


 特別講演

## The Case for KAIS in Korea's Industrial Future

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The dynamic leadership of President Park Chung Hee has brought about great changes not only in the political picture of Korea but in her industrial future. His psychic and almost extra sensory perceptiveness of the impending needs and demands of Korea and the fulfilment of these needs marks him as a man of destiny. Korea is indeed very fortunate in having him at this critical stage of her industrial history. He has with almost unflinching good judgment brought his country through all the birth pangs of an infant nation to the envious status of a normally developing nation. But even President Park Chung Hee cannot single-handedly carry out or even implement the ambitious plans he has outlined without the help of all of us. He especially needs the help of the intellectual echelon comprised of academia, industries and government.

Presently, I shall concentrate on the effective role that academia can and must play in the President's plans for the future. For centuries, Korea has been steeped in the traditions and practices of Confucian teachings. Personally, I have nothing against Confucian Philosophy per se. However, I'm against the rote and memorization which this type of philosophy engenders. As time progressed, this ancient and honorable method of learning and teaching became outmoded since it did not

accommodate itself with the changing times. Educators and other thinking men in Korea became greatly concerned and started to question and probe the workings of the Korean system of education which they had initially inherited from the Chinese and Japanese. As a result, education in Korea today, is at the crossroads of survival. Higher education in science and technology—not very good at its best, now has to struggle to survive. In order to survive, Korea has to make commitments not only in money but also engage in changes to break away from the past and at the same time, she must adopt revolutionary measures to counteract various outmoded practices which has a tendency to denigrate the educational system. This type of commitment means significant changes in the attitudes of educators as well as that of political bodies. It means a flexible and innovative approach to education and greater social, moral and material support on the part of the legislative bodies. As an educator, I am concerned with all of the broad changes in education but for the time being shall confine myself on this occasion to the field of my expertise.

As far as I'm concerned, chemistry and chemical engineering curricula and teaching should be revolutionized. The relevancy of subject matters and the inculcation of the techniques of basic and applied research are the only answers to a meaningful industrial survival. To do these things, the upgrad-

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ing of the University system of students, teachers and facilities must be made. Real practical respect for the teachers and not mere mouthings of Confucianistic mumbo jumbos are the orders of the day if one is to survive. The professors should be given not only respect but they should have their own self-respect and self-esteem by being given a living wage. On the other hand, the professors should earn this respect by better performance of their duties and obligations. They, too, cannot live on past glories and traditions. They must continue to perform and meet the changing times. They must be able to show their students (not disciples) that "research" is to see what everybody else has seen and to think what nobody else has thought. They also must be able to teach others to know what the problems are before anyone can solve them and at the same time they should educate the students about problems waiting to be solved or holding back developments.

Chemistry and chemical engineering, in my opinion, are twin brothers of material science. It is hard to make a chemical engineer out of a chemist but the reverse is not true. In this game of brinkmanship, the Koreans have an advantage. The Korean students are strong on mathematics and abstractions but short on imagination and experience in organic syntheses. They do not lack manual dexterity or manipulative skill but by training and tradition they have been steered away from syntheses—some because of finances, lack of proper guidance or lack of older professors who themselves were afraid of tackling an ever changing and imagination-requiring field.

What then is the solution?

I would like to suggest a new course of action and teaching. Let us call it "imagineering" for want of a more suitable term. This involves the incorporation of chemistry and engineering to encompass all fields of chemistry with its engineering implications into a large dynamic field requiring imagination—disregard for old taboos and outmoded approaches—into areas where everybody else has seen but has not thought about. This makes the dual field

of chemistry and chemical engineering areas of unconfined and unrestricted thinking and mental discipline—a 24 hour job. This "horrendous" job demands discipline not only from the students but from the teachers. It challenges the teachers to anticipate the wants not only of the students but of industry. We are then really involved in a survival of the fittest—of both teachers and students. Both parties have the right to demand the bests of each other. As part of this thinking, in my opinion, tenure as it now practiced should be modified. In its place, I would suggest limited tenure of five years' duration, reviewable at end of each 3 year period. This will keep the teachers on their toes and up on all developments. As each student and teacher have their responsibilities, the universities and the country, too, have their collective responsibilities in seeing to it that the professors are adequately paid so that he is free of financial worries in the pursuit of excellence. Industries also must see to it that they are participants in this deal. Without proven and dedicated professors, industries would be without properly trained scientific personnel, very necessary and important human resources in the struggle for existence.

Now let us go back to the teachers. He should at all times have his pulse on the changing times and anticipate new developments so as to train his students to meet the changing demands. He should also really educate his students—leading them, cajoling them and training them. He should be friend, mentor, critic, parent. To him, the chemical and engineering textbooks should be mere historical documents—accounts of past accomplishments and failures—not the final words or limitations of science. This, he must etch in the minds of his students and also the fact that knowledge is not finite. He must also by some sort of an esp (extra sensory perception) transmit to his students the joys of success and the travail of failures—but withal the wonderful and meaningful adventures of research, be it basic or applied. He must also transmit to them—that monetary rewards are not the ultimate objectives in the practice of his profession but that the joys of accomplishment

far outweigh them.

As part of the program of teaching chemistry and chemical technology, since most of the students eventually will end up in industrial or academic research—the teacher must emphasize that one of the most important elements of group behavior is communication. Personal communication between scientists and engineers, teacher and student, is probably the most important channel for the exchange of technical data of direct use in solving immediate problems.

One of the most important attributes that a teacher can have is the ability to develop the special psychological process of creativity which is one of the most subtle and powerful abilities of the human mind. Its effective use requires the insightful cultivation that is required in developing any highly skilled performance in human beings. Creativity is the process by which a human brain makes illogical jumps when it is considering a problem, jumps that others have not made and could not be expected to make in trying to solve the same problem. This is not a God given attribute—it is a cultivated one which requires as much practice as an athletic champion who remains unbeatable.

These principles I have stated above can now be broadly expanded into the practical aims and mission-oriented objectives of the Korea Advanced Institute of Science (shortly termed KAIS) into other fields of endeavors in a similar manner.

This Institute founded by President Park Chung Hee is a model well-worth studying. KAIS's prime objectives are to produce capable graduate scientists and engineers needed for the fast-growing economy; to modernize and upgrade Korean higher education; to undertake mission-oriented basic research of prime interest to the Korean industry; and development of science and technology and of necessity supply the manpower for the ambitious programs of the technical needs of Korea.

To meet these objectives KAIS is set up with a philosophy different from most American graduate schools. Ever since Sputnik, U.S. university professors have kept up steady pressure on the

Federal Government for grant money. But some of these same professors never have given much thought to giving the Government any return on its investment. At KAIS it is planned to get away from this. KAIS cannot afford the luxury of undirected research. It must be mission-oriented in all its spendings. KAIS is recruiting professors, therefore, whose industrial experience and research-capabilities fit in with the development of Korean industry and economy. KAIS has already hired nearly 30 professors to staff KAIS, all of whom are Korean and most of whom received their graduate training outside Korea, particularly in the U.S. Its staff members range in age from 28 to 47.

KAIS will offer three different graduate programs—master of science, an engineer's degree, and a doctor of science—in seven different fields by 1975, including basic, electrical, mechanical, material, chemical, industrial, and biological sciences.

Primary emphasis will be on a two-year M.S. program in those fields of engineering and applied science that are of high priority to the Korean industry. The attitude KAIS will take is that if a particular segment of the Korean industry does not require at least 15 KAIS-type M.S. graduates per year, then that discipline does not have a sufficiently high priority to warrant a curriculum at KAIS. Emphasis in chemistry for example will be on organic, petrochemistry, environmental control, quality control, and especially pharmaceuticals and fine chemicals.

The doctor of science degree is intended to prepare individuals to do research and advanced development in Korean industry and in governmental institutes. The engineer's degree is visualized as an intermediate between the M.S. and Sc.D.

In essence, KAIS is trying to learn from the past mistakes of the American system.

KAIS itself came about as a result of bilateral cooperation between the U.S. and Korean governments. In August, 1970 at the request of Korean President Park Chung Hee, a team of U.S. and Korean scientists sponsored by the U.S. Agency for International Development and lead by Dr.

Frederick E. Terman of Stanford University and including chemist Franklin A. Long from Cornell began a feasibility study. KAIS was formally founded in February, 1971.

A distinctive feature of KAIS will be the extensive interaction with the technological activities of Korean industry. This is to insure that both the faculty and students of KAIS are knowledgeable regarding the real world of engineering, and can interpret their learnings accordingly. Also, because of its clearly defined mission, KAIS will have laboratories far superior to anything available in other Korean educational institutions.

We believe with Dr. Edward David, President Nixon's Scientific Advisor, that the establishment of KAIS is a "bold new step in improving the education of future scientists and an example to be studied carefully by other developing countries in Asia and elsewhere."

He are also in accord with the philosophy of Dr. Hyung Sup Chai the present minister of Science and Technology, who believes that the future of Korea's industrial stability and development liss in the acceleration and development of the patent research potential of Korea's budding scientists.