



STATUS OF ORGANIC CHEMISTRY IN PHARMACY EDUCATION

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Many a child dreams of mixing chemicals and going on to become a renowned scientist. We enter college to pursue our favorite degree and have a lot of aspirations as we begin our academic journey. Inevitably, we are bombarded with organic chemistry in the very first year which brings with it a whole lot of anxiety and gives us sleepless nights. Over time, most students tend to stay away from chemistry and gradually develop an aversion towards the subject. This phenomenon occurs across disciplines and cultures. As one would expect, it is very much prevalent in our pharmacy colleges where organic chemistry is a terror at the undergraduate B. Pharm level. This situation has now escalated to such alarming proportions that there are no takers for the chemistry-based M. Pharm specializations at the postgraduate level all over India in many institutions. Many amongst the current crop of young teachers have trained in this environment and are afflicted by this phobia. As a result, effective chemistry teachers are few and far between. This opinion piece is intended to serve as a wake-up call for all those concerned with addressing the issue of undergraduate organic chemistry in the pharmacy educational setup in our country lest we completely lose touch with this fascinating stream of basic science.

Organic chemistry is indeed an abstract science involving complex topics and presents the first real challenge to students at the undergraduate level. Consequently, success in this subject boosts confidence and prepares students mentally to face any major academic hurdle. Having been a student not too long ago and being a teacher now, the author realizes that it is painstaking to both learn and teach organic chemistry. From a student perspective; motivation, discipline with regard to study habits and time management remain the main mantras for succeeding in any course. In addition, success in organic chemistry requires one to be good at problem solving, just like in mathematics. Although a teacher's responsibility is to teach the material, handling a subject of this nature requires a lot of effort in terms of properly organizing the content, simplifying the perennially grey areas like stereochemistry and maintaining a level of enthusiasm that percolates through to the class. Unlike a few other subjects, organic chemistry cannot be self-taught and needs an

instructor in an active role who is able to encourage the students to devote the time necessary to succeed in it. In India, due importance has not been given to the art of teaching organic chemistry and the author attempts to highlight some of the problems plaguing the pharmacy colleges with regard to the neglect accorded to the subject.

In academic institutions in the western countries, the senior and experienced professors spend most of their time writing grant proposals and supervising research while only occasionally teaching a course. This scenario does not exist in our educational setup because we are primarily teaching institutions and this trend should continue at the B. Pharm level. The administrative responsibilities delegated to good teachers should be kept at a minimum and their primary role as teachers should be acknowledged. Since organic chemistry needs a lot of preparation time, teachers handling such difficult subjects and performing well should be duly recognized. This will definitely motivate them to better their performance which will, in turn, kindle the student's interest for the subject. If this happens at the undergraduate level and the fear of organic chemistry is overcome, it will have a cascading effect at the postgraduate level and will no doubt revive the enthusiasm of students in the chemistry stream.

With the advent of newer technologies, innovative methods involving the World Wide Web have been used in classroom teaching. Universities are offering a number of online distance learning programmes making the use of the internet inevitable in handling various subjects by teachers. Such computer-based tools have definitely helped chemistry teachers to present a number of concepts clearly. While most present generation teachers have embraced technology well and with a positive effect, we have unfortunately ignored the blackboard as a teaching aid. Nowadays, it is not uncommon to find introductory organic chemistry being taught completely as PowerPoint lectures. Subjects like these need hours of practice to master and no matter how much one reads, one shall not be comfortable unless one draws structures and mechanisms. Therefore, the author is deeply concerned



by the growing lack of face-to-face student-teacher communication in this tech-savvy world of education.

Assigning text and reference books appropriate for the level of a course is crucial for the student to make full sense of the material prescribed in the syllabus. After all, lecture times are not enough to complete every single aspect in detail and the student often has to resort to the textbooks for further reading. Organic chemistry is replete with textbooks; however, most of them are often wordy and incomprehensible for a reader at the undergraduate level. Moreover, many excellent texts are quite expensive and most college libraries do not stock them in quantities enough for effective use by the student community. What is really needed at this level is a workbook style text suitable for self-study having numerous problems throughout, catering to students who are new to the subject, who need a refresher or those who simply want to improve their confidence levels.

Over the years, most pharmacy colleges across universities in India have adopted a pattern of examination involving multiple choice questions, short notes and essay type questions. While this is a reasonable format for many subjects in the pharmacy curriculum, it becomes worthless in subjects like organic chemistry. The author feels that promoting descriptive questions in chemistry-based subjects is a sin committed by the teaching fraternity and completely misguides the students about the nature and power of the subject. It is therefore earnestly hoped that serious reforms will be taken up with regard to assessment of the students in these subjects like the ongoing efforts in the author's own college. Setting an analytical question paper will require extra effort on the part of the concerned teachers but if they are duly recognized for upping the standard, rewards can later be reaped out of the system by the same teachers when their effort to push the better-prepared students at the postgraduate level is reduced.

Another factor which compounds the problem of teaching organic chemistry is the theory-to-laboratory disconnect; the latter requiring a completely specialized skillset. Unlike the other advanced labs, even the top synthetic chemistry lab cannot be air-conditioned – an unsavoury fact to many students in a hot country like ours. Besides, many chemicals need very cautious handling and the different smells emanating from these laboratories are rather unpleasant. Even with utmost care, fire accidents and explosions are bound to happen. The probability of such incidents increase manifold due to our negligence of safety regulations. Besides, the students and the faculty are unaware of the protocol to be followed during such an accident and are unable to contain the damage. Therefore, it is necessary that a suitably ventilated space is designated for such labs

during the planning phase of a new building. The labs should also be equipped with fully functional fuming cupboards and fire extinguishers. However, many of our pharmacy colleges are not in a position to provide adequate infrastructure for doing quality practical work and the routine experiments carried out in most institutions don't manage to draw the students towards chemistry.

This is where the pharmaceutical industry can play a pivotal role by providing internship opportunities to nurture the talents of motivated students, kindle their interest and transform it into a passion for the chemical sciences. This exercise can also help resolve another major concern amongst pharmacy graduates specializing in chemistry who tend to be increasingly overlooked in chemistry R&D jobs compared to their peers in pure chemistry who are often found to be more competent in their understanding and application of chemistry. Industry involvement at the undergraduate level will thus make pharmacy students equally employable as their chemistry counterparts in pharmaceutical companies.

B. Pharm student projects in many pharmacy colleges are a formality and merely serve as fillers in the time tables of final year students. The author feels that a six-month period should be demarcated for carrying out a project and teachers acting as guides should closely monitor the progress of the same. Synthetic chemistry-based projects require time and the targets can't be met unless a devoted time slot is not made available in the curriculum. Moreover, some colleges lack even the rudimentary laboratory facilities as well as qualified guides to monitor student projects. In such cases, it is only natural that students develop bitterness towards the subject due to lack of productivity and guidance in their respective projects. Therefore, as a matter of policy, students should be allowed to carry out their project in an industry or any other institution, if they so desire. Personally, the author has been a beneficiary of such an off-campus practice school programme in a reputed institution.

A concerted effort needs to be taken by those of us concerned to come out of this slumber, overcome the negative attitude surrounding chemistry and improve the didactic standards on offer in many of our pharmacy institutions. It is time we pay heed to findings from various studies in the highly sought after area of chemical education research and implement effective classroom learning as well as teaching strategies for such abstract subjects. If reared in the right environment, there is no reason why students will not opt to specialize and build a career in pharmaceutical and medicinal chemistry. It is often said that ordinary teachers teach, good teachers explain, excellent teachers demonstrate and great teachers

inspire. The author urges all faculty members to strive to produce a talented generation of synthetic medicinal chemists and would like to conclude by quoting the famous American educator and chemist Joel Hildebrand “Good teaching is primarily an art, and

can neither be defined nor standardized. Good teachers are born and made; neither part of the process can be omitted”.