

Learning Metrics: A measurements based approach to learning

It is now well accepted that only that which can be measured can be improved. Not that immeasurable things cannot be made better, but improving them in a predictable manner, following a roadmap that can be agreed upon by the major stake holders is difficult.

When we look at how education is managed and the activities related to learning achievement are organized, we realize that there is very little usage of a measurements based approach. Of course students are regularly assessed, given marks and grades and several statistical tools deployed by way of normalization, but by and large the reliability of the assessment methods and the meaning that can be drawn from it are of limited use.

The current model we have is one of identification of talent, rather than the development of talent. We may almost describe our current model as one of a tribal existence, where we depend entirely on naturally occurring talent in students, naturally occurring talent in faculty and hope that good Institutions will be a magnet for both. This model has produced islands of excellence on certain occasions in the past, but they have been invariably not sustained for more than three decades or so, till the naturally occurring talent migrated or retired. We now have the spectacle of the Scientific Adviser to the Prime Minister, drawing attention to the complete extinction of pursuit of higher learning. While he chooses to blame bureaucracy for it, and this is a favourite whipping boy, he does not accept the complete ignoring of a modern approach to education in the last 3 decades. The whole approach of a tribal leader driven approach is now failing.

The other day, I read an item in a newspaper stating that when Celsius designed the scale for temperature measurement that bears his name, he had proposed the freezing point of water as 100 and its boiling point as 0 degrees. Apparently it was only after his death that people gathered courage to change it.

This is analogous to our current educational practices. The students who after a rigorous screening examination are selected to study in the premier Institutions such as the IIT's and the IIM's are the ones who would be able to learn on their own anyway and especially after the availability of online materials and resources as they are now. Even our premier Institutions have sanctioned faculty strengths that are much less comparable to the norms against student numbers in leading Institutions elsewhere. And

Even these relatively small numbers cannot be maintained in future because of attrition and migration to alternative better working environments. There is therefore no option but to start looking at new ways of overcoming the problem.

So, what is a naturally occurring good learner? He or she is a self-learner, who understands how to construct learning from the resources and experience that are provided to him. There was a time when many students of Physics and Mathematics would get selected with very high ranks in the Civil Services examination, while choosing an additional subject like History, Sociology or International Law, a subject that they had never studied at Senior Secondary or University Undergraduate level. In recent times, several IIT Graduates are doing similar stuff. The point is that these students had learnt to learn and could then change from pursuing on subject to another. It is as if once you have learnt to drive well; you could drive in a completely new town as long as you had mastered the art of safe driving, rules of the road and read maps and road signs.

What is it that we measure today? Consider two undergraduate degrees in Science from two different Universities. They could have different curricula, different faculty, different learning resources, and different laboratories etc. but eventually they have to be compared. What instruments exist for this? None really. It may some experts comparing them and then in their judgement they may declare them equivalent. Unable to actually do the task truthfully, the AIU resorts to a generic social statement that all such degrees are recognized on a reciprocal mutual basis and the result will be that when the day of reckoning comes, like the humpty dumpty , all the king's horses and all the king's men will not be able to put it together again.

In the US, the first measure was the Carnegie credit, and now most Universities follow some kind of credit system which allows for transferability. It is based on a simple notion of faculty lecture time. One credit is typically defined as one faculty contact hour per week for the duration of the term. A term is usually 14 to 16 weeks, so one credit is now taken to be 15 hours of didactic learning provided by the faculty. What happens in an intensively technology empowered interactive methodology employing the new emerging participative media. The distance learning system addressed this issue by taking account of the total student learning time including his reading of materials, doing assignments and other assigned activities. The IGNOU adopted a total of 30 hours of student effort in all the learning activities to be defined as one credit. It comes out nicely as approximately a 1:1 ratio between lectures and self-study.

So, we are about to embark on this globally connected 24x7 business at the speed of thought knowledge economy, with an educational model with just two learning metrics (credit for the course and grade for the student) and one learning tool (classroom lectures/labs/project work etc.). Looks to me a very unequal battle.

In this short narration, it is not possible to list out all possible approaches to learning metrics or to detail the tools for learning enhancement. They are the subject of various seminars and workshops that are available, but let me just give some more suggestions.

Long monolithic courses of 4 to 6 credits have to give way to shorter courses in the future. The IIT's have started one credit courses, to be able to make more effective use of visiting colleagues and have them deliver a set of 15 lectures over three to five days of their visit. Taking the principle further to make every such learning event countable, I have gone ahead and created a concept of fractional credit course content and given them suitable descriptors. Yes, some of these may lack an assessment possibility, but as they get packaged into re-usable learning objects, they may be held in sharable repositories for students to fulfill their credit requirements while pursuing their interest areas. Some of these are tabulated below:

S.No.	Descriptor	Credits	Duration
1	Short Learning Object (SLO)	0.001	54 seconds
2	Granule	0.005	4.5 minutes
3	Re-usable Learning Object (RLO)	0.01	9 minutes
4	Sachet	0.02	18 minutes
5	Nugget	0.025	22.5 minutes
6	Capsule	0.05	45 minutes
7	Session	0.01	90 minutes
8	Unit	1.0	15 hours
9	Course Module	3 to 6	45 to 90 hours

Progress has always been possible when, we have been able to look at the finer details going beyond the limitations of the coarse macro view. And as we progress to almost take account of the importance of every minute, in response to Rudyard Kipling's exhortation in his poem "If":

"If you can fill the unforgiving minute

With sixty seconds worth of distance run
The whole earth is yours and all that's in it

And what is more, you'll be a man my son!!! “

And now when we look at the learner side, we need to be able to measure the differences between the learners in more useful terms rather than information recall and rote learning. Adopting the methods of mastery learning, we will be able to teach to agreed common targets everything that needs to be taught. But if we want to empower learners to construct their own learning, then we will need metrics for learning rates and learning styles and the quality of their learning whether fragile or otherwise. This may look impossible, but in another field, namely software this has been done and without it the software Industry could not have been where it is. From writing programs for the love of it, and not even wanting to see the code of their colleagues, we now have a whole discipline of software engineering and software product management, of which software metrics and productivity measures are well accepted.

In the recent years, the three ideas that have had a huge impact on the way organizations work are Quality, business processes and their re-engineering and the importance of intellectual capital. All three must be assimilated into the educational systems, because it is the teachers who will become leaders in the knowledge economy, as they alone know how to construct knowledge. A mere expert knows his subject, but a good teacher knows how a person can learn the subject. If it can be done in a measured way, it can develop into teaching technologies rather than mere magic at the hands of a great teacher or a non-replicable art in the hands of a few that will eventually die out.