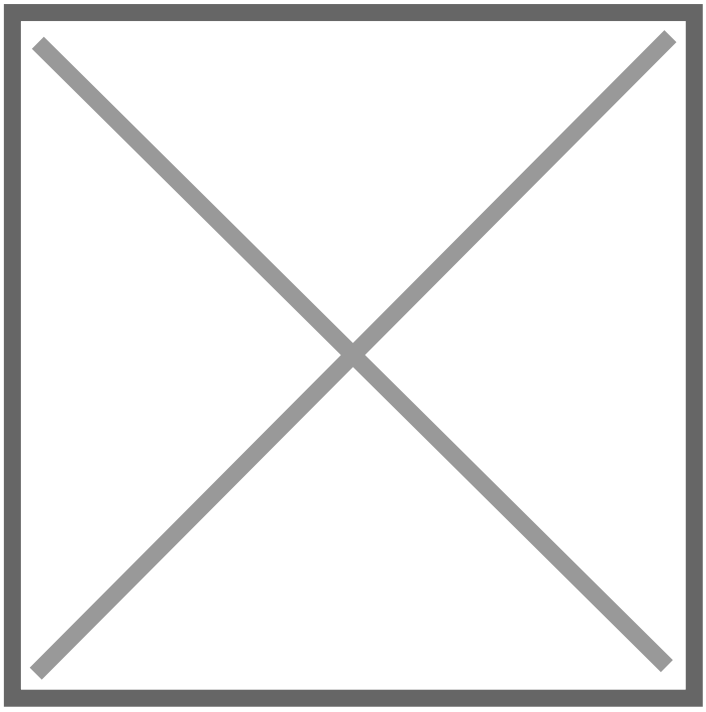
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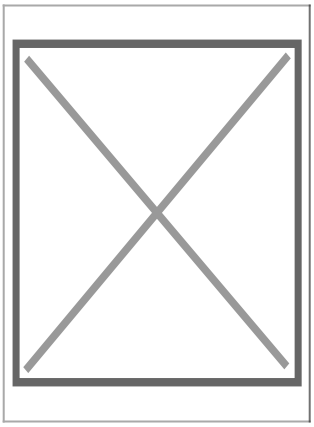
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Proper syllabi, the need of the hour

Biotechnology is the buzzword today. It is perceived as a hot career choice and more than a job. It is an invitation to participate in the development of new products and processes that could improve the quality of human life as much as any other discovery since the Industrial Revolution. And the Department of Biotechnology (DBT) too believes in the need for highly qualified and skilled workforce in this sector. It has invested heavily in enhancing the availability of well-trained human resource in this sector. There are now over 300 educational and research centers offering formal training in biotech techniques.

Despite these efforts, a section of people in the industry that BioSpectrum spoke to said the basic problem was related to the outdated curricula used in most educational institutions. There is considerable time lag in updating of the curricula to include the latest biotechnology breakthroughs.



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- Nirupa Bareja of Biocon

"Biotech being a sunrise sector, there is tremendous hype from a career perspective. What we fail to realize is that while the universities are churning out thousands of Biotech students, the quality is still in question. Almost every other college is offering a course in biotech without even having the proper infrastructure and more importantly qualified faculty to train the students. Students get attracted whether or not they are really interested in biotech and register for the course. Career counseling should begin at the school level itself to ensure that students make the proper decision," informed Nirupa Bareja, group head-HR, Biocon.

The curricula are also set many times without taking into account the needs of the industry. "Whilst students spend a lot of time and energy studying and thereafter clearing the exams, they may still not have the right knowledge. Again our method of teaching by rout and not with an objective of gaining knowledge is impairing quality students graduating," she added. Professionals, in particular scientists, from the industry should be involved with academicians in looking at the syllabi suggest several other top management heads in the industry.

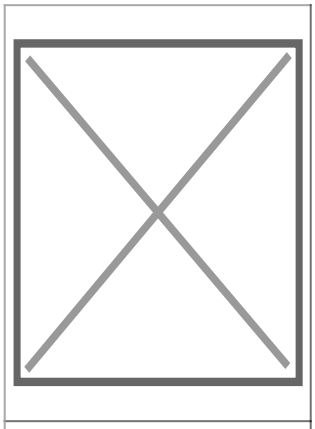
"Biotech courses offered by academic institutions should have more industrial orientation. This can be exemplified by taking a very simple example. How to detect a contamination at various stages of fermentation? This type of practical may carry five marks in the syllabus of Microbiology or Biotech courses. However, in the biotech industry, if you are unable to detect the contamination proactively, then you may have to drain the whole fermenter batch leading to a loss of Rs 5- 15 lakh depending upon the price of biotech product. Hence, the mindset of biotech students should be oriented for the functioning of biotech industrial set up right from undergraduate students," opined Bipin Deshmane, general manager, Fermentation, Shreya Biotech Pvt Ltd, Mumbai, who is also a member of Board of Studies of Microbiology and Environmental Sciences of Shivaji University, Kolhapur.

Biotech syllabus of many universities at graduate and post-graduate level does not adequately cover the following areas.

- Regulatory requirements of biotech industry in general and biotherapeutics and biologics industry in particular.
- Quality Control analysis-in process as well as finished product analysis-of biotech products in general or r-DNA products in particular.
- Ã¢â?¬Â¢ Current Good Manufacturing Practices (cGMP) and Current Good Automated Manufacturing Practices in Biotech industry (cGAMP).
- Knowledge of various international regulatory agencies like the US FDA, UK MCA and Australia TGA etc. for getting accreditation for manufacturing facility.
- Knowledge of various regulatory approvals required for setting up a biotech factory e.g. factory inspectorate, pollution control board, FDA and GEAC.
- Although upstream i.e., fermentation part for biotech product is covered in detail, the downstream i.e., the purification and recovery part of biotech products is not adequately covered.
- Financial, commercial and business aspects of biotech industry.

"Being a member of the Board of studies in Microbiology, Shivaji University, Kolhapur, I had the privilege to introduce some of these topics in their graduate and postgraduate syllabi. PG diploma courses covering these areas can be introduced in the academic biotech institutes, for example PG Diploma in Regulatory Affairs and PG Diploma in Quality Control in Biotech. Biotech is a multidisciplinary field. Hence, various departments of college or universities like Chemistry, Botany, Zoology, Microbiology, Biochemistry, Chemical Engineering, and IT can come together and contribute for the development and execution of excellent biotech courses," Bipin Deshmane suggested.

"Globalization of education is around the corner and biotechnology will not be exception to that. Our biotech institutions have to gear up to meet the challenges posed by globalization. Biotech academic research institutes should take up research projects relevant and useful to biotech industry and should achieve the paradigm shift in the approach from 'Publish or Perish' to 'Patent and Flourish'!" he added.



"A biotechnology course should be run in its own department. Alternatively the colleges should organize Departments of Bioscience, so that the infrastructure and staff can be meaningfully used for all the biology courses."
- Dr Kameswar Rao of FBAE

According to Dr SD Ravetkar, senior director, Serum Institute of India, biotech institutes should have some accreditation system and this should be decided by a joint committee of academicians, people from the industry and DBT. "They should impart theoretical knowledge along with hands-on practical experience. Courses should be designed with industry feedback to create product i.e., 'student' required by customer i.e., industry. This will also help students to get jobs immediately and to their satisfaction. Lately, more demand and less supply has resulted in a good rate of absorption of students," he observed.

Talking about the rate of absorption of these students, Nirupa Bareja said, "The supply is far ahead of the demand and we receive a huge number of applications all through the year. Last year we received over 60,000 applications. As mentioned earlier the quality of a major chunk of these applications is average to below average, hence we do a very selective hunt for top quality people even at entry levels. Also, Biocon being a leader in the Biotechnology arena is most preferred and hence the huge number of applications."

"Basically the curriculum has to be designed in such a way that it should meet the needs of the industry. There are different levels involved in biotechnology and bioinformatics. Even we find there is a lack of trained teachers who can share their experiences on different aspects in bioinformatics. There should be a good interaction between the academic and research institutes, where researchers are working on many projects. This helps the students to know the practical aspects," felt Rajeev Gangal, founder, SciNova Technologies, Pune.

The academic institutions should maintain and upgrade the mode of selection at the time of admission. Otherwise it will be difficult to teach/ train the students with various aspects of biology, mathematics, statistics and other fields of sciences is another suggestion.

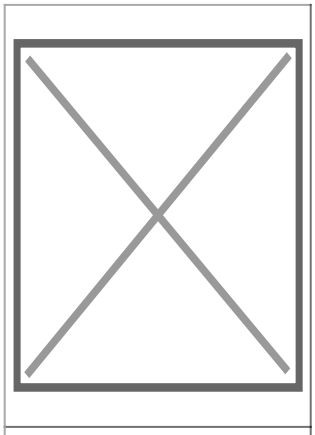
"The universities should also look for tie-ups with the leading/top education institutions in the world like MIT to get the feel of the actual research. Instead of short-term projects (2-3 months - summer-winter projects) the institutions should look for associations with industry so that the students can take up projects for six months to two years. They should also look for affiliations with the companies such as Ocimum Biosolutions and GSK Biosciences," Gangal added.

"Students passing out from our institutions and universities lack practical training as most of the institutions don't have proper infrastructure. We need to have more training centres like IITs," said Varaprasad Reddy, managing director, Shantha Biotech, Hyderabad.

Dr Dhananjay B Patankar, head-Biotechnology, Intas Pharmaceuticals Ltd, said, "As a company we look for good students with basic and fundamentals not with just bits of this and that. The students should have a thorough knowledge of the subject.

The title of the degree doesn't matter for us. We look for quality and content. The universities, which are offering biotechnology courses, are heavily depending on molecular biology and genetic engineering. In addition to that we also look at students who have completed courses on enzymes, microbiology, biochemistry etc."

"The candidates during the interview say that they are interested only in doing research. But there are many opportunities in other fields like quality control, production/manufacturing that are equally challenging like doing research. Hence I feel the universities should highlight these areas to the students so as to take up a career in these fields."



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With the product patent regime in the pipeline, universities should look at offering extra courses on patents as a one of the subjects during the three-four year course by inviting guest lecturers, industry people and law firms to teach the basics on patents and other regulatory issues some others have avered. The universities instead of opening new departments should strengthen the existing departments in terms of infrastructure, increasing the number of visiting faculties etc.

Many leading biotech firms have started tying up with leading institutions to train people in this field. Ocimum Biosolutions, one such company dealing with bioinformatics solutions, offers a six-month training programme in partnership with the Michigan Technological University. "This is a rather rigorous course and only about 10-15 students are selected for training. We absorb about 40 per cent of them in-house," said Anuradha Acharya, CEO, Ocimum Biosolutions. "We have placed almost all our students in India and abroad," she added. "It is very much important to get the right kind of training if one wants to really succeed in this field," she felt.

Though biotech is a buzzword, several industry leaders speak about the shrinking base of students interested in science education. Talented students opt for studying medicine or engineering. Added Akilesh Pandey, chief scientific adviser, Institute of Bioinformatics, Bangalore, "We encountered major problems in the recruitment of research trainees. The quality of postgraduates in biotechnology, biochemistry and biology varies drastically. Even when the applicants were somewhat good, they often showed a clear bias towards the thinking prevalent in their institutes where they underwent their training."

The DBT has pointed out there has been an unrealistic projection of the manpower requirement in the sector due to which a number of private engineering colleges have started offering biotech courses even at the B Tech level. It also pointed out that many universities were offering bio-informatics courses at the undergraduate level, without adequate infrastructure and faculty support. Therefore, the quality of these students had become a big question mark.

The DBT has highlighted the need to set up a regulatory body under the AICTE for the maintenance of the standard of education. The Department felt that there was a need to focus on post-graduate and research programs on biotechnology, and B Tech programs should be restricted only to those institutions which have established departments of chemical engineering. The Department has also recommended not to sanction undergraduate programmes on bio-informatics, and to restrict such programmes only at the post-graduate level. Dr C Kameswara Rao, executive secretary, Foundation for Biotechnology Awareness and Education (FBAE), expressed, "As biotechnology is not a single subject in itself and as it is of a recent origin, necessarily teaching has to be done by those who have degrees in botany, zoology, microbiology, biochemistry, etc. However, the teachers who teach biotechnology must have some exposure to the theoretical aspects and hands-on-experience in the practical aspects, of the subjects they teach. Hence, colleges that recruit people qualified in basic subjects to teach biotechnology, should encourage and support the teachers", he suggested.

Talking about refresher courses and laboratory training programmes for biotechnology teachers, Dr Kameswara Rao said that the UGC supported teacher training under the refresher course program in all subjects. But there were no refresher courses for the biotechnology teachers, who he felt, need them more than the teachers of other subjects. It is an unarguable need that such training programmes are organised to enhance teacher competence, he noted.

Dr Kameswara Rao noted that it was important that all universities prepare statutory documents for all the courses of study that will help both the colleges as well as the Local Inquiry Committees (LICs). This will bring some uniformity in the facilities provided by the colleges, he said. "A biotechnology course should be run in its own department. Alternatively the colleges should organize Departments of Bioscience, so that the infrastructure and staff can be meaningfully used for all the biology courses", he pointed out. In the engineering colleges it appears that the departments of chemical technology, wherever present, seem to stake claim to run the BE course in biotechnology, which is not in the interests of the course, in the long run, he added.

Stressing on the need for an academic audit, Dr Kameswara Rao said it was urgently needed in order to identify the colleges that are upto an acceptable standard and to caution those that are substandard, so that they rectify the shortcomings. If they did not comply in a reasonable time, they needed to be disaffiliated. It would be in the interest of the colleges to go through the audit process, as they would give an opportunity to officially establish their credibility, he suggested.

Dr S Shantharam, International Food Policy Research Institute, Washington, felt that there is no need for new biotech institutions, while the existing institutions are in great need of financial inputs to perform even minimally. He stressed the need for sufficient governmental funding to make the curricula, faculty and laboratory facilities to offer internationally competitive educational programs. He emphasized the need to educate the public and the media and considered that an informed student community will function as the best ambassadors of biotechnology and would help in removing the misconceptions and baseless fears regarding the perils of biotechnology from the public mind.

With no proper syllabi on biotechnology, the industry is facing a lot of hurdles.

Namratha Jagtap with Rolly Dureha and Narayan Kulkarni