers, both as students and in practice, find subjects such as enterprise and innovation alien. Operationally it requires cooperation between participating faculties to create the opportunity for the students to enjoy engaging with each other in the self managed learning environment provided by the 'Advice Letter' relationship described below. For pedagogic innovations of this nature, champions within each faculty are essential:

> *A single leader, a college president, can initiate change, but the idea does not go far unless ranking and powerful members of the faculty swing into line and remain committed after the initiator has gone*

(Shattock, M., National Conference of University Professors, 2007, citing Burton Clark, 1970).

We recognise that whilst this initiative has been piloted in Bournemouth, it has the potential to be transferred to other institutions. This is borne out in the feedback we have received from the UK IPO, patent practitioners, participants in the IP and Engineering workshops and delegates at conferences attended by the project team.

The 'Advice Letter' has been recognised by participants at the National Council for Graduate Enterprise international conference in September 2007 following a presentation by Roach and Soetendorp. It has potential to create self managed learning opportunities between engineering and law students in different universities, and students from faculties other than engineering and law (e.g. media, business, environment, etc). The 'Advice Letter' is the subject of a HEA National Teaching Fellowship project bid by Bournemouth University. We are seeking resources to enable the 'Advice Letter' to be evaluated and piloted between different faculties in different universities.

Over the last two years a presentation methodology has evolved where students studying IP law are paired with product design students. The IP law students act as advisers for the product design students, acting as clients, who undertake a major project which results in a working prototype. The IP law students consider the product designers' projects and construct an 'Advice Letter' on all aspects of possible intellectual property protection and exploitation. The 'Advice Letter' is summatively assessed for the IP law student and the product designer has to include consideration of the Advice Letter within their project report.

The students are grouped at a formal masterclass where both cohorts of students receive presentations from a practising patent attorney and a practising product designer. Students have been encouraged to set up meetings between 'clients' and 'advisers' face to face, via phone, text or email. A typical email trail is shown below, evidencing the high level of interactive dialogue and deep learning taking place by both parties.

- *"I am designing a sensory table for wine bars, activated by the user"* (Colin)
- *"I understand that have a joint Workshop and wondered whether you would be able to meet up afterwards"* (Natasha)
- *"Client confirmed following:*
  i. His product will be controlled by sound levels… 4 electromagnets will control the rippling effect in the ferrofluid EFH1 ii. he is not aware of any similar or identical products on the market iii. He is designing a logo for the product (Natasha)
- *"I've attached a logo for you to see. I'm going to call it 'skimming stone"* (Colin)
- *"I have been looking at your trade mark and on searching the Patent Office website it doesn't appear that anyone else has registered "skimming stone" as a TM, nor as a*

domain name. In terms of your logo, I note that one of the squares contains a ripple effect. I wondered whether this is a drawing you have produced yourself, or whether you have copied it?" (Natasha)

- "*With regard to the logo, I did use a copied picture which I manipulated a bit. However, I will be making my own version of a ripple for that square for my design show*" (Colin)
- Natasha asks about*: software, hardware, ripple visual effect, and Colin's relationship with the bar that is interested in 'skimming stone'*
- Colin responds to the questions, and explains that he has not been commissioned to make 'skimming stone' but is allowed to use the bar's logo.

In the current year (2007/2008), students are encouraged to conduct their 'meetings' via discussion groups on the university's virtual learning environment. Working online affords greater opportunity of promulgating the Advice Letter model to other universities, including universities which might offer engineering but no law or law but no engineering.

Feedback received from the students is overwhelmingly supportive.

Launching the 'Advice Letter' at the masterclass, held in the autumn term, has been an effective way of initiating the cross disciplinary work. Working with groups of 'advisers' and 'clients', rather than pairs, should ensure a more consistent level of engagement from all parties, mitigating the risk of a 'poor' adviser working a 'good' client, and vice versa. Working in groups allows flexibility in cohort sizes and offers the opportunity to introduce an element of peer assessment. An email from the engineering students' tutor, at the end of the exercise run at Bournemouth 2006/7 said "*When they [design engineers] got to write their reports the students then really appreciated the input from your students [IP law] so ended up being generally happy bunnies, except for those few who didn't get a letter for whatever reason.*"

Comments on the Advice Letter:

Paul Turner, a retired patent attorney, on reading about the work (Soetendorp R, *"Developing The Curriculum For Collaborative Intellectual Property Education"* JILT 2006 Special Issue from University of Warwick), wrote (by email on14 October 2007) "*I would like to encourage the design students to make them aware of the problems as you have done in your department*" and has offered a prize to reward student success in this area.

David Morgan, Enterprise and Education Development Manager with the UK Intellectual Property Office, wrote (by email on 29 September 2007) *"I am most impressed with the innovative approach which is being taken by Ruth Soetendorp and Jim Roach of Bournemouth University to deliver what is sometimes perceived as a difficult subject to undergraduates, that is a means of conveying to undergraduates some understanding of the key role that IP plays in enabling business to compete successfully in global economies.*

At the UK IPO we consider engagement with this target audience to be a key element in attaining one of our objectives which is to target today's students/tomorrow's generation business people and ensuring they acquire a sufficient knowledge and understanding of the value which is contained within the hidden intellectual assets of organisations.

Ruth and Jim have developed an innovative approach using students as the resource in a programme which is worth considering for national roll out."

What has been achieved - (3) web resource

The web resource located at www.engsc.ac.uk and www.ukcle.ac.uk brings together resources from many different sources, as described in the contents list below.

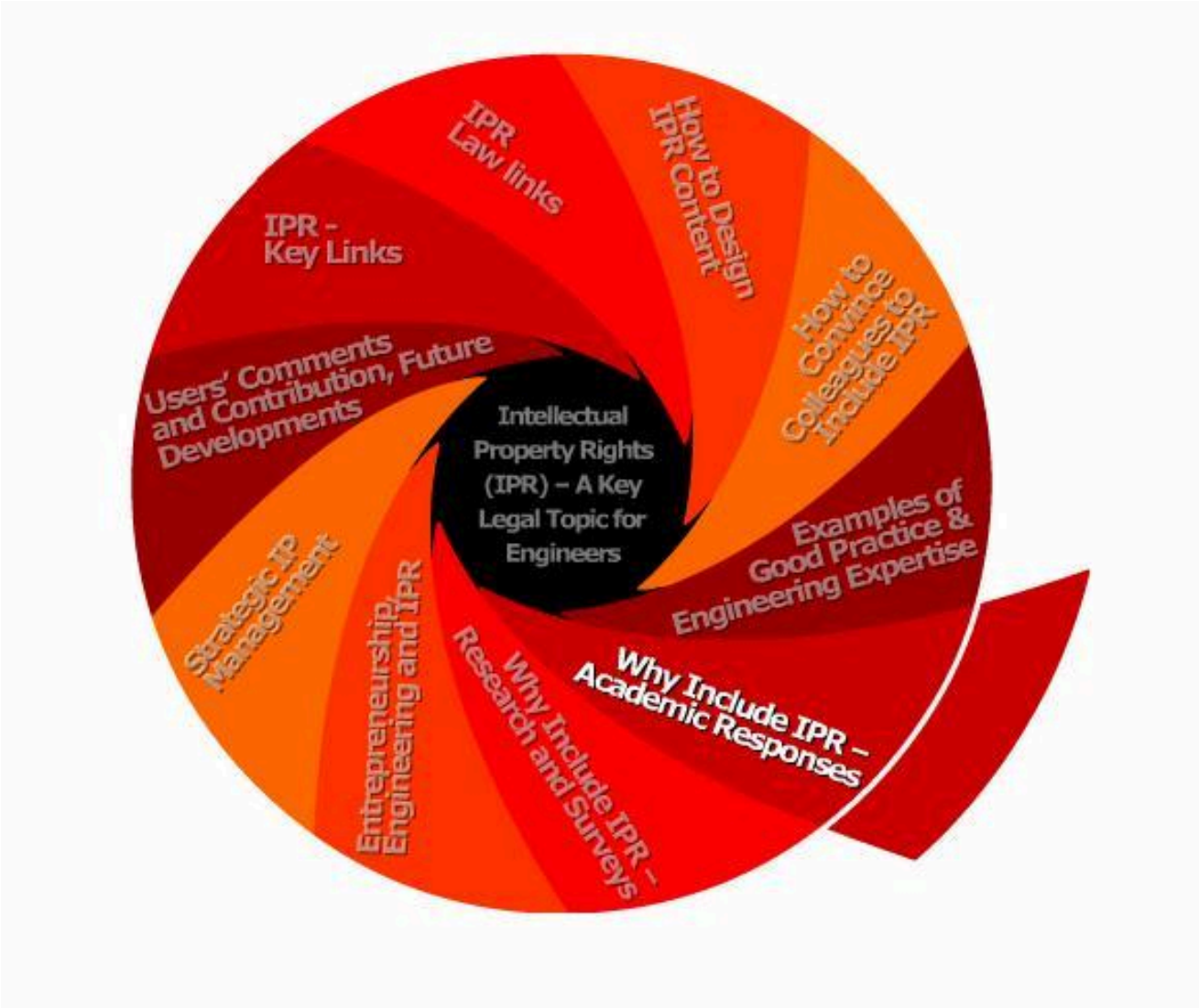
UK Project leaders Ruth Soetendorp and Jim Roach have presented the 'IP and Engineers' research project to the Learning in Law initiative, the UKCLE and the Engineering Subject Centre. They have presented conference papers to the National Council for Graduate Enterprise, the International Enterprise Education Conference, the European Patent Office, the World Intellectual Property Organisation, the HEA Interdisciplinarity: Learning, Leadership and Life conference and Bournemouth University's Learning and Teaching Study Day. All presentation and publication outputs can be found on the web resource.

Website design

Based on a whorl (below) the areas covered are:

1. Intellectual property rights (IPR) – a key topic for engineers (p*roject outline)*
2. IPR key links (*links to key information providers within the IPR sector)*
3. IPR law links (*links to legal resources)*
4. How to design IPR content (*links to resources giving examples of activities, including the Advice Letter, student feedback forms and further materials supporting the use of the Advice Letter)*
5. How to convince colleagues to include IPR (*links to papers evidencing the need for and positive outcomes of the inclusion of IPR)*
6. Examples of good practice and engineering expertise (*links to papers presented at both the 2005 and 2007 workshops)*
7. Why include IPR – academic responses (*links to papers which outline outcomes of including IPR)*
8. Why include IPR – research and surveys (*links to international research papers and government reports concerning inclusion of IPR education; its benefits to economic growth and the development of the engineering sector)*
9. Entrepreneurship, engineering and IPR *(links to a range of papers considering the impact of the inclusion of IPR in engineering within the wider community)*
10. Strategic IP management *(links to papers that consider the asset management aspect of IPR within business)*
11. Users' comments and contribution, future developments *(interactive area and space to notify of future events and extensions to the current project)*

Website design



To link directly to the whorl go to
http://www.engsc.ac.uk/resources/ipminiproj/index.asp

Conclusions

Intellectual property management underpins commercial exploitation of engineering solutions.

Deferring initial exposure to intellectual property rights until post graduation exposes new engineers to the risks of mismanaged intellectual property (both for themselves and for their employers). Integrating intellectual property awareness at the undergraduate stage of education has several benefits. Undergraduates are receptive to new ideas - if something is included in their university studies they will appreciate the significance more than if their engineering professors have chosen to ignore it.

There is no established pedagogy for creating well planned, integrated, sequenced and cumulative learning experiences for IP education when the learning activities reside in different subjects within a course. The challenge of integrating relevant material from other disciplines into the core engineering curricula is also a challenge faced by other initiatives which seek to do likewise across the curriculum (see McLaughlan, 2007 and Roach, 2006). Outcomes from this project in IP Education are expected to inform and be informed by approaches used in these other initiatives.

We are grateful to the Engineering Subject Centre and the UK Centre for Legal Education for supporting this initiative.

Jim Roach
Ruth Soetendorp

Bournemouth, 31 October 2007

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Appendix 1: Members of the 'IP and Engineers' project team

Bill Childs has, through monitoring student and teacher feedback and undertaking curriculum design research, developed considerable expertise in successfully integrating law subjects into non-law curricula, particularly where the majority of students are engineers, scientists and bio-scientists. Bill's doctoral research focused on developing strategies to overcome the reluctance of many non-law students and non-law curriculum designers to engage at an appropriate level, and to recognise the value in the exposure of non-law students to the rudiments of the legal processes.

Dr Rob McLaughlan's development of curricula models that allow for the integration of non-core techniques through active learning techniques informed the design of resource outcomes for this project. Through active learning techniques such as online role-play simulation, Rob has developed curricula models that allow for the integration of non-core elements into engineering programmes. He has published widely in engineering education and won national and international awards for his educational material.

Professor Jim Roach's experience of managing knowledge transfer partnerships has made him aware, as an engineer, of the need to incorporate IP teaching into the portfolio of skills that engineers require in order to operate in the modern economy. Jim's innovative engineering work has involved developing new products and processes and championing knowledge transfer from university to industry. He was awarded one of the first twelve HEFCE National Business Fellowships in 2001.

Professor Ruth Soetendorp drew on her experience in the design and delivery of postgraduate intellectual property management programmes and interactive, self managed resources to facilitate university and work-based IPR learning. Ruth's cross-disciplinary work to encourage the inclusion of intellectual property awareness and competence in engineering and other non-law programmes led to the award of a HEA National Teaching Fellowship in 2001. She has delivered papers, workshops and published on law for non-lawyers with UKCLE.

Whilst on sabbatical in the law department at UTS, Ruth, Bill and Rob began to discuss the value to engineering students of including intellectual property in the curriculum. Ruth recalled the way in which, with Jim, IP law undergraduates and engineering undergraduates at Bournemouth had been brought together to work as 'advisers' and 'clients' to the mutual benefit of both groups of students.

The HEA Engineering Subject Centre and HEA Law Subject Centre (UKCLE) both agreed that there was sufficient potential in the ideas we were exploring to support a mini-project researching how a key concept (intellectual property) which was not core (to engineering) could be integrated into the curriculum. Between 2005 and 2007 the four team members collaborated to produce opportunities for dialogue which generated resources and materials.

Appendix 2: IPR for engineers - engineering academics' responses to questions concerning intellectual property education 2002 - 2003

A one A4 sheet questionnaire (see below) was designed for use when discussing IPR at the European Electrical Engineers Education conference in York in April 2002. It was subsequently used with engineers at the Australian Association of Engineering Education in Canberra, September 2002. It was used in discussion with the engineering faculty at Tokyo Metropolitan University in November 2002. Finally, it was e-mailed to the engineering staff at Bournemouth in January 2003. There were 35 respondents from 18 universities

Questions 1 and 2
29 respondents felt that IPR is an enterprise skill, four did not. Only nine featured IPR in their undergraduate programmes, 20 did not.

Questions 3, 4, 5, 6, 7, and 8
In Australia, 36% of Universities (5 out of 14) include IPR. Where they do, there is no consistency as to who teaches it, nor where in the course it is located. In Japan, only one university's faculty (Tokyo Metropolitan University) was given the questionnaire. At TMU an optional IPR unit is taught by part time lecturers for a full semester, 1 ½ to 2 hours over ten weeks. However, individual members of faculty have different impressions of what was being delivered. From the European responses, only one university's engineering faculty (Bournemouth) includes IPR and, where there are 10 or more hours spent studying IPR, it is summatively assessed.

Questions 9, 10, 11, 12
Ten respondents from Australia, Japan and Europe felt that the syllabus was already too crowded. Six respondents felt IPR was not taught because engineers are reluctant to teach unfamiliar topics. Comments identified that academics are unaware of IPR and that it's a subject students will learn in later life. Other comments were that this was not a strong enough reason for non-inclusion, that IPR is a key matter for those in industrially related research and that IPR is a subject that would be taught by experts. Six respondents agreed that IPR is not included because it is not an explicit benchmark or accreditation requirement. Their comments included: "this [accreditation] may be of increasing relevance; if it were an accreditation requirement, it would be the most effective way to change our programme."

Question 12
Respondents' other comments included:
Australia:
It is no one person's responsibility. Would probably be seen as a 'soft' subject rather than 'hard' engineering by some.
We did consider IPR, I am now more aware, thank you.
Europe
Awareness is not yet there.
There are many conflicting requirements around the issues of course content. If a colleague really wanted to teach it, maybe time would be found.
Recent course developments have concentrated on other areas. We have a theme running through all the courses called professional studies which would be a natural place for it.
If we had the space - there are more important things electronics engineers need to know about: standards, safety, etc.

Intellectual Property Rights [IPR] Awareness
An entrepreneurial, business skill for undergraduate engineers
Thank you for taking the time to complete this short questionnaire.

Institution Country
Faculty Department

Name email

Do your consider IPR awareness to be an enterprise skill?

Does IPR feature in your undergraduate engineering course content? **YES** or **NO**

If **YES**
in which module is IPR taught?

at which level is it taught

Who teaches IPR awareness?

How many hours are students expected to spend on IPR (contact and private study)?

What resources are used?

Is IPR awareness assessed (formatively or summatively), and if so how?

If **NO**
Is it because
The syllabus is too crowded?

Engineering academics are reluctant to teach an unfamiliar topic?

IPR is not an explicit benchmark or accreditation requirement?

Other reasons:

Please return the completed sheet to Professor RUTH SOETENDORP. Many thanks.
Centre for Intellectual Property Policy and Management, Bournemouth University, Poole, BH12 5BB UK
rsoetend@bournemouth.ac.uk

RESPONSES

1. Do you consider IPR awareness to be an enterprise skill?

	Yes	No	other
Australia	13	1	no idea
Japan	6	2	
Europe	10	1	and part of professional development

2. Does IPR feature in your undergraduate engineering course content?

	Yes	No	other
Australia	2	9	as far as I know Yes or no (slightly) Sometimes
Japan	3	2	IPR course optional, so inadequate
Europe	4	9	not significantly as yet no, but it ought to be think so, but not certain

If YES (IPR does feature in your undergraduate course content)

3. In which module is IPR taught?
4. At which level is it taught?
5. Who teaches IPR awareness?
6. How many hours are students expected to spend on IPR (contact and private study)
7. What resources are used?
8. Is IPR awareness assessed (formatively or summatively) if so how?

AUSTRALIA

I
3. Management
4. Final year of the engineering course
5. Appropriate specialist from business area
6. 8 hours
7. Lecturer's own
8. Written assignment

II
5. Guest lecture by patent attorney
6. One hour

III
5. Patent attorney gives a one/two hour guest lecture – I'm not involved

IV
3. Systems Engineering Management
4. 2nd and 4th Year u/grad
5. Engineers
6. 2 – 3 hours
7. Papers on venture capital and not sure

8. Minor exam question, related essay

V
3. Intellectual Property Law
4. 3rd or 4th year compulsory subject
5. Faculty of Law
6. 12 hours per week over 13-16 week seminar
7. Don't know
8. Don't know – but I know it is assessed

JAPAN

VI
3. Patent, utility model design, trademark, copyright
4. 3rd grade
5. Outside patent attorney
6. 30 hours (actually 22 ½ hours)
7. Japanese patent office textbook
8. Yes, but inadequate

3. As a fundamental subject for engineering school
4. 3rd and 4th year
5. Patent specialists from another University
6. 2hrs x 15 weeks
7. Pamphlets from the Japanese patent attorney association, newspapers on patents
8. Only 20% of students join the IPR class

3. I'm not sure
4. Elementary level, I suppose
5. Part time lecturer
6. 1 ½ hours x 15
7. I'm not sure
8. I'm not sure

3. I'm not sure
4. 3rd grade
5. Visiting lecturer
6. 2hrs x 15 weeks
7. Don't know

3. At undergraduate and also at postgraduate level
4. .
5. 1.5 hours x q5 weeks
6. .
7. .

EUROPE

VII
3. Engineering innovation and enterprise
4. Higher level (level 3)
5. Engineer
6. +/- 10 hours
7. www, UK patent office stuff, DTI
8. Part of one written assignment

3. Software engineering management
4. Higher level (level 3)
5. Computing Staff
6. 3 – 6 hours
7. Textbooks
8. Probably not – IPR is not an explicit ILO (independent learning outcome) for the unit

3. Professional Design Practice, Project
4. Higher level (level 3)
5. Law faculty specialist
6. 10 hours
7. Lecturer's own and visit from Patent Agent/Patent office
8. Exam question

3. Systems Environment
4. Certificate level (level 2)
5. Law faculty specialist
6. 30 hours
7. Lecturer's own
8. Written assignment

If NO (IPR does NOT feature in your undergraduate course content) is it because:

9. The syllabus is too crowded?
10. Engineering academics are reluctant to teach unfamiliar topic?
11. IPR is not an explicit engineering or benchmark accreditation topic?
12. Other reasons

AUSTRALIA

VIII
9. No
10. No
11. Partly in the sense that it being a requirement for accreditation would be the most effective way to change our program
12. If 'we don't know about, we probably don't think about it much, and if we did, we would think the students will learn it later in life

II
9. The syllabus is too crowded
10. Most academics are unaware of IP

III
12. Probably all of the above. It is no one person's responsibility. Would probably be seen as a 'soft' subject rather than 'hard' engineering by some.

IX
10. Yes
11. Yes

X
10 Yes

XI
12. While all of the reasons are true, in fact we did not consider IPR. I am now more aware. Thank you

XII
9. Yes

10. Yes

XIII 9. Yes
10. Yes

XIV 9. Maybe
10. Maybe
11. Yes

JAPAN

VI 9. Yes
10. Maybe
12. No professional teaching staff
12. My research field is concerned with strength design of machine members and structures. It is already opened what is important concept of the design methods and evaluation method to materials used

EUROPE

XV 9. Yes
10. It would be taught by an expert
12. Awareness is not yet there

XVI 9. Yes
10. This is not a strong reason
11. This may be of increasing relevance
12. There are many conflicting requirements around the issues of course content. If a colleague really wanted to teach it, maybe time would be found

XVII 11. Yes
12. It has been in the past, and will be again in the future

XVIII 10. It is a key matter for those in industrially related research
11. Recent course developments have concentrated on other areas. We have a theme running through all the courses called professional studies which would be a natural place for it.

VII 9. Yes
10. No
11. Yes
12. If we had the space, there are more important things electronics engineers need to know about. standards, safety, etc.

Availability of Patent Office personnel and materials

The support of the Patent Office Marketing and Information Directorate has been key to the development of this work.

With the Patent Training Package *Making it Happen* shortly to be available on CD–ROM, it is hoped that it will be more easily accessible within University departments.

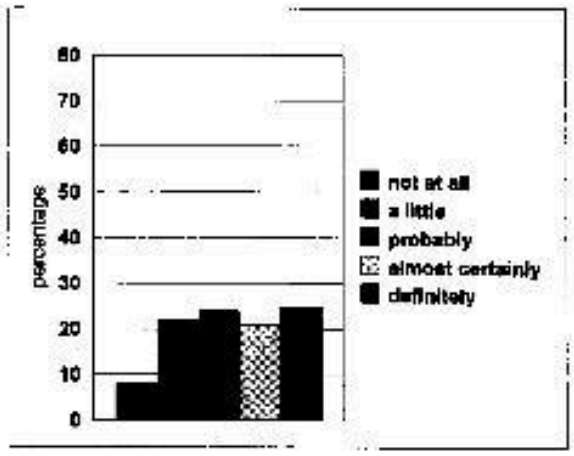


Fig. 1. Will "protecting your invention" be of value during your course?

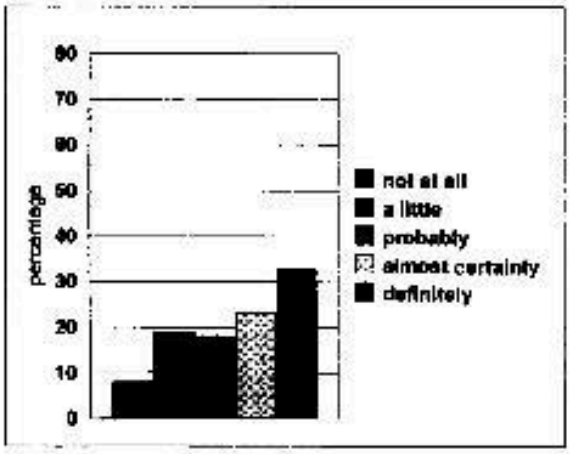


Fig. 3. Will "design rights" be of value to you during your course?

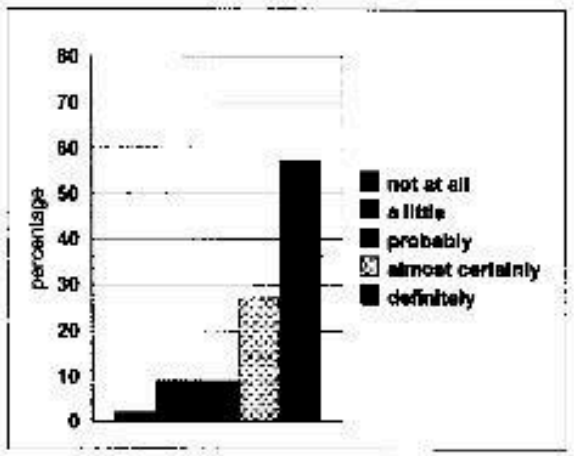


Fig. 2. Will "protecting your invention" be of value to you in your future profession?

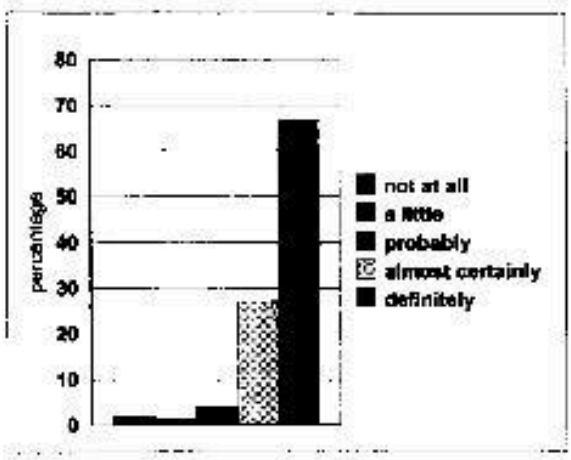
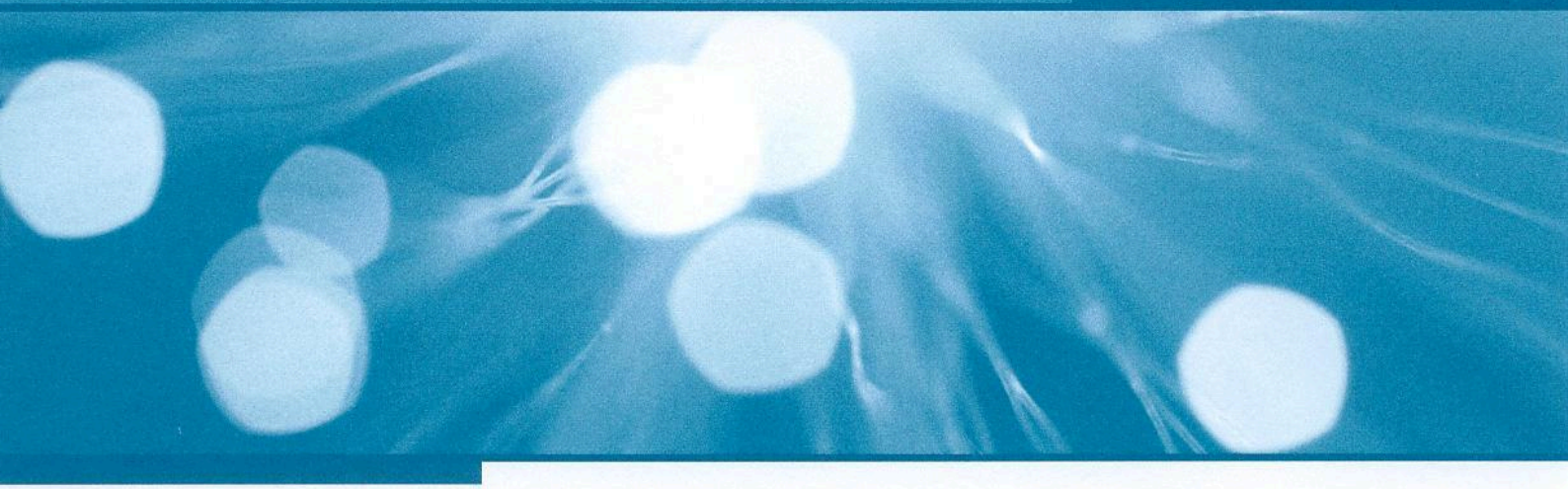


Fig. 4. Will "design rights" be of value to you in your future profession?

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