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Opinion
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How Should be the Practical Courses in Organic Chemistry Laboratories in Spain?

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Opinion

Organic Chemistry is a fundamental discipline in Chemistry. With no doubt, Organic Chemistry occupies a central and determinant role in any education program of wherever developed country due to the extremely important character that this solid science redeems in many diverse areas as pharmaceutical, agrochemical, cosmetic, clinic and food industries, for instance. Considering all these aspects without forgetting the breakthroughs got it for this science in the research field during last two decades and interdisciplinary connections with nanotechnology, material sciences or medicinal chemistry, Organic Chemistry constitutes one of the highest and precious treasures of science and, thus, of mankind.

Albeit Organic Chemistry bases its roots and most fundamentals principles on theoretical chemistry and physics, and through the current century is being common the employment of theoretical calculations applying specific developed software to its evolution, there is no doubt that this eminent science is still being obviously empirical. We can affirm even more; it will always be.

On account of these arguments, whichever educational program in Chemistry degrees, around the world, must contain basic and advanced practical courses to teach to prepare organic molecules, purify them, structurally characterize them and so on. Yes, for sure, but not only! That is not enough. At least, it should not be enough! Two centuries after its born, Organic Chemistry professors and lecturers should not be conformed with only this honest goal. Maybe, this could be accepted for professors in last century. But whether we consider all aspects we have treated in the introduction it is obvious that we need going further.

Taking into account my experience as a young lecturer in Spanish University, it is quite surprising to find advanced practical programs in Organic Laboratories which contain practical courses that have not been changed for decades! Practical procedures being taught for twenty or thirty years, not being considered modern methods introduced during the current century. And practical courses being taught to students without showing any connection with the modern industry or novel research. Old and caducous techniques being transmitted as they were the real chemistry done in modern and top laboratories. Nonetheless one can argue that organic procedures are always more or less the same, there are a lot of improvements introduced along the years, and we, as professors, must take into account them in order to prepare a new generation of chemists, according to and in parallel way of the development of our discipline. Hence, it is a common space find students during their Last Grade project (namely in Spain TFG) that avow they do not know many basic operations in a modern synthetic laboratory. Furthermore, students recognize that whether they had been taught on those skills, they had chosen Organic Chemistry as main discipline to be further studied.

Therefore, it is clear what I am pointing out in this article requires a deep debate in Spanish Organic departments which, as I am claiming, carry on new and renovated guidelines for these advanced practical courses. Just to illustrate what I am saying, during this current academic year I was personally in charge of an Advanced Organic Laboratory, and along other partners [1] have introduced modern organic synthetic procedures as was the study of Organocatalysis applied on Diels Alder cycloaddition, [2] a synthetic methodology which was awarded with the Nobel Prize in Chemistry in 2021 to Benjamin List and David Mc.Millan [3]. On the other hand, and with the aim of showing to students the connection between organic laboratories and pharmaceutical industry, we have taught the preparation of one of the top sold drugs over the world, the anti-depressive fluoxetine (Prozac) [4].

So, focus must be brought to the fact that we were not forced to introduce these modern procedures in that guideline. We could have taught the identical old procedures and techniques, and chemicals, since three or four decades ago are being systematically taught. We were only forced by the vocation and because of we were convinced that updated modern organic chemistry is quite more attractive to students. In fact, the final survey made by students showed the high level of satisfaction among them, who personally congratulated and acknowledged to professors and personal who participated on the course.

To sum up, I honestly think that these kind of practical courses must be urgently updated and from my point of view it is clear that two possible solutions may be proposed: a) The first one, the proposal that only young lecturers with strong background got it abroad, where they have been able to see the most modern methodologies and strategies could be able to impart these type of lessons; b) Professors who really are researchers, which can be demonstrated by their current publications. Moreover, it would be better whether these options did not depend only on good will. I mean that it would be great if someday the educational laws in Spain treat this important and disregarded topic.

Finally, just to reminder, if possible, strong vocation on both organic chemistry and teaching might be highly recommendable. It would be good to keep in mind that students will be the next generation of organic chemists in academic and industrial laboratories. I wonder what can we expect from them if we are teaching organic chemistry as we were living in 80´s of last century? I still believe that young lecturers can revert the current situation in many Spanish laboratories. More chemistry, more work and less bureaucracy. Being updated is not only urgently necessary, but also glaringly mandatory!

References

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