

# Education in the IITs: A Question of Head and Heart

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*This paper tackles a provocative theme with particular reference to the undergraduate system of the Indian Institutes of Technology: why have the alumni of these prestigious institutes produced over the past 30 years not risen to positions of leadership, even academic leadership? One of the reasons is considered to be the obsession with conventional-type examinations, which inhibits creative and innovative thinking. An analysis of the distinctive traits of specialists and leaders reinforces this view and clarifies the deficiencies in the existing academic processes. While the national scene, particularly at present, does not inspire the desired qualities of sacrifice, compassion, duty-consciousness and responsibility, the faculty and the academic system have a significant role to play in correcting the deficiencies.*

AS I have been asked to write from my personal experience about the IITs, I have thought it best to write this article more as an effusion of the heart than as a carefully analysed logical statement. The specific theme I have chosen for discussion is an issue about which I have been concerned since my days as Director of IIT Madras: *do we in the IITs train the heads but not the hearts of our students?*

The provocation for this theme is the fact that—contrary to expectations raised by their talents—few IIT alumni have attained significant leadership positions in the country. There is no doubt that IIT students are admitted on the basis of a scrupulously honest and rigorous entrance test. It is also widely accepted that only the most outstanding ever make the grade into the IIT. It is also acknowledged that IIT training is rigorous and among the best in the world. Yet, after nearly 40 years of existence, IITs have little to boast about their alumni's success in the real world. Others, far less qualified, and far less rigorously trained, have snatched away positions of leadership, even academic leadership. *Could this failure be because we train people to handle the world of machines and not the world of human beings?*

It can be argued with some force that the social climate in India does not favour ability, particularly in technology. Even then, it would be unfair to dub everyone who has reached top positions in the country as inferior; most of them must have certain qualities of head and heart to have reached the top, qualities that IIT graduates apparently do not possess. As IIT students are no doubt among the best, the fault ought to be that of IIT education.

Not merely IIT students, even the faculty have not distinguished themselves in leadership positions as well as one should expect. Often, the directors of IITs are chosen from outside the system, but few IIT faculty get to become heads of institutions elsewhere.

I have a suspicion that IIT students and faculty are like thoroughbred horses: finely tuned to certain narrowly defined tasks, often performing magnificently in such limited assignments, but exhibiting little competence elsewhere. Further, I suspect that this sad situation is the result of a blinkered view of the world they possess, because they have little interest in affairs outside their own narrow field.

Let me give an example of this type of attitude: on the day Sheik Mujibur Rehman and his entire family were brutally massacred in Dacca, in our neighbouring institution, Jawaharlal Nehru University, all work came to a standstill; everybody there was much worried about the implications of the tragedy in our neighbouring country. But here in IIT Delhi, it was business as usual. That day, I must have met dozens in the corridors; they were all intent on their own problems and the historic incident passed them by without causing the slightest ripple in their hearts and minds.

Which was the wise response—the one at JNU or the one at IIT Delhi? We can argue that neither was correct; stopping work will not help solve problems, even help preparing ourselves to deal with such issues in our own limited sphere. At the same time, to be totally unconcerned and indifferent to such a traumatic event indicates either a myopic view, or savours of cold-blooded pursuit of self-interest. This episode reminds me of Sherlock Holmes, who did not know that the earth went round the sun. On being informed of this fact by his (decidedly intellectually inferior) friend Watson, Holmes replies 'I see no earthly use for such an information; so I shall endeavour to erase it from my mind!' Could IITians be like that?

Holmes was an acknowledged genius, and genius can be excused many idiosyncrasies. Unfortunately, few of our students fall into the class of genius. That even as outstanding institutions, few of



IIT students can have qualities of genius is understandable, but what is not so satisfactory is that practically none of the products of IITs has become an acknowledged genius. Surely, IITs ought to have produced a number of such minds by now!

I have a suspicion that this failure is because of our obsession with examinations. The academic programme in the IITs revolves round examinations; in fact, IITs are very good at conducting examinations, far better than any other university in India. So are students in writing examinations. A student of mine told me recently: 'We have no dread of examinations; rather we are addicted to them!' Ability to succeed in examinations is no doubt a very useful skill, but only up to a point. As Einstein and many others have demonstrated, success in examinations is neither a necessary nor a sufficient basis for innovative thinking. Instead, an excess of emphasis on examinations forces students merely to reproduce what they have been taught. They get to be good at analysis, but not in synthesis. The fact is that IIT teachers like precision; they worship received wisdom; their research too attempts to confirm—and enhance—what is well accepted, but they do not question authority; they have little patience with aberrant imagination, which is the first step towards innovation.

Everyone in the IIT system must have heard of the schoolchild's puzzle: how to link together nine points arranged in a square—three rows of three points each—by four straight lines without retracing any part of the path. That is possible, if and only if, one goes *outside* the bounds of the square formed by these nine points. Likewise, there is the puzzle how six matchsticks can be used to form four triangles: that too is possible only when one gets out of the constriction of two dimensions to form a three-dimensional pyramid. In either case, the mind has to go outside the normal bounds; likewise, however talented, it is quite impossible to achieve anything worthwhile unless the mind explores the space outside the bounds of established wisdom, outside the norms of convention. However, IIT faculty and IIT students are as conventional as they come. In fact, in all my years in the IITs I have almost never come across a naughty

student! Not that our students are angelic; far from it, but their transgressions have been boringly conventional. Years ago, some students of Cambridge University hauled up an Austin 7 car on to the roof of the lofty Senate building. That required great ingenuity, engineering skill and daring. The nearest to such a prank that I know of in an IIT is the occasion when a couple of students rode a scooter on top of the hyperbolic roof of the Convocation Hall at IIT Delhi. Daring but not ingenious enough!

Thus we have two broad failings of IIT education: a lack of wide interest and a lack of spirit of adventure, intellectual adventure. It is also possible that IIT students are not good at politicking. There is little politics in the IITs. That is a great relief, something I am definitely thankful about. Unfortunately, such a sanitized atmosphere does not blood our students in a lifelike arena, does not teach them how to face the real world as it exists in India. I have no workable solution to this problem: ideally, what we need to do is to change—not the IIT system—but Indian society itself. That no doubt is an extremely difficult task. If that be so, is it not appropriate that IITians dare to tackle it?

Reverting to the topic of leadership, a limitation of IIT education is that it is geared to train specialists only. Some characteristic differences between the culture of the specialist and that of the leader are indicated in Table 1.

There could be a debate on how far the kind of differentiation that has been indicated in Table 1 is valid. That is too wide an issue to be discussed here; it is enough to know that the two activities of specialization and organization call for distinctively *separate* characteristics of their own; that one may be skilful in one direction but not in the other; that only few, a rare few indeed, shine in both.

If we look at the features listed, IITs can be said to perform very well in all the features for training specialists—except in stimulating imagination. On the 'leadership' side, IITs may be faulted (in spite of the appreciable time allotted for humanities) for inducing little awareness of societal issues, for providing few opportunities for socialization (due to heavy workload and the over-emphasis on examinations), for not encouraging lateral thinking, for

Table 1. Distinctive differences between specialists and leaders

Characteristic	Specialist	Leader
Type of knowledge	Deep academic	Broad informative
Knowledge base	Data	Information
Skill	Dexterity	Sociability
Mode of logic	Serial deduction	Lateral induction
Operational process	Differentiation	Integration
Process of reasoning	Autocorrelation	Cross-correlation
Intellectual objective	Analysis	Synthesis
Psychology	Introversion	Extroversion
Mental base	Imagination	Experience



### FROM THE OTHER SIDE OF THE FENCE: A STUDENT'S VIEW

Seven years after graduating from one IIT, I have returned to another—if only for a brief spell to study for a M.Tech. in a different discipline. It is interesting to observe how things have changed, particularly with regard to the issues raised in this article.

*An excess of emphasis on examinations forces students merely to reproduce what they have been taught.*

That is not quite true. The exams are usually open-books; hence, there is no question of replication—they test understanding rather than memory. Many teachers give a weighting (up to 50%) for assignments rather than exams; many would like to have even a higher percentage for assignments if the academic office would permit. However, as one teacher commented, it is much harder to set an open-book test than a closed-book one. There are as yet not many teachers with sufficient command over their subject, or confidence in themselves, to venture open-book examinations.

The interesting point is that there are now a new breed of young teachers (from my genera-

tion!) who have returned to the IITs. These are the ones who dare more often to set open-book exams, give interesting and challenging assignments, and interact with students on a more informal basis. They are the teachers who (unlike in the past) will not be forgotten in a year's time or even in ten.

*Our alumni value their alma mater very little.*

Recently, a research scholar in our department had to undergo a kidney transplant and needed for the purpose as much as Rs. 2.5 lakhs (250,000). Our alumni in the US provided the money for someone who (as far as they were concerned) was a mere stranger, the only link being he too was an IITian. I do not know whether this is symptomatic of our department in particular, but I would like to believe that things are changing—for the better!

On the electronics news you often come across queries about who are the Indians who have made good. I am sure more and more Indians are making waves; more important, we are showing interest in the achievements of fellow Indians.

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placing insufficient emphasis on integration and on synthesis. As for the introversion-extroversion characteristic, it is possible that the JEE system tends to favour introverts.

In any case, it would be appropriate for the IITs to take an introspective view of their own system of education, and enquire what reforms they should introduce to make their students more forceful, and more competent to take over leadership responsibilities.

The problem is, in the IIT system, the student is pushed through an assembly line as it were: each teacher is a specialist, imparts one narrow sliver of information and passes on, and so does the student. In most cases, students see their teachers only for one course and in one semester. Thirty hours is all the contact they ever have with each other (assuming the student attends classes regularly, which is increasingly a matter of doubt). In general, a student passes through 50 or so teachers during their stay in the undergraduate classes. With each such teacher, the student has an elastic interaction; momentum is conserved and no heat is either generated nor lost. In the language of communication theory, the channel of communication between teacher and student is a memory-less one!

Under these circumstances, it is not much wonder that our alumni value their *alma mater* very little. I can indicate an upper limit—barely one day's income! I know that is true because I tested it in a number of cases when I was in Madras.

In IIT Madras there was in the 1960s and 1970s a loan fund to help indigent students; the loans were not large, a few thousand rupees at the most. In due course, these students left, and, as is the dominant culture in IIT Madras, they left to settle down in the USA and prospered there. Yet, practically none of them ever cared to return the loans—in spite of reminders. I myself sent a plea that as the loans had not been returned, the fund was exhausted, that we had no resources to help needy students any more; but the heart of any of the alumni—who all by then would have been in a prosperous condition—was not touched. What they had to repay was barely a \$100 or so—about a day's earnings. That is why I estimate that the value of the five years they spent in IIT Madras was not considered by them to be worth even one day's earnings. To them, IIT was a milch cow, to be milked dry. In their calculations, there was apparently no *profit* in repaying the loan they had taken.

Profit appears to be a prime motivator among IIT students. That is what we teach them all the time. Day in and day out, we teach a bewildering variety of algorithms to maximize and optimize. It is not much wonder that they translate—subconsciously—what they learn in the classroom into their behaviour outside. They learn how to study the least to obtain the highest marks; how to choose the topics that promise the best grades for least effort; how to attend as few classes as possible and get away with it. Mammon and profit are the god-



desses they learn to worship as an extension of the engineering skills we impart to them.

Love is not what one can get from the beloved, not even what one is willing to give to the beloved but what one is prepared to give up for the beloved. Likewise, true leadership is not self-optimization, but the optimization of the welfare of the group even if that means a self-sacrifice. It is precisely such a zest for sacrifice that we do not teach our students.

It can be argued that there is hardly any instance of self-sacrificing leadership in the country at present. It may be said that many of those who reach the heights of leadership are good at politicking and no more. That may be true to a certain extent, but it would be cynical to assume that such is the case at all times: in many cases, people have indeed risen because of their qualities of heart, and of course of the head. If IIT students have not succeeded where they have, it is probably because IITs have not taught them well enough to cooperate, to be concerned about others' welfare, to help others, to take the long view.

At the same time, it is also true that the Indian power-élite look down on the profession of the engineer—as a profession, engineering occupies a lowly status in society. That is true particularly in the state governments and in the conventional engineering departments at the centre where intellectually more proficient engineers are bossed over by academically inferior officers of the administrative service. Even in industry, it is the marketing agent and the tax consultant who commands attention rather than the engineer. That is an inescapable consequence of our taxation system: tax evasion, smuggling and monopolization bring windfall profits which technology improvements cannot offer. There is some change in these retrograde policies. These changes are forcing IITs to get closer to industry. In one respect that is good—our education will get closer to the real world; in another it is a risk—our attention may be diverted more towards the pursuit of profit than towards the pursuit of knowledge.

It has been said of Harvard that when somebody enquired how that university managed to acquire so much scholarship, the answer was given: 'We get every year a number of bright youngsters each of whom brings in quite a lot of knowledge; when they

leave, they take nothing away!' I wish we could say the same about IITs! Our students too leave little behind—not a thought, nor a quirk, not even some mischief. As a rule, each one is plodding, sincere and profoundly dull. Their minds are concentrated on 'tuts', grades, and more often than not on the much-hoped-for transfer to foreign lands where the streets are believed to be paved with gold. IIT for them is a tool, to be used and discarded when done with, not the *alma mater* one cherishes for ever, whose memories return again and again long after the goodbyes were made.

No doubt there are exceptions; the pity is they are the exceptions and not the norm.

The responsibility for this atrophy of the heart that afflicts IIT students is most probably ours, the faculty. Except for the initial years of founding, the relationship between students and faculty has been a matter of business than one of intimate contact. I am told that in Japan, the relationship between professor and student is so close, that it is not uncommon for the professor to find a spouse for the student. Let us not think of so much rapport, but can we at least expect our students to remember the names of their teachers? That, I am afraid, is beyond the capability of most of our students. That is a fact because I know many of my students could not recall who had taught them in earlier years.

Right from the time of Socrates, it is fashionable to blame the younger generation. I would not like to do so. In my opinion, we, the faculty, have evidently been not impressive enough! Time we change—too late for me personally, but younger ones would better try!

The late Professor V. V. John once remarked about a top scientist bemoaning the state of science in the country: 'What was he doing when he was in the cook-house?' The same can be asked of me: 'What was I doing when I was in the cook-house, when I was Director for five long years.' My answer is: the pianist did his best but was that good enough? Entrusted as we have been with the brightest minds of the country, it is not enough for us to be the best in the country (which we are), but the best in the world, which we are not as yet, but can be. Maybe the new generation of young teachers will carry the IITs further ahead than my generation has been able to do.

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Since his days in Madras, Professor Indiresan has taken keen interest in issues concerning economic development and social justice. He has written extensively on these topics in various Indian newspapers (in particular, a monthly column in *Economic Times*), in learned journals,



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