化学工学教育
CHEMICAL ENGINEERING EDUCATION

韓國의 工學敎育*

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Engineering Education in Korea*

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Present Status

Korea's advent as an industrial country is gaining an ever increasing momentum by virtue of the successive Five Year Economic Development Plans during the past 15 years. The prime objective of the Third Five Year Economic Development Plan was to promote the heavy and chemical industries, thus calling for a great number of engineers and technicians of high quality.

The rapid expansion in numbers of students, teachers, and schools was noted during the 1960's.

The total number of four-year colleges and universities have reached 72, out of which 32 institutes have engineering education disciplines. While the total college students are more than 240,000, those in engineering fields are about 44,000 which amounts to 18% of the total.

The five-year junior technical college program after middle school education appeared in 1963 and supplied the technical manpower required for the economic development plan in Korea. These colleges which numbered 23 in 1969 were converted into two-year junior technical colleges in 1974 to meet the rapid increase of demand. Currently, there are 20 such colleges, and 15 out of the total 87 junior vocational colleges have technical departments. By number, 28,000 out of 40,000 junior vocational college students are the technical students. The number of students in the total of 72 technical high schools are 124,000. This is the source of junior technicians in various fields of the country.

As an innovatory measure to improve the quality of higher education, the Ministry of Education launched the pilot college or university programs. The major features of the program can be briefed as follows:

Firstly, the credit requirements for graduation dropped from 160 to 140 in order to effect a qualitative improvement of the education program.

*This paper was presented at the Fourth Korea-U. S. Joint Continuing Committee for Scientific Cooperation in Seattle, Washington, U. S. A. on November 3, 1976.

Secondly, the student admission quota which used to be set on the basis of each department is now set on the basis of college or field, thus giving more flexibility.

Thirdly, the system of minor specialization is enforced for the college students to broaden their academic foundation and to increase the job opportunity.

There are currently 24 pilot colleges and some of them are promoting the accelerated graduation system adopted in 1975 by the amendment of the education law. The selection of the pilot colleges was made by the evaluation committee on the basis of the plan for the improvement of their education program submitted by a number of colleges or universities. It is doubtful whether the accelerated graduation system is sound in the light of ever increasing quantity of teaching materials due to the birth of new technologies. It is also doubted if the reduction of graduation credit requirement from 160 to 140 would really effect a qualitative improvement of the education program.

2. Curriculum Design

The industries of a developing country naturally expect the graduates from colleges to be prepared for the practical techniques and skills for their immediate demand.

Objective oriented teaching program and close relationship between education and industry need to be fruitful. A logical sequence of the curriculum design process comprises the problem indentification, curriculum synthesis, critical assessment, and implementation.

The modular approach in curriculum design has been contemplated in Seoul National University. In the case of chemical engineering deparment, for instance, a curriculum module consisting of courses emphasizing process control, or a module emphasizing chemical equipment design or plant design can be conceived in order to respond to the needs of industry.

This, however, may require on the average more than two professors to cover one module. Therefore if there are six different modules, we may need more than twelve professors in one department. This is apparently not the case in Seoul National University.

The system of minor specialization in engineering education could be introduced to compensate the possible shortcomings of the modular type of curriculum design.

Practical training and industrial experience are essencial elements in the education of engineers and technicians. Poor facilities for laboratory and workshop, lack of operating budget, short of teaching staffs and assistants, poorly developed textbooks, and inefficient administration procedures are the major constraints which have to be removed urgently.

One example of inefficiency is as follows: The central procurement system of laboratory supplies is being adopted in Seoul National University to save the expenditure by making the purchase in bulk through bidding at a central purchasing office. Goods are classified into paper-category, chemicals-category, elemental electronic circuit-category, etc. This type of purchasing system may work very well in case of purchasing well standardized military supplies. But in case of laboratory supplies where an item can come in any different number of quality and model, bulk purchasing concept seems to be definitely wrong. Nevertheless, the university administration believes in only one merit.

3. Upgrading the Student Quality

The recent policy of the government has been materialized in such a direction as to enforce a senior project and on-the-job training in relevant

industries during the summer and/or winter vacation.

It is also required for all senior student to take the national technical qualification examination. Those who passed the examinations are awarded with the title of "Class I Engineer" which is next to the "Professional Engineer". In other wards a senior engineering student must submit a thesis-form report on his project, and take the national technical qualification examinations. The former is requisite for the B. S. degree and the latter for Class I Engineer. This means that one has to worry about both the academic degree and the professional title at the same time. It looks to be a great source of confusion, and one may say that a college student should worry about the B. S. degree only. But, since the examinations are compulsory, there is no way to avoid them.

Although these are believed to have aimed at improving the quality of the engineering student to meet the demand of the society, these policies, without preceding improvement of laboratory facilities and staff quality and number, may lead to unexpected reverse effect distracting young students from the regular college education.

Next year a new policy concerning admission to engineering colleges will be practiced to give special quotas to some qualifed technical high school graduates, aiming to add more incentives to the aspirants for vocational high schools over the general academic high schools. Since similar practice at the Seoul National University in earlier days had failed, a very special care has to be placed in the implementation. Otherwise, this may result in the same conclusion as "Hoping to make the eyebrow right, one pulled out his eyes".

4. Staffing and Staff Development

Most engineering colleges in Korea face a critical shortage of teaching staffs nowadays.

The number of engineering professors is about 1,400 and the ratio of the students to professors is about 30. The appointment and promotion of the university professors are tightly administered by the Ministry of Education in cooperation with the individual colleges and universities. The professorship is deemed highly of in the Korean society because of the narrowness of the road to this particular profession.

As of February this year, all the university faculties in Korea, national or private, were newly appointed under the contract system which was introduced to upgrade the quality of the faculty members. The term of contract depends on the standing of the professorship and is in the range of 2 to 6 years.

The professors of engineering colleges are mostly internally recruited. The inducement of overseas Korean brains, especially the doctoral degree holders, have recently been accentuated, yet the number constitutes very few to alleviate the shortage in professors.

Most professors lack the practical industrial experiences. Therefore, it becomes very difficult to put the industry oriented teaching program into engineering education.

Uniform rate salary structure is another aspect to be reexamined in order to recruit and secure competent young engineering educators. In evaluating the staffs, practical or industrial experiences as well as the conventional academic records must be favorably credited.

Most professors in Korea have virtually no opportunities to refresh and cultivate themselves because of teaching overload and lack of budgetary support. They should be given a one-year or a one-semester work-leave in industry, or study-leave in or outside the country.

The quality staff development may be enhanced by communicating with the industry through seminars and whorkshops organized by the educ-

ation side or jointly by both parties.

For continuing education of engineers working in industry, senimars and workshops may not be enough. A field engineer or a R & D engineer should also be given study-leaves in the universities so that they can refresh their hardened brains. This means that a university must always be the source of the up-to-date knowledge for which the industry people envy or look up the university men. This mutual actions will, in any sense, contribute greatly to the upgrading of the standards on both sides. Unfortunately, Korea is not in this situation yet. However, the most stunning recent announcement is that the government research grants for university professors will be tripled next year in comparison to those of the present yeas.

5. Korea as the Regional Center of Engineering Education in Southeast Asia

Last August, Seoul National University and UNESCO organized jointly, with the support from the Korea Traders Scholarship Foundation, an international meeting on innovations in education and training of engineers and technicians. The meeting carried a subtitle "New curricula and forms of training with special reference to education-industry cooperation" and the topics of discussion was focussed on the need for orienting teaching programs and methods of teaching and learning to meet the needs of economy, industry and society.

The participants included senior educators of engineers and technicians from ten different countries in Southeast Asia, as well as the representatives of industries and other related international organizations. Some thirty papers were presented at the meeting dealing with selected areas where innovations in engineering education had been or could be made: curricula, pedagogy, application of technology for teaching purposes, staff selection and promotion, and selection of students. This kind of effort is hoped to stimulate engineering education as well as cooperation between industry and education which is vital in the matters of student training, staff and curriculum relevance.

6. Industry-Education Cooperation

Actually, the industry-education cooperation in Korea is symbolized by the operation of the Korea Traders Scholarship Foundation which sponsors some industry-education interaction activities, and grants scholarships to the high school and college students. The foundation also grants the research fund to the professors in the amount totalling ₩300 million. The foundation is well known to the Southeast Asian countries, and has become, in some sense, the target of envy in that part of the world.

The foundation, however, seems to us too meager to handle the growing request for research fund. This may be one of the reasons why this committee discusses on the proposed Korea Science and Engineering Foundation. It is thought that Korea alone cannot achieve this goal. The U. S. assistance in funding is absolutely needed. Why do the Koreans expect the U. S. cooperation in establishing the National Science and Engineering Foundation? The reason is that Korea is actually defending the U. S. by being prosperous and independent. If a healthy Korea were not there, there would be no peace in Northeast Asia, and further in Pacific Ocean.

7. Financing and Governance

The education budget and the science and technology budget for 1975 stood at 16 and 2%

of the total Korean government budget, respectively. The account of expenditures for higher education amounted to 18.8 billion wons. Although the research and development expenditures increased more than 20 % annually in last 10 years, the amount reached 23 billion wons which was mere 0.28 % of the Korean GNP. The concurrent cost for educating one engineering student in the average Korean colleges is believed to be about $ 500 with one exception.

Without cultivating much better financing conditions, outcomes from education and research cannot be expected too much. It may be impossible to maintain the present day Korean trend of economical development from technical and competitive point of view. The Ministry of Education, particularly, its Higher Education Bureau and Science Education Bureau are largely responsible for the engineering and technical college education. However, the Ministry of Science and Technology, established in 1967, is to administer the science and technology policy in consonance with the economic development plan.

It appears that the engineering and technical education is being supported and administered strongly by both ministries, but they are, in reality, apt to produce irrelevant confusion and complexity, probably due to insufficient coordination and the lack of engineering education expertise.

8. Concluding Remarks

The engineering education in Korea is entering a new phase where all engineering educators and administrators have to put every effort to produce fruitful products for the future technological society. A balanced administrative support is the key for the realization of quality education and relevant prestige. While some approaches are proposed to cope with the issues in the engineering education, many problems and issues are yet waiting to be solved. For this solution, we like to invite many suggestions and comments as well as assistance from our U. S. friends.