Present State of Teaching Analytical Chemistry in Hungary*

E. Pungor and T. Meisel

Institute for General and Analytical Chemistry, Technical University, Budapest, Hungary

Higher education in the field of science and technology has problems which are practically independent of the state of general and industrial development of a country, and also others which are correlated with its size, civilization and technical level. In this paper it is intended to present both types of problems by the example of teaching Analytical Chemistry, particularly with regard to the situation and demands in Hungary.

It has always been a characteristic feature of Analytical Chemistry in Hungary that in spite of the relative economic and technical backwardness of the country, analytical chemists always realized the new trends in the field and could adapt and develop new techniques, and what is even more important, introduced them into higher education, as this could ensure the high level of knowledge of new generations of chemists.

In order to give a critical report on the teaching of Analytical Chemistry in Hungary, it is necessary to give a brief survey of the general teaching system. There is an 8-year obligatory general school training for children between 6 and 14 years of age, with a uniform program. This means about 1.5 million pupils. After general school follows either secondary (high) school training (14–18 years) or skilled worker training (about 120–130 thousand pupils), and then, after entrance examinations, college (3 years) or university (5 years) training (40–60 thousand).

Universities to be mentioned in connection with teaching Analytical Chemistry in Hungary are the following (number of enrolments per year in parentheses): Technical University of Budapest, Faculty of Chemical Engineering (120–140); University for Chemical Industries, Veszprém (140–160); L. Eötvös University, Budapest (30); L. Kossuth University, Debrecen (30); A. József University, Szeged (30).

Some other institutions of importance in teaching Analytical Chemistry are:

a) the faculties of pharmacy at various universities [Budapest (60), Szeged (40)];
b) Faculty of Metallurgical Engineering of the Miskolc University of Heavy Industry (140);
c) chemistry-biology branch of teachers’ training institutions (Budapest, Szeged, Debrecen).

Items a) and c) are interesting because according to the traditions and general practice in Hungary, a remarkable proportion of those trained in these in-
It should be noted that the pattern and curriculum of university training in Hungary in general, and also the training of chemical engineers might be considered as relatively rigid. Recently, there have been efforts to change this situation. Another characteristic feature is that the differences between the training of chemists and chemical engineers are not as great as in the Western-European countries. Nevertheless, there are differences, one of which is that in addition to fundamental subjects, unit operations, technologies and mechanics are of greater proportion in institutions training engineers, whereas these subjects obtain less and theoretical subjects more emphasis in the curriculum of science universities. In short, it can be stated that the experts graduated from the two types of institutions are practically equivalent.

To demonstrate the situation, the curriculum of the Faculty of Chemistry at the Technical University of Budapest is presented in Fig. 1. We have to state that the proportions are greatly different from those presented as ideal by Professor Malissa [1]. However, in evaluating the present system we have to consider that it meets the requirements of the national economy in Hungary.

Another characteristic feature of teaching chemical engineers in Hungary is the two-level system, which means, that during the first 3 years so-called industrial engineers are trained for managing technologies and development at a lower level. After these 3 years all the students are graduated as industrial engineers and part of them are admitted to stay for 2 more years to be trained as research and development engineers. However, entrance into the higher level course is not free. The condition is a certain level of marks as well as completion of studies in a certain amount of fundamental subjects. About 50—70% of the students enter the second stage.

There are some subjects called by us “criterion subjects” the mastering of which constitutes the main criterion for admission to the second stage. In addition to the whole system of two-level training, also these subjects are of importance from the point of view of teaching Analytical Chemistry, as there are two analytical subjects among them at the Technical University of Budapest. All the other universities mentioned provide a 5-years training.

In Figs. 2 and 3 the number of lectures and laboratory hours devoted to Analytical Chemistry per semester are presented. It is clearly shown that the number of hours is in general low, but the proportion of laboratory hours is relatively high.

When collecting data we have also asked for the opinions of Analytical Chemists from other universities, who generally complained about the short time allowed for teaching Analytical Chemistry. This complaint also reflects the general trend prevailing in the past 20—30 years. Before this period about twice the time has been devoted to Analytical Chemistry, and further, if we consider that instrumental analysis was at its infancy at that time, the present situation seems to be catastrophic. However, we are of the opinion that the time devoted to teaching Analytical Chemistry is not tragically short, and by making good use of it, it can be effectively utilized according to the objectives of the training. For this purpose the following points are to be considered.

a) The time available does not allow specialists to be trained, but may ensure a knowledge and skill in Analytical Chemistry which serves as basis for specializing.

b) We have to finish with the illusion of the necessity of inorganic qualitative analysis. We were led to this idea by both ideological and practical considerations. In the 2 h of lecture and 6—8 h of laboratory work per week which were earlier devoted to qualitative analysis in nearly all the universities in Hungary, actually a special and limited field of inorganic chemistry was taught. Apart from some exceptions, organic analysis was not considered as important and not dealt with at all. On the other hand, nowadays the elemental and functional group analysis of organic compounds by chemical methods has lost its earlier importance, whereas modern spectrochemical techniques are to the most part included in other subjects. Undoubtedly, these methods can be well taught also by non-analytical chemists, although one might complain about the lack of analytical approach in dealing with these methods.