Cracking the Academic Performance Indicator score: is it a 'boon' or just a 'cocoon'?

Despite efforts being made to improve the quality of education and research, Indian institutes have failed to make it to the top 200 in the World University Rankings 2013. A rank is assigned primarily on the basis of quality of teaching and research output from institutions across the globe. India not making it to the top in the list is a concern because there are numerous institutions and universities mushrooming in the country.

To ensure a place among the top institutes, an efficient evaluation system should be introduced and the University Grants Commission's (UGC) Performance Based Appraisal System (PBAS) and Academic Performance Indicator (API) scores[1] should be revised. API is introduced in an effort to boost the performance efficiency of faculty in Indian institutions, to evaluate their performance on teaching and research output. The existing evaluation system is applicable to both universities and colleges. However, there is a need to differentiate between the two because: (i) the level of teaching in universities and colleges differs; (ii) the responsibilities of faculty in universities and colleges are not alike; (iii) most of the universities (except the newly launched Central Universities) offer postgraduate courses, whereas colleges have to deal with both undergraduate and postgraduate courses.

Faculty in universities devote more time to research, but in colleges they devote more time to teaching. Thus, there exists a disparity in assessing the output of faculty from colleges and universities. One refereed publication is rewarded with an API score of 15, whereas it is 10 for one non-refereed article. It is to be noted that due to time constraint, faculty at colleges indulge in writing non-refereed (mainly popular science) articles and thus can generate high API. The API score is also based on the impact factor[2] (IF) of the journal in which the refereed article is published. Still many prefer to publish in non-refereed articles. The reason is that faculty can publish one or two refereed publications in a year (resulting in API score of 15–30), but they can easily achieve five to eight non-refereed articles in periodicals (total API score of 50–80). Here one might wonder what is wrong in gaining non-refereed publications to improve API score, when PBAS looks for such scores. Faculty can publish non-refereed science articles in periodicals, but what is not acceptable is that just to improve their API score, they turn their full attention to writing popular science articles. So, in the long run, the genuine faculty who strive to publish both refereed and non-refereed articles are left behind in the 'API score race' and the forerunners would be those who concentrate chiefly on non-refereed articles.

During personal interactions with researchers (mostly from colleges) who attended faculty recruitment interviews, many had high API scores for (a) publishing non-refereed articles and (b) teaching and developing curriculum. Thus, there is a need to plug the existing loopholes in API score, else it may only serve as a 'cocoon' for the faculty to defend their performance during PBAS. The API score, as in its current form, can do more harm than good[3]. Such metrics would only accelerate the transformation of intellectual efforts of faculty towards the race for gathering numerics to climb up in their career ladder[3,4].

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Making learning in chemistry laboratory more meaningful

Laboratory experiments are an integral part of teaching and learning chemistry at the undergraduate (UG) level and substantial weightage and time is given to them in any UG curriculum. The objectives of experiments in chemistry laboratories are never stated and explained clearly. Due to the cook-book or recipe-style nature of these chemistry experiments[1], students perform them blindly without abstracting the basic principles behind the experiments. They fail to understand the purpose of their investigation and the sequence of tasks they need to perform the experiment. Studies have shown that students often perform the experiments to follow instructions or to just arrive at the right answer[2]. As a result, experiments at the chemistry laboratory have become routine and monotonous.

It is important and essential to set some objectives for the chemistry laboratory at the UG level and modify the nature of experiments. In our opinion, some of the following could be considered

1. Expose students to basic experimental techniques and skills and help them master them.
2. Make students aware about risk and safety aspects in laboratories.
3. Help them develop core competencies such as (a) background reading and planning of experiment (including time management), (b) use of chemical databases and software packages, (c) execution of experiments, (d) data analysis and evaluation and (e) report writing and communication through presentations.

Often with the prescribed syllabus, emphasis is on completing the stipulated number of experiments in the given time.

In fact, in our opinion, objectives 1 and 2 mentioned above are also not completely achieved as use of new glassware/plasticware, correct way of performing operations and safety aspects are not discussed with students. Report writing is also not given much importance. Analysis of the data obtained by the entire class and drawing inferences from them are lacking most of the times. Often, students are provided with solutions and thus, they are never involved in writing appropriate balanced equations and finding out the molar equivalence of the reactants. A consequence of this is that they fail to understand stoichiometry of the reactions. As a result, laboratory work is not taken seriously by students. The question we are asking is whether changes can be implemented in the existing UG chemistry laboratory curriculum so that some of the objectives stated above can be achieved.

To start with, we suggest conducting a few orientation sessions at the beginning of the laboratory programme. During such sessions, students are introduced to (i) the different types of glassware, plasticware, instruments and their uses; (ii) taught the correct way of performing various operations, and (iii) informed about the safety aspects – the do's and don'ts particularly related to chemicals. In fact, short videos can be made or downloaded from standard internet sources which can also be used for this purpose. The advantage with using videos is that they can be played or viewed frequently if operations are not understood by students.

The experiment to be performed can be given/announced in advance so that students can read about the same and familiarize themselves with the experiment. Each laboratory session can be split into initial discussion of experiment, actual performance of experiment and post-facto discussion. The initial discussion can focus on students' understanding and/or queries regarding the experiment, whereas the post facto discussion can be regarding problems faced and analysis of the results/data obtained. Such changes if introduced at least for a few laboratory sessions at the beginning of the first year will help build confidence among the students and also enhance their participation.

It is also important that the chemistry laboratory becomes more student-centred and thus small projects doable over 3–5 laboratory sessions can be introduced as part of chemistry laboratory, probably in the third year. Such projects have been reported to develop the practical skills of students[3]. These projects can be done in groups and we see it as an opportunity where objective 3 mentioned earlier can be partly or fully achieved. Projects give ownership to students, where they can plan and design the experimental procedure, execute them and interpret the data obtained. Students get an opportunity to use the experimental skills and operations learnt by them in the first two years, to a new situation. A group of 3 to 4 students can do a project together. Students can be asked to maintain individual records in the laboratory book and at the end of the project, each group can be asked to make small presentations. Each student can submit a short reflective write-up summarizing what he/she has learnt and the difficulties faced while doing the project. We strongly believe that such an activity will increase peer interactions, communication and also boost the class morale. As a part of the projects, students will go through different processes that an independent investigator needs for performing experiments and the focus is not just in producing the final result. Assessment of such a project is more holistic compared to assessment in the traditional laboratory. One example of generating a project is discussed below.

In a regular laboratory (for colleges under the University of Mumbai), each batch has around 20 students and under electrophilic aromatic substitution, students normally perform two experiments. However, the theory of electrophilic aromatic substitution is done in detail. The experiments can be restructured as follows: the class of 20 could be divided into five to six groups. One group could take the unsubstituted substrate, another could study the reaction on, say, anisaldehyde and a third on nitrobenzene. The students could plan out the reaction based on their knowledge of orienting effects. The fourth, fifth and sixth groups could perform the experiments by varying the parameters like stoichiometry, temperature and solvent. At the end of the session, the students can reflect upon the data obtained, exchange and discuss the data and draw their conclusions. Thus the entire batch has the results of electrophilic aromatic substitution and they will be able to relate substituent effects to the results obtained.

We are aware that there are various constraining factors, but what we are emphasizing is an alternative approach under the given circumstances. Such an approach will help create more learning opportunities in conventional laboratories. The entire exercise is meaningful even though it needs reduction in the total number of experiments in the syllabus. Such initiatives are steps towards a positive direction where students are prepared for future careers either in academics or industry.

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