EXPERIMENTING WITH PATENT ENHANCED EDUCATION TO ADDRESS THE MISSING LINK BETWEEN INDUSTRY AND UNIVERSITY

T. Ozkul

American University of Sharjah (UNITED ARAB EMIRATES)

Abstract

Close cooperation between academia and industry is the key to successful innovation and technologic development. Academia is good in scientific research and industry is good in application and commercialisation of the technology. Having a close cooperation between these two entities would certainly benefit both of them. Yet in reality this is hardly the case. An unambitious, almost accidental experiment done in a higher education institution provided a clue to how this can be achieved in real life. Experiment was not only successful in igniting innovation and entrepreneurial spirit of the students but also generated the type of individuals needed by the industry. Successful implementation and experimentation of the educational program is likely to generate the type of professionals who would closed the gap between industry and the academia.

Keywords: Patent enhanced education, intellectual property, know-how, know-why, scaffolding.

1 INTRODUCTION

Years ago, the author has experimented with integrating patent based case studies into an engineering course. It was a simple experiment where usual textbook-based case study was replaced with a real life patent related to the subject being studied. In order to explain the patents that are being studied adequately, the students were introduced into the patent concepts, into different parts of the patent documents and the techno-legal language of the patents. Which started as an unambitious, almost accidental experiment has generated great interest from the students.

Puzzled by the unexpectedly encouraging results of the experiment, the author has spent some time doing research to understand what has intrigued the students so much. The research indicated that there is high demand for patent knowledge by both students and academics. Students all over the world literally “crave” for patent education in their studies. Survey after survey, study after study all research indicated a great desire by students to integrate their study with IP education. In a series of landmark surveys commissioned by UK Government starting from 2012 until 2016 jointly with UK Intellectual Property Office and Student Union tried to understand students’ attitudes toward intellectual property and IP education in higher education institutions. The surveys done by 2800 students and 250 academics indicated that %75 of students indicated that learning IP in higher education is very important to them. The surveyed academics indicated that current way of “teaching IP” is not adequate at all. Although the survey was conducted in UK, the results indicated that students in other countries have similar sentiments about IP, IP teaching and learning issues. Please see the detailed survey results and extraordinary executive summaries written by leading education specialists about the importance/– or the seriousness of lack of- IP education [1] [2] [3] [4].

Armed with the understanding of the great desire for IP education and the analyses of the results of our first experiment, the educational experiment was repeated again after some time in a more structured way. This time the author has clearly identified the goals of the experiment targeting “increasing innovation and “entrepreneurship” among the students while serving the requirements of the course being taught at the same time.

The result of the second experiment was a phenomenal success, which resulted in bunch of students with boosted confidence and many patentable projects. Encouraged by the results the experiment, the trial was expanded into different courses, different grades of student groups.

After ten years of tinkering with the approach, testing with different courses, testing with different levels of students, the author has developed a firm idea of where this type of educational enhancement fits, and what kind of students it would benefit most. It is the observation of the author that the students who received “patent enhanced education” are better equipped for addressing the needs of the industry.

The methodology followed by the author, the recommendations for selecting courses and grades of students are given in the following sections.

2 METHODOLOGY

The methodology for "patent enhanced education" was developed after experimenting with it over ten years of experimentation. In this section, the best configuration of the methodology as well as recommended level of the audience, the type of courses that are more suitable and suggestions for implementing this education in other institutions will be summarized.

2.1 The "preferred embodiment" of the methodology

The terminology of "preferred embodiment" in patent language refers to the best-recommended practices for replicating the results of the patented invention. In this section, we will be giving the best-recommended configurations for having the benefits of the "patent enhanced education" approach if you were to replicate the results of our experiments. The author would like to indicate that these recommendations stated in this paper reflect his opinions in his field of engineering and the extensions of his claims over other fields of studies should be taken cautiously. Although the author has confidence that the methodology can be applied to wide range of subjects ranging from medical to business school, whether our recommendations would benefit a specific subject is to be judged and tested by the readers.

2.1.1 The best audience for patent enhanced course.

According to our observations the best student groups for the patent enhanced education are senior level undergraduate students or graduate level students. It is observed that the maturity level of the students have a big impact on the success of the methodology. In our experiments, it was clearly noticeable that graduate students have benefited most from the patent enhanced education methodology. Next best audience were senior level undergraduate students. Although our experiments were predominantly with engineering students, we believe the educational principles can be extended to any audience with different technical even social and business backgrounds [5].

2.1.2 The best type of courses

The methodology can be applied to any course that utilizes "case studies" to study contents of the course. The courses with dynamic content, where there are frequent new developments happening in the subject of the study, are the best courses to be used with patent enhanced education approach. Since most graduate courses are research oriented courses and use of case studies are common, they fit best into the description.

Flexibility of the course is an important concern. Since elective courses typically has more flexibility in terms of contents than core courses, elective courses are better to experiment with patent enhanced education methodology. This is our opinion about the type of the courses but obviously exceptions are possible. There may be core courses that may benefit significantly from the approach if the methodology and the required time for administering the required parts of using patent enhanced approach is integrated into the syllabi of the course.

2.1.3 Fitting the extra material into the syllabus

The patent enhanced education methodology requires introduction into patent concepts, and learning how to read and write patent documents. Fitting this into the existing syllabus of the course is one of the most challenging part of the patent enhanced education. Typically, this requires investment of at least 1.5 weeks of study in a 16-week semester. A highly recommended approach is to integrate this knowledge into a lower level common engineering preparation course where all students learn basics of reading and writing patent documents. Once this subject is introduced adequately in the common courses, the higher-level courses can utilize the information by simply refreshing the subject.

This approach can facilitate adaption of "patent enhanced education" at many levels of the education. In author's opinion the best common engineering courses to integrate basic patent reading and writing methodology is the required "engineering ethics" course. Since the subject of "patents" is very much related to "engineering ethics", we think that this will be an excellent subject to enhance the contents of engineering ethics course. It may additionally "spice" the ethics course contents since many

students find engineering ethics courses boring. (This is author's personal opinion, please take it lightly.)

Another common engineering course that may be suitable for integrating patent education is the statistics course. The statistics is taught in many universities as a common required engineering course and may be a suitable course for consideration of integrating patent knowledge. Since the subject of statistics and patents are not related very much, it would be a challenge to fit patent knowledge into statistics syllabi, but nevertheless it may be a viable option to look into.

Graduate curriculum also needs to integrate the basic patent education into one of the required college core courses. In author's opinion courses like "Advanced Engineering Mathematics" or "Advanced Computational Methods" can be used for integrating patent education into graduate level courses.

As it was mentioned in the previous section, inclusion of the patent education is critical in graduate school. The graduate level courses are the best courses that benefited most from patent enhanced education in our experiments. Having such importance, inclusion of patent education should not be missed in any graduate school. Although one may argue that having patent education at undergraduate level may decrease the burden of teaching it at graduate school level, since some of the graduate students come from different schools and backgrounds, it is the highly recommended that patent education should be included at graduate level as well as undergraduate level. Sparing two weeks of syllabus of common required graduate course may pay handsome dividends to the university in terms of patents.

Today patents are considered as one of the top indicators of high quality education. According to Reuters 100: The World's Most Innovative Universities, the educational institutions are ranked according to their invention of new technologies that drive global economy. Unlike other rankings utilizing subjective surveys, Reuters 100 relies exclusively on objective data such as citations and patent filings. According to the study, sometimes even one significant invention can drive the university up in the rankings significantly [6].

Researchers working for Council on Integrity in Results Reporting (CIRR) indicate that patent statistics are the least biased indicators when it comes to deciding innovation level of countries or institutions [7].

2.2 How to select the material to include in the course?

Assuming that the students acquired basic patent reading and writing skills, what should we do to convert the course into patent enhanced course?

The first step in the process is the selection of the patents to include in the study. The author recommends using either WIPO database, Google Patents database or European Union Patent data base for searching patents related to the subject of the course. Author recommends using European patent office database search tool Espacenet [8] since it includes database from many different countries as well as Europe. Starting point of the search should be either a known patent in the field, or smart search which allows users to search database through key words. Experienced users are recommended to use "classification search" as the best possible tool for searching the patent database. Classification is a standard list, which lists all existing and developing subjects into categories. They are very detailed and lets user to search a tree of subjects to reach the appropriate subject of the course. The search ends up with a classification code that indicates the code for the subject. Once this code is acquired, the patent database can be searched in a highly skilled manner giving only the patents related to the selected subject. Espacenet classification code starting page can be found in this reference [9].

Out of the hundreds of patents that may show up in the list, we would recommend selecting patents with the following priority:

1 Recently granted patents,

2 Patents granted to well-known companies,

3 Patents related to well publicized subjects (if possible)

These types of patents are recommended, but in the absence of it, any patent related to the subject of the course regardless whether it is new or old dated is acceptable.

The priority items listed above have some significant meaning and should be followed if possible. Having recently granted patents emphasizes the fact that the subject is “relevant” to the state of the art and contemporary. Having patents granted to well-known companies emphasizes the fact that it is being used successfully by the most important players in the industry. Topics related to well publicized subjects helps catch attention of the students.

2.2.1 What to study in the selected patent

Typical patent document is made up of several sections like abstract, background, summary of the invention, description and claims. Abstract is the short summary, background is the technical problem that needs to be solved as well as the state of the art technology in the field. The summary is the short summary of the invention and the description is the detailed explanation of the invention. The claims are the legal claims of the inventor for the patent application. Out of these listed sections, only description and the claims are written in legal language which makes reading and understanding these sections challenging. But the rest of the sections are written in plane language and can easily be understood.

The most important section in the patent document for the students is the background section. This may be surprising since “background” does not really explain anything about the invention at all. But actually it explains something very important. It explains the technical problem, the business problem, the social problem, the technical inefficiencies and the real manufacturing problems that requires fixing. This section explains the reason behind the patent application. The inventor has to state all these facts in order to convince the pattern examiner that the invention has some technical and industrial merit. This is absolutely necessary in order for the application to be granted. One of the major condition of granting a patent application is the “industrial applicability”. Any invention that is not serving a real need of industry or human need will not be granted. So, for this reason the inventor has to state the problem in a convincing language as well as the proposed solution to convince the patent examiner that the patent has some merit.

During our long running experiment we have found this section is to be the most useful section of the patent document since it states the “know-why” of the problem. The patent document is probably one of the unique documents where one can find honest-to-goodness statement of the deficiency of the current state of the art. This is what we call “know-why” of the problem. We are all familiar with the terminology “know-how”, but many may not heard of “know-why” before. “Know-how” refers to knowing the art of doing something and “know-why” refers to why we are doing something. Many researchers have studied the effect of “know-why” on education and consider as very important for the education [10], [11].

Every part of patent document is a treasure throve; starting with the background part until the section of claims. Background part introduces the real engineering problems and getting introduced to real engineering problems puts the students in contact with realities of life and industry.

In other sections of the patent document, like the description and the claims, the students see the solutions generated to the real problems which gives them the idea of how to approach and solve problems in general. In many cases students initially seem to get overwhelmed by the apparent complexity of the patent document, but after studying the background and the solution in detail, the problem appear to be more manageable. Once they grasp the idea and understand the solution presented by the patent, the feeling of overwhelm is replaced by self-confidence. At this stage, the author has witnessed in many cases that his students claim that “they can do better than that” and start generating their alternative solutions. Although in many cases the solutions generated by the students are inferior to what is produced in the patent document, this is how self-confidence builds up, how innovative and entrepreneurial spirit among students start.

3 HOW PATENT ENHANCED EDUCATION ADDRESSES THE MISSING LINK BETWEEN INDUSTRY AND ACADEMIA

Industry need engineers who can understand and generate solutions to real life problems of the industry. A landmark survey done by UK government among UK Industries indicated that 94% of respondents thought that it was important for businesses to understand how to protect their IP, yet 79% did not now even the simplest basics of protecting their IP and only less than 10% provides IP training for their staff [12]. The survey can safely be extended to other countries and other businesses since today IP is considered as one of the most valuable assets in the world.

This statistics indicate that industry clearly values IP very much but also needs help in IP related issues. In many cases having an IP professional on board of an industrial company is prohibitive in terms of cost In our opinion academia is in the best position for providing this much needed help to industry through better educating their faculty and students.

Patent enhanced education addresses the need of the industry in several ways:

1 Students learn how to use patent databases effectively for searching patents related to a problem.

2 Students learn realities of real life problems by studying "know-why" through the "background" part of patent documents. This prepares them for facing the realities of industrial problems when they happen to encounter them.

3 Students learn how to generate innovative solutions to problems.

4 Students gain self-confidence and learn to search solutions on their own.

Patent documents are an excellent source for teaching "know-why" to the students. Know-why is the key to bringing students level to the state of the art of the technology. Searching patent databases, drafting patent documents, developing patents is a category of actions that suit best to the academia. Having students' educated in these respects and having academicians who are well versed in these issues may be an excellent way of starting collaboration between university and the industry.

The author in the past has witnessed first-hand how the patent education given to the right audience resulted in emergence of patents coming out of companies. Armed with this knowledge, the author has confidence that patent enhanced education not only would help the academic institution to excel in rankings of highly valued academic institutions but also helps industrial development through better IP educated graduates who would make a difference in the companies that they work for. The fact that "patent enhanced education" increases self-confidence and entrepreneurship abilities of students is another big plus for the academic institution. Innovative companies formed by innovative students add enormous value to the state economy [13].

4 HOW TO SET UP AN ACADEMIC ECOSYSTEM FOR PATENT ENHANCED EDUCATION

Hopefully now that we are convinced about the need of the IP education, the effect of integrating IP education into our courses and the potential benefit to industry, there remains one important question. How do we make our academic institution to be one that effectively practices patent enhanced education in its courses?

The author suggests creating a suitable eco-system for patent enhanced education which may benefit both the students, the faculty and the university simultaneously.

The ecosystem should:

- make it easy for both faculty and students to file patent applications,
- should train the trainers who would practice patent enhanced education,
- should generate students who are qualified for helping industry and academia with their IP needs,

Creation of the ecosystem requires two steps; first setting up an office to manage and coordinate the necessary actions within the institution, second training the educators who would practice patent enhanced education in their courses.

Ideally the office to manage and coordinate necessary actions needs to be closely cooperating with upper administration of the academic institution directly.

4.1 How to train the educators for patent enhanced education?

The author suggests setting up Educational Innovation Office within the institution which trains faculty and researchers for IP related matters. We recommend selecting no more than 12 faculty in every academic year for receiving IP Enhanced Education Training. Faculty should be selected from volunteers who are eager to practice the patent enhanced education methodology in their courses. Our experience indicates that a four day workshop is sufficient to bring the faculty and researchers to

an acceptable level. Once the faculty has learned the basics, help should be provided to select and integrate patents into the course. The patent enhanced education approach should be well publicized in the school before the courses are introduced. This creates a sense of excitement among the students which is very valuable for the success of the course. After the course is conducted, if there are any patents generated by the student projects, the patent applications should be filed by the Educational Innovation Office and the success should be well publicized.

By selecting and educating no more than 12 faculty every year, the institution can gradually be adapting “patent enhanced education” in many of its courses within a short time.

5 CONCLUSIONS: WHAT WE EXPECT TO GET FROM PATENT ENHANCED EDUCATION?

The ideal educational environment need to inspire, teach, and encourage to innovate the students. Education blended with patents have potential to achieve this.

The intention of “patent enhanced education” is much more than graduating candidates who has ability to draft patents. Patent drafting is a skill that belongs to professional patent lawyers and we have no intention to compete with patent lawyers in this respect. What we aim to achieve is to generate individuals who have ability to identify innovative points of research and present it in a suitable way for the patent lawyers to craft an application around it. Patent lawyers are law professionals with ability to turn ideas given to them into patent applications. We aim to generate engineers and scientists who can generate quality patent ideas, encapsulate it and hand it to patent lawyers to work on it. As one patent lawyer puts it very wisely, patent lawyers are there to capture the “heart and soul” of the invention [14]. Our aim is to educate students who can identify opportunities, innovate solutions and present the “heart and soul” of the invention to the appropriate office of the academic institution or the company to become a patented product.

Students who have ability to search patent databases, identify innovative ideas, write and file patent applications will be very valuable for the industry. We believe “patent enhanced education” has proven its potential to be instrumental in inspiring, educating and encouraging innovation among the higher education students.

REFERENCES

[1] R. Soetendorp, M. Haberman and S. Smith, “University IP policies: perception and practice,” Intellectual Property Awareness Network Education Group, December 2016 Available at: http://www.wipo.int/wipo_magazine/en/2016/06/article_0009.html

[2] University IP Policy: perception and practice how students and staff understand intellectual property policy at their HEI Available at: http://ipaware.org/wp-content/uploads/2016/10/IPAN_NUS_University_IP_Policy_16aug16.pdf

[3] Student attitudes towards intellectual property, Joint report of Intellectual Property Office, National Union of Students and IPAN Intellectual Property Awareness Network Education Group, Available at: https://www.nus.org.uk/PageFiles/12238/IP%20report.pdf

[4] S. Barazza, “The future of IP in higher education,” Editorial, Journal of Intellectual Property Law & Practice, 2016, Vol. 11, No. 10

[5] J. Lerner, M. Baker, A. Speen, A. Leamon, “Financial Patent Quality: Finance Patents After State Street Harvard Business School,” Working Paper 16-068, http://www.hbs.edu/faculty/Publication%20Files/16-068_702dabb8-70c5-4917-a257-75dc8b0c4f6b.pdf

[6] D. Ewalt, “Reuters Top 100: The World's Most Innovative Universities – 2017”, Sep.27, 2017 Available at: https://www.reuters.com/article/us-amers-reuters-ranking-innovative-univ/reuters-top-100-the-worlds-most-innovative-universities-2017-idUSKCN1C209R

[7] Council on Integrity in Results Reporting (CIRR) CIRR XXIII (78) 2017, 97-126 ISSN 1848-5782 UDC 339.92:364.1(510:061.1EU) DOI 10.1515/cirr-2017-0009

[8] Espacenet Database Search tool, Available at: HTTPS://WORLDWIDE.ESPACENET.COM/

[9] Espacenet, Classification search tool, Available at: HTTPS://WORLDWIDE.ESPACENET.COM/CLASSIFICATION?LOCALE=EN_EP

[10] D. Monllor-Satoca, T. Lana-Villarreal, P. Bonete Ferrández, R. Gómez Torregrosa, “A "Know-How vs. Know-What" Approach in the Teaching-Learning of Competences in Physical Chemistry”, Departament de Química Física, Ap. 99, E-03080 Alacant, Spain Universitat d’Alacant, Available at: https://web.ua.es/va/ice/jornadas-redes/documentos/2013-posters/334641.pdf

[11] R. Garud, “ON THE DISTINCTION BETWEEN KNOW-HOW, KNOW-WHAT AND KNOW-WHY”, 7-13, Tisch Hall 40, West 4th Street Leonard N. School of Management New York University, Available at: http://ftp.unicauca.edu.co/Facultades/FIET/Materias/Gestion_tecnologica/2005/Clase%209/KNOW.pdf

[12] Intellectual Property Awareness Survey 2015, Intellectual Property Office UK, Available at: https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/500211/IP_awareness_survey_2015.pdf

[13] A. Valeroa, J. Van Reenenb, The Economic Impact of Universities: Evidence from Across the Globe, Available at: http://www.eua.be/Libraries/nrc-activities/valero-amp-mimeo-2016_the-economic-impact-of-universities---evidence-from-across-the-globe.pdf

[14] R. Krajec, CAN PATENT QUALITY BE MEASURED? https://krajec.com/can-patent-quality-be-measured/