

Foreword

From Professor's Daily Affairs

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The society has been thrown into confusion. Since last year, various situations at home and abroad are shaking what we have thought understandable. The daily life of us members of a faculty is not an exception. Today, the number of 18-year-old population in high schools is rapidly decreasing. Each department and faculty of a university has an enrollment limit that has been recognized by the Ministry of Education, Culture, Sports, Science and Technology (MEXT). It has become a real possibility that the limit may no longer be reached. Reaching an enrollment limit is more critical than the employment rate of graduates. If the competitive rate of applicants become lower and departments can't fill the capacity, they will immediately become a target of elimination and consolidation. Therefore, all universities are making efforts on PR activities for high school students, creating a remarkable PR booklet, participating in various university orientation meetings and holding an open campus day repeatedly. I am engaged in a role related to these activities. Last year, I had a chance to hear recent situations of high school students from career guidance counselors in a prefecture in the Chukyo region. There was a story that left me an impression.

Today's high school students have been told to "have a dream" since they were young, under the education policy that focuses on individuality. As a result, they consider their future occupation more than students in the past. On the contrary, an increasing number of students can't make a decision on their career when they think of failing to realize their dream and they feel cornered, as they have been told that the failure is as a result of their self-responsibility. Having seen these situations of high school students, PR staff of universities become more vigorous for their PR activities to attract students. In the case of an engineering department, they become too quick to jump to conclusions of highlighting the "pleasure of manufacturing." In my university, the number of opportunities in which professors are sent to high schools to hold classes or introduce research activities is increasing. Normally, we take on a subject that attract students' interest such as robot. The problem is that if students take our interesting subjects on faith and enroll in an technical department, many of them would

be disillusioned with the actual lectures they take after enrollment. In actual classes, we hear many complaints such as "I would like to experience actual manufacturing more," "mathematics and technical classroom lectures are not interesting," and "I would like to operate an robot."

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How about theory of mechanism and "machine element design" that I teach? Although both courses, are typical special technical subjects, are they interesting to learn? The goals of lectures in machine element design are to understand the JIS standards regarding basic machine elements including screws, gears and bearing, and to learn how to decide satisfying materials and shapes based on the load conditions given using the knowledge of strength of materials. However, are these contents of any interest that high school students imagine?

For example, students learn about the idea and standards of "fit" in the first stage of machine element design learning. I myself remember finding it innocuous and uninteresting when I first learned about it as a student. However, as I become familiar with when and how the specific values of the eye-hurting fine figures in the tables of fit limits or tolerances were decided, and as I become older, I found out the importance of "fit" and felt it in my body. Needless to say, screws, gears and rolling bearing were all invented by humans from nothing and they don't exist in nature as they are. This is nothing but the enticement of machine elements. These man-made things are standardized throughout the world. When you understand that an M10-screw bolt that is purchased in a tool shop in Germany unconditionally "fits" a nut that is purchased in a home center in Japan is a truly miracle happening, you might find machine element interesting. However, I know that high school students can't imagine such a story.

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Screws, gears and rolling bearing are invented in Europe. Originally, the idea of engineering came from Europe. I travel to Europe every year to participate in international conferences related to precision engineering. I visited various countries and cities that host each conference. After many visits, I found that "Europe" is a very diverse place and people using different languages and customs are coming and going all the time. For example, there are French-speaking area and Dutch-

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speaking area in Belgium. To me, it is very confusing to see the destination of train on display as different spellings are used for geographical names in each language. Swiss people can speak three languages without hesitation. People from various countries gather in Europe and they share the tradition of Christianity from the Middle Ages and the values in modern Europe. When I chat with the local fellows in an international conference, I feel the foundation supported by their solid tradition in the engineering they are implementing. I can also see the historical inevitability in automobiles and trains that run through the towns in each country of Europe.

Modern science and engineering and industry based on modern science emerged and developed only in Europe. This is because there was little centralized and monopolistic wealth in Europe as no dictatorial centralized government like successive dynasties in China existed, and the fact that all people had a chance to make money equally had a deep influence.¹⁾ There, engineers and traders (and academics?) were both able to make a profit by cooperating each other to create and upgrade machinery. As a result, the country became wealthy. It is said that, as the École polytechnique in France and TH^{Note 1)} in German-speaking areas were established by the government as systematic education and research facilities for such useful and positive knowledge²⁾, the idea of "engineering" gradually became deposited and crystallized.³⁾ Since European people stepped out of the grace and spell of God that have continued from the Middle Ages and decided to seek for wealth through industrialization - live by their own ideas and actions, the big waves of modernization have emerged and developed the present world. In this modern world, we are running about in confusion around the clock.

Note 1) Technische Hochschule. It started as a technical collage and later became a university of technology.

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How about engineering in Japan? Japan opened its door to foreign countries with the arrival of the black ships of Commodore Perry after 300 years of the peaceful isolation. The country was suddenly exposed to the Western civilization of science and technology, which led to forced innovative changes. Japan struggled to absorb engineering. Engineering in Japan is so to speak "ersatz engineering" that was forced by Western countries, and it didn't arise as a sequence of Japanese own culture. Japanese people were, however, most excellent in mastering engineering outside Western countries. Today, Japan sees a demand of incorporating roles of university into industrial and economic systems in a more practical way and teaching and studying subjects that can actually be used in the society. However, this might be seen as a matter of course in the engineering field. Since engineering originally had a strong connection with economy (traders). There is one barrier to developing a system that generates economic benefits through practical cooperation between universities and companies. Those, like myself, who are engaged in university and haven't entered the workforce are not able to understand the philosophy of "making a

profit." If the real purpose of engineering is to make a profit through the sharing of positive values and cooperation between engineers and traders, academics who have no pleasure in making a profit would be useless.

Nevertheless, we faculty members are expected to tell young people (who are forced to have a dream) the reason why we chose our academic field based on our dream. In fact, the reason that faculty members became involved in their present academic field rather comes from personal situation. In my case, although I was in a robot engineering laboratory as a student, I was assigned to a screw laboratory in the graduate school for certain reasons. All I can say is that I was fated to the field. Then, I became hooked on screw. In any academic field, our tasks that we actually work on every day in laboratory are not interesting, but rather an accumulation of small and boring things. However, I find a pleasure there. Therefore, we continue to be fascinated with the study. This pleasure cannot be learned from others but you have to find on your own in your study and research. The pleasure can't be found if you seek for your dream only. Confucius says, "if you think of something alone without learning from others, you fall into self-righteous" and Max Weber told off, "return to your own business!"⁴⁾ If we can rather deposit the "spirit of Japanese engineering" from our daily work such as above, engineering in Japan will become more valuable. My small dream is to see it actually happens.

References

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