공학인증제도를 운영하는 지방대학의 산학협력 모델에 관한 연구

A Coop Project-based Business Engineers' Model for Regional Universities Running ABEEK Program

임강빈*, 조대철**, 이해각***

Kang-Bin Yim*, Dae-Chul Cho**, Hae-Kag Lee***

ABSTRACT

This paper suggests a realistic, business engineers' model based on Coop projects run by regional universities or colleges, in which students must meet the guidelines for engineering design that ABEEK requires. Many of current activities such as Coop programs and Internships aimed for engineering majored-undergraduates have notled them either to a satisfactory level of business skill at entrepreneur side, or to their higher chance of employment opportunities. Under the circumstances like this, we need a revised version of Coop activities: for example, launching a project that will be fully supported intrust by both sides, and thus improving students' business skill while they are working on that project. We demonstrate in this study how students have greatly improved their business skill through a model project that was planned by a working group, was successfully carried out on real job positions, and many of the students in the working group were job-offered finally as this new model suggested.

Key Words : ABEEK, Academy-Industry Coop Model, Project-based Model

I. Introduction

Due to global regression, industry all over the country is reducing capacity of new employment, automatically resulting in higher growth of youth unemployment. Meantime many of individual companies are in short of work force, and are requesting universities "well-trained" graduates.

In this paper, we attempt to suggest some efficient solutions which will satisfy both parties by finding basic problems lingering around the current situation, and by diagnosing why the problems would not be resolved with ease.

We are not sure how the new design-oriented

* 순천향대학교 정보보호학과(yim@sch.ac.kr)
** 순천향대학교 에너지환경공학과(darchul@sch.ac.kr)
*** 순천향대학교 컴퓨터공학과(lhk7083@sch.ac.kr)
제1저자 (First Author) : 임강빈
교신저자 : 이해각
접수일자 : 2011년 5월 15일
수정일자 : 2011년 5월 27일
확정일자 : 2011년 6월 08일

courses help improving students' business skill even though those courses have been offered as ABEEK programs[1] proceed. Intrinsically the contents of the design based courses are limited in instruction times and in weight-placement.

Few students would take project-courses which were based on design and manufacturing at the expense of hard work and time consuming efforts. Those courses were proved to be not for everyone. Also, universities have made several attempts to grow the employment rate including customized co-op programs and internship programs. Years' effort like these did not prove to be worthy. Programs like these could shake regular curricula and senior courses in particular to result in insolvency of them.

Hereupon we present a project based co-op program overcoming the disadvantages of the existent co-op programs. A research team was constituted for carrying out a project to produce recognizable results. This example was found to be good enough to improve employment rate and students' business skill, which were satisfactory for both parties.

This paper is composed of the following successive four sections: current engineering education status and its according problems in section 2; newly proposed co-op project-based business engineers' model in section 3; a research team for implementing the new model in section 4; in final section, suggestions for the future.

II. Survey of Existent Business Engineers' Programs

1. Unbalanced supply and demand of engineers

According to the 2008 unemployment survey[2] which had been done by public media, the unemployment rate was 3.15% officially or 7.41% in sentiment rate. The new employees decreased by 12,000 compared to that in previous year. It has been proved that most of universities experienced a big reduction in the employment rate at the 1st survey for the employment status done in February, 2008[3].

Nonetheless industry as employers for job applicants seems to hesitate to hire new employees but to be in want of capable engineers since they have had difficulties in carrying out R & D and the other competitive business activities due to unsmooth supply of new engineers. In other words, we are oddly imbalanced between engineers'supply and demand; this is not the case of the ordinary imbalance that supply surpasses demand or vice versa. In a sense, we could find an easier solution if we try.

In that context, we first take a look at possible causes of the imbalance before rushing for a solution.

First, industry as the demander seeks only 'all-made-ready' engineers. At the same time, they indicate that universities ultimately fail to raise business engineers, especially in that fast changing IT area.

This negative viewpoint even involves the following:

- University graduates need to start over
- Even high GPA(grade point average) holders work poorly
- No idea what has been learned in universities
- Professors fail to support businesses with skillful students
- On university side colleges and universities are not destined to be vocational but need to have a responsibility to find an appropriate solution. As mentioned before, industry's accusation against universities can be summarized as follows:
- One way communicated curriculum
- Too basic lab classes
- Not sufficient extracurricular counseling or mentoring
- Not enough trustworthy networking between industry and academia
- Also some regional universities intrinsically have students who lack 'necessary' business skill due to their unfortunate circumstances

comprising 'evasion for science-engineering.'

- And some others are:
- Anxiety for not getting jobs closely related to their majors
- Defeated mind arising from incapable business skill
- Insufficient English proficiency

The psychological pressures like these are apt to make undergraduates passive, finally in business skill, resulting in failure in improvement: more specifically, failure to understand how majors are connected to real jobs, ignorance of how to train major-grounded business skill, and no self-motivated study.

More serious problem is that graduates have to wander for jobs which are far different from their majors. That prevented them from managing themselves to enhance business skill consequently: for example, preference to big companies, hypersensitiveness to current employment rate, attaching weight on learning foreign languages, and partiality for public service jobs. Under these circumstances industry and academic applicants become alienated mutually, and then industry might have the following difficulties:

- Hard to verify ability of an applicant just by resume
- Hard to judge personality and ability within a limited time of interview
- Too much investment in job-training after hiring
- Hard to employ appropriate personnel at a reasonable price

Solutions to the above problems are hard to find on either university or industry, and plausible suggestions are desperately asked by each side.

2. Problems and their solutions to the existent programs

For last few years a variety of ways to improve the employment rate for university graduates were attempted. Two of them are customized co-op curriculum and internship program.

The customized co-op curriculum is focusing on establishing an official agreement with industry, reshaping curriculum into more industry-oriented one, and, therefore, elevating the employment rate with a reduction of cost for training new employees.

The customized co-op education requires reshaping the current curriculum into what companies need most. In the process, some courses are very closely related to a company's products which are too popular and applicable. That raises a couple of questions like:

1) frequent revision of curricula where companies' demand on hot and popular products or technology prevails

2) too product-oriented curriculum only providing with vocational contents of education

3) not enough instructors' pool to keep up short-living product cycle

4) too rigorous education frame for students to be self-motivated.

Considering all the risks for customized co-op education, it aims to reform curriculum, not to develop business skill. That is, its goal is to raise specialized engineers on a narrowly specified area. Those good examples are found on areas of display control or display materials where electronics or materials engineering cooperates with display manufacturers. So is informative security area.

An internship program is designated in order students to have opportunities of working in industry before graduating, resulting in understanding the real jobs and better preparing for jobs on students' side, and pre-occupying work force, leading then to decrease the training cost of new employees on industry's side.

However, many of internship programs join even students who are not ready and then not performing well at the jobs. As a result, companies are reluctant to hire new, unverified interns. Out of a survey, only a few of internship trainees are found to get a job at the partner company.

Particularly, if internship programs are linked to credited courses, the other courses for seniors are

apt to be affected negatively and the participants are sometimes alienated from the advantage that they are supposed to take.

Another option for improving employment rate will be a placement exhibition. It provides information exchange between applicants and employers, and expands mutual sample space along with timely encounters. A third party often plays a big role in higher employment rate through an organized advertisement.

The placement exhibition, however, retains some issues to think about. Applicants cannot be pre-selected and therefore, efficiency in the process is low. In that case, companies just try to use the exhibition for self-advertisement to the multitude, not for new employment.

As said in section 2, some suggestions for existent Business Model programs can be summarized as customized education - operation of flexible curricula, internship as ready -made work force, and placement exhibition -need to be well-organized for competitive employment opportunities.

To develop and operate successful co-op programs, both of academy and industry need to make an effort to understand the basic problems and to resolve them through sincere cooperation. Academy should prepare a long-term curriculum including practice of business skill, recruit specialists, and support them.

On the other hand, industry need try to construct an academy-industry network thus to help improving the existent co-op programs with a small investment, which would be much larger otherwise.

III. Coop Project-based Business Engineers' Model

1. Required quality for business engineers

Industry sets values on two main categories of quality: general acquirements and professional ones.

The general acquirements include personality, morale, creativity, resource management, self management and expression, readability of technical documents, and English communication skill etc. In particular job morale is based on mutual trust between employer and employees, which is very crucial for continuity of employment as well as for management of human resource that may be in short anytime in small businesses.

The professional quality industry needs will be a good understanding of a specific knowledge, programming, job and system analysis, self-motivation in doing projects, adaptability to a new project, ability for effective data selection and analysis, documentation ability from planning to results, and so on. Self-motivation is a vital quality but would not be easily learned through the conventional one-directional education.

2. Current status of undergraduates' business skill

Curriculum and non-curricular activities for undergraduates are being executed in the most of information security departments. The curriculum has been systemized as many of the related researches have been done, but business skill development for the students is far short of a satisfactory level which industry requires meeting with: no more than a few hours of practical training or internship credits. Fortunately, one third of the students are involved in improving their business skill through the extra curricular activities, specifically academic clubs. In short term it would be just working for them; however, in the long run, we need a continuous, systematic supporting system to help them adapting to future job environment which could change and evolve. Furthermore, it would be urgent because the rest, 70% are considered to lack the abilities of self motivation and personal growth.

3. Business skill to be developed in universities

Business skill on industry side could be about commodity and its related knowledge. They are essentially peripheral but could be surely obtained through job adaptation, which universities need not to concern about. The core skill that industry asks universities to take part in will be the general and professional acquirements already mentioned in section 1, which are common in every industry: since every company has its own products in different work environment.

Most of small companies and businesses have relatively larger percentage of labor expenses than big ones, are short of investment for the training of new employees and are apt to put new employees into real jobs, not properly equipped with necessary business skill, instead. Consequently, the new comers have few chances of being trained but a good deal of work load, before starting a new real job.

From this point of view, development of business skill in universities is advantageous in many ways. Firstly, new training/education for the business skill can be given as a supportive to the existing curriculum with a reasonable cost. Secondly, the results out of the training/education are not judged in successor failure. Also, various cases of successes and failures are acceptable, are being demonstrated, and are utilized for future improvement. In addition, students are given a lot of opportunities for developing their skill, in different levels, as independent or connecting classes even linked to the students' activities on campus, eventually are ready to meet one of the goals of engineering education.

4. Coop Project-based Business Engineers' Model

As the procedure and managing method for resolving problems rising on projects should be learned first of all, universities need to provide with skill to resolve the occurring problems, not item-related knowledge of a specific area.

In order to grow the problem solving skill students need to be exposed to the environment where various items are suggested, repetitive designing & implementation is made, and real, field issues are discussed for resolution. In other words they are allowed to choose promising items appropriate to students' levels and current market. According to that, projects are defined, data were collected for selection and analysis, and results were evaluated and were assured to be led to improvement.

Also, additionally they are asked to document all the procedure and results. While projects are in progress, meetings and consultation with the professor and graduate assistants should be made at regular basis. That will lead the students to self recognition through a couple of advice and suggestions. This process requires patience until a certain level is attained. Then the repetitive training process should grow the quality and ability of students for enhancing their views on macroscopic problem recognition.

Business skill training at universities not only values itself but also provides industry with the following;

- Long-term collection of data for judging students' ability and personality
- Provision of periodic or non-periodic discussions, in visitation or remoteness
- Selectivity for pre-contracted employees if necessary
- Mutual sharing of knowledge and results obtained from the training

To fulfill the purpose universities should set a network among industry and them based on mutual trust, form an undergraduates-centered task group comprising a professor, and graduate students, and then supporting industry with specific technology and future engineers through training for business skill and personal quality. On the other hand, industry should provide academy with useful subjects and materials which lack in it so that the task group could take better items in market or in the real world.

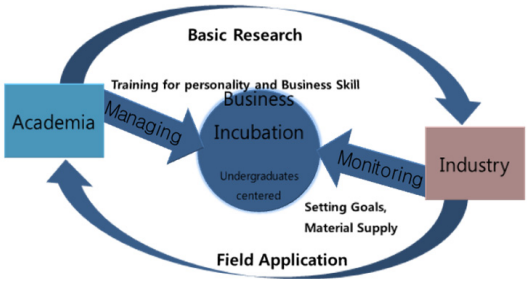

Fig.1. A model case based on academy-industry cooperation

Fig.1 shows how undergraduates can be centered in a coop program between industry and academy.

IV. An example model

This chapter shows how the research and development team worked on a real example and what it produced.

The team was composed of two Master students and four undergraduates who would be supervised by a professor on Nov. in 2005. After that, the team grew with 20 undergraduates, delegates from 5 companies, 2 master students, 1 PhD student and a professor, maintaining 25% of experienced crew.

1. Form an environment for business skill education/training

The team was permanently positioned in the university with a support from the delegate companies. It also constructed a cyber space including a data server and some project management sites in order for all the related parties to share information and cooperate with each other.

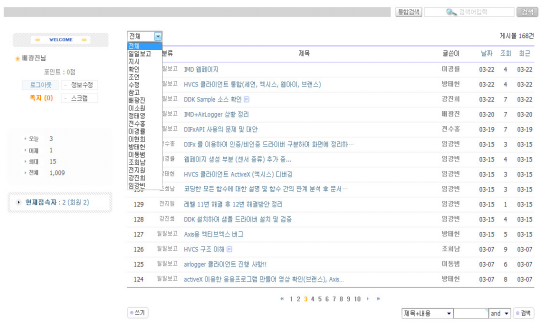

Fig. 2. An internet site for project management and information sharing

A project management site in Fig. 2 was used as a window for daily reports, problem shooting, communication, orders, and advice at students' side and as that for member management, suggestions and resolution of occurring problems at professor's side as well. Some important issues out of this site have been discussed at the weekly meeting (see Fig. 3).

Fig. 3. Discussion is going on the site cited in Fig. 2

Each member was encouraged to manage his/her experiences and achievement in his own area by writing his portfolio (Fig. 4-1 and 4-2) in the site. In the data server one can manage various file folders such as project folder, and common ones as well as personal one (Fig. 5). Self-tasking like this allowed each member not only to grow his/her ability and business skill, but also to evaluate them by him/herself.

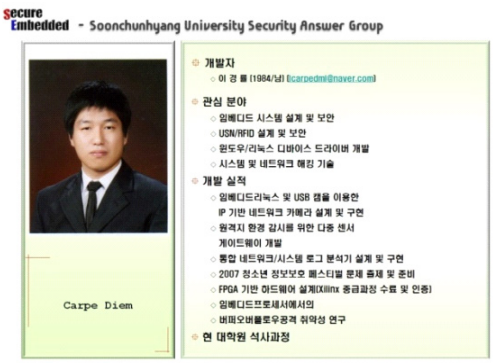

Fig. 4-1. Managing the portfolio at the server

Fig. 4-2. Managing the portfolio at the server

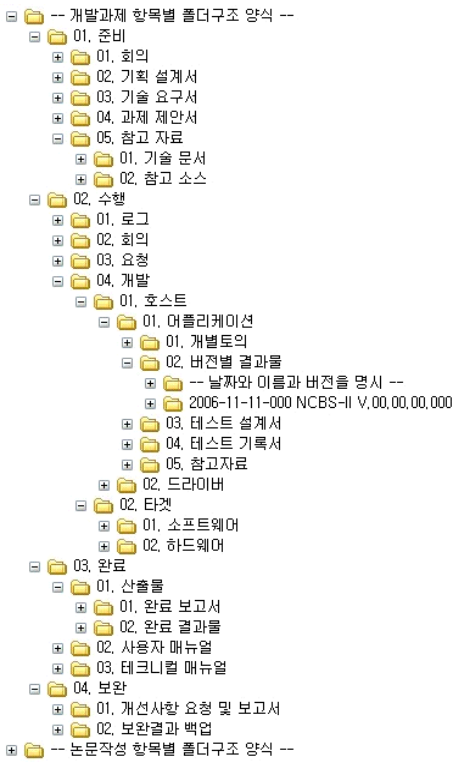

Fig. 5. A server manages the status and products of all projects.

Fig. 6. Some pictures taken at a workshop

Here the team had workshops at a regular basis where all the educational and/or training results would be reported and discussed along with strong bond and close cooperation among the attendees. The members have had opportunities for higher level of self expression ability and awareness of role model in the community through the workshops which the delegate companies financially aided for (see Fig. 6).

2. Results of business skill education/training

As mentioned before various projects were initiated by the research team powered by undergraduates. The themes of the projects were granted by industry in a reasonable scale that students would be able to manage. By doing this students could learn practical and market oriented vision while industry might use the results for its own sake, which would turn out to be a win-win cooperation for both sides. The students' achievements were listed as follows:

- Deployment of the Centralized Management System for Networked CCTV, Kyeonggi ITS: Developing Client ActiveX, Web Counterpart, and Connection Module to Networked CCTV
- Deployment of the Sensor Network in the Underground Chambers for Communication Cables, Pusan City: Porting the OS, Developing Device Drivers and CGI Interfaces
- Deployment of Environment Monitoring Network and Counting Web Site, Yeonje Gu: Message Parser, Message Compactor and Web Interface
- Development of an Alternate Apparatus against Keyboard Hacking, Internal Project: User Interface, DB Module, Keyboard Protocol

In addition, the students were advised to publish the results they got through the projects as conference papers. The following is the list of papers published until now:

- "Design and Implementation of a streaming

server supporting multiple clients on web cameras for video surveillance", Proceedings of The Institute of Electronics Engineers of Korea, Vol. 4, No. 1, Nov. 2006
- "Implementation of a Web-based Weather Monitoring Server on TCP/IP Network", Proceedings of The Institute of Electronics Engineers of Korea, Vol. 4, No. 1, Nov. 2006
- "Study on the Buffer Overflow Attack Vulnerability on the Embedded Processors", Proceedings of Korea Institute of Information Security and Cryptology, Vol. 17, No. 2, Dec. 2007
- "Implementation of a Centralized Management Framework for Integrated Web-based Video Monitoring", Proceedings of Korea Institute of Information Security and Cryptology, Vol. 18, No. 1, Jun. 2008
- "A New Keyboard Protocol Evading Password Sniff", Proceedings of Korea Institute of Information Security and Cryptology, Vol. 18, No. 1, Jun. 2008
- "A Remedy of the Cross Compiler Against Buffer Overflow on the Embedded Processors", Proceedings of Korea Institute of Information Security and Cryptology, Vol. 18, No. 1, Jun. 2008
- "Implementation of an Integrated Network/System Log Analyzer using Open Source Software", Korea Proceedings of Information and Communication Society, Vol. 37, Jul. 2008
- Most of the undergraduates who participated in the research team have had jobs at Ahn Lab, Hauri, A3 Security Consulting, TaeKwang ENC, LinkLoad, ILUON, etc. including graduate schools. The companies listed here are above an average level in that area in Korea.

V. Conclusion and suggestions

This work is to suggest an example solution to the lingering problem in currently on going coop programs for aiming to improve students' business skill that industry requests new employees to acquire. In this work we organized a research team that was supposed to carry out a few company-sponsored projects, through which we demonstrated this strategy might successfully work for the two parties.

Graduate Year (No)		Company or Job
2005	1	Taekwang ENC
2005	1	Doctoral Candidate
2006	1	A3 Security
2006	1	Ahn Lab Inc.
2007	1	Linkload
2007	1	Master Student
2007	1	Army Officer
2007	1	A3 Security

Graduate Year (No)		Company or Job
2008	1	Ahn Lab Inc.
2008	1	Eluon Co.
2008	1	KARPH
2008		
2009	1	Hauri, Inc.
2009	1	Senior
2010	4	Junior
2011-	7	freshmen/sophomore

Fig. 7. Companies which the team students are now working at

After completing the work, we have carried out a survey targeting the participants, and had interviews with them in order to analyze and improve the programs. The results of the survey show that the proposed model is successful for both students and teachers. After the analysis, the success factors for the work can be derived as follows;

Firstly, students were interested in and satisfied with the programs. One of the reasons of satisfaction is that the subjects are related to students' favorites and up-to-date topics.

Secondly, students were mentored by company experts, who are role models for the students, which attracted the students' attentions. Moreover, students' design abilities such as problem-definition ability, problem-solving techniques have been upgraded by the mentors'know-how.

Thirdly, students' communication skill and teamwork have been upgraded. During the education program, every outcome has been made in cooperation, and they have a presentation time and a conversation time at every meeting. After the completion of these programs, a workshop was held for all participants, and it gave a chance to have an interdisciplinary brainstorming on the various types of subjects. Through this training, they havelearned not only how to make teammates understand their assertions, but also how to

understand teammates' opinions.

Finally, some students have been hired by recommendations of their company mentors. This is very remarkable case in Korea comparing the traditional programs, and also shows the increase of reciprocal confidence between students and company mentors.

However, there need an cooperative elaboration from industry, universities and government since the projects usually bring a great deal of work to be done by students and managers – professors and graduate assistants – in charge.

References

[1] www.abeek.or.kr.
[2] 대한민국 경제 및 재정통계, 국회예산정책처 경제분석실 거시경제분석팀, 국회예산정책처 2008
[3] 한국교육개발원 취업통계시스템 : http://swiss.kedi.re.kr/

이 해 각 (Hae-Kag Lee) 정회원

1985년 2월 : 한양대학교 산업공학과 (공학사)
1987년 2월 : KAIST 산업공학과 (공학석사)
1992년 8월 : KAIST 산업공학과 (공학박사)
1992년~현재 : 순천향대학교 컴퓨터공학부 교수
<관심분야> DB시스템설계 및 구축, 데이터마이닝, 시스템 시뮬레이션

조 대 철 (Daechul Cho)

1985년 2월 : 서울대학교 화학공학과 (공학사)
1987년 2월 : KAIST 화학공학과 (공학석사)
1996년 5월 : 미국 퍼듀대 화학공학과 (공학박사)
2000년~현재 : 순천향대학교 에너지환경공학과 교수
<관심분야> 생물학적 환경조절, 바이오계면현상, 바이오에너지(전지, 생물자원)

임 강 빈 (Kang-Bin Yim)

1988년 2월 : 아주대학교 전자공학과(공학사)
1992년 2월 : 아주대학교 전자공학과(공학석사)
2001년 2월 : 아주대학교 전자공학과(공학박사)
2003년 ~ 현재 : 순천향대학교 정보보호학과 교수
<관심분야> 시스템보안, 운영체제보안, 융합보안, 영상보안