DEVELOPING THE CURRICULUM FOR COLLABORATIVE INTELLECTUAL PROPERTY EDUCATION

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Abstract

Intellectual property education, i.e. how intellectual property should be taught or more importantly how intellectual property is learnt, is a recent addition to the academic 'intellectual property' agenda. The regulation, acquisition and management of intellectual property rights presents economic, ethical, social and policy challenges across the international academic and business communities. Intellectual property is also the starting point of interesting academic cross-disciplinary collaborations in learning and teaching and in research. It will probably always be primarily a law subject taught by lawyers to law students hoping to practice. At the same time there is a growing array of disciplines demanding an awareness of and a competence in handling intellectual property concepts and regulations. At Bournemouth, we have been teaching IP across the disciplines for more than a decade. Recently, the Higher Education Academy subject centres in Law and in Engineering jointly funded a project to research 'IP for Engineers'. WIPO has begun addressing IP Education in earnest. At an international symposium in July 2005, papers addressed different aspects of IP Education, including Collaboration between Law Faculties and other disciplines. In November 2005, they jointly sponsored a National Conference in China to consider IP Education from primary school thru postgraduate research. IP education beyond the law school raises interesting questions for anyone contemplating teaching this complex law subject to non-lawyers. What constitutes the IP syllabus? Who should be teaching IP? When should it be taught? How should it be taught? What resources should be available? This paper begins to explore some of the answers.

1. Introduction

Intellectual property law is a comparative newcomer to U.S. and European university law schools. In the UK an important step forward was the publication in 1981 by Prof Bill Cornish of his textbook on patents, copyright, trade marks and applied rights. Interest in intellectual property legal education grew in the early 1980's in response to the need for intellectual property expertise to resolve computer software based disputes. More recently, graduates have been attracted to intellectual property courses because they recognise that intellectual property strategy and management are key business skills, particularly in the knowledge based industries. Intellectual property training is also undertaken by graduates from science and technology who see a future as patent examiners or patent attorneys. Additional career paths for intellectual property graduates are in University technology transfer offices, in businesses involved with start-ups, or in companies involved in the securitisation of intellectual property assets.

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Another catalyst for the growth of intellectual property education on both sides of the Atlantic has come from the changing attitudes of banks, financial institutions and the accounting professions. Intellectual property used only to have a balance sheet value if it had been traded. Now the commercial value of intellectual property is more likely to be the most powerful asset a company possesses. Intellectual property rights can 'command premium selling prices, dominate market share, capture customer loyalty and represent formidable barriers to customers'[1] EU and U.S. government departments, particularly defence, health, agriculture and education, have also tasked themselves in recent years with responsibility for capturing the value in the intellectual property they create.

A recent new area for government attention in Europe and the United States has been 'enterprise education'. Well aware of the challenges in preparing young people to make an entrepreneurial career choice, universities are linking with regional business development organisations to develop opportunities for enterprise education. Since intellectual property management is a key entrepreneurial skill it is likely that the growth in enterprise programmes will increase interest in intellectual property[2].

A UK undergraduate student expecting to practice as a lawyer needs to study another year after their qualifying law degree for a professional qualification, or two years following a degree in any other discipline. In the UK, 50% of university law schools offer an intellectual property law elective as part of the undergraduate law degree. Intellectual property is usually taught in the second or final year as a full credit bearing option module. It is possible to study intellectual property as part of an interdisciplinary award, combined, for example, with computing, e-commerce, chemistry, electronic engineering, business information or economics[3]

In Europe, intellectual property education has been boosted by EU aspirations to be a leading region of technological achievement. The Commission has actively promoted the objective that all students in science, engineering and business studies receive at least basic training on intellectual property and technology transfer.[4] EU research and development funding, through the Framework Funding schemes, has made monies available for university researchers to work on developing learning and teaching resources that would enhance intellectual property curriculum development.

It is impossible to think of intellectual property rights in isolation from the outputs of innovation and creativity. IP legislation embodies the outcome of political debate between cultural, industrial and commercial interests and IP specialists. Intellectual property litigation locates IP law at the cutting edge of science, technology, and the arts. Intellectual property rights pervade global social and economic life. International governments' technology transfer and enterprise agendas show they consider interdisciplinary IP education and research to be vital for continued economic growth. The introduction to universities of technology transfer offices (t.t.o.'s) has done much to raise IP awareness on campus[5], especially since most t.t.o.'s employ at least one IP person. Professional bodies are beginning to refer to IP competencies in accreditation guidelines[6].

Nevertheless, despite a growing demand for awareness and competence in handling intellectual property concepts and regulations, the majority of students

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currently graduate from university, including from Law Schools, unaware of intellectual property. As a result, the learning and teaching of intellectual property, outside the Law School, has been a recent addition to the academic 'intellectual property' agenda.

Educating students from non-law disciplines raises questions and challenges. From the learning and teaching perspective the questions include:

- What constitutes the IP syllabus?
- Who should be teaching IP?
- When should it be taught?
- How should it be taught?
- What resources should be available?
- Why teach IP?
- From the research perspective, the value of publishing on cross-disciplinary topics is still not perceived as being on a par with mono-disciplinary work, for promotion or research assessment exercise purposes.

To support the growing interest in intellectual property, international institutions are developing resources. For example, the World Intellectual Property Organisation[7], the UK Patent Office[8] and the European Patent Office[9], are each actively engaged in projects that will facilitate engagement across the disciplines with intellectual property. They cover diverse aspects of intellectual property, including regulation, acquisition, management and enforcement of intellectual property rights. They also acknowledge the economic, ethical, social and policy contexts within which intellectual property operates. But they don't address how best to integrate the academic and pedagogic challenges associated with developing curricula that will integrate intellectual property education across the disciplines.

2. Influence of Interdisciplinary Collaboration on Curriculum Development

One of the newest channels for curriculum development is the interdisciplinary collaborative intellectual property teaching and research that is taking place between law schools and other faculties. This was the subject of a paper delivered to WIPO Seminar on Intellectual Property Education and Research in Geneva in June/July 2005[10]. Although there are serious challenges and difficulties facing academics wishing to engage in interdisciplinary work, there is a growing body of evidence that intellectual property in particular is a fertile ground for collaborative work.

WIPO's objectives for the seminar included recognition 'of a growing need for an interdisciplinary approach to IP education and IP research capacity'. Evidence for such an approach can be discerned. There are post graduate programmes that deliver IP in combination with non-law disciplines.[11] There are research projects that exploit the creative opportunities that occur at the junction between traditional disciplines. But these examples of good practice appear to occur by happenstance. As often as not they are the result of

chance encounters between enthusiasts.

Universidad de la Republica and the Universidad de Montevideo, Uruguay, teach IP in Schools of Law, Chemistry and Engineering, as well as the Industrial Design Centre. From 15 to -40 IP academic colleagues meet for weekly discussion, and belong to GPI group, which brings together academics from law and information technology disciplines. Universidad de Republica Law School and Chemistry School are developing a study of 'phitoterapics' at the request of Uruguayan enterprises

International collaborative research provides opportunities to question fundamental assumptions, to develop new methodologies. An international mix of research partners extends the range of questions asked, and broadens the experience base of the team. Researchers have described collaboration: 'fun and enjoyment' 'inspiring' 'you learn an awful lot'.[12]

There are challenges to collaborative work. Cheap and effective global communication makes it more attractive to build international interdisciplinary teams. But costing in global travel inflates research costs. Drafting proposals that include interdisciplinary questions can be difficult to write and find support for. Winning and distributing funds can present difficulties. As in any team, members' individual roles need to be agreed early on. Likewise, decisions on what outputs can be published when, and where need early agreement. Even IP research projects need to ensure the intellectual property produced in the course of the research is properly attributed.

The biggest problem posed by working cross-faculty however is the reluctance of universities to accommodate interdisciplinary appointments. At its most prosaic, it is the department that hires, appraises, reviews, and promotes – and these are procedures that do not work across faculty borders. Research undertaken amongst United States universities[13] found that as scholars move toward tenure, their intellectual contributions to works with many authors are challenged. That creates a disjuncture: lured into the collaborative research needed for progress in an interdisciplinary field, scholars are later held to the standards of the specific disciplines.

In UK the university funding model is based on the research assessment exercise. Therefore, the attitude of research councils to collaborative research is studied carefully. Some research councils are neutral (e.g. the British Academy and the EPSRC), some regard cross-disciplinary collaboration positively (ESRC). Nevertheless the Higher Education Funding Council admits there is a 'widespread perception amongst institutions that the RAE and the research funding model do not appropriately recognise and reward collaboration.'[14] The situation is similar in the United States 'The situation is improving, but most grant agencies remain as disciplinary as universities, and, by definition, interdisciplinary projects don't fit their disciplinary guidelines. The agencies often have problems reviewing interdisciplinary work. Reviewers may demand more rigor in their own area and may not recognise the value of the synthetic approach'[15]

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University of North Carolina's research committee minutes for 04-05 record:
We want to promote and protect CIR because it makes the UNC campus better, and those who do this kind of research deserve encouragement and recognition. We recognise that not everybody needs to do CIR. We do hope that the promotion and tenure, and merit review systems will acknowledge the valueof CIR when faculty choose to engage in such scholarship[16]

Universities will not be able to resist for ever creating a culture that will provide the environment in which collaborative interdisciplinary education and research will thrive. Nowotny, Scott and Gibbons (2002)[17] suggest the classical or liberal model of the university, which was based on the transmission of a received body of knowledge from teacher to student, is disappearing. They predict universities moving from the production solely of Mode 1, or single disciplinary, knowledge, produced as the result of research conducted in the absence of a practical goal.
Instead, they envisage universities engaging more in research intended to produce knowledge that will be useful to someone. Labelled Mode 2, it will be undertaken by coalitions of academics working across the disciplines, within the university, or with external partners in industry and commerce.

The Institute of Automotive Studies at Oxford University's Begbroke Science Park provides a focal point for the University's research and development in partnership with industry. One case study is the SPRINTcar (Short Production Run Innovative Technology Car) which 'will deliver collaborative intellectual property and new opportunities for UK business'. Management and marketing process, design and embodiment processes, and intellectual property issues and commercialisation processes are expected to form MBA and PhD projects

3. Collaborative and Interdisciplinary Research and Teaching

There are different models for collaboration between faculties to delivery intellectual property education. As an example, take 'the ethics of IP ownership', since ethics and IP are directly relevant to students as they encounter issues of authorship and use experienced in the production of work for publication or assessment. There are different models for combining ethics with IP in collaborative research or education:

Models for combining Intellectual Property with Ethics:

The University of Wolverhampton, UK – hopes to develop **a centre** for research into intellectual property in developing countries. The rationale for establishing the new centre states 'researchers will work closely with economic and social units, administrators, managers, innovators and marketers to establish the causal links between forms of technological and economic progress on the one hand, and of IP on the other'.

Case Western Reserve University, USA runs *onlineeethics.org*, **an online ethics centre** for engineering and science faculties, that includes IP and Ethics resources to

be used to facilitate their students learning about IP ownership, responsible authorship, and use of IP.

IPRsonline is **a portal site** that involves NGOs including WIPO, UNCTAD, ICTSD working with academics commissioned to produce research reports which will inform ethical policy making.

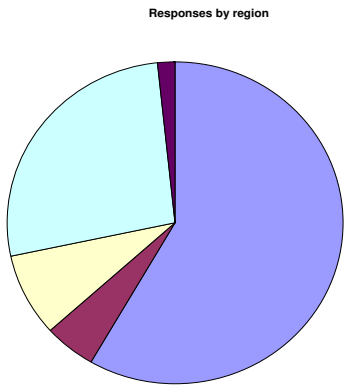
The University of Leuven, Belgium is involved in **bidding for funding** to research into DNA and public health, in co-operation with the Faculty of Medicine and the Faculty of Theology.

Bournemouth University's LLM IP includes **a full unit** on Intellectual Property Policy and Ethics, with invited guest speakers from appropriate organisations.

For the paper delivered to the WIPO Seminar on Intellectual Property Education and Research in Geneva in June/July 2005 a survey was undertaken of approximately 240 members of the two associations, whose memberships are understood to overlap. The ATRIP/UKIPTN survey suggests a possible mismatch between education and research aspirations of IP academics surveyed and WIPO. The majority of IP academics are law academics, working in law faculties. The research and promotion aspirations of the majority of the respondents seemed firmly fixed in Mode 1.

There were 61 responses. Respondents were predominantly academic members of ATRIP or UKIPTN, but 4 were IP legal practitioners who taught part time. 1 respondent had responsibility for Patent Office education programmes. Additionally 3 academics were involved in IP education and research, but were not members of either association, were invited to respond.

Responses by region



- Europe 37
- North America 16
- South America 4
- Africa 3
- Asia 1
- Australasia & Pacific Rim 0
- India 0

- There was one response from Asia [Japan] and one from a new European state.
- none from India, Australasia or the Pacific Rim.
- *Is there an intellectual perspective on IP collaboration or Interdisciplinary IP collaboration?*

The majority of responses came from Western Europe and North America. There were a small number each from Africa and South America. There was one only from

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Asia [Japan] and one from a new European state. There were none from India, Australasia or the Pacific Rim.

3.1 IP teachers' primary discipline

It was surprising to note that the IP academics gave law as their primary discipline, but not all identified it as intellectual property law. It was anticipated that ATRIP/UKIPTN includes IP academics from a range of primary disciplines. It would be useful to target future survey questions to a wider group of IP academics, including members of societies representing IP in the context of a discrete discipline interest (e.g. Society for Economic Research on Copyright Issues). Some teach one or two specific areas of IP law only. Others identified their prime discipline as a combination of IP law, patents, trade marks, copyright, private commercial, contract, antitrust, licensing, competition, civil, corporate, or business law, or jurisprudence. The four non-ATRIP/UKIPTN members' primary disciplines were physics, management, education and law.

3.2 Faculty location of IP teaching

Of the 57 ATRIP/UKIPTN respondents, 54 work in a Law School, Department or Faculty. The other three were in Management or Business faculties. The four non ATRIP/UKIPTN respondents were located in an IP faculty, business school, engineering faculty, and Patent Office. Again, it was anticipated that ATRIP/UKIPTN academics would be more evident in social science or business faculties than they are.

3.3 Size of IP teaching teams

The smallest 'team' comprised one person teaching alone, part time. The largest comprised 23 full time and 57 part time. In between, IP law is taught by teams of full time academics, supported by part time academics and practitioners. 5 respondents mentioned that IP doctoral researchers are involved in teaching.

3.4 Collaborative Activity

More than 50% of academics teach outside their own law faculty, and 25% teach in a non-law faculty. There is an eclectic mix of faculties that receive IP input. But there is no evidence that where in any university one faculty offers its students IP, other faculties will follow suit.

3.5 Teaching outside the Law Faculty

Of the respondents surveyed, 45% do no teaching outside their own law faculty. 54% of the respondents teach outside their own law faculty, often teaching IP at another institution. 25% of the respondents teach IP in a non law faculty. IP appears to be taught in only one or two of the faculties listed in any university, with no clear reason why. Nor is it clear how the link is made between IP law and non-law faculties.

Teaching Collaboration – the disciplines

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Chemistry Industrial Design Engineering Bio Science Computing Literature Media Business Medicine Economics Art History Education Architecture Art & Design

There is evidence of IP classes offered to non-lawyers on courses at all levels, undergraduate and postgraduate, as well as professional courses. None of the respondents described innovative interdisciplinary teaching.
Only one respondent expressed an unfulfilled aspiration to be involved in collaborative teaching [in her university's Film & Media School].

3.6 Collaborative IP Research

51% of respondents identified themselves as involved in collaborative IP research. They describe work with national government agencies, international bodies and other universities producing a wide variety of IP law and policy based outcomes:

Collaborative IP research projects
aspects of patent law
IP education for schools, higher education and business
stemcell research patents; IPR in transition
research exemptions in patent law
IP policy and lawn in developing countries
copyright in information society, Opensource software & IPR
Brazil/Italy project on biodiversity
artists earnings, G.I's. Historical sources of ©
Copyright, IP History, EU projects, IPR helpdesk
implementation of EC directive on biotech, implementation of TRIPS
copyright ownership, copyright issues, moral rights
IP & conflicts of law
online digital archive codification of IP law, relating Slovak Private law database right, geospatial information, digital curation centre
USPTO registry for secured transactions involving IP assets
IP research academy
IP policy making

IP scholars network; IP research network

3.7 Collaborative Interdisciplinary Research

20% of respondents described involvement in collaborative interdisciplinary research with academics from another faculty. Ten disciplines were identified as research partners in the survey

Collaborative interdisciplinary research - the disciplines:
Chemistry
Industrial Design
Literature
Economics
Engineering
Science
Social Science
Business Studies: Management, Finance
Medicine
Theology

30% of respondents are involved in both research and teaching outside their law faculty. Several European respondents expressed an interest in future collaborative work, both teaching and research. This is not currently happening due to low staffing levels and resource commitments. One USA respondent pointed out that bidding for research funds is not widespread amongst US law schools. One European respondent commented that promotion boards do not encourage CIR.[18]

There is markedly less interest in interdisciplinary intellectual property work in the U.S. than in Europe. Hennessey[19] suggests that at root may be that law school professors, whose first degrees tend to be political science, history or government, are suspicious of patent attorneys, whose first degrees are science and technology. The lawyers doubt the patent attorneys' ability to get to grips with general legal questions! Another reason may be simply that 'attorney' and 'lawyer' mean the same thing, giving rise to another cause for suspicion. Trade mark work used to be the preserve of patent attorneys, and copyright work of lawyers who worked with creative, publishing communities. In today's intellectual property practice, lawyers are not the only profession. They will probably be interacting with tech transfer professionals, patent examiners, licensing executives, software designers, artists, laboratory researchers, translators, human rights activists – all of whom will be interested in understanding more about intellectual property.

Teaching across disciplines requires an understanding of the relevance of law to the context of the discipline in which you are working. Student learning must focus on context as well as content. Curriculum designers expecting to integrate cognitively disparate topics into the syllabus must develop new learning and teaching strategies and methods.

4. Curriculum Development in the Law School

Curriculum development is a standard item on the agenda of university boards and their faculties'. There are several sources of pressure to keep the curriculum developing, many of which are external to the academic group, including

- Need to compete in the market for home and overseas students
- Government expectations
- Emergence of new technologies
- Employers, professional bodies and accrediting institutions
- Industry and the professions

At the same time, the following factors within an institution or academic group also play a significant role in influencing change:

- individuals with strong leadership skills
- financial pressures
- academic fashion, academic attitudes

In the area of intellectual property education, the pressure for curriculum change comes from a similar range of stakeholders, and similar circumstances. But it is important from an early stage in any discussion of curriculum change in the area of intellectual property to be prepared to consider the subject both as a law discipline subject and as an interdisciplinary subject.

The intellectual property law curriculum in law schools is in a constant state of development, given the continuing development of national and international intellectual property law. Law schools are also looking to design intellectual property programmes that are relevant to business, the creative industries, science and technology. At the same time, faculties of diverse disciplines including business, chemistry, engineering, bioscience, medicine, arts and humanities are themselves beginning to appreciate that intellectual property should feature on their curricula. Some are beginning to develop intellectual property programmes, with or without law school involvement.

Law school intellectual property studies are offered in undergraduate degrees usually in the final year. By that time students will have studied contract and other foundation law subjects which form a good underpinning to intellectual property studies. It is unusual for an undergraduate programme to cover all the different aspects of intellectual property. Most programmes cover copyrights and patents, then trade marks. Least likely to be included is design law. Copyrights tend to have most time allocated, whereas quasi rights including confidentiality and know-have least. Geographical indications is one new area which law school programmes would be include, if there were more time. All law schools face decisions about what to include or leave out.

Growth of Law School IP syllabus

Substantive national law
Substantive international law

Trade Secrets & Confidentiality
Human Resource issues
Competition Law
Commercial Exploitation – law and practice
Management and Strategy
National and International policy
Ethics
Alternative regimes…… and more

One of the factors that should be influencing curriculum change in this area should be the future range of careers opening to graduates (see Hennessey[20] 2004). It is important that curricula remain responsive to the demands of employers and professional accreditation bodies. At the same time the study of intellectual property law in the law school is an academic study. Space should found to introduce students to criticality as well as developing a vocational skill. Studying intellectual property law brings one into contact with deep moral, philosophy and ethical issues which raise questions about the nature of property itself. Critical approaches to intellectual property education should include examination of the fact that patents often go unused and are an inappropriate form of protection. The ideas that govern the open source software and GNU public licence and Creative Commons licenses are insufficiently researched at university or understood in the workplace.

The curriculum is delivered via the 'programme', which comprises 'units' or 'modules', each of which must satisfy university, and independent sector criteria[21]. Programmes and units must identify aims, objectives, and independent learning outcomes, which are delivered via learning and teaching methodologies, including assessments.

Where the law school based intellectual property programme designer is looking towards producing graduates who can work collaboratively across the disciplines, the combination of independent learning outcomes and assessments is crucial.

Two innovative assessments used with LLB undergraduates studying intellectual property law at Bournemouth University provide evidence that the student has achieved two of the independent learning objectives set for the course:
1: to diagnose innovative works in the context of substantive intellectual property law
2: critically to appraise current intellectual property law policy issues

'Advice Letter'
Intellectual Property Practice students write one assignment as an IP Adviser to a student 'client' from design engineering. The IPP students must advise the design engineers on the intellectual property potential of their final year projects. The assignment tests the IP students' ability to identify appropriate advice and apply it. Whilst the text of the advice letter must be intelligible to the design engineer, the IP student is expected to submit a full appendix of the legal authority on which her

advice has been based. The exercise has benefits for both groups of students in enhancing graduate employability skills. The IP lawyers get clinical experience of drafting advice. The design engineers receive intellectual property information they would not otherwise have had as well as receiving clinical experience of presenting their ideas in dialogue with a professional adviser. This assignment helps reduce plagiarism because the advice has to be tailored to the client's needs.

'IP Issues'
Because the syllabus is crowded there is little time to focus on the policy issues affecting different intellectual property regimes. The intellectual property students are asked to select an 'intellectual property issue' to research as a small group during the course of the programme, and to write up their research as an examination question in the summer exam. Issues students have chosen include patenting pharmaceuticals for use in combating disease in developing countries; patenting gene therapies; protecting television programme formats; protecting and exploiting traditional knowledge. Before the exams, the student groups make informal presentations to the class on their research. It provides an opportunity for the students to be updated on a set of leading edge intellectual property topics, and to have something interesting to say on their subject at interview!

In the UK the Joint Education Board of the Chartered Institute of Patent Agents and the Institute of Trade Mark Attorneys has begun to give exemption from the foundation stage of their professional examinations for students completing an approved intellectual property unit as part of an undergraduate law degree[22].

5. Intellectual Property Curriculum Development - Beyond the Law School

Intellectual property is one of the areas being explored by academics beyond the law school, aware that their students would benefit from an awareness of intellectual property concepts, combined with a basic competence in recognising, protecting, exploiting and enforcing intellectual property rights. In addition, professional bodies, governmental and international institutions have recognised the importance of developing intellectual property learning opportunities in the work place, as part of lifelong learning and continuous professional development.

Addressing the Royal Society of Arts in London (2003) the internationally renowned intellectual property academic James Boyle said:
'We need to bring together the programmers and the web publishers, design artists and the film makers and the people who are computer scientists and entrepreneurs and say 'intellectual property is affecting you and you ought to be thinking about how its affecting you'. This is something in which we have to educate people.'
Robert Heverly[23], on the other hand, questions whether we should teach intellectual property to non-lawyers. The university's role is to present a balanced view to students, and that applies equally to intellectual property. It is important to emphasise that intellectual property protection is not a panacea, and there are alternatives to traditional licensing arrangements. He argues for 'universities' responsibility to present students with a full and unbiased picture of intellectual property law, and its options'

Non-law academics have not always been enthusiastic about introducing intellectual property to the curriculum. Asked in 2003 whether they would teach intellectual property concepts to their students, engineering academics responded on a personal level:

- I shouldn't have to teach this
- I don't know how to teach this
- If we had decent students in the first place I wouldn't need to teach this.

Objectively, they were reluctant because:

- The syllabus is too crowded
- Intellectual property is not an explicit benchmark or accreditation requirement[24]

Additional reasons for their lack of enthusiasm included:

- It is no one person's responsibility
- It would be seen as 'soft' rather than 'hard' engineering
- Awareness is not there yet
- It is a subject that ought to be taught by experts
- There are more important things engineers need to think about, e.g. safety[25]

Their students on the other hand have responded positively to intellectual property as something relevant to their future careers. One Japanese engineering undergraduate commented after an introductory intellectual property session, 'Intellectual property is like food for engineers. They should have a little every day'. However, research undertaken at MIT (2004) revealed that science students did not put value on patenting[26].

Intellectual property education is unlikely to succeed if it is externally imposed on a faculty. Rather work needs to be done to enable non-law faculties to open up their curricula to intellectual property, and support its delivery to their students.

'Intellectual property education has a particularly important role to play by supporting engineers in the creation of product or process development opportunities that have a unique and defensible IP. This is the fundamental basis upon which further entrepreneurial activity can be based. However there is no well established pedagogy for educating engineers and scientists about intellectual property'.[27]

In preparation for a workshop held in London in October 2005, a small group of UK and Australian engineering faculty professors were surveyed about the extent of intellectual property teaching in their faculties. Their comments included[28]

UK & Australian engineering professors on IP education

- 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 some guest lectures on some courses

- 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
- Touched upon in several subjects, taught by an engineer, sometimes with an IP academic from the Law faculty
- It is present but not well developed in 4th year Management. We want to develop a stronger IP presence
- It is taught by an engineer as a separate part of discrete final year business management unit

At the workshop[29] a mixed group of intellectual property academics, engineering academics, with others from business, the UK Patent Office, and National Council for Graduate Entrepreneurship met to explore ways in which to progress the inclusion of intellectual property in the engineering curriculum. The workshop participants agreed that their findings would be broadly relevant to other non-law science and technology disciplines, as well as to other innovative and creative industries. Key questions discussed were:

- Who best to teach intellectual property to engineers?
- What does a graduating engineer need in their 'IP toolbox'?
- What should be the intellectual property learning outcomes for engineers?

Who best to teach IP to engineers?

- University Lawyer,
- Technology Transfer Office staff,
- Adjunct professor – patent attorney, or
- patent attorney as visiting lecturer.
- Intellectual property law academic
- Knowledge Transfer staff
- Engineering academic – especially with some experience of patenting
- Local business person

They used one or more of the following resources or delivery styles

- Lectures
- Course notes and hand outs
- Government texts
- Case studies
- UK Patent Office and other web based resources
- Games
- Lecturers materials

Contents of the graduate engineers 'IP Tool Box'

- Broad, rather than deep, understanding of intellectual property
- Awareness of implications surrounding disclosure and confidentiality
- Linkages between IP, innovation and business development

- Awareness of cultural differences between university research and business development
- How not to be taken advantage of in IP matters
- Who to ask for advice
- Where to find and How to use patent information

At a more sophisticated level, students should be able to understand
- What goes into a patent application and why
- Time scale and costs of patent protection
- Implications of steps to be taken, or avoided, in the patent process
- Relevance of patents
- IP is more than just patents – Trade marks, copyright, design rights
- Intellectual property ownership
- Non disclosure agreements
- National and International intellectual property issues
- Offensive and Defensive patent strategies
- IP Valuation
- IP commercialisation and exploitation
- Open source licensing and other 'alternative' regimes

Learning Outcomes:
It was stressed that patents, in particular, should not be taught uncritically. Students need to appreciate that applying for a patent is not always the most appropriate course of action. Teaching should involve use of role models and case studies. Learning outcomes focussed on a mixture of attitude, competence and knowledge captured in this matrix[30]

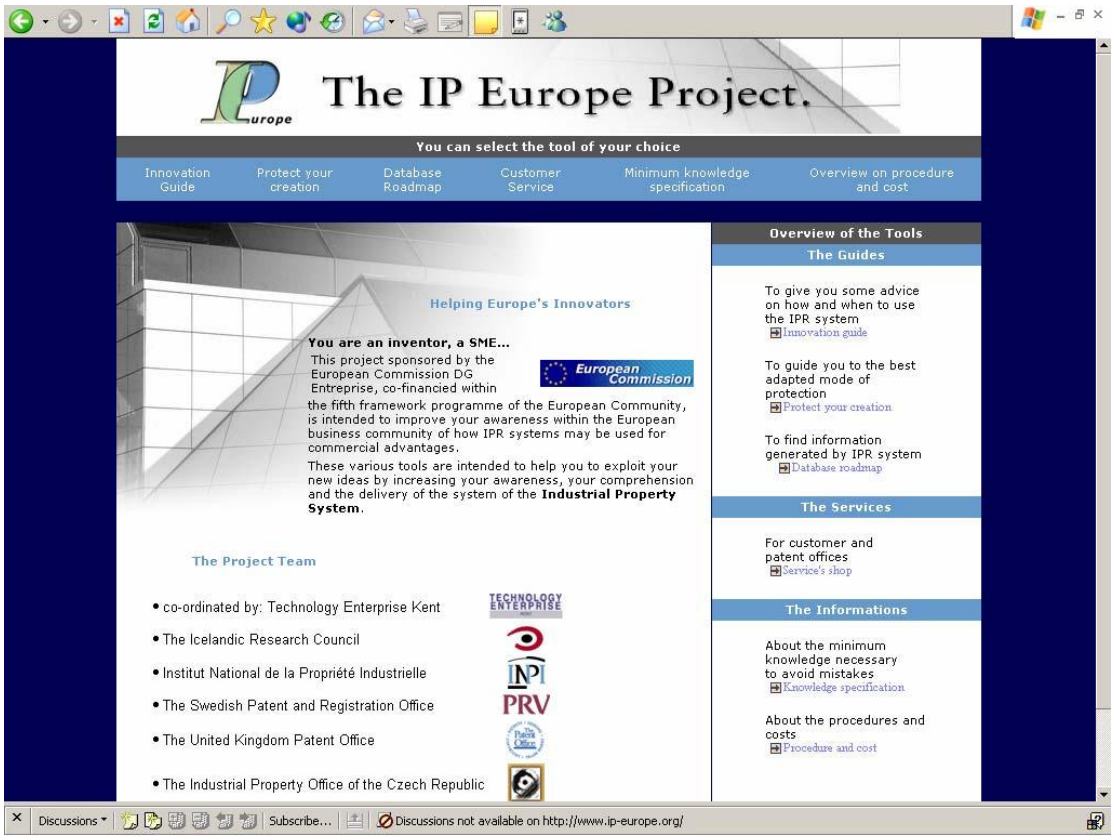
Attitude	*Ability to: appreciate the ethical view; recognise that intellectual property is integral to an engineer's work, that awareness of intellectual property rights is everyone's responsibility*
Competence	*Ability to: implement initial steps to protect; know who to consult for further advice, and when; identify the context in which intellectual property rights are being used or created*
Knowledge	*Ability to: understand the legal frameworks governing intellectual property rights and their commercial exploitation; fulfil responsibility of managing an intellectual property portfolio; appreciate the human resource issues and recognise the benefits of learning from history*

6. Intellectual Property Education in Continuing Professional Development and Lifelong Learning

Once at work, the student is more likely to be drawn more towards 'vocational' or 'pragmatic' training outcomes, rather than 'academic' consideration of the subject. Nevertheless, the range of intellectual property education topics in the work context can be wide. Interests will include the practical aspects of recognition, protection,

exploitation and enforcement of rights; human resource issues; strategic issues; national and international issues. There have been responses from industry to the needs of people already in work wanting to understand more about intellectual property. Phillips in China and Gillette UK plc in UK [design of an intranet based resource] are two examples.

Other responses have been the creation, by private and public sector institutions, of 'free at the point of consumption' learning resources. The WIPO Worldwide Academy, for example, has a comprehensive web based provision that is suitable for use by the casual enquirer as well as for the serious student. The European Patent Academy is a new development of the European Patent Office, with goals of '*supporting and developing innovation in Europe by promoting and participating in training projects designed for industry and patent system users in the areas of creation, strategy, evaluation and management*'[31]. The European Commission, through framework funding initiatives, has supported a number of initiatives. Some of these are free to use, for example the IP Europe Project[32], is aimed at inventors and small and medium sized enterprises.



Whatever the level, intellectual property studies should involve students in a critical evaluation of intellectual property and an appraisal of the stages of intellectual property management:

- how intellectual property rights are first recognised
- how they can be protected in law
- how they are commercially exploited
- how they are legally enforced

7. Conclusion

There are some good examples of collaboration between IP academics in education and research. There are some, but fewer, interesting examples of research and teaching by IP academics working in collaboration with academics from other disciplines. Non-law faculties, in particular engineering, science and technology, are beginning to refer their students to IP matters, often as a result of technology transfer activity in the university. There is no clear methodology or pedagogy for the delivery of IP to non-lawyers, although work is currently underway to identify good practice in this area.

Interdisciplinary research collaboration happens serendipitously. When it does, it is enjoyable. But it fits awkwardly with university research and promotion norms. It is not clear why or how collaborations develop between IP academics and other faculties. Academic 'enthusiasm' 'passion' and 'good interpersonal relationships' seem to play a significant part. There seems no clear pattern for collaborative teaching to lead to research, or to follow from a collaborative research project.

It is necessary to understand what is meant by 'collaboration' before advocating, or dismissing it. There may be different attitudes to collaboration between IP specialists, or between IP academics and specialists from other disciplines. If collaboration is a 'good thing', who should be responsible for promoting it, and how?

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