Teaching the Millenials

We have 3000 engineering colleges in the country, but we produce very few genuine engineers. A good engineer is curious, questions a lot, and loves problem solving. They ask why, and think alternatives. They dream possibilities, take personal risks in realizing some of them. Is this the reality today? We know the answer. We blame students and we blame faculty. But once you come over and teach, you realize how difficult we have made it for the younger generation to learn, and for the faculty to teach.

To understand the as-is situation, let me share an experience in a private University in Chennai. I was interviewing computer science and IT final year students. In the first few minutes, it is clear they don't know how to write a program. I would ask, "have you written any program so far?"

Strangely, all of them have an identical response: "Yes, factorial".

"Ok, write it now", I'd say.

Almost no one got it right, even after hints. Most would write the core logic right:

```
while (i  <=  n)
{
        fact = fact * i;
        i++;
}
```

The critical factor in factorial is the initialization, where *fact* needs to be initialized to 1, not zero. Many did not get it right even after their mistake is pointed out. The same dialog is repeated with every student, till one girl replied "I do not remember."

This response opened my eyes. It underlines the fundamental issue that plagues our education system today. It is about memorizing, even programs. Students repeatedly tell us the topper in class is definitely not the best in programming – as he memorizes programs. Predictable questions will come in examinations, and you have to reproduce the standard answer if you have to be sure of marks.

If we understand this root cause, the solution seems simple enough, but do we recognize this?

We have crammed course upon course in our curriculum. They must do differential equations when their concepts on basic arithmetic are not clear – or must learn three or four languages at a leopard's pace before being able to write 5 lines in one language. There's lecture upon lecture of "theory" with no focus on how that concept can be applied in real life. Exams check for ability to memorize. To top it, new courses get added: Ethics, Environment Science, Cyber Security, Disaster Management, all are very important. We get into an academic debate on the importance of all the courses we introduce without realizing the camel's back was broken long back, and it cannot walk any more…

This is a result of an education system not developed from student learning point of view. We need to understand we can never hope to teach everything. We must rather inspire our students to learn and teach them how to learn.

I have often been invited to deliver talks in campus. Usually, I try to convert the talk into a discussion with students; that helps me learn and remain fresh. I began one such discussion with the MBA class in a reputed institute with the question: “Tell me one critical success factor in your career that will not be taught in your management course”. The responses took me by surprise. The students talked about manipulation, about adjusting to demands of business. “No one is a Gandhi”, and you need to be “practical” to get ahead, I learnt. I asked “how many of you will comply if your boss asks you to do something you believe is immoral?” A large number raised their hands. This defined what we discussed next. More important, it led me to introspect, as these students represent the future of India.

Why is ethics important for the employer? Simple. You need employees you can trust. Trust increases team productivity, improves responsiveness to customer needs, and builds an agile organization. To teach ethics, we must not add another course in an already crowded curriculum. Ethics is learnt through practices followed in our environment. Unfortunately, in our current environment, students pay money to come into colleges (sometimes accepted only in cash), get into colleges where copying is allowed, or pass percentages are 95%; later, bribes are paid to land a job. Such practices form a quick route to a degree and a job, but are not an appropriate environment to teach ‘Professional Ethics’.

At Centurion University, we took a view of how much the student can learn and take away in the four years that she can apply and proudly use later in life. Using this principle, we found it prudent to make the following changes:

1. Treat the four years as an opportunity to produce something useful, rather than an ordeal of memorizing 50 courses. The Computer Science student must develop some practically useful software that she can proudly claim as her handiwork. This will result in a confident and productive professional. Creating such output in the time window of four years is feasible.
2. Start projects as early as 2nd Year, and also build programming into content of most courses.
3. Teach at most two languages (for the language proficient, more are available as electives), so we focus on depth rather than proliferation of languages.

We understand the above is easier said than done. The teaching methodology has to change, and our faculty will morph into new age teachers with project experience in a period of two years (this is not a matter of a one-week workshop). Foster parenting by faculty will provide custom off-classroom attention to students. And presence of custom e-content available to every student in a tablet will catalyze a more engaging classroom experience. The examination system will test concepts and problem solving ability more than rote learning; this change process has already begun. The journey will be long, and difficult for both students and faculty, but we know this is a necessary change on our path to evolving a motivating and meaningful education system.

About the author: Kalyan K. Banerjee graduated in EE from IIT Delhi before doing his masters in CS from IIT Kanpur. He joined Wipro’s R&D from campus. After 13 years in Wipro, he co-founded Mindtree with nine others. Part of the Centurion journey as Pro Vice Chancellor, from last year. Can be reached at kalyankb@cutm.ac.in.