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Indian Institute of Technology
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Proposal for Teaching Learning Centre under the Pandit Madan Mohan Malviya National Mission at Indian Institute of Technology, Hyderabad

Introduction

India has been home to the oldest of the universities practicing different modes of teaching in various areas of study. However, evolution in teaching has not cop up with the revolutionary changes in study disciplines and requirements of today's generations. IIT Hyderabad has identified the gap and has taken steps since its inception. Pedagogy is the key ingredient to produce well rounded and global individuals in an academic institution and at the same time the one which should be most dynamic. Some of the efforts to enhance teaching at IIT Hyderabad are discussed below. The efforts towards improving pedagogy have materialized into a more flexible and robust academic program at IIT Hyderabad. IIT Hyderabad today strongly feels that the learnings need to be shared and further built on. For the bigger aim of improving the teaching process and effectivity of the student- teacher interaction, IIT Hyderabad would like to propose a Teaching Learning Centre under the Pandit Madan Mohan Malviya National Mission.

Vision and aim

The vision of TLC at IITH is an effective education ecosystem (3E) (figure 1). The aim is to facilitate learning in teaching to provide an academic environment which can enable students to discover, invent, create, innovate and develop (DICID- a concept from http://www.tandfonline.com/doi/abs/10.1080/03043790701433061#.VYpT6_mqqko) and compete in the 21st century.

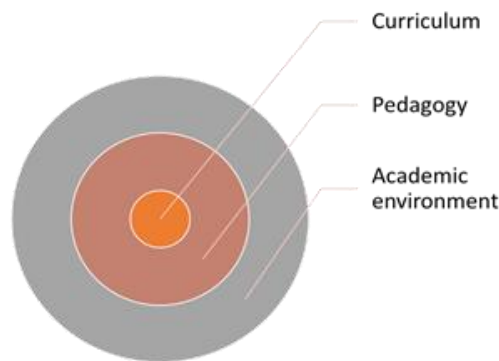


Figure 1 - Attributes of effective education ecosystem (EEE)

Work done so far

About IITH in brief

IIT Hyderabad started functioning in the year 2008 with 3 B.Tech programs; Computer Science and Engineering, Electrical Engineering and Mechanical Engineering. Each of these programs had an intake of 40 students each through IIT-JEE. In 2009 IITH started admitting PhD students and 2010 almost all engineering departments started offering M.Tech programs. M.Sc program started in the year 2010 with the Department of Chemistry and in the subsequent years Physics and Mathematics departments started their M.Sc programs. M.Phil program was started in the year 2012 by the Liberal Arts department and the youngest department in IITH; Design started M.Des and PhD programs in the year 2014. Today IITH offers 8 B.Tech programs, 16 M.Tech programs, 3 M.Sc programs, 5 M.Phil programs, 1 M.Des program and PhD programs in all branches of engineering, science, liberal arts and design.

Efforts at IIT Hyderabad

1. Fractal Academics: IIT Hyderabad, in 2013, undertook a rigorous exercise to study the various pedagogical issues plaguing the institution and possible solutions. Despite having world class faculty following best teaching practices existing across the globe, it was found that student interest was variable and the learning outcomes inconsistent with the teaching effort. It was found that newer teaching/learning practices were needed for the present generation of students who are used to smartphones/tablets right from high school. Also the new paradigm should have a built in enabler for industry academia interaction.

The *Fractal Academic Program* at IIT Hyderabad was a result of this exercise. The key features of the fractal program were continuous assessment, modularity, attention to student feedback, focus on independent student projects and a breadth-depth model, where a range of courses taught over the four years of engineering would be covered in the first two years and students would be free to pursue specific in depth interests in the next two years.

While the fractal program is relatively new, feedback both from students as well as faculty has been positive since the learning outcomes are already becoming visible within a short span of two years.

2. As a part of TEQIP nodal centre, IITH has already taken lead to organize workshops on ‘educators for 21st century engineers’ and ‘teacher effectiveness’ which focusses on teaching beyond course content.

Abstract to the workshop on ‘educators for 21st century engineers’ - Contemporary engineering education has moved beyond the traditional focus on imparting subject-specific technical knowledge to the inculcation of broader skills in critical thinking and analysis. Given the current demands of the society, where engineers are increasingly employed in multifarious roles in a multicultural and multinational environment, there is now emphasis on the evolution of interdisciplinary courses. Therefore as engineering educators our roles become

more diversified. The aim is now to produce global engineers with emphasis on transferable skills. At the same time, we have to be aware that the current generation, Gen Z, is different from previous generations. Therefore, teaching methods and evaluation strategies have to be adapted to the changing needs of the youth. Teaching and research need to go hand-in-hand and have to be inclusive of social and environmental awareness. http://www.iith.ac.in/teqip/about_iith/EDU%20Report.pdf.

Other details may be found on <http://www.iith.ac.in/teqip/>

IIT Hyderabad faculty have also done some webinars (IUCEE webinar, virtual academy <http://iucee.com/webinars/>) and published work on similar topics (<http://www.journalet.org/index.php/jcet/article/view/53297>).

Problems, Proposed solutions and Implementation

The process of teaching may be defined in the following steps. Therefore the proposed

solutions are also categorized accordingly.

1. Content Development and Delivery

Considering that today's generation has good access to all kind of information, classroom teaching needs to be reinvented. Given this, content in the course and the method used to deliver the content becomes very important. Today's educators need to evolve content continuously at a fast pace and use technology to the fullest.

Most of the teaching material is currently available online. This can be in the form of video lectures, e-books, PPT slides and tutorial notes.

Instead of wasting valuable time in recreating content from the above sources, teachers should focus on directing students to relevant content and spend more time on problem solving through discussions. Smartphones and tablets can be intelligently used for sharing content with students. Such teaching/learning methods have been successfully implemented in many courses at IIT Hyderabad.

A singular advantage of such an approach is a personalised teaching program, where varied content is available for different groups of students, depending upon their learning curves. Such an approach has been extremely successful in computer programming courses at IIT Hyderabad and can be extended to theory courses as well. Students are likely to appreciate such an approach since the non-uniformity allows them to learn at their own pace without worrying about the competition.

TLC at IIT would provide training programs for various teaching methodologies based on the above template.

2. Student Evaluation

In most colleges across India, students are evaluated only two or three times during the semester. Several studies have shown that the teaching/learning process is effective only if students are evaluated continuously.

In the fractal academic system at IIT Hyderabad, students are evaluated continuously through tests every week. Supplementary theory and computer assignments are also given for practice. Such an evaluation process allows the students to think independently.

At the TLC at IIT Hyderabad, teachers will be trained to develop efficient student evaluation techniques and revise them periodically.

3. Teaching Assistance and methodologies

Organizing content, continuous assessment, etc. require a lot of man hours that may leave little time for research. As a result, teachers need to have enough support staff to assist them in these activities.

At IIT Hyderabad, senior undergraduate students have been successfully used as teaching assistants for courses taken by their juniors. Contrary to popular perception, UG students can be extremely ethical and hardworking, and most junior students at IIT Hyderabad find it easier to learn many subjects from their seniors. This also helps the senior students gain more subject knowledge, besides improving their oratorical and presentation skills.

Such a teaching assistance program is unique to IIT Hyderabad. The TLC at IIT Hyderabad will aim to establish such a system at all colleges throughout the country. For this purpose, along with teachers, some bright students from respective colleges will also be trained.

Lecturing is a traditional means of delivering content. With the advent of newer teaching methodologies, teaching can be made more effective. Some of the methods include flip teaching, distributed teaching, discussions, and so on. TLC at IIT would provide training programs for various teaching methodologies, also carry out research on effectivity of methods for delivering particular kind of content in the Indian students. Online tools also should be made use of. However, with so many options, teachers get confused. TLC will help identify the right resource and method.

4. Teacher Evaluation through Student Feedback

Teaching process in India is an open loop system, with no scope for student feedback. Barring the IITs, very few institutions across India have any mechanism for student feedback. Student feedback plays a very important role in assessing the ability of a teacher to successfully convey her ideas to the student. Student feedback also enables the teacher to assess her shortcomings and improve upon them.

It is extremely important that the feedback process be designed properly. The TLC at IIT Hyderabad will introduce teachers to various student feedback mechanisms and identify the

key issues with pedagogy by sifting through the feedback data.

5. Research through Teaching

It is extremely important that a teacher be involved in research. This boosts the teacher's confidence, besides enabling her to tailor the course curriculum according to the needs of the industry.

Theoretical/applied research is usually considered to be an activity unrelated to teaching. This is not true. It is possible to divide a big research problem into smaller ones that can be given to students at various levels. The confidence of students will phenomenally increase if they are able to solve problems that are typically handled by faculty or senior research scholars.

The ability to involve students in research activity is an art. IIT Hyderabad is one of the few institution in fostering undergraduate research. Very few institutions worldwide can claim such capabilities.

Teachers will be shown how to incorporate research activity into the teaching curriculum at the TLC at IIT Hyderabad. This could lead to significant research activity throughout the country and increase the research output.

TLC assessment yardsticks

The TLC at IITH will continuously assess its performance and evolve. Some of the quantitative yardsticks would be –

1. Number of faculty and potential faculty trained
2. Hours spent on training programs (3-5 days each program with 6 hours each day)
3. Fraction of trained faculty incorporated the learnings from TLC in their teaching
4. Fraction of faculty who came back for another training program

A trained faculty will be given chance to demonstrate the learning or the change introduced by them in the next training session.

5. Student feedback from associated colleges
6. Development of innovative pedagogy
7. New training programs introduced