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Conversations with Professor M M Pant

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An Investment in Education is the Best Option and other essays

LMP Education Trust is a charitable Trust devoted mainly to matters that are related to developmental education.

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An Investment in Education is the Best Option

As we hurl into the Knowledge Economy, all the economies are speculating upon their possible Fates in the Future and what would be their rightful places in the New World Order.

The modern economy is closely linked to stocks as a major means of investments and we have seen from time to time irrational exuberance in stock prices Followed by corrections or sometimes even large scale crashes, where large amounts of capital are simply wiped out. The recent sub-prime crises and its roll-over effect have had a chastening effect on investors. The hall of fame for stock market manipulators includes controversial figures such as Ivan Kreuger, Mike Millikan and our own Harshad Mehta and Ketan Parikhs. Real estate also does not always give great returns and it fact it was the erosion of real estate value that triggered the loan defaults.

Contrary to what most of the Indian middle class considers axiomatic, investments in gold, real estate, stocks or mutual funds do not give great returns. Great returns are always the result of investments in education, acquisition of high value skills and creation of intellectual property by way of application of these skills in creative and innovative contexts. Illiterate or uneducated business leaders are a thing of the past. The current and future leaders will be working at the frontiers of knowledge, in science, technology including bio-technology and cutting edge discoveries. Google is an example. There are many others.

Human capital, a concept introduced by Nobel Laureate Theodore W. Schultz and elaborated on by Nobel Laureate Gary Becker, is the notion that individuals acquire skills and knowledge to increase their value in labor markets.¹ Experience, training and education are the three main mechanisms for acquiring human capital, with education being primary for most individuals. Education facilitates the acquisition of new skills and knowledge that increase productivity. This increase in productivity frees up resources to create new technologies, new businesses and new wealth, eventually resulting in increased economic growth. Education is a “public good” in that society benefits from increased education as well as the individual.

An investment in education is therefore the best option. Whether it is the education of your children, your own education or the investment in the education of the community, they all yield better returns than any alternative investment. And of course you can always invest in creating or promoting organizations that create, design, develop and deliver educational products and services.

At various points of times in the past, competitive advantage has accrued from domestication of animals, harnessing various sources of energy, developing successful business and governance model, but in the post WTO post Internet continuously flattening and shrinking world, the strategic advantages will come from continuous creativity, innovation, efficient strategies of creating and deploying intellectual property, all of which will flow from the ability of a population to use education effectively.

As of now, high quality and modern education was useful to only a small proportion of the population and was fulfilled by the classical traditional tribal way of education. The system looked for naturally occurring good learners, naturally occurring researchers and knowledge creators (faculty), put them together on nice campuses and hoped that good education would happen. It happened and there are a few splendid examples of the success of this model all over the world. The key word here is 'few'. And we could add the phrase 'and far between'. The problem with the model is that it is not replicable. It is not scalable in any meaningful terms. And lastly it is not even sustainable. Somewhat along the principles of increase of entropy, most splendid Institutes lose their lustre over a few decades, if not earlier.

In countries like India, a huge dose of over-regulation and the stranglehold of bureaucrats and politicians ensure that they do not stand a chance of survival.

And herein lies the opportunities in education.

One can draw an analogy between the Government's efforts of providing drinking water or electrical power to that of providing education. For both water and power, if a consumer wants to be able to use it meaningfully, additional arrangements have to be made so that the water is potable, the electricity is available and the education is usable.

It is generally emerging in various studies that only about 40% of MBA's are employable, only about 25% of Engineering graduates are employable and of the General B.A., B.Sc. or B.Com graduates, only about 5% are employable. So, again either the parent, the learner or the employer

has to make the additional effort of making them employable. One idea that could help is like the statutory warnings on Cigarettes, there should be a statutory warning in all University announcements and brochures, web-sites giving full disclosure of the unemployability ratios of their graduates over the last 2 to 3 years. This information should be mandatory under the RTI Act. Why on earth, should taxpayer's money and a special supplement collected under the education cess be spent on creating unemployable graduates?

Maybe there should be a mandatory requirement of a warning sign at the entrances of Universities and on all their documents like those required on cigarette packets along the following lines "Investing 3 years of your youth in this campus is likely to make you more unemployable than you are now."

The biggest opportunity in the education business is to augment the employability potential of such people. Like the old adage that prevention is better than cure, there could be an even more huge opportunity in preventing unemployability, by appropriate education and training. The opportunities for employment would not come through the Rozgar Yojana schemes of the Government, but through empowering the young boys and girls with skills that are required by the global work-force.

The amount of education acquired by workers has an important impact on labor market experience. The most direct way that education affects the labor market experience of workers is by increasing their productivity, thus increasing their earnings. The more education individuals acquire, the better they are able to absorb new information, acquire new skills and familiarize themselves with new technologies.² By increasing their human capital, workers enhance the productivity of their labor and of the other capital they use at work.

Calculating the return on investment in education has intrigued economists since early this century. Initial analyses of the effects of education on earnings were done by estimating tuition and foregone costs for given levels of schooling and then discounting the earnings differentials between workers at those different levels. Most estimates showed rates or returns on education comparable to rates of return on investment in physical capital.

The amount of education an individual receives not only affects his earnings, but the quality of his employment as well. In his book *Studies in Human Capital*, Jacob Mincer stated that educated workers have three advantages relative to less-educated workers: higher wages, greater

employment stability and greater upward mobility in income. Increased earnings by workers with higher education levels are a result of two factors. First, as discussed earlier, increased human capital results in higher productivity that allows workers to extract higher hourly wages. Second, increased education increases labor force participation, decreases the probability of unemployment and decreases job turnover. The result is that highly educated workers labor a greater number of hours annually for higher hourly wages than their less educated labor market competitors.

Educational needs are not confined to the traditional school and college going stage, but now span the entire life-span.

We are now getting around to accept that learning in the future will not be limited to the compulsory school education, which is part of the Sarva Shiksha Abhiyan, for all, followed by a tertiary education for a few, but will move towards a life-long learning phenomenon, with well demarcated stages spanning early childhood to well beyond the standard retirement age. In other words life-span learning will stretch from the cradle to the grave, from the womb to the tomb.

The traditional Hindu life-span is considered to be of 4 stages, Brahmacharya, Grihastha, Vanaprastha and Sanyas. Shakespeare in this stages of life has categorised life as comprising 7 stages. A more detailed classification of the stages of life could be as shishu, bala, kishore, yuva, vayask, praudh, vridha etc. again probably 7 stages.

From a modern perspective taking account of longer life-spans, rapid growth in knowledge, obsolescence of erstwhile knowledge skills and the need to learn, un-learn and re-learn throughout the life, maybe we could look at the continuum of life-span learning as comprising the following stages:

1. Pre-natal, neo-natal and pre-school learning:: 5 years
2. Classes 1 to 5 of schooling: 5 years
3. Classes 6 to 10 of schooling: 5 years
4. Senior secondary school : 2 years
5. Traditional University degree: 3 years
6. Additional years in professional education/ P.G. Degree: 2 years
7. Specialized training/qualifications/preparations for career : 2-3 years
8. First job adjustments: 5 years
9. Job changing period : 5 years
10. Settling down to a career/ lifestyle: 10 years

11. Mid-life crises: 10 years
12. Retirement Planning : 5 years
13. First phase of post- retirement: 5 years
14. Second Phase of post-retirement: 5 years
15. The final years : 5 to 20 years

The total need per person over a lifetime is about 50 years compared to the minimal 20 to 25 years for educated persons now, that is almost a 100% increase. Multiply this by the relatively larger fraction of the population that needs to be educated, say about 70 crores. And an average of about 200 hours of learning per year, we have a need of 700,000 crore-hours of learning to be developed. Even at a very modest average cost of ₹ 20/- per hour of learning over the entire range, we are talking of a market opportunity of ₹ 14,000,000 crores. If this sounds too much, just recall that a 2 year Management program to which the admission ratio is a very small percent, the tuition fee is ₹ 11 lakh and that too in a Government created Institute in India, not at the London School of Economics. Therefore, if anything the above is an under-estimate of the market opportunity in the education sector.

As for the benefits arising from having acquired the right skills, we only have to look at the 7 figure salaries being offered to the few students coming out of the premier Institutions. For the ordinary, the Ernst and Young had in a study some years ago had found that by acquiring basic skills in English and the use of ICT, an average graduate could move his income potential from the range of \$50 per month to about \$250 per month. If he has skills in let us say legal matters such as contracting, drafting or Intellectual Property it can move up to several hundred dollars per hour.

India has over the last decades initiated reforms. While we are still dragging our feet in some ways, the fact is that India was one of the founding members of the WTO and education is one of the 12 services that are covered under the services agreement and within education 4 modes of deliveries have been agreed, while testing is also being actively considered as an educational service. There is already considerable movement in promoting 'for-profit' education and some members of the Planning Commission have supported the idea, of course a number of people oppose it on some alternative philosophy. In any case, in the education business opportunities that are coming up, all economies that are making the transition to knowledge economy (and who isn't doing so?) need education desperately in larger numbers.

Apart from the large foreign players such as Pearson and Kaplan taking an interest in India, apparently Mukesh Ambani has decided upon entering the education space and this will also transform the face of education.

Access to funds should not be a problem, as there is already a weary population disillusioned by the traditional businesses. Funds from abroad are accessible and Indian ventures can also now invest and buy companies abroad. So we have a tremendous opportunity of really going fast, going worldwide and creating another success story.

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"Eureka!"

The Act of Creation

"This is the legendary exclamation made by Archimedes and hence the term, 'Eureka Act!' This is the process which has led to brilliant discoveries..."

Creativity can be roughly defined as the ability to make or otherwise bring into existence something new, whether a new solution to a problem, a new method or device, or a new artistic object or form. A creative person is usually very intelligent in the ordinary sense of the term and can meet the problems of life as rationally as anyone else can, but often he refuses to let only the intellect rule. On the contrary, he relies very strongly on intuition. However, the converse is not always true. All intelligent people may not be creative. A distinction can be made between the convergent thinkers, the analytical reasoning measured by intelligence tests and divergent thinking which displays a richness of ideas and originality of thinking. It seems that a mix of both convergent thinking and divergent thinking is desirable in different degrees depending upon the tasks and problems under consideration.

Divergent (or creative) thinking has been defined as an activity that leads to new information or previously undiscovered solutions, rather than to a predetermined, correct solution (as in convergent thinking). The extreme case of convergent thinking is an algorithmic approach to problem solving, which is at the root of all computer programs and is the most mechanical approach to problem solving. Discovering a new algorithm could, however, be a creative exercise especially if it is in some ways better at solving the problem.

Real life problems often require flexibility, originality and inventiveness especially for problems in which the individual must apply his own unique experience and context.

Many creative people enjoy and take a deep interest in apparent disorder, contradictions and imbalance. And from this apparent chaos and uncertainty they create organized bodies of knowledge often by observing patterns and relationships not seen by others. Several sixteenth century astronomers, before Kepler, have observed the movements of

the planets. Kepler explained them, laying down the principles on which Newton later built. Newton defined the laws of gravity, which other scientists later refined. The empirical evidence for the 'theory of relativity' was available for fifty years before Einstein. Many laboring scientists had all the data, but it was Einstein's brain that made all the relevant right connections.

Those who like to analyse the process of creative thinking tend to organize this as comprising four progressive stages. In what may be described as the first stage (preparation), the thinker assembles and explores the available information and data and perhaps makes some tentative preliminary decisions about their value in solving the problem at hand. The problem may not always be a grand scientific bottleneck. It could be part of daily life, may be a personal, emotional difficulty that needs expression or resolution.

The next stage is called incubation, in which he mulls over possibilities and shifts from one to another relatively free of any rigid, rational or logical preconceptions and constraints. Incubation seems to be partly unconscious, proceeding without the individual's full awareness.

The next stage of illumination occurs when the pieces of information fall into place and a definite decision is reached about the result or solution. This is followed by the final stage of verification, refinement or polishing which is the process of making relatively rather minor modifications in committing ideas to final form. Although the four phases have been ordered in a logical sequence, in reality they may not be so well demarcated but may vary widely and proceed in different orders from one instance to another. Also the time spent at the various stages may vary. Sometimes the incubation stage, where different alternatives are being considered may last several years.

The scientist relies more on disciplined, logical thinking to lead him into new directions whereas the artist is more imaginative and expressive. However, all scientific discoveries are conscious, logical and reasoned. Scientists and mathematicians can often be very creative when they are asleep or dreaming. Kekule, who proposed the cyclic structure for Benzene found it in a dream. Many mathematicians have dreamt of solutions to difficult problems and just wrote them down after waking up. Clearly their minds were seized of the problem and were constantly working on them. So it was probably not a dream in the usual sense, but a continuation of their thinking effort while asleep. That being mentally uninhibited can lead to creative experiences was stated by Einstein in a lecture that

he delivered at Berlin in 1918 where he stated: "The supreme task of the Physicist is to arrive at universal elementary laws from which the cosmos can be built up by pure deduction. There is no logical path to these laws; only intuition, resting on sympathetic understanding of experience can reach them." Later he is reported as writing that these laws, the universal elementary laws from which the cosmos can be built are arrived at by "the free inventions of the mind" rather than by observation, experimentation or logical inference alone. However, these free inventions of the mind have to pass the rigorous test of reality and experimentation. But sometimes the expression can precede the observation, such as when Dirac predicted the positron long before it was experimentally discovered.

However, the inventor, Thomas Edison, whose creativity resulted in the gramophone, the electric light bulb and the means to make motion pictures held the view that genius was only one-percent inspiration and the rest ninety-nine percent required perspiration.

Clearly objective standards for evaluating the degree or extent of creativity are lacking and inter comparisons may not be easy. Even then a number of psychometricians have attempted to develop tests that measure creative abilities, involving such test items as unusual or multiple word associations, the composition of fable endings and the description of unusual uses or improvements for ordinary objects or implements. And while quantitative exactitude may not be possible, at least a qualitative framework can be available. In fact a relatively new branch called 'Fuzzy' mathematics has been developed to respond to the problem of bringing some precision to apparently qualitative parameters. And now we do have gadgets and devices such as washing machines, cameras, televisions based on fuzzy logic. So maybe creativity could also be measured although with some 'fuzziness'.

Philosophers and researchers have been trying to find answers to the central question: whether the creative problem is solved by the conscious mind or by the unconscious mind and, therefore, whether we can actually be trained to be creative.

My own view is that we are intrinsically capable of creative and innovative activities and do them unrecorded throughout our lives. However, since society rewards compliant people, we tend to let our creative abilities fall into disuse.

But in the coming years there would be greater value to innovation and creativity and indeed they would become key ingredients for flourishing and thriving. While the 'Tit' may survive in terms of the

Darwinian theory, to actually thrive and flourish one would have to be creative.

Even in the financial sense in the Intellectual Property regime of the future, people who are creators and authors of intellectual property would be the leaders.

Psychological experiments in the fields of motivation and learning have demonstrated that novelty is a great inducement to action. There is, it seems, a continuous and perennial tension in higher organisms between the establishment and maintenance of environmental constancies and the interruption of achieved equilibria in the pursuit of new possibilities of experience. Psychological studies of highly creative people have demonstrated this tension in terms of such dualities as intellect and intuition, the conscious and the unconscious, mental health and mental disorder, the conventional and the unconventional and complexity and simplicity.

It would be desirable to foster creativity and while there may be a difference of opinion whether this can be done, definitely an attitude to appreciate creativity can be created and everyone can be stimulated to be at least a little more creative. And sooner than later these attempts at creative thinking and expression would yield significant giant steps as well. And once such a spirit has been developed and the sparks ignited, creativity can continue till very late in life, as the works of several writers have shown.

So, next time you get a new idea or you think differently from the rest of the group do not be apologetic about it. Say what you feel, record it somewhere and at your own pace follow it through. Who knows, one day the world will accept those thoughts and you would feel rewarded.

■ ■ ■

Educating India

A matter of great Urgency

As we get hurled into the current century with the power of convergence between the world of the atoms and the world of bits, the statement that knowledge will be the most competitive weapon or advantage is no longer rhetoric, but a stark reality. In some sense this was always true, but it is now manifest in many very compelling ways.

It therefore follows that for the convinced, it should now be a matter for action. While there is a lot of lip service paid to education and educational initiatives, the actions which usually speak louder than words show that education is a long way from becoming center-stage in the nation's business.

Let us begin with the recent action of the Directorate of Education Delhi, de-recognising one of the best Delhi schools, often rated as such by independent agencies, for having been open one day after the Directorate of Education felt it would be much too hot for children to learn. This was fortunately reviewed by the Lt. Governor, but look at the amount of energy wasted. If there was some logic or reasoning the Directorate had, at least it should have been openly expressed and appreciated. There are numerous such examples and not justifiable regulations laid down by the regulating bodies. So the first step is to get the Government get out of the business of trying to regulate the operational parts of education. The policy, the strategy, quality parameters and the broad directions yes, but syllabus, time-table, calendar of activities- no, no.

This is the actual cause of worry. It is hard to find any documents outlining the strategic approach of the country towards education as a competing tool especially in the emerging context of globalisation as reflected in the WTO. Everyone, the Planning Commission, the Directorates, the Ministries is working at the details from transfer and postings to midday meals and the grand and absolutely right thought of launching a satellite purely for educational purposes but there is no assessment of what is the state of and direction that we should take in steering the educational ship of India. Often the large sums of money

required for education and the inability of being able to raise them stifles further thought. But the question is not whether we can afford the money for education or not, but whether we can afford not to give education our highest priority. And yes, let us debate whether education is not more important than defence and also throw open the question as to what else is more important.

The speed at which we move is awfully slow. Our mindset is reflected in the order derecognising the school referred to above for having taught one extra day. Should we not create a system where the entire educational infrastructure is used over longer periods of time if not round the clock. For a nation with huge illiteracy and just a tiny percentage having access to higher education, let us at least acknowledge that we need to think of methods of solving the problem. For 60 years we have unwittingly denied access to millions of potential learners just because of not seeing it as a challenge.

We must remember that when the physical power available to the world was manual labour of humans supplemented with some animal power, we were leaders. With advent of steam engine and later electrical and other forms of power, we slipped and other nations marched ahead of us. The coming years of convergence of bits and atoms are again possibly providing us a level playing field. If we can seize the opportunity, we could be world leaders once again but if we slip, we would find ourselves at the bottom of the heap.

Where would we get the money from? From the people themselves. If we can convey the message that an investment in education is the best investment, whether it is for your own education, your children's education or your neighbour's education and that it gives even in pure money terms better returns than similar investment in land, gold or Ketan Parikh companies or for that matter the Government of India's Unit Trust and provide mechanisms where such investments can get fair returns there can be significant improvement in the educational infrastructure and its utilisation. If we put our act together in time in a meaningful co-operative manner and see public and private as a partnership, rather than as a divide, we may see in the coming years the phenomenon of Indianisation of the Globe concurrently with the Globalisation of India... maybe that will be the new Amrit Manthan of the millennium.

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Whither Education?

The recent media coverage about events in education, refer to a number of changes. These are changes in heads of educational Institutions, educational societies and to some amount of roll back in policies and curricula. It is somewhat like replacing one set of bandicoots by another and hoping that things would change. There is also an assumption that all the past half-century was right and only the preceding five years or so were an aberration.

However, it must not be forgotten that even in the almost fifty years after independence, we have not even been able to tackle the problem of literacy, let alone the bigger challenges. Tokenism and a few isolated examples of excellence (largely because intelligence and motivation is statistically distributed and with almost the size of one hundred million, there will be some achievers) but the question is are they inspite of the system or because of the support from the system?

The big challenges that we face in the educational arena are:

1. The challenge of numbers
2. The challenge of access
3. The challenge of relevance
4. The challenge of credibility
5. The challenge of quality.

There are of course a number of obvious implicit extensions of these challenges, such as the challenges of financial and availability of intellectual resources etc. But even if they are overcome, for what purposes do we deploy them and how?

In a recent informal conversation when one of our group criticized the power sector by referring to the almost astronomical sums which are estimated as the losses due to power thefts and which are passed on to the honest bill-paying customers, someone did a quick back of the envelope estimate of the huge loss in the higher-education sector alone in terms of under-utilized or non-utilized resources in terms of land, buildings and equipment which are utilized but for a small fraction of the time. In a way the UGC, AICTE and other regulatory agencies have directly squandered and plundered huge amounts of public funds, with added insult of not actually providing any meaningful quality education

to any meaningful proportion of the population. Look at any figure for the cascading drop-out rate from elementary school onwards, till at higher education we have about 5% having access and of its quality, the less said the better. Meaningful respectable education is available to less than 1% of the population, with the result that we have the new 'Quit India' movement under which almost 100,000 students went abroad in pursuit of higher education. The sums that they would pay to other countries could easily have been deployed here for the good of larger numbers.

In order to see what needs to be done let me refer to the example of a tree-frog somewhere deep in the Amazon rain forest, sitting on a log watching a fly. The frog is similar to all others of its kind, except that by a genetic fluke, the frog is now settled with a brain that perceives its surroundings as they were a second ago. (With our process of planning in the Planning Commission and the execution by the bureaucracy our vision has a time lag of about 7 to 10 years). So what happens to the frog? When the frog sees a fly within its range, it lunges out. But with its out of date information it misses. Eventually weakened by a rarely sated hunger, the frog falls off the log and dies. The lesson learnt is that a frog that calculates the trajectory from the most recent data eats; the one that doesn't starves. It is that simple. Humans are information gathering and utilizing systems and they need to process much more complex environments than mere trajectories of flies, but the lesson is equally applicable.

Which amongst our bodies, the Planning Commission, the UGC, the AICTE, the NAAC, the NCTE do you think has a meaningful articulation of how it would bring about an innovative solution to the impending paradox of needing a massive reasonably well-educated world-class workforce to flourish and thrive in the knowledge economy and the appalling and pathetic condition of our educational enterprise, with the many challenges stated in the beginning of this article. It is not of much consequence that (other than building some degree of self-confidence that we can do it) that a few Indians have done very well and are symbols of excellence in almost all walks of life all over the globe. What I wish to emphasize here is the scaling up of it, so that a very large number, if not possibly all Indians should do well and at least significantly better than before. We have a huge number of people in the 15 to 25 year range and this can be huge engine of economic growth if we prepare them for the knowledge economy and surely we will be a super-power. But surely we cannot achieve that goal by swelling on the past and making changes which take us further behind in times. Rather we need to think forward

and prepare our youth in the new skills, attributes and knowledge that will make them world-class in every sense of the term.

The answers are actually quite simple and we only have to look at what we did (or did not do) in the recent past in the IT and IT enabled sector. It is to replace the license-quota and inspector raj and the 'I object' approach to development with a norms and standards based facilitating and enabling framework managed by independent professionals (not pliable Government paid time bound promoted professors, who change colours with the Government). So instead of sacking with every change of Government the Chairman UGC, the Director NCERT, the Chairman AICTE, the Chairman NCTE, the Chairman NAAC etc, let us get rid of these bodies completely. In any case no self-respecting academic will touch these positions with a long pole in the present scenario. Like Gandhi's and Tilak's demand for freedom and Pantji's demand for home rule, I think the students and teachers of this country need to take responsibility for their actions rather than depending upon the time-lagged and warped visions that have led us so far.

In the USA for example, for becoming an accrediting body in higher education, the first and foremost condition is that it should not be a Government body, whereas in India all such bodies are Government bodies for all intents and purposes. Little wonder that we are at the bottom of the league.

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The Teaching Profession in the Knowledge Economy

During this month, on the 5th September we celebrate Teacher's day and it is therefore an appropriate occasion to reflect on our traditions of learning, their present status and contemplate on the needs, challenges and promises of the future.

So we have the greatest disciple of all times Arjun, taught by the greatest teachers like Dronacharya and Lord Krishna and Yudhishtira learning from the Yaksha in a question-answer format with rewards on success, a method now described in the standard literature as the Socratic method. Anecdotes relating to education in our mythology as well as traditions are replete with examples of personalization, mastery-learning, knowledge obtained by denial, experiential learning and parental role in pre-natal and neo-natal learning.

State Control

The guru-centred and community supported educational system was working quite well until the British rulers discovered this and promptly brought in State intervention and State patronage and eventually State Control. More than 57 years after independence we have not been able to achieve universal literacy and any meaningful targets in elementary, secondary, or tertiary education. As we enter the knowledge economy, we must change this situation and give up urgently the factors, methods and systems which are inadequate in the new environment and adopt new innovative and future-oriented methods and practices.

In the immediate past 3 to 4 decades, we have seen the establishment of teaching Institutions modeled on the factory system, with emphasis on minimum performance standards, Institutional supremacy and little interest in individual excellence. So there were no special schools or teaching arrangements for specially gifted children, accelerated learning, mastery learning, personalization etc. So the very best with the highest abilities and the bottom of the class were administered exactly the same learning challenges and environment. There were a few islands of achievement which were given disproportionately high resources and

there was no process of measurement. So there were teachers unions and student unions and a teachers constituency representative in some state legislative assemblies.

Just like lawyers were at the forefront of the freedom movement, student union leaders were political leaders in the more recent past and now business leaders and film stars are centre-stage in the national scene and economic policies are tested against the Sensex movement, in the emerging knowledge economy it is the teachers who will be most important. This is so because it is the teachers who specialize in the creation of a learning experience and thus of knowledge. We have had reforms with relinquishment of State controls in many areas, but the most urgent of them is required in education.

Supremacy of Teacher

We need to re-assert and re-establish the supremacy of the teacher and not the bureaucrat or the Institution. Not through tokenism of distribution of a few national awards once a year, but in our day to day practice and through a series of steps seriously acknowledging the importance of education and of teachers in the construction of learning. As we enter the knowledge economy, it is important to appreciate that education alone will create valuable knowledge products for global use and this alone will let us flourish and thrive in the new age. We must not forget that it is India which gave the world the concept of zero and if we could charge a royalty, or licensing fee for it, like Bill Gate's charges for use of its Microsoft Software, we would be the richest country in the world.

Innovative Society

It is generally agreed that the future economy will flourish on know-how and innovative ideas and then it follows logically that any society that virtually writes off the majority of its population through poor quality education with indifferent teachers is throwing away its most precious assets. The goal is therefore to have an innovative and inclusive society and this cannot be achieved without putting teachers at the centre-stage.

De-controlling education is the most important step towards full freedom and fulfillment of the nation's ambitions. The Constitution guarantees us the fundamental right to practice the occupation of 'education'. Of course it is subject to reasonable restrictions in the overall interests of Society. But the current restrictions on the right to carry out the occupation is itself coming in the way of the constitutional obligation

of education for all. While the qualifications, training and preparation to qualify for the profession have been defined and could be refined quite easily, the next step of actual practice is curtailed by the inadequacy of opportunities because the Government does not have the will or the wherewithal to create enough schools, colleges or Universities. And when some State Governments and following the spirit of 'may a thousand flowers bloom', went on to create innovative models, numerous regulatory bodies have created stumbling blocks rather than facilitating pathways.

The reality is of course clear. Like post 1942, when it was clear that the British have to leave in a fairly short time, it is clear that thanks to its inability and insincerity in performing its tasks, the traditional regulatory bodies have to give way to more independent professional bodies for facilitating adherence to quality standards and fostering a movement of inclusive education.

Independent Practitioners

This is a call for a re-establishment of the teaching profession, which meets International standards in keeping with the call of Globalisation, permits independent practitioners to move about under mode 4 of GATS as well as practice their profession at home, without the need for Institutional intermediaries and with access to and training in modern ICT tools for both synchronous and a-synchronous interactions with learners across the globe. If we do this fast enough we will witness a multiple of what the IT segment did for this country.

So let us consider what is new about the knowledge economy. The point is that knowledge is about judgement, ways of thinking and discernment.

In this new economy the majority of all growth will be within commodities, products and services which can be traded across the airwaves. This economy is therefore fuelled by innovation, which itself is a result of increased communication (and the speed of communication)

The use of email and the internet and now of instant messaging has had a profound effect on the world, particularly with regard to time. What once took days or even months can be achieved in seconds.

In turn this is changing lives and the workplace. Consider that now businesses must think hard about how to manage their workforce, i.e. Life Long Learning & Personal Development.

Organisations must therefore be more creative and innovative. The

way to compete has changed. Competition is now largely about the brand since that brand holds a degree of promise with the customer. This new economy can be viewed more in terms of intangible assets. Such as Trust.

So where does education fit in?

If jobs are no longer for life and employment demands Life Long Learning then schools, colleges and Universities must create a culture for self development / responsibility for learning. Schools must aim to nurture creativity and innovation. Pupils must learn generic skills through the structure of subjects.

The National Education machine as it exists will not deliver quickly. Therefore it comes down to exploring newer models that encourage individuals, whether they be schools, colleges or Institutions to co-operate with individual teachers to respond.

The New Challenges

The new challenges, whether of access, equity, adopting technology, becoming more relevant will have to be addressed by newer methods. And they will give rise to the emergence of the independent educator and the re-emergence of teaching and education as a new profession that can be practiced in numerous ways. Just as it is legitimately possible for any lawyer, doctor, engineer, architect, chartered accountant etc to work for a State Government, the Central Government, a large corporation, a small business or set up to work independently on his own and the brand perception is independent of the context in which he or she is working. It should be possible for qualified educators to work outside Institutional frameworks on their own. And of course the Gurukul system was about this. If we decouple the responsibilities for laying down of standards, conduct of examinations, the teaching-learning processes and maintaining databases of educational qualifications, we can see lots of opportunities for educationists, unconstrained by creators of Institutions whether Government or the businessman. Collective, co-operative networking arrangements with branded teachers working together under a brand which communicates a commitment to a shared vision would remove many ills of the existing systems and unlock the large potential that we have in retired accomplished teachers or unemployed younger people. Teachers need not ever retire and continue imparting education till they can do so (incidentally there is no retirement age for politicians, lawyers and many other professionals).

Some people will view these thoughts with varying degrees of skepticism. But it is indeed a very straightforward solution to the twin problems of educated unemployment and not enough access to education to the needy. One can't but help thinking of the exhortation from Vivekananda.....'Arise, awake and stop not till the goal is reached' and the goal is a flourishing and thriving India with an educated population and teachers at the helm of it.



Responding to Challenges of Global Competition

From a few years ago, when almost nobody had heard of the International Baccalaureate Program, we are now in a state when almost every other day, an IB school is being announced. We have seen in the past a similar craze for 'Montessori' education, followed by the use of the word 'Convent' by all and sundry, with many being completely innocent of whether they were in fact a convent or not. It just sounded right and attracted students, who would then be given uniforms and maybe a bit of smattering of spoken and written English. The absurdity was so high that you even had schools such as St. Mira's convent or maybe Lakshmi Bai Convent and in fact a rather successful Dr Kaushal Convent. The next wave of progress was to use computers for children right from class 1, the earlier the better. Never mind the pedagogy or even the development of the child's sensory motor facilities.

The latest buzz-word, short of the IB or IGCE etc is the use of the word International, Global, World or some similar meaning term. Next to be followed would probably be cosmic, holistic, celestial, universal, Galactic, or some such attractive out of the world expression.

The good part in all this is that it reflects the drive towards becoming better than the immediate neighbour and striving towards higher challenges and standards.

Someday, when the Government actually opens its eyes from its deep slumber we will truly have world schools in which children of all nationalities will study together and India will be the preferred Education destination, because of its enormously rich heritage. After all sitting over tens of thousands of years of civilization is a capital asset that can now be unlocked.

Well, there is no doubt in my mind that the IB is probably the best International program around. But alas in spite of the desires of the top visionaries at IB to do so, there is no feasible way in which it can attempt to reach the kind of numbers that are at the bottom of the pyramid and are the real challenge to Indian education. The obvious answer is that many other schools could and would need to acquire a good world class education by following sound strategic plans, by drawing from what the

best practices in the past have taught us and maybe extrapolating a bit into the future to the so-called next practices as elucidated by Professor C. K. Prahlad.

An interesting question that flashed through me as I write this is how many Nobel Laureates would have gone through the IB curriculum and the answer would be statistically insignificant. So also one could look at the key business leaders or outstanding statesman. So there is enough evidence and hope that one could achieve excellence through alternative ways as well.

One initiative just launched is called the Globalachieve system which draws upon a fair amount of research over long periods, to evolve assessment methods which are measurable in a more defined and standardised way so that it could be used as a scalable measure of the quality of achievement. A visit to the site www.globalachieve.com would be very informative to those who want to forge ahead. I gather that almost 50 or so schools of fairly acknowledged reputation are already involved in the program. Teachers who are part of the Globalachieve system get to participate in professional development workshops to continuously improve their practice and improve themselves. For example the forthcoming workshop on implementing developmental assessments is extremely useful to put in place viable and effective alternatives to the traditional examination system which is being sought to be done away, at least partly. Progress maps, portfolios, projects, performances, products and other forms of assessment, which are Internationally followed, could be adopted after the exposure and training at these intensive workshops.

One of the very important aspects of the IB program is the theory of Knowledge course, which is central to the Diploma program. The importance of this in preparing our children for the world of tomorrow cannot be under-estimated.

We all realize and are in agreement that the next 50 years will see changes in the world at a rate and with an impact that we have never seen before. This is because we now have a better understanding of the world of atoms, right to being able to handle nano-technology, the world of bits to an extent that we can now make almost all erstwhile inanimate machines endowed with an 'intelligence' that can respond in unimaginable and unforeseen ways to human behaviour to create adaptive devices and gadgets, and a highly connected 'always on' world through Broadband Internet and awaiting the magic of Internet 2 at not too distant a future.

As a source of energy we are about to enter the hydrogen economy and as the basic human activity we would be in complete mastery of biotechnology with a better understanding of the human genome.

What would it take to be a leader, thriver and a spearheader of change in the emerging world. Surely not the same knowledge, attitude, skills and beliefs as of the past, which may have well served both national and International civil servants in a largely colonial order, but a capacity to cope with the knowledge economy of the future with much greater transparency, right to information and greater democratic governance..

An awareness of the different dimensions of learning and internalizing in themselves the capacity to 'learn to know' is what will separate the leaders from the rest of humanity.

We need to adopt the most well accepted ingredients of ever new emerging educational methodologies and draw the most from, research done, world-wide for better understanding of how effective learning takes place, at all stages of development.

Of course the final years of the Diploma Programme of the International Baccalaureate includes this very explicitly and formally as the 'Theory of Knowledge' course of study, which no other educational program in India either at the school level or at any other level offers. Even the IIT's and IIM's do not provide their students with the understanding of epistemology inducted into everything that the student studies.

In the true spirit of the Vedas, encouraging us to be receivers of noble thoughts from all directions, let us open ourselves to them, build upon them to create by adoption or adaptation our very own system to make our learners future proof. We will need to do this by active and interactive participation of practicing educators, enlightened and concerned parents and to create and give to ourselves, rather than let it be thrust upon us by the powers of the State or even of International trade blocks. You are invited to become part of this new freedom movement to liberate education and take it forward.

There can be doubt whatsoever that the new generation learners from these globally oriented world-class schools would be most valuable in their most productive years, a few decades from now. A great future beckons them.



Creating the India Brand in Education

We have recently seen in the media the huge recognition that the IIT brand has now had in the US and in the rest of the world as well. This is a result of several path breaking measures that were taken in the early sixties, whose benefits we are now harvesting.

There have been expressions of hope and sometimes concern from almost the entire world that India has the potential of becoming the world's leading supplier of education. This is based on two major observations.

Firstly, the success that India has achieved in demonstrating its abilities in IT application and IT enabled services, so much so that it is seen as the most preferred destination for IT enabled business processes outsourcing. This is so in spite of its lagging in hardware, almost no significant quantum of owned software, absence of a software patents regime and a general lack of high-end developmental initiatives.

The other is the command and fluency over English for which we again have a significantly large numerical population, despite the fact that several states are discouraging English for school education. Since large parts of the higher growth economies need both English education as well as IT enabled applications, India is well suited to achieve success as the leading supplier of these. In a sense, it is reminiscent of the Japanese in the Industrial Age, who in spite of not having the ores and raw materials became very successful in making steel and other products.

However, as a colleague of mine argued that only when the statistical mean and the mode of the Indian achievers reaches greater heights that the India brand will become valuable.

In my opinion, one component of the answer is that the stellar achievements are because of individual excellence and the mediocrity is because of the state's non-chalant approach. It is of course true that these individuals have often benefited from the State created infra-structure, but for most people, it is a low quality system with inconsistent quality of delivery.

If we recall the past track record of the Industrial and services sector, there was a sea-change in the quality of Indian products when the reforms

process opened them to global opportunities and competition. All in all, it has been beneficial to the consumer.

We need a similar reform in education and some fundamental thinking on moving ahead fast with the sole object of the citizen's welfare. While the Government should be pro-active in thinking and development of standards, it should not be limited by its ability in its execution. Because in its execution, it unleashes the full potential of the weapons of mass destruction, that now only the Government is legally allowed to own. We have seen the importance of the outsourcing model in achieving organizational efficiency in world-wide operations. What I suggest here is less Government involvement in operational execution and the creation of what some people have called an 'in-sourcing' model with NGO participation, which may be not only not for profit organizations, but for others as well.

We need to have a re-look at the current proposition supported by Supreme Court pronouncements that profit organizations should not participate in the education processes. This is obviously having the result that the citizen cannot directly invest in education. If IT companies can make profits, pharmaceuticals can make profits, if citizens can invest in hospitals, liquor companies and hotels and entertainment business; there is no logical reason as to why they should not be allowed to invest their surplus wealth in the educational infrastructure. They can actually invest up to US\$ 25000 under the new regime internationally, but not so within India. Does it remind you of discrimination in India against Indians.. Indians and dogs not allowed. If making residential buildings and shopping complexes can be encouraged, why not encourage investment in the creation of educational infra-structure. There must be a framework to regulate the quality and, of course, eventually it is competition that will drive standards. Apart from driving away possible investments in education, the State is doing so many other things to dilute or even destroy the Indian Education Brand. While there are numerous examples of this, but two recent ones deserve a special mention, namely the decision to sack a large number of NIT Directors in one go and removing the Chairman of UGC on the ground that the appointments had a legal problem. In both cases, the concerned persons did not do anything with respect to processing their own appointments and the entire processing was done by the Ministry officials. They were duty-bound to seek the best legal advice. The administrators are expected to be senior members of the IAS and are not expected to be irresponsible. The persons appointed

must have had good reputations, having held high academic positions and these are all destroyed with complete disregard to the effect on the branding of the Institutes. The NIT's are premier Institutes of technology, only a step behind the IIT's. The UGC is the apex body for education, trying to oversee a system of higher education, which is among the largest in the world.

While the Prime Minister, who has himself been the Chairman of UGC is compelled to retain ministers who have been charged in criminal cases, He does not seem to care enough for maintaining the dignity of the major Institution and its Chairman. The approach should not be to seek legal advice and use the machinery of the State to remove a particular person through an obvious ventriloquism through a Public Interest Litigation but to find ways and means to see that the Institution functions effectively. It is quite interesting that another former Chairman of the UGC, who filed a PIL because some Universities were trying to function without seeking grants from UGC, is also not vocal in the media when the office of the Chairman of UGC is itself being defiled. How will a future incumbent of the post of Chairman, UGC indemnify himself against the incompetency in the processing by ministry officials and which self-respecting academic will accept such an appointment where the appointing authority itself does not take responsibility for its actions. And what happened to the good old principle of 'estoppel'. I know the courts ruling that there is no 'estoppel' against statute, but what about 'estoppel' against executive action. In any case, even if the rule regarding three terms limitation in the UGC has been violated, what is the damage? Whose rights have been violated? At the most of an imaginary other individual who was denied this opportunity where the rule was held against him. Did this happen for the applicant in the PIL. I do not know, but seems extremely unlikely that he would have filed a petition within the usual 90 days of the appointment.

This is why, reforms are urgently needed in education. We need to create a pool of independent professionals in education, so that they can provide the necessary inputs, advice and give directions for educational policy, which is otherwise being totally guided by loyal officials and pliant academics. This reminds one of the titles of a recent book by Arun Shourie, namely, 'Will the Iron Fence Save a Tree Hollowed by Termites?' Our people have become very reticent and passive, but if we do not get up and fight for our education, you will have shlokas being sent over your

cell-phones by a company from Finland; private for profit universities from Shanghai attracting your students who normally go to IIT; the IIT's and NIT's being run like schools by the Municipality, design being taught by Institutes from Korea, hospitality from Switzerland, tourism by Mauritius, management by USA and so on.

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Transforming 'the Argumentative Indian' to a Creative and Innovative Indian

Two recent books, both best-sellers, have talked about India and considered together can be of considerable help in laying down an approach towards India's future and creating its rightful place in the Knowledge Economy.

Thomas Friedman's book "The world is flat" looks at today's India and sees its talent contributing to world-wide developments in Science, Technology and business. He specifically refers to the creation of the IIT's in the 1960's and says that the creation of the IIT's was a very good decision. The greatest beneficiary of the IIT's was USA and it benefited immensely from the resulting talent pipe that filled up at New Delhi and emptied at Palo Alto, in the Silicon Valley at California.

Amartya Sen on the other hand, in his "The Argumentative Indian" dwells on the past bringing up the glorious Indian tradition of discussion and questioning and a participative society. In his very first essay he refers to the eternal questions raised in the Vedas: Who really knows? Who will here proclaim it? Whence was it produced? Whence is this creation? The Gods came afterwards, with the creation of the universe. Who then knows whence it has arisen? Whence this creation has arisen – perhaps it formed itself, or perhaps it did not – the one who looks down on it, in the highest one, only he knows – or perhaps he does not know.

In the same essay he also refers to Javali, a sceptical pundit who gave the following epistemological advice that to Rama : ' Follow what is within your experience and do not trouble yourself with what lies beyond the province of human experience'.

It is such traditions that encourage exploration and developing a scientific viewpoint towards the world.

A simplified view of the loss of our leadership in the world is that in the era when we were all limited to manual labour and domesticated animals as sources of power, India was a thought leader. As other sources of energy became available, we slipped during the last two centuries and in the last 50 years or so an inward looking, license and control regime, pushed us further behind in world rankings.

A study by the Pratichi Trust set up by Amartya Sen with the help of the proceeds of his Nobel award, found that elementary education in the year 2000 was in a depressing state.' A very large proportion of the children rely on private tuition as a supplement to what they get from the schools and those who do not are evidently prevented from doing so because of penury, rather than being satisfied with the teaching the children get in school. Effective elementary education has in practice ceased to be free in substantial parts of the country, which is of course a violation of a basic right.' Like the electricity or water provided by public systems which have to be further processed by the user to make it really useful, education also has to be supplemented to create a useful person. We need to move beyond mere 'sarva shiksha' to ' sampoorana shiksha'. Higher education fares no better with almost 95% of the graduates being unemployable in mainstream activities.

The recent economic reforms have allowed us to recover some ground, though we need to speed up reforms and liberate the restrictions on the educational systems to rapidly get ready for the Knowledge Economy.

Among the types of persons who will succeed in the future, according to Thomas Friedman are the ones who are most adaptable learners and can continually learn to learn. If we create the right kind of people, we will go beyond the mere talent pipe to USA to a fountain of talent for the entire world.

It will not be possible to do so by the earlier model of some islands of excellence made very exclusive. But rather the vast population would also need to be improved in their knowledge and skills so that the cognitive capital of the nation can be raised.

To become a leader again we need to create a movement of encouraging all Indians to participate in events and programs which enhance creativity and demonstrate the pleasure that thinking afresh and thinking differently gives. My own view is that we are all intrinsically capable of creative and innovative activities and do them unrecorded throughout our lives, however since society rewards compliant behaviour, we tend to let our creative abilities fall into abuse.

Philosophers and researchers have been trying to find answers to the central question: whether the creative problem is solved by the conscious mind or the unconscious mind and therefore whether we can be actually trained to be creative. It is desirable to foster creativity and while there is a difference of opinion whether this can be done through

systematic intervention, definitely an attitude to appreciate creativity can be developed and everyone can be stimulated to be a little more creative. And sooner than later these attempts at creative thinking and expression would yield significant giant steps as well. And once such a spirit has been developed and the sparks ignited, creativity can continue till very late in life, as the works of several writers have shown.

So, next time you get a new idea or think differently from the peer group, don't be apologetic about it. Say what you feel, record it somewhere and at your own pace continue to follow up on it. Who knows, one day the world will accept this thoughts and you would feel rewarded.

But creativity as I refer to here is not only about poetic license or an artist's imagination. It is also about creating useful items for everyday living. In the Knowledge Economy the central attention would be to Knowledge Products, Knowledge Processes and Knowledge workers. Bill Gates has in one of his recent discussions has said that sometime in the last 20 years the word " knowledge " changed from a noun to an adjective. The phrase knowledge worker was however used for first time by Peter Drucker in 1959 and the IIT's created the first set of Knowledge workers in the technology domain. But Knowledge workers are not only those who are deep in technology. Tomorrow's knowledge workers would make use of the latest Information and Communication Technologies and a set of generic analytic, problem solving skills, lateral thinking, creativity and innovation to create new universes of products and services. It is said that Alexander had felt disappointed that there was only one world to conquer. A Knowledge worker would have the opportunity to create any number of universes he is capable of.

So what would be the eight-fold way for preparing the Knowledge workers of the future? The following eight skills or knowledge sets would be inherent requirements for prospering and flourishing in the Knowledge Economy:

1. Proficiency, not mere literacy in ICT skills.
2. English Language Communication skills in Reading, Writing, Listening and Speaking both face to face and remotely over telephone and audio and video-conferencing systems.
3. Analytic and critical thinking skills.
4. Creativity, innovation and problem solving
5. Multi-cultural adaptability
6. Managing Self: Stress and Time management

7. Awareness of scientific principles and their applications

8. Universal human values and ethics

So, how can we transform the argumentative Indian to a creative Indian with the above attributes? Surely not by a State delivered program. If you will see the findings of Amartya Sen's research, it endorses the general belief that the State intervention in elementary education has forced almost anyone who can afford to seek private additional help. This mission can be done by finding groups who would be catalysts and facilitators, who will carry out the above interventions concurrently while the learners are studying in the normal programs. To do this, paradoxically it is the higher end technologies that would be able to come to help. The 'hole in the wall' experiments of Sugata Mitra have amply demonstrated that given the resources and a good interface, children can learn a lot by themselves. The State however can and should play a catalyst and facilitator role, providing a platform for various organizations to work towards common goals, sharable resources etc. much like the Internet itself. The successful expansion of the telecom sector allowing multiple players and technologies to be all deployed for the consumer benefit is a good example. There is no reservation for SC/ST , backward or other backward classes or worrying about the creamy layer as far as mobile phones are concerned. Why the have so in education? Simply because the State has prevented its growth and what Gandhiji had criticized the British for in thwarting the spread of literacy in his Chatham House speech, is exactly what our Governments did for the last 60 years, denying quality educational opportunities to the majority of the population, even when it was willing to pay for it. This sinister approach will have to be given up, if we want India to occupy its rightful place in the future.

If we fail to do so, even with the right demographic profile of a significant youth population, we will not be able to use their energies and the unrest that it will generate will be far more traumatic than we have ever seen before. We will once again be consigned to the dustbin of history.

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The Future Learning Environments

In ancient times, learners went to seek learning at the feet of the masters (gurus) and lived with them, served them and imbibed their values system and approaches to knowledge. One was by and large free to choose one's guru and the guru had the right to decide which pupil he would accept. There were gurus and philosophers who were on the right side of the rulers and there were men of the stature of Diogenes who had scorn for them. No wonder Alexander is reputed to have said that he would have wanted to be Diogenes, if he were not Alexander.

It seems that till the pre-colonial times, India too had a system with gurus at the centre and the community to support them and then the British rulers rightly diagnosed this as the strength of the society and promptly went about declaring such education illegal and put in place a state sponsored, controlled and administered system, which we are following to this day. In one sentence most of the education being handed down by the State is pathetic, though there are a few islands of excellence.

Some three decades ago, satellite based education experiments demonstrated the possibility of countrywide classrooms. Along another dimension, these three decades saw rapid advances in computing technology, with faster processors, more compact memories, lower electrical power requirements to run these and a massification which has been unprecedented. The more recent convergences that have now occurred between information technologies and communication technologies have now redefined broadcasting, so that entirely new varieties of one to many and many to many communications are possible with two-way interactivities. Add to that the different manifestations of wirelessness such as the blue-tooth, the Wi-fi, the Wi-max, the GSM and the CDMA and we have the clear possibility of reaching out to almost any latitude and longitude. You no longer have to be born at the right latitude, the right longitude and the right time to have access to high quality education, but it can be more or less independent of location.

So would the recent launch of the Educational Satellite fulfill the expectation of reaching out to our entire constituency in the Constitutional obligation of education for all? Well it could, but there are at least three more major components to make it really work. The first is the new

pedagogy, if you will, of creating a teaching-learning experience which has the satellite based transmission of knowledge as a key component.

The second is giving it legitimacy. As of now a learner who has learnt entirely by himself by watching any of the many educational channels and has acquired the capability of passing a Board or a University exam cannot do so, unless he is admitted to some Institution, all of whom have very restrictive access policies and encourage exclusivity rather than inclusiveness. The third and in many ways really central to the whole program is training of teachers to use this and adopt it. Today, a hypothetical teacher who is a 'digital Socrates' is actually not allowed to practice his profession by the NCTE, the AICTE, the UGC and all other regulatory bodies. He is, however, not jailed as yet, or crucified like Christ or sentenced to death like Galileo and Aristotle and we must be grateful for small mercies.

We should, however, not despair. For often the solution to problems of the future lies in learning from the past and adapting to the new context.

Let us get back to community response, putting the teacher centre-stage and not necessarily waiting for the Government to make the first move. I would like to take this opportunity to share with our readers, a very recent experiment in putting the highest end technologies available in the most impoverished settings of a roofless, class-room less teaching initiative, where children are getting free education entirely through voluntary effort.

Under the aegis of a fledgeling initiative named the Learning Foundation India, three volunteers two of them Lillas, who have studied Psychology and Journalism in the USA and Herschel, an external student of the University of London, created an experience, which I will call the HLL experience. What HLL did was to place a laptop computer with a big screen in place of the black board, have about six students interact with it using a wireless keyboard and within a short time the children (aged between six to ten years) were so engaged that over the next two hours they were constructing relatively long sentences, writing difficult words and continuously thinking of new things they could do. On the way they heard music, took photographs using a digital camera, saw their pictures, communicating in a mix of English and gestures. While in some ways reminiscent of the 'hole in the wall' experiment of the NIIT, this was clearly different in that it was 'inclusive' with the children actually touching and playing with the latest equipment and guided, mentored, patted, complimented and occasionally even hugged by their teachers as

a reward for having shown evidence of learning. The increase in esteem and confidence were enormous.

In my view, the HLL experiment is a historical moment in Indian education, as it struggles to find how it can morph from the colonial past, an extremely unsatisfactory present to a bright future that we somehow intuitively feel should be ours. It is as significant as Piaget's observations on young children's learning or the experiments on electro-magnetic induction by Faraday when he could get the galvanometer to show a flicker of current when a magnet was moved near a wire.

From that experiment to creating grids of electrical power generator was an evolutionary journey. We would probably see in the future grids of teachers working seamlessly with networks of computers and world-wide learning pads in the learner's hands that will replace the slate and pencil of yester-years.



Mastery Learning

A measurements based approach to education

We are crying hoarse about the emerging Knowledge economy and now the time has come when we must seriously start preparing for it. We should not repeat the story of a decade earlier, where we had signed the WTO agreement of which TRIPS is a major component, without adequate understanding and are still struggling to get the Patents bill passed after almost 10 years.

There has been a constitutional amendment to provide free and compulsory education to all children, but the implementation of the Sarva Shiksha is still going broadly the literacy mission way. No standards for content, processes or evaluation of achievement have been defined.

However, those amongst us, who think of ourselves as responsible and concerned parents, must get on with the task of assuring that our children are equipped to face the challenges of globalization and to benefit from the opportunities that it provides. We are witness to the recent news items describing the more than \$1 50,000 dollar salary that our premier Management Institute graduates are being offered.

Realising that the USA is slipping behind in having adequate numbers of its population as high college achievers, it has fiercely (and in spite of significant criticism) launched an initiative of No Child Left Behind with the objective of raising the achievement levels of its school leaving students, especially in view of the high variability of the exit levels of children from different state systems of education.

In India we have according to the Constitution the responsibility of education with the States and have a similar wide variation in the standards prevailing in different States.

When children are admitted to the first level in school, say class 1, Nursery or Prep they all have the capacity to display almost the same level of competence in alphabets and simple words and sentences. The group remains fairly homogeneous till class 3 or class 4, but then differences start appearing in the cohort and by the time they do the Board exam at class 10, their performance is so far apart that they are then usually classified into Science, Commerce or Arts stream depending upon their differential abilities.

And by the time they clear class 12, the variations are even higher, with the top making it to IIT's and other reputed Institutions and the bottom are condemned to study through correspondence, distance-learning or at private Universities of doubtful academic standing.



While educators have thought of achieving mastery learning for long, the inadequacy of technology and peer support mechanisms prevented its implementation. Keller did some experiments, which were followed up by some more at an individual level, but not really at a systems level because a mass scale implementation was not feasible. We are now at a time when there is both desirability and feasibility of the methods of mastery learning proposed by leading educators in the past.

To make progress on a desired learning path, we need to know where we are, be able to compare it with where we want to be and organise the learning intervention that would lead to that direction. The existing evaluation and assessment instruments and the reporting methodology do not help. Even the recent global initiatives such as the TIMMS and other tests of International achievement emphasise relative rankings and

percentiles rather than the achievement levels of students and defining learning paths for them. We need to create new instruments of assessment and measurement and implement them through a team of trained assessors and mentors.

Our first proposal is to use new parameters to indicate the development of a child in entirety, for which we have identified 12 attributes, listed below:

The Persona

- Physical Health
- Emotional Health
- Values and Beliefs

Generic and Higher Order Skills

- Information and Communication Technology Skills (ICT Skills)
- Knowledge Gathering and Sharing Skills
- Problem Solving Skills
- Learning to Learn Skills

Prescribed Curricular Subjects

- Mathematics
- Science
- Social Science
- English
- Hindi (or other Indian language)

For each of these dimensions, standards of achievement are being developed primarily relying on International standards. Where appropriate, such as for Mathematics, Science, English, ICT skills using guidelines of our national bodies such as the NCERT/CBSE and for Social Science, Hindi and other locally oriented domains, developing new ones where existing standards are not available, such as in physical health, values and beliefs.

We propose to use this mainly till the pre-Board stage, that is up to class 9, because in class 10, the focus of most students is and probably ought to be to do their best in the external Board exams. We believe that having followed this methodology, they would all be ready to score the maximum marks in the Board exams and also to do better in general

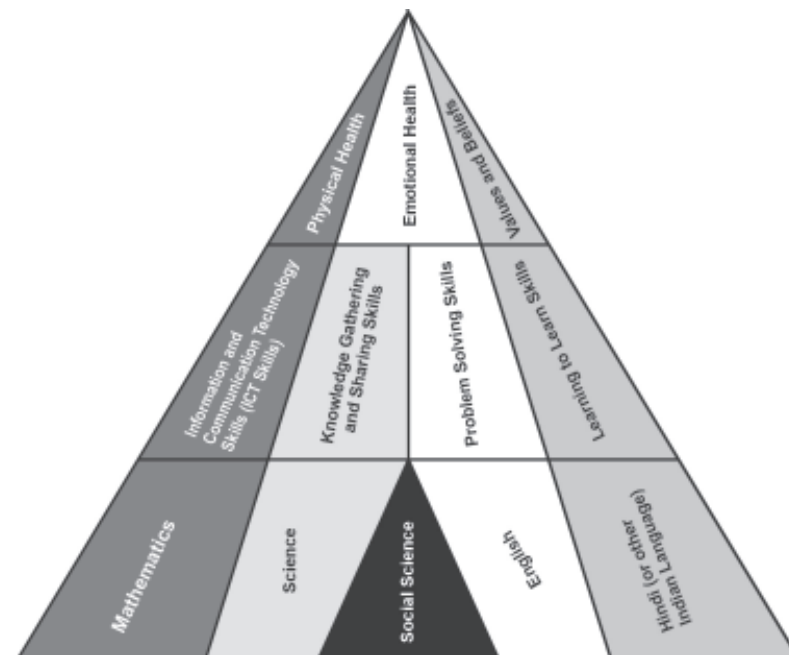
having developed the other skills and competencies, whose development often suffers because of not having a set of standards and measuring instruments. Thus use of the numbers 1 to 9 in the reports will reflect mastery level achievement against standards expected for classes 1 to 9 and 0 will reflect the need to achievement class 1 standards. Since the standards cannot precisely declare in advance the ability levels of all children studying in a given class, in practice learners achievement may be at a lower or higher stage in a given domain. The assessment process is therefore quite challenging.

In the above framework, each student's stage of development at any given time (not only once a year) would be represented by a 12 digit number, with values for each digit ranging from 0 to 9. It would be given as a bar-code on a student reporting system, so that future access to learning resources would be on that basis. Also diagrammatically, it would be represented as a developmental pyramid as shown below, or as a do-decagonal representation like on a radar screen, representing what may be called a learning wavefront. The more symmetric the shape of the wavefront, the more well-balanced is the development. A skewness would be indicative of severe interventions required in some areas. In each of the 12 segments indicated in the developmental pyramid, there would be a number ranging from 0 to 9 reflecting the level of attainment. There would also be a colour coding scheme to make this more visually communicative. This would be supplemented with identification of the best attainment, the least attainment, those where it is at par with expected levels and where it is ahead or behind the expected levels. To summarise these, the standard deviation for these 12 parameters against the desired level would be also calculated. Another detailed report would actually indicate the strand-wise achievement indicators.

For each strand, at each level outcomes achieved are measured on a 5 point scale as:

- very little evidence of attainment (Colour Code: Medium Grey)
- beginners level of attainment (Colour Code: Light Grey)
- developing moderate level of attainment (Colour Code: Black)
- established desired levels (Colour Code: Dark Grey)
- beyond the targeted level (Colour Code: White)

These assessments of learning achievement would initially be done by specially trained assessors using a data bank of questions at their disposal. Concurrently, a computerized system of adaptive testing would



also be developed to allow scalability and reduction of times required for administering and processing the diagnostics. Eventually this will lead to the application of fuzzy mathematics and development of embedded systems that will make handling of these testing operations to be done by special purpose machines, like those used by doctors for ultra-sound, NMR or CAT scan.

The immediate and early adopters are a set of pioneering schools in and around Delhi, who are continuously seeking improvement and are not stung by an arrogance of past success and are distributed over the NCR landscape. In due course, we expect more schools to participate, as well as enlightened parents to seek the system directly, even if the schools in which their children study do not adopt it.

To know more about the mastery learning movement and to participate at the next stages of this project, please contact the author, through e-mail at professor@mmpant.org. The thoughts and ideas, including the designs given here, are all protected under the copyright and allied laws of India and through the various covenants and conventions, administered by WIPO, in the rest of the world as well and all legal rights in them vest in the author.

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Educational Podcasting :

Learning from the fourth screen

The term 'Podcast' has now become quite popular. Created as a coined word from iPod and broadcasting and propelled by the hugely successful iPod in its various incarnations, it has taken the youth by storm all over the world.

However, the term Podcasting is used in a more generic sense to connote sending audio and sometimes pictures as well as video to hand-held devices, much like the term Xeroxing is used as an all encompassing term to mean photocopying, whether done on an HP machine or a Canon or a Ricoh. Almost all other companies in this space are creating competing products, with Sony's walkman and cellphone companies creating smart-phone devices which would do the basic Podcast receiving Function in addition to the usual talk Function. It is expected that by the year 2010 the number of persons using such devices will be in hundreds of millions and would basically become a global youth icon. The small screen hand-held is now recognized as the Fourth screen.

The first screen was obviously the Cinema screen, on which we watched our movies in earlier years and occasionally still do so. The second is the television screen, now available in a large range of sizes from small to the very large plasma and LCD screens. The third screen is rather recent in the form of Computer monitors and now the ubiquitous laptop. And finally the Fourth screen is that of the cellphones, pocket PC's, PDA's, iPods' etc. As we can see all these co-exist. While the major discussion around Podcasting and its earlier textual manifestation of blogging, is in terms of the effect it would have on the mainstream media and the concerns over piracy of musical materials, an important beneficial side-effect is the potential of using Podcasting as a tool for education and creating a completely new form of engagement between the learner and the teacher. It would become the most important agent in the goal of universalisation of access to education and also for reaching out to the visually challenged.

The word Podcasting is linked to Adam Curry, who is seen as the founder of this mode of communication and over the last couple of years, Podcasting has grown at a phenomenal pace. One of the nicest

places to get a flavour of the Podcast experience is to visit <http://Podcasts.yahoo.com> and follow the links to know all about Podcasting and to listen to a few Podcasts as well.

Not surprisingly, Apple has spent considerable effort and resources to bring educational Podcasting to the youth, more specifically the users of iPods. But this has led to the emergence of significant research literature on how to effectively use Podcasts for educational purposes.

That India is a keen believer in the use of such emerging technologies and endorses the philosophy that they can lead to solving some of the great educational challenges before us is seen clearly by the huge amount of money it spent on launching a satellite dedicated exclusively for educational purposes, even without a fully developed understanding in operational and quantitative terms of its utility. For the first six months or so the effective utilization would have in fact been a very meager percentage of its potential. It is therefore a great opportunity that the launch of the video iPods on 12th October 2005, provides for deploying a great technology for empowering the individual teacher to be able to send his audio or audio-video to any student in any part of the world and for any learner to receive it on a hand held, which he may own or share. The EDUSAT is still in the captive hands of a few Governmental agencies, while Podcasting is like the charkha of the 'knowledge economy'. The Mahatma would have surely loved it and encouraged every educated person to make a Podcast a day. Maybe he would have formulated "A Podcast a day keeps ignorance away".

To know what the rest of the world has achieved in educational Podcasting, all that you have to do is to type in "Educational Podcasting" in the Google search engine and you will instantly see a whole lot of links to such efforts. You can choose the ones that look interesting to you and explore further. I do not wish to overwhelm the reader with loads of information of what has been done elsewhere in the world. Rather I will draw attention to what is happening and can be done in India.

Many reputed schools are now thinking of getting their students to acquire an iPod or similar device. This is in sharp contrast to the scene earlier in the year, when school and college managements were busy confiscating cell-phones if brought on campus. There is also a movement at mobilizing teachers to start contributing their own Podcasts. For this, the interested teachers would be trained into script writing for the purpose and their audiorecording or video-recording would be carried either in a properly designed "Podcast studio" being set up for this purpose

comprising 100% digital state of the art audio and videorecording equipment, editing software, software to convert these files to appropriate formats and to upload them on adequately powered servers with the requisite software so that they can be Podcast, using RSS, the rapid syndication systems to the rest of the world by specially trained Podcasting professionals.

The teachers themselves would be the subject matter and teaching pedagogy experts that they already are. However, they will be oriented towards core concepts of 'podagogy', to build upon the pedagogy or andragogy, that they may already be aware of. One of the core principles of 'podagogy' is to impart all learning in small chunks, rather than through long monolithic lectures. Thus while all classroom lectures are of an average duration of one hour and not infrequently of 90 minutes and so are the EDUSAT transmissions, by contrast 'Podcasts' are of shorter and small time duration.

Typically of one minute duration they could be of three to five minutes duration sometimes, with the upper limit being about 8 minutes. Only in the rarest of rare cases should they reach 10 minutes. This is based on the research on the span of attention when engaging with such media.

This is also quite aligned to the framework of re-usable learning objects(RLO's) and Learning Objects Repositories (LOR's) that are now being built by global co-operation. Podcasts may become the latest variations of learning objects, adding on to earlier practices of Java applets and webquests. The advent of Podcasts at this time seems so opportune.

The NCERT has just now released its syllabus under the new National Curriculum Framework with the philosophy of reducing the burden on students and making the teaching of Mathematics, Science, Social Science and languages more interesting and activity based. Use of these emerging technologies like blogging and Podcasting could create tremendous benefits in terms of both the learning experience and the learning outcomes. In tune with the NCERT's launch schedule, we propose to make the Podcasts to support the learners available according to the following schedule:

- From April 2006 for Classes I, III, VI, IX and XI
- From April 2007 for Classes II, IV, VII, X and XII
- From April 2008 for Classes V and VIII

To prepare the stage for the above, we are proposing to launch some general interest Podcasts under the following themes by the end of this year. The first five themes (listed in alphabetical order) would be:

IELTS Preparation Tips

- Improving Scholastic achievement
- International Education Systems
- Prospering Through Knowledge
- Right to Information shortly to follow (again in alphabetical order) would be the next five:
- After 10 + 2 what?
- CAT preparation guidance
- Introduction to French
- Learning to e-learn
- Professional Teacher Development

The above thoughts have been mentioned to convey the fact that the method of 'Podcasting' has real practical applications. Coupled with the use of blogging it provides a means of empowerment of the teacher as never before. Allowing a teacher to go beyond the traditional publishers and broadcasters, it now virtually allows any teacher who has anything worthwhile to tell her students to be able to do so with very little barriers of costs or technologies. Yes, a bit of motivation and commitment are required. I am sure upon reading this article, readers will come up with their own ideas for useful Podcasts.

At this point it is useful to remind ourselves, that the use of audio in education, actually predates the emergence of the world-wide web by several decades. Audi-cassettes and audi-books have been used successfully before. But the high one-time production costs and the huge margins extorted by distributors meant that relatively few could be produced. That has been reduced now, practically to zero, if you can learn all the skills or just seek out someone who will help you in doing it. We are of course always willing to help. So, if you have an idea that you want to use Podcasting for, you do not have to wait any further.



Learning to e-learn :

Flourishing and thriving in a flattening world

In a recent very well received book entitled 'The world is flat', three times Pulitzer award winner Thomas Friedman has identified the recent globalization process, version 3.0 as he calls it and compared this with the earlier manifestations of globalization namely 2.0 and 1.0. And he has identified ten factors which have led to this globalization process. The result is that while in Globalisation 1.0 countries were globalizing (colonizing) and in version 2.0 it was Companies that were Globalising, in version 3.0 of the Globalisation process it is the individuals who are being empowered to collaborate and compete globally. While Globalisation 1.0 and 2.0 were driven primarily by European and American individuals and businesses, Globalisation 3.0 will be driven by individuals from a more diverse non-Western non-white group, comprising in fact every colour of the human rainbow.

The all important question is that while the book is very complimentary to India and is like a wake up call to USA and other parts of the developed world, it is an even greater wake up call to ourselves. To warn USA it points out to the quiet crisis and "dirty little secrets" of the American education system. These are inadequate numbers, lack of ambition and lack of student interest in studying Science and Maths, which are in fact the universal language of technology.

While Thomas Friedman may imagine a design and probably foresight and planning in the recent success in IT in India, it is in fact an unplanned phenomenon, completely contrary to what the planners had really thought. The policy makers for industrial development had never factored IT developments in their strategy. IIT Kharagpur was not created to produce world class talent, but to produce engineers which would be able to respond to the needs of the locomotive factory nearby at Durgapur. We have stumbled upon this success by a number of factors which are not really germane to the proposition being built here.

Even today the serious deployment of e-learning to provide access to learning and to improve the quality of education being delivered is not acceptable to the State sponsored education system.

However we need not wait for another set of accidental good fortune to make our mark, but start acting and preparing ourselves to flourish

and thrive in a flattening world. While Government may continue to drag its feet, as individuals interested in the future of our children, we should start addressing ourselves to the question of how our children would flourish and thrive in a flat world.

Thomas Friedman describes four categories of people who would be able to do so. The first of these are very special people. He gives examples of people like Michael Jordan, Bill Gates, Barbara Streisand. We could have our own Amitabh Bacchhan, Sharukh Khan, M.F. Hussain, or what have you. The next category is those who are specialists and here we have all the high specialty doctors, technicians, lawyers, management and business consultants, forensic experts. Next come the anchored people. And finally the rapid adapters. And these are a set of attributes, skills and values that we can instill. The markets want early adopters, but to flourish you have to be an adaptor. Maybe the chameleon. And isn't this what Darwin's theory of evolution is all about when stripped down to its essentials.

Thomas Friedman projects that with the rapid advances and convergences in technologies, those with specialized education and the ability to learn how to learn would command high compensation and will be in demand. The ability of learning how to learn enables you to climb up the knowledge ladder faster. High quality 'ideation' would be valued and the concepts provided would be detailed and developed by followers.

So how do we become adaptable in the Knowledge Economy? Descartes had said several centuries ago 'Cogito ergo sum' and the goal of human existence is to evolve into a 'homo faber' or thinking animal moving upward in the evolutionary stages from homo erectus to homo sapien and now to homo faber.

John Flavell had coined, almost a quarter of a century ago, the term 'metacognition' to refer to thinking about thinking and we can now see that in the emerging Knowledge Economy the metadata may often become more important than the data itself. So in essence we have to create a facility for thinking about thinking or learning to learn.

While it may appear that the ability to learn is an instinctive ability and cannot be systematically inculcated, in reality just as we can and do teach mathematics and music, sometime even making it compulsory, it is important that we train our students in the ability of learning to learn.

Prior to the availability of pervasive and ubiquitous computing, many of the above thoughts were in the realm of philosophy or educational

psychology, but could not be translated into actual learning strategies that could be adopted in a meaningful scale. But now the same convergences in the information communication and wireless technologies that are forcing the need for rapid adaptors also provides the means through the deployment of e-learning to achieve the desired goals.

The possibility of easily deploying e-learning allows us the means of implementing Cognitive Strategy Instruction (CSI) which is an instructional approach that emphasizes the development of thinking skills and processes as a means to enhance learning. The objective of CSI is to enable all students to become more strategic, self-reliant, flexible and productive in their learning. CSI is based on the assumption that there are identifiable cognitive strategies, previously believed to be utilized by only the best and the brightest students, which can be taught to most if not all students.

My personal take on this is that all students should during their University years undertake a good course on learning to e-learn. We have all been hearing about the importance of life-long learning and learning to learn. And it is now a significant time since Delor's report identified the four pillars of learning ; learning to know, learning to do, learning to be and learning to live together. But since then there has been no real implementation of the philosophy enunciated above.

One of the important developments that have happened in the direction of opening access to information for a world-wide audience is the MIT open courseware initiative and the other is the FOSS, the free and open source systems movement. In the same spirit is the wikipedia and the wikiversity. The promoters of the wikis have as their mission 'a world in which every single person is given free access to the sum of all human knowledge'

I have therefore designed a short course whose outline I am describing below. This would comprise of 15 didactic sessions of about 1 hour each on the following themes,Each of these 'lectures' would have associated with them self-learning,peer learning and further teacher-learner interactivity for another hour or so. Thus both in the face to face system as well as the distance learning system, the measure of this course would be one credit. It could also be delivered as pure online or in a multi-modal blended format combining as per student choice different modes.

Session No.	Descriptor of Theme
1	e-learning as a response to a flattening world
2	Attributes,skill sets &infra-structure for a successful e-learner
3	A snap-shot of e-learning needs across the life-span
4	The constructivist approach to e-learning
5	Flourishing and thriving in the Knowledge economy
6	Interactivity mechanisms in e-learning
7	Quality concerns in e-learning:e-learning standards
8	e-learning Communities
9	e-learning goes Open source
10	Learning Objects and their repositories
11	Free e-learning resources :The MIT and other initiatives
12	Priced e-learning opportunities
13	The steroids: PDA's,wikis,podcasting,blogging
14	Cognitive Instructional strategies applied to e-learning
15	How to learn what you want to learn?

The course would be extremely useful for all University level students,whether they are studying at State sponsored formal Universities, State sponsored Open Universities or professional Institutes.

To flourish and thrive in the emerging Knowledge economy, the students would have to get out of what is being done in the classroom and learn more,achieve more,create evidence of their skills and achievements, beyond the marks in the examinations. A whole lot of these would have to be acquired outside the class-room through self-study and maybe special programs that are pursued concurrently with the University studies.

A few years ago, the Chairman of Cisco, John Chambers had stated that e-learning will be so huge that the size of e-mail would start looking like a rounding off error. His predictions got lost in the aftermath of the dot-com bust and was perhaps seen as the wishful thinking of a beneficiary, but when the dust is settled and we get back to our respective businesses, the truth will come back to us.

While to some extent the desire and ability to learn is inborn and instinctive and in terms of Kohler's experiments with apes, given a set of resources, learners would eventually find a way of putting them in a right sequence and pattern to solve a new problem, some training and practice in enhancing critical thinking and higher order information processing skills would make for better harnessing of and dealing with e-learning resources.

It is well known for ages that 'he who knows not and knows that he knows not, he is ignorant, teach him'. He who knows not and knows not that he knows not, he is arrogant, shun him. But 'he who knows and knows that he knows, he is wise, follow him'.

In the early years of the war, the concept of the Intelligence Quotient was developed largely to support large scale recruitments for the army. More recently the Emotional Quotient has been begun to be appreciated and sometimes we also talk of the spiritual quotient. We are accordingly developing the concept and measure of an eLQ or the e-learnability Quotient, which if we were to draw the right inferences from Friedman would be a very important indicator of the potential for success in the flattened world of the Knowledge Economy.

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Personalized and Adaptive Learning (PAL): The new hope for Indian Education

There are often paradigm shifts that occur in the course of evolution that completely alter the way certain activities were being done. These are sometimes in response to sudden challenges or to the occurrence of disruptive events in the form of large impact natural events.

But we are witnessing some shifts currently that are occurring because of the rapid convergences between technologies and their disruptive effects on the present way of doing things. This is also promoting the shift towards an emerging Knowledge Economy, where the most important resource is the human resource and especially its innovation and creative ability to create cognitive capital.

Our traditional model of educational excellence requires the establishment of an educational campus, maybe as a school or a college or a University, wherein highly accomplished faculty and highly capable students are provided an array of learning facilities and an encouraging learning environment.

The model has stood the test of time and several Institutions across the world have established themselves as highly respected schools, colleges or Universities. They are however for the chosen few and an additional problem is that there are no measurable performance parameters to see how they measure up in comparison amongst themselves or against themselves in different years. In the absence of 'learning metrics' which can measure the different components of a good teaching-learning experience, a well planned and measurement oriented approach towards achieving well defined goals, attaining the benchmarks of prevailing best practices or progressing towards the next practices as exhorted by C.K. Prahlad becomes a difficult task.

Let us begin with the current state of educational measurements. Most systems in India look at the performance of students at the 10th and 10+2 level Board conducted public examinations, as a summary of a student's 12 years of education. This is often indicated in terms of marks or grades or percentiles, all of which are normative measures and do not

provide any comparison between different examination Boards (and we have a large number of them), or between different years of even the same examination Board. Hence the need and existence of numerous additional screening examinations for entrance to higher education which themselves are not standardized or subjected to a rigorous analysis for their effectiveness.

There are some parameters prescribed by the regulating agencies such as the School Boards and the UGC/AICTE but they are all at the level of Infrastructure and some other aspects of input. But there is no articulation of learning outcomes as criterion referenced evaluation or of the processes themselves and especially on the customization of the teacher-learner interaction. Also the system encourages a very exclusive system of education, with very few seats; numerous restrictions and almost 100 times more people denied the opportunity.

So what are the current challenges before us? In one sentence it is to deliver high quality education, to a large number of students in a manner that all of them can acquire the knowledge and skills agreed as the desired learning outcomes. And the distribution of their achievement indicators (grades) is no longer the standard Bell shaped curve of a normal distribution, but a flatter distribution with almost all learners getting the full score.

Two recent Constitutional amendments that have made this a requirement are the ones relating to the Sarva Shiksha at the School level and the reservation for the OBC. A lot of people have expressed opposition to the reservation move based on the misconception that good education can only be provided to a 'few' and not to 'all', implying the so-called lack of 'merit' makes them unfit for education. This is not quite true and is a result of lack of awareness of the power of newer models of education on which educationists worldwide have been working upon for a long time and modern technological solutions implementing such models.

Researchers such as Skinner, Lev, Dewey, Piaget, Brunner, Spiro, Merrill, Bloom, Marzano, Gardner and Keller have developed many theories and models for pedagogy.

Similarly psychologists have been studying different personality types and developing on the initial work of Carl C Jung, the most famous being the MBTI classifying personalities on Extraversion-Intraversion, Sensing-Intuition, Thinking-Feeling, Judging-Perceiving, developed by Isabela Briggs Myers and her mother Katherine Cook Briggs.

While we do realize that every learner is unique, but in our delivery of education, we force just one model for all and therefore the result is that only a few are able to successfully complete their learning goals. Rather than declaring the student a failure, we must acknowledge the inability of the teaching process to match the learning style of the learner.

Pedagogists categorise themselves as behaviourist, cognitive and constructivist, though there are more than maybe 300 different pedagogical strategies that have been proposed in the literature.

A traditional class-room situation does not allow for the implementation of multiple learning styles, although the same teacher may adopt a variety of different teaching-learning strategies during a session. However it is the same sequence of presentation that would be available to all the students.

But using modern computer based technologies it is possible to allow for multiple learning styles to create a higher degree of personalization and implement adaptive learning to enable every learner to reach the desired goal and maybe eventually reach a 6 sigma level of performance.

Dr. Nishikant Sonwalkar, as Principal Educational Architect at the Massachusetts Institute of Technology, has synthesized some of the most influential theories into a multi-dimensional framework that allows a systematic approach towards excellence in the design and development of effective online education that is adaptive and uses the learning preference diagnostic tests to present educational content to match the individual learning styles.

The five fundamental learning styles proposed by Dr Sonwalkar are:

Apprenticeship:

A "building block" approach for presenting concepts in a step-by-step procedural learning style.

Incidental:

Based on "events" that trigger the learning experience, learners begin with an event that introduces a concept and provokes questions.

Inductive:

Deductive:

Based on stimulating the learner to enable the discernment of trends through the presentation of data, simulation, graphs, charts or other data.

Discovery:

An inquiry method of learning in which students learn by doing, testing the boundaries of their own knowledge.

Adaptive Learning Systems may be defined as intelligent systems that are self-organized based on the observation of the learning preference of an individual resulting in their best learning performance.

The system needs to have a well defined pedagogical framework, a well defined quantification of learning performance and learning preference inference model and a dynamic content sequencing engine to present the learning resources.

Developing on these, a product has been developed, named iDesigner that will allow academics to transform their course content into an adaptive learning mode and this has been successfully demonstrated for a range of courses from mathematics at school level, a digital literacy course and English as a second language course, a management course and several other programs.

This general approach can be applied in a number of contexts.

First let us see the possibilities of using them for technical education such as in the IIT's and other technical Institutions. After the reservation decision has been implemented, the student demographic at these Institutions will not be a narrow homogeneous group but a largely dispersed one with varying scores in the JEE, reflecting the variety of learning styles embedded in the range of JEE scores. The above model of adaptive learning which has already been tried out at MIT and some other Institutions provides an appropriate answer to both expanding the intake, teach a heterogeneous group and get better outcomes. The Institutes are already well equipped and deploy learning resources that can be readily converted to the new format.

There is no difficulty in doing the same for the general degree programs. In fact Dr. Sonwalkar conducted recently a 5 day workshop for a group of about 25 University faculty at the Consortium for Educational Communication at New Delhi in the methodology. If we scale this up quickly o involve a few thousand teachers from a few

hundred Universities the desired Constitutional objectives can be achieved.

Similarly if the the NCERT and the National Institute of Open Schooling too adopt this methodology then in a decade or so, there may be no need for reservations of any kind.

Lack of funds is not the real impediment to adopting this approach. But a positive outlook and a desire to be able to deploy a new strategy to solve the new challenges is required.

It is a pity that the Knowledge Commission which could have given a lead in creating a socially inclusive system providing a high quality education to all, instead of exploring methods to achieve the goal is still trying to maintain an elitist exclusive club for those who have access to this limited good quality education.

How will the adaptive learning model work in the future? In the not too distant future it would seem very difficult to have intermediaries who would be able to re-package existing knowledge (as is currently done in text-books) or increasingly as new media products for easy assimilation by the students. As John Ziman had said " A treatise expounds, but a textbook explains".

But if we go by the scenario analysis by Nick Bontis, a Knowledge Management Guru ' By the 1930's, the world's cumulative information base was doubling every 30 years. By the 1970's, this rate shrank to 7 years. By the year 2010, the information base of the world, will double every 11 hours'. It would clearly not be possible to have enough text-book writers and text-books for them to be current and useful.

The learners of tomorrow will have to be better information gatherers and users and the role of teachers would be more of mentors and annotators of learning resources so that learners can transact them with the learning strategies that are suitable for them. The learning community of tomorrow using participative media and technologies such as handheld devices, communicating through podcasts and blogs seeking knowledge directly from the Internet through wikipedias, creating there own folksonomies would be very different from the schools and University Communities of yesterday.

Just imagine what it could do for the long tail which had been kept deprived for so long.



Convergences Between OPEN AND FORMAL LEARNING

(Key note address delivered in International Seminar at Jaipur)

Her Excellency the Governor of the State of Rajasthan and Chancellor, VMOU, Smt. Pratibha Patil; the Honble Minister for Education, Law and Justice Shri Ghanshyam Tiwari; Hon'ble Minister for State of Education, Shri Vasudev Devnani; Dr. Vyas, the Vice-Chancellor; Prof. Ghadoliya, the Organizing Secretary and all the distinguished Vice-Chancellors, academicians and thought leaders who are present here today.

I am indeed very pleased to have this opportunity to address a gathering where both the people who cerebrate on things that we should do and those who take executive decisions on how these things should happen have gathered together in the same forum. And therefore the pursuit of quality in distance education is likely to bear fruit because together we should be able to move in the direction we choose for ourselves.

What I want to do is to touch upon almost all the themes that have been identified for this event because the speakers who are experts in each of these areas will share detailed experiences on some of the important things that are happening which will drive the efforts towards what distance education should be doing.

I would like to talk about especially with respect to the learning society and the knowledge economy. A question which has been asked several times during the last few years and on which I too have been interacting with a number of organizations is that while distance learning is happening, is expanding, more people which are going into it: is the quality of distance education satisfactory? And when one starts addressing this question one normally tries to start bench marking with respect to the past. So you start comparing technical institutions with University of Roorkee, you start comparing other institutions with universities of whatsoever standing you choose.

But I think time has now come to realize that education itself is undergoing a Fundamental change. That even if we could, we should not be looking at re-constructing the universities of the past but be creating universities of the Future. When we start looking at creating universities

of the Future, then we Find that distance learning becomes the core engine behind that and this has happened because of the vast strides which technology has made in the recent past. Prof. Vyas talked about the convergences.

I think I will dwell For sometime on these convergences to draw attention to the Fact that rather than looking at two disparate kinds of educational systems: one of Formal face-to-face and another remote distance learning system, we are now almost ready to have something which is a convergence between the two systems and this convergence is happening because unlike twenty five to thirty years ago when many of these institutions were created, technology is something which is now available in the form which is very different from what anybody could have imagined.

Computers as we all know in the last three decades have become faster, they have become smaller, they consume less and less power and they are accessible in all kinds of geographical areas. So we have seen an expansion of the usage of computers. Computers began with mathematicians and computer scientists started realizing that the world of numbers did not go from zero to ten and one to hundred and million but could be just represented as zeros and ones and this binary representation allowed them to do a lot of arithmetic from where the name computer actually came. And it is because of this name that many of us are afraid to think of the computer. As computers progressively became faster and had more & more memory it was realized that they could be used not only to handle numbers but to handle text as well. And then they realized that if we could handle text by putting it as zeros and ones (building on the Morse code experience in telegraphy), one can also convert audio speeches so that you can have digital audio. And more recently we started having digital picture and digital video so much so that almost everything now can be expressed in a digital form. And while this could be done it would therefore immediately mean that huge convergence was possible because earlier we had books which had a separate role from magazines, news-papers, radio-broadcast, television telecast. All these media needed different devices, different methods, different platforms but today in an all electronic digital form you can have your text, your graphics, audio, video or whatever you want. So clearly from the point of view of learning which is basically an engagement between a teacher who knows a subject and a learner who wants to know that subject, this kind of a convergence has a tremendous opportunity.

What happened later was something even more fundamental and not planned for. Initially while computer was being used for various applications you had to be in its neighborhood to have access to a powerful computer to use it. So a computer located in New York was available to the people who were in New York, the computers in Silicon Valley were available to the people who were in Silicon Valley.

But then suddenly another revolution happened and this was the Communication Revolution. Typically the costs of communication were very high over long distances. So for example, if somebody in Perth in Australia wants to speak to somebody else in San Francisco in US, for the duration of this conversation you would have to have a dedicated circuit available for these two people to talk. And therefore, long distance international calls were very expensive. Even STD calls within India were expensive. Now a days you are hearing of all India calling at rupee one per call. Why this has now become possible is because of the same march of digitalization which moved from numbers to texts, to audio to video, moved to the idea of communication as well. So modern communication does not go like a dedicated circuit but splits into a number of small digital packets which go all over the place and re-assemble to the destination. And therefore, like the post office charges, the same price of envelope or the letter card that you send to anywhere in the country, you can have the same cost for communication anywhere in the world.

And we call this as the death of distance, not the death of distance education but rather the emergence of distance education and you also say that Geography is History. What I am trying to say by these two statements is that because of this convergence of computer and communication you now have the possibility of putting the best teacher who is appropriate for a context with the learner who is eager to learn and put them together at an affordable cost. This cost will be less and therefore the entire paradigm of creating large number of institutions in remote geographical locations disappears to a model which is somewhat like the electricity distribution model. The electricity that you get at your home, at office or factory does not necessarily come from the nearest power station which you have. Various power stations generating electricity put it on a grid and the grid distributes electricity and you get the electricity from wherever you want.

In some sense all educationists will be able to put together their learning; they will chunk it in a certain way to make it available so that wherever somebody needs you get it. And this is what has actually

happened. Today a person in the most interior part of India if he could get some internet connection is able to get the course from MIT a course from Stanford, or a course from any other place including our own Institutions. That is the globalization that we are talking about. Now very often if we don't take this perspective, we are afraid of globalization.

It is clear that more and more of this is going to happen and so we have to be aware of this and prepare for the change. If anything is allowed to come it will but the opportunities it throws up are enormous. And this I want to elaborate a little further. We all agree and we all repeat the statement that "We are moving towards the knowledge economy". But how are we preparing for it? The knowledge economy is not a linear extension of the current economy but a sudden fundamental change.

Let me briefly run through in a very short span the stages that we have gone through. At some point of time all humans were cave man, they lived in caves. Many of us continue to lead a similar life in the urban environment where we live in very small flats, we got out to the town and then we try to save ourselves from dying in a bus accident or terrorist bomb or something. We come back home and watch television, similar to the caveman watching painting on the walls of his cave. And then of course, you move on. Then we were hunters and gatherers and then we settled on river banks so we had an agricultural society, the Indo-Gangetic Plain, the Nile, the Amazon and other big rivers.

And then was the industrial revolution. Now because our immediate past is so closely linked to agricultural and industrial revolutions, most of the educational systems relate to that. And even today, for example, U.S. academic calendar follows a schedule where student can go back to the farm during a harvest time. If you were in the hunter or gatherer society you had to be very strong, you would be a good hunter or gatherer you would chop wood, collect wood, take it and transport it etc because that was what was valued.

Entering the agricultural society, the skills required were completely different. You had to grow crops and you had to understand as to what kind of crops would grow on your soil, on your climates etc. etc. And when you enter the industrial society, your entire knowledge of growing of crops is not useful. What is important is as to how you handle the factory or make industrial products.

So what happens in the knowledge economy? In the knowledge economy, we would be required to deal with knowledge products. And the only organizations which deal with knowledge and knowledge

products are higher education institutions. And therefore, universities will once again become a centre stage in the knowledge economy because in the earlier economy the large part of the frontiers of new and emerging knowledge was not very useful in the economy.

I will give you few examples about what was meant by knowledge products. All of you heard of this company called "Google". "Google" is a very rich company. Lots of money with it and all it has are algorithms for selecting a piece of data from huge amount of data. That's all. It has no oil, it has no minerals. In a recent World Bank Report which I read and very surprisingly it says "the disadvantage or perils of having natural resources". The report says that people who are rich in natural resources don't have to work very hard because resources are exploited. But the people who don't have natural resources are the people who have to exercise their intellectual talents to be able to create new things, new ideas. And therefore, it has looked at so many countries which are rich in mineral resources but not doing so well. So people may have mineral, the people may have oil but it is the company like BSP Billiton which make the money out of it.

Now the point I would like to make is that we need to start appreciating what is different about the knowledge economy. Because if we do use technology but for teaching something which was relevant to the hunters and gatherers and cave man or the industrial society, we would not make progress and we would be disappointed.

Another example of knowledge product is something for the diabetics. Some of you may be having diabetes. Many of you may be having some relative with diabetes or you know somebody who has diabetes. Diabetes is a phenomenon where the insulin is not secreted adequately and therefore there are problems. Researchers have found an isomer called sucralose and this is patented as Splenda which can be used by Diabetic patients. Isomerism etc. which would be an academic theme in Chemistry and may not be otherwise valued, has created a knowledge product that has very important business implications?

There is another product which has been recently approved by FDA in USA called "Respirate". What is respirate? Resperate is a high-tech model of Swami Ramdev. So Swami Ramdev teaches you how to do yoga and reduce your blood-pressure by doing yoga appropriately. Still the success rate may or may not be high. What respirate does is to put a too to measure your breathing rate, analyzes it and decides as to what should be your right breathing rate and give you musical cues according to which

you breath between 10 breaths per minute to 15 breaths per minute and then of course you can reduce your blood-pressure without any drugs.

So what I am trying to say is that as this technology is advancing, as the capacity of computer to handle the larger and larger processing increases completely new kinds of products can be developed and these are called knowledge products.

Now why I am saying all this that if you looked at quick snap shots of India's education history, at some point of time we had Nalanda and these were things for which the world came to us. We lost the ground because of the British system of education which was enforced on us but they were good modes of British educational system. But the kind of things we pride are let's say that IIT and to some extent open universities education and distance learning which are two major initiatives of recent time if you look at it. And I am talking about this because I have been directly involved with that. I have a Ph.D. from one IIT (Roorkee), have been a faculty member of another IIT (Kanpur), Board Member of a third IIT (Delhi) and of course have been with the open universities for a long time. When IITs were created, there was already engineering education happening in India. There was Guindy College of Engineering, there was BHU and many other Colleges but the IIT brought in a fundamental change. They did not make the same kind of engineers which the other Colleges were making And they did it with international collaboration. So there was an IIT at Kanpur with US collaboration, there was an IIT in Chennai with German collaboration, there was an IIT in Delhi with UK collaboration and who benefited. There is very famous book these day by Thomas Friedman called "World is Flat" which is full about facts of India and how the Indians have done so well in recent time and there he says that one of the good things that India did was to create IITs in 1960s. What the IIT ended up doing was to create a talent pipe which filled in New Delhi and empty with Palo Alto in the Silicon Valley and America was the greatest beneficiary.

I will venture to say that those countries who missed out on creating IIT in India actually lost tremendous opportunity for their own economic growth. But today if you try to create another IIT, it will be a mistake. The IIT is very hugely successful because people who were behind it knew what was coming. And what was coming was moving away from engineers, as narrow technicians to a breed of broad based problem solvers. In fact it is interesting to note that Peter Drucker one of the famous management thought leaders, used in 1959, the term "knowledge workers" for the first time. The IIT was created in 1961-62 onwards and that is why

because of the alignment of the vision of the IIT to the alignment of the thought leaders, what was happening was right. We had what I like to call the “**first generation knowledge workers**” of India.

At some level even Lawyers, Doctors, Journalists are all knowledge workers. And my suggestion for this forum actually is that we should now work on creating the “**next generation knowledge workers**”. And if you are looking at creating this new generation of knowledge workers, it is not IIT we need, but it is the Open University that we need because next generation knowledge workers are not specialist in technology. They are people from all varieties of discipline who have learned to become familiar with the technology, who can pursue in the global process while becoming familiar with English, who have developed skills for problem solving, for creativity, innovation. As I gave you the example the successful knowledge workers will come from Chemistry, from Physics, from Psychology from Social Sciences, all kinds of disciplines. So that narrow focus we have had in the last few decade that the science was something which was valued and others were not. Now actually the pendulum is likely to swing in the other way. We have had a model of very exclusive education. As a model of education, good education, quality education has been selecting very small number of people. So out of hundreds of thousands select a few hundreds. Select very good faculty, put them in a campus, give them resources, they will do well. While this model may be apparently working well we shall have to find a proper mode to solve the emerging challenges. Exclusive education is available to 1% to 0.1% of the population. What happens to the 99% to 99.9%. For them we need an inclusive education model. We need completely different model which only the open learning system can run where we say no matter where you are as a learner if you want to learn we will give a pathway to learning. The expression I have coined for this is what I call the GPS model of education. We all know about that Geographical Positioning System. Because GPS is something which you carry with you, three satellites observe you and tell you where you are. And then of course the system will give you direction as where to move. That is what the education system has to be : such that all these people who are otherwise condemned by the so called formal system, now we will provide a migration path and each of these paths could be an individual separate path. It is only the open university system which actually said that you could configure a completely unique different path for each learner. We make them into groups but in principle it allows you to do so. Earlier on

when we implemented distance learning without enough technology the operational constraints prevented the pursuit of the ideal. So if you said there are a pool of 42 subjects to choose from and you can study any four you want, you could not practically do that because number of combinations will become $(42 \times 41 \times 40 \times 39) / (4 \times 3 \times 2 \times 1)$ and sheer logistic operation would prevent from doing it. But today if you have all these things on computer in terms of certain design then just log on to the internet and select any URL. You can go to the computer system and select whatever you want, whenever you want. Now this is very important because the future successful nations are not going to be nations which succeed only on their inherent natural resources. Leading and successful nations are going to be those which are going to be magnets for talent talent. I want to emphasize that the earlier education model was for identifying talent. So if you merely **identified** talent, you could be happy with 1% of population being talented. It is a find model. But if you want to **develop** talent and you want at least 50% of your people be useful then you need to have a different model of which technology is the core engine.

So why is this important? This is important because the wealth of nations tomorrow is going to be in the knowledge economy directly related to the skill sets of the population.

Earnst and Young had done a study for the Asian region and he found that a typical university graduate in the Asian region, if he does not know functional English and he does not know functional ICT then he can expect to get only a salary of 50 US \$ a month. The same student if he has IT skills and English communication skills, his salary goes to 250 US\$ a month. Now that is the GDP of tomorrow. They are all talking about tax in services etc. But the possibility of people being able to provide higher value services will depend upon whether they are higher skilled sets and add to this new sets about creativity innovation, researching, problem solving and you would have people of higher income.

So the way to economic prosperity now is through educating larger masses of people. It is fine to have a few islands of excellence. They will continue to do great innovative work, but is no longer adequate.

So what I am suggesting? I am suggesting that now the time has come for convergence between a formal system which has created a lot of under-graduates, mostly unemployable and the Open University system to upgrade their skills for employability. Statistics says that not more than 5% to 10% of an average University's graduate are employable. Almost 90% are unemployable. You can use an Open University system

not as alternative to this unemployable graduate generating machine but have a complimentary role ; as an umbrella, as a re-inforcement and affirm that the open university system will now add employable skills to the domain of knowledge that the universities are providing. So we can begin to identify a set of say 12 skills (each of which can be learnt over a month) which are required for future employment and these are generally agreed world-wide. And we know that because of the absence of these skills a majority of graduates are not being employed. So then you can say that open universities should start focusing on the concurrent courses being given to people while they are studying in the university because without domain expertise again you won't be able to move. So domain expertise education is fine. Anybody would go only on short term skill based course will perish. So the university system, formal system, continues to give the domain based specialization; B.Sc. (Honours), B.A.(Honours) whatever, but the open university system through technology gives an umbrella which provides employable skills and these they can be given by Certificate, Diploma and so on and they can be aligned with the international certification. It is very important today. The reason why IIT got accepted was that they were always striving for international standards.

So today also it is important for us if we learn English it should be of international standard. So students who passes out English from a University should be able to get the expected score in IELTS. In Hongkong they have done that. Hongkong as it becomes part of integrating to world and you know China is a recent Signatory to the WTO. the eight universities in Hongkong through their UGC have together legislated that every student who graduate out of these universities must get a decent score in IELTS, the International English Language Testing System which is comparable to what anybody who have got from another institution where he could have studied. Similarly for ICT, similarly for other kinds of skills. So that is the crisis. The important thing which is coming out of globalization is that there is a tremendous opportunity for foreign students wanting to study with us. I have been so many times requested on a personal basis when a university want me to identify the institutions in India where the students can go and spend a term and learn. Their obvious preference is for Institutes like the IIT's for technical education. But many interesting alternatives also crop up from time to time. Some desire that while their students were in India, they wanted to do a good course in Hindi as well. And I realized that we don't do that. In fact, this idea was first put to me by a Japanese Professor when we were talking about

teaching English to the Chinese and Japanese. And then he said that why don't you teach Hindi. Because India is now a centre stage. The book "the World is Flat" has talked about India so much that they want to pursue something to do with India itself. And if they want to come to India they want a quick course in Hindi and again an online version can become very useful. Now imagine a good on line course in functional Hindi about India, India's culture, tradition, experiences. The day the person books his ticket which is three weeks, four weeks or six weeks in advance the person can register for such an on line course.

So when a foreign visitor comes here he is aware of the cultural sensitivity, is aware of the basic greetings, is aware of the basic number system and so on so on. So there is, you know, a huge plethora of opportunities available. There are the technologies which one has to use. And finally what I want to say is it is becoming more and more ubiquitous. They could include instant messaging, sms, blogging, podcasting and wikis, all 21st century technologies.

When I started computing, in 1966 there was only one big computer at Tata Institute of Fundamental Research. And researchers like us got 15 minutes of computer time per month. Today everybody in his pocket is carrying more computing power than all of India had in 1960s. Now as these things become commonplace, we would probably come to a model where instead of being required to switch off your cell-phones in class, we will require all cell-phones to be on, although in silent or vibrating mode because messages about the transactions that is happening will be communicated to you on your cell-phone. Look at most of the youth of today employed in India but otherwise carrying cell-phone, l-pod and all these kind of devices. So these will become the devices of future. They will become like the slate and pencils of future. And broadcasting, belonging these are all methodology which we can integrate. I don't like to talk about that in detail because that is better done in one of the detailed sessions.

But in terms of an overall strategy what I am trying to say is that this is the time for convergence. This is time for open universities to look at concurrent courses which students can do while studying in the face to face formal system. This is time to start looking at employability as an important outcome of the education and this kind of an approach deploying technology can help moving in that direction to prosper. Prosperity for the people who get such an education, prosperity for the country and of course we will be active partners in the globalized world resulting in the Indianisation of the Globe during the Globalisation of India.

From the art of teaching to the Science of Learning

The occasion of Teacher's day, is an opportune time to reflect upon the nature of the teaching activity, the evolution of the teacher's role and its future especially in the light of impact of technology and the migration from an exclusive approach of education to an inclusive universalisation of education as the key to flourishing and thriving in the knowledge economy.

And when one wants to describe the new paradigm in education, which is emerging as a result of the developments in the last few decades, it is I think fairly well expressed as the title of this piece, the shift "from the art of teaching to the science of learning"

Traditionally good teaching was an art learnt at the feet of the masters through long periods of internship and following good examples and practices. A great teacher was like a master artist or sculptor, who from the rock of his vast knowledge chiseled out in real time before his audience a form of the knowledge construct appropriate for his learners. However the problem with this artistic form of teaching was that it was not scalable and we saw in the past decades a sudden expansion in the number of colleges, universities and students in higher education coupled with a substantial decline in the standards, so much so that now we by and large agree that by and large the higher education system is incapable of meeting the challenges of quality with quantity.

The structure of matter, the nature of the cosmos, the nature of the human mind and its relationship to the brain are some of the overwhelming questions that have engaged thought-leaders throughout history.

Until recently, understanding the mind—and the thinking and learning that the mind makes possible—has remained an elusive quest, in part because of a lack of powerful research tools. Today, the world is in the midst of an extraordinary explosion of scientific work on the mind and brain, on the processes of thinking and learning, on the neural processes that occur during thought and learning and on the development of competence.

These have important implications for education. New understanding of the learning process is leading to many different approaches to the design of curriculum, teaching and assessment that differ almost entirely from those found today.

For most of the previous century, the focus of education was on the imparting of literacy skills: simple reading, writing and arithmetic. Even at the University level it was about mere acquisition of information, often from different sources. But it was only at the research level that students were trained to read and think critically, to express themselves clearly and persuasively, to solve complex problems in science and mathematics. Now, at the beginning of the new century, these aspects of higher level cognitive skills are required of almost everyone in order to successfully cope with the complexities of contemporary life. The skill demands for work have changed dramatically, with the result that 'the skills of a lifetime become obsolete in an instant' as has the need for organizations and workers to change in response to competitive workplace pressures. A responsible participation in the democratic process has also become increasingly complicated as the locus of attention has shifted from local and divisive to national and global unifying concerns and no longer limited to casting a vote once in five years to a practical participation through exercising the rights conferred in the recently enacted right to information Act.

Now that we have a large number of interdisciplinary inquiries and new teams of scientific collaborations, the path from basic research to educational practice is somewhat clearer, though not yet easy to pursue. Till recently, educators paid little attention to the work of cognitive scientists and researchers in cognitive science worked in laboratories far removed from classrooms. Today, cognitive researchers are spending more time working with teachers, testing and refining their theories in real classrooms where they can see how different settings and classroom interactions influence applications of their theories.

What is perhaps currently most striking is the variety of research approaches and techniques that have been developed and ways in which evidence from many different branches of science are beginning to converge. For example:

Research in cognitive psychology has increased our understanding of the nature of competent performance and the principles of knowledge organization that underlie people's abilities to solve problems.

Developmental researchers have shown that young learners can understand a great deal which make it possible to create innovative curricula that introduce important concepts for advanced reasoning at early ages.

Research on learning and its transfer has uncovered important principles for structuring learning experiences that enable people to use what they have learned in new contexts.

Work in social psychology, cognitive psychology and anthropology is making clear that all learning takes place in settings that have particular sets of cultural and social norms and expectations and that these learning environments influence learning in powerful ways.

Neuroscience is beginning to provide evidence for many principles of learning that have emerged from laboratory research and it is showing how learning changes the physical structure of the brain and, with it, the functional organization of the brain.

Current and emerging technologies are leading to the development of many new opportunities to guide and enhance learning that were unimaginable earlier.

Above all, information and knowledge are growing at a far more rapid rate than ever before in the history of humankind. Also, the meaning of “knowing” has shifted from being able to remember and repeat information to being able to find and use it. More than ever, the sheer magnitude of human knowledge renders its coverage by education an impossibility; rather, the goal of education is better conceived as helping students develop the intellectual tools and learning strategies needed to acquire the knowledge that allows people to think productively about specific areas of human knowledge, such as history, science and technology, social phenomena, mathematics and the arts. Fundamental understanding about subjects, including how to frame and ask meaningful questions about various subject areas, contributes to individuals' more basic understanding of principles of learning that can assist them in becoming self-sustaining, lifelong learners.

New developments in the science of learning also emphasize the importance of helping people take control of their own learning. Since understanding is viewed as important, people must learn to recognize when they understand and when they need more information. What strategies might they use to assess whether they understand someone else's meaning? What kinds of evidence do they need in order to believe

particular claims? How can they build their own theories of phenomena and test them effectively?

Many important activities that support active learning have been studied under the heading of “metacognition”. Metacognition refers to people's abilities to predict their performances on various tasks (e.g., how well they will be able to remember various stimuli) and to monitor their current levels of mastery and understanding. Teaching practices congruent with a metacognitive approach to learning include those that focus on sense-making, self-assessment and reflection on what worked and what needs improving. These practices have been shown to increase the degree to which students transfer their learning to new settings and events.

The future model of teaching-learning would therefore be based on an educational diagnostics and navigational services approach, with high-tech approach to facilitate student teacher interaction. Adoption of Internet services, push technologies, personalization, chunking of learning into small re-usable learning objects (RLO's), online communities and especially the use of cellular phones, personal digital assistants etc. would allow access to educational opportunities from the palm of the learner's hands.

The next generation media of great appeal to the screen-agers would totally transform education in a somewhat similar way that provision of healthcare and medical services were transformed as the results of advanced scientific and medical research has transformed and continues to promise improvement. Just as infant mortality and deaths from many earlier mass killers like malaria, typhoid, tuberculosis etc have been all but eliminated, the right combination of technology and scientific research in the cognitive sciences hold out the promise of removal of illiteracy, ignorance and the possibility of a new generation that can propel the country on to the desired path of global leadership.

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Nano-Learning

Our traditional education model is basically reflective of a tribal way of life. We look for naturally occurring good learners and naturally occurring good teachers and put them together in locations ranging from the Gurukul to residential Schools or Universities and now through technology mediated distance or remote learning.

But the basic model of large long duration monolithic courses and relatively short assessment periods mean that any quality assurance or maintenance of standards is fairly unreliable and over years even reputed Institutions have doubts whether their quality is as good as in the past decades. This is in sharp contrast in manufacturing across sectors, where there are no two opinions that the goods produced now are far superior than those produced a couple of decades ago. Any system that does not have an ISO certification, a CMM level 5 in software or striving towards 6 sigma in manufacturing or services would not be considered a serious player in the industry.

An alternative approach has been in terms of re-usable learning objects and sharable repositories of such learning objects. And then suddenly we had the emergence of blogs, podcasts and youtube permitting easy uploading of videos. Many of these products could be seen as being transacted in a couple of minutes, sometimes even smaller than the typically 8 minute capsule in a 22 minute video or TV broadcast. Since most devices for broadcasting music and video use a format of a few minutes duration, any use by the teaching-learning system of the same standards will benefit from the iPods and the iPhones that are being already adopted by the youth in unprecedented numbers.

Apart from the basic philosophy of education being based in the primitive ages, at the technological level, we are stuck at the civil engineering model of education. In one of my recent visits to a reputed University I was shown around by the Vice-Chancellor a large hall they had constructed at a cost of around ` 20 crores, which had a seating capacity of about 2500 students which would be used once a year during the ceremonial convocation. I didn't have the heart to spoil the party by suggesting that a similar amount of money might place at the hands of all undergraduates in the University hand-held devices supporting nano-

learning leading to a better quality of learning and the resulting employability of its graduates would give greater glory to the University, than having the Governor give a Convocation address with 95% unemployment for the graduating students.

So, what is nano-learning? The term is being used more to draw upon the buzz already prevailing regarding the potential of nano-technologies in many areas from medicine, drugs to materials. And now of course, the recently launched Tata nano.

It is well accepted that the actual 'teachable moment' is just that. A moment in which a cognitive conflict is resolved and clarity arises and understanding takes place. It may be the moment of enlightenment of Buddha, or the eureka moment of Archimedes or the solution of a complex chemical structural formula as in the Benzene ring or the double helix of the DNA. The recent book Blink devotes itself to this moment of realization in various contexts.

If we design for nano-learning, then these learning moments are part of a design and transaction with specially designed and created nano-learning objects. Of course passive nano-learning may lead to boring e-learning. The nano-learning objects have to be supported by learning transactions by suitable academics, coaches, professors, mentors who create the desired personalized learning environments. This may be done through e-mail, sms, forums and occasional meeting with the teacher. Content alone may be priceless or it may be worthless. It is only in the hands of an effective and enthusiastic teacher, a real guru that this would be really effective.

Special training, orientation and motivation is needed to effectively transact nano-learning.

I have written a short poem to indicate the possibilities of such a blended nano-learning model:

"An e-mail a day
An sms or two
Some conversations on cell-phone
And your learning improves;

Visit the learning node
Meet your mentor
In face to face mode
And your learning gets better;

Make good use of the web and Internet resources
Discussion forums and instant messaging features
Heed the feedback and hear the discourses
To find your learning becoming richer;

They say slow and steady wins the race
Choose your blend as well as the pace
Soon you'll find your learning is whole
No matter what, you reach your goal !!”

Let us elaborate further with one example of nano-learning application. As we migrate to a modern economy driven largely by creativity and innovation, all active players in the economic production processes have to acquire new knowledge and skills in an almost ‘just in time’ situation. It is not practical to go back to a full time learning experience at a University. Distance learning, while a possible solution also is not quite suitable in this context, because distance learning Institutions are seen as alternative degree providing Institutions and subject to parity of esteem problems and regulatory systems which draw upon the precedents from the centuries long tradition of higher education. But the needs of these learners are quite different and their backgrounds and level of preparation would be quite different.

Let us take the MBA as an example. All MBA Institutions will have a rigorous entrance test such as the CAT, MAT, GMAT or equivalent and although ostensibly they may be encouraging a diverse background of learners, at one level through the filtering test, they are seeking a very filtered homogeneous group, almost like what in Mathematics is called a delta function. After the one or two year program, they create a Bell-shaped curve with a dispersion from an A to an E and sometimes an F also. On the other hand, there are large numbers of members of the workforce who have to apply managerial skills, without the possibility or need of having an MBA degree. They would like to acquire and use managerial skills as needed. A pay as you go in mobile subscriptions, in other words an ‘on demand’ acquisition of managerial skills and competencies.

So, how would a nano-learning MBA work? In one form of it, we could make a pool of nano-learning objects, with transaction durations of 1 hour each, similar to a regular University lecture. A closely connected set of 3 such lectures could be seen as a half-day seminar, which could be

conducted face to face or e-mode. Five such seminars are the equivalent of an academic credit, which is usually 15 hours of classroom contact. In this format, we are looking at chunking of learning in chunks of 0.2 credits.

We could granularise this even further. At the next level, we could chunk the learning at 0.01 credits, that is about 9 minutes of instruction. A number of these could be strung together like a playlist to create the desired learning goals.

Elliot Masie was probably the first to realize the potential of nano-learning by reflecting upon the fact that he was himself a nano-learner. In his own words “I am a nano-learner. What does that mean? Each day, I learn several things in small chunks. Really small chunks. A 90-second conversation with an expert triggers a huge “a-ha.” A few moments concentrating on learning how something works leads to a new micro-skill. What’s more, I am not that unusual. Most people acquire most of their knowledge in smaller pieces.

Most instructional designers’ eyes get glassy when they hear me suggest that we should have a role in the design of three-minute or shorter learning elements. Yet that is exactly what nano-learning is all about.

We have a unique opportunity to stretch our thinking about the size of our average learning project. Right now, most learning modules start at 15 minutes and often cover hours or days of involvement. But most learning moments are teachable moments. Malcolm Knowles described the perfect teachable moment as the intersection of a small question with a great small answer. That is at the heart of nano-learning.

We can apply the art, science and technologies of education to the world of nano-learning. We need to combine a better appreciation of the effective TV advertisement and the compelling movie preview. Nano-learning could allow us to build extensive and shareable libraries of small elements that can be rated and ranked for effectiveness. Most of all, nanolearning is aligned the fact that learning can and does happen every day – not just when we attend a class or take an e-learning program.

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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 24 × 7 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.

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e-Learnability Quotient

You must be familiar with the intelligence mapping through IQ, EQ and Howard Gardener's multiple intelligence. Individuals with higher IQ and EQ are expected to perform better than others.

Most of the thinking about IQ was during the recruitment process of soldiers for the war. Then of course, it was noticed that a single number is not adequate and developments on EQ, MI etc. happened. But all these developments were in the pre-Internet, pre-Globalisation era. Success now and in the future will be achieved by those who can go beyond these and relate to the new emerging technologies. The computer is 'an engine of the mind' and the use of the Internet allows you to tap in and share knowledge with others who would form part of the community of practice. We are already in web version 2.0 and people are talking of web 3.0, the semantic web on the horizon. People who will not be able to relate to this and use them for their benefits, will remain on the fringes, much like the illiterates of today.

This essay is an introduction to a concept of eLearnability Quotient that will become increasingly important in the future. If one would have a high eLQ, then it would not matter whether the person had a degree or qualification from an IIT or an IIM. Even in the past for every person who achieved success with an IIT/IIM qualification, there were maybe 5 times as many people who also did very well, because of their innate intelligence, their highly developed EQ and leveraging their multiple intelligences. Now eLQ is the new competitive advantage.

A satisfactory method of estimating the eLQ is still under exploration, but we begin with a statement of components that enhance or diminish one's eLQ. In due course, there will be instruments that seek evidence of the qualities required for a high eLQ and standardize the scores for effective usage. In this essay, which just introduces what is meant by the term eLearnability Quotient we give a self-assessment method for rating yourself in eLearnability skills.

Looking at the present world, it can be said that the illiterate of tomorrow will be those who cannot learn, unlearn and re-learn.

What is eLearnability Quotient?

While there is no doubt that in the post WTO post Internet world of the Knowledge economy, one of the major methods of acquiring knowledge would be through e-learning, it is also apparent that e-learning is not as yet having the penetration or impact on the educational system in keeping with its potential.

Many factors, including the design of e-learning to effectively fulfil learner needs and the failure of it being given an equal status to the traditional systems contribute to this. But one factor that is yet somewhat ignored is the readiness of the learner to fully benefit from the resource based and learner empowering models of e-learning. There is still lack of appreciation of the fact that learners who have till their school level studied under a certain system would find it most challenging to adopt successfully a completely new learning environment. The two systems are as different as chalk and cheese to use a cliché. It is rather like a small town person used to eating with his hands food served on a plate by his mother, suddenly required to have a buffet dinner on a large dining table with a dozen pieces of cutlery of all sizes and shapes and no orientation to this style of eating.

Looking into the challenges to a prospective e-learner, the following parameter named as the eLearnability quotient or eLQ is proposed.

The eLQ is an assessment of a learner's abilities over a number of domains and within each domain over several strands, to have a total of maybe 50 to 100 strands in the final version.

For each strand, suitable testing instruments would be used to measure the learner's abilities. Points are awarded on a scale of 1 to 5. A score of 1 indicates no proficiency at all. A score of 2 implies a basic minimal level of proficiency. A score of 3 reflects an average ability to handle most common and routinely encountered situations. A score of 4 is given to those who can demonstrate their competency at solving complex problems. Finally a score of 5 would be given to those who have shown an exceptional ability in the concerned tasks.

While the scale and instruments for seeking evidence are under development, we are sharing here the sort of things that will go into the making of the eLQ, so that those interested can start with a self-assessment to know their areas of strengths, as well as where they would need re-inforcement.

Self-assessment of eLQ.

Grade yourselves from (1) to (5) as following :

V. Poor	Poor	Average	Good	Very Good
(1)	(2)	(3)	(4)	(5)

	(1)	(2)	(3)	(4)	(5)
IT Skills					
1. Do you have the Knowledge of basic computer operations?					
2. Can you use MS-Word, MS-Powerpoint and MS-excel for preparing a document, slide presentation or a worksheet?					
3. Can you use email for sending messages to your friends and mates					
4. Can you post your opinion using the discussion forums?					
5. Can you communicate with your friends and mates using online chat?					
6. Can you surf the net to find information on what all courses are on offer by a university?					
Awareness of your learning style					
7. Are you good as a spatial learner, an aural learner, a verbal learner, kinesthetic learner?					

8. Do you prefer using logic and reasoning in expressing your thoughts? Are you a logical learner?					
9. Do you prefer working in groups/in association with other people? Are you a social learner or a solitary learner?					
Attributes of a successful e-learner					
10. Do you possess good observation skills and the ability to pick up good options and discard the ones that are not required?					
11. Are you able to see, understand and translate visual information into notes etc.?					
12. Do you possess cognitive skills of perceptual focus, memory storage and recall for problem solving purposes that are required during e-learning?					
13. Are you self aware and self monitored in handling the information?					
14. Do you derive enjoyment from the activity, searching for meaningful information?					
15. Do you remain independent in studying and following instructions on your own? That is do you feel free to seek the instructor help whenever it is required, seek the instructor help whenever it is required.					
16. Do you plan your day and make a time schedule to work dedicatedly on it to complete assignments and other work in time?					

Learning Strategies					
17. Do you remain attentive and concentrate throughout during the lecture hours, while reading, while doing assignments, during discussions etc.					
18. Do you read the material/text and understand thoroughly what information has been presented in the written form?					
19. Are you able to memorize what has been learnt?					
Using Google as a search engine					
20. Can you search what are the universities that offer online degrees?					
21. Can you get the ratings of the various online universities?					
22. Do know the path of getting admission in these universities?					
23. Can you express your opinions, ideas and even experiences to the other students and instructor using blogs?					
24. Do you get engaged in discussing with your classmates and others on how is your work and improve further on it using the blogs?					
Blogging					
25. Using blogs, do you have the idea about what the rest of the class is thinking about a particular topic by participating in group discussion/ debate?					

26. Do you feel that you have become more responsible while writing your views and opinions in weblogs? This implies that you learn how to protect your content with copyright issues, privacy, plagiarism etc.					
Podcasting					
27. Do you take podcasting mentor lecture as an additional source for reviewing what has been taught in the class?					
28. Do you use podcasting to provide feedback on the peer to peer interaction in the lecture class?					
29. Do you use podcast lectures whenever you miss the classes?					
Wikipedia					
30. Using wikipedia have you learnt the skill of information literacy and critical thinking?					
31. Using wikipedia have you learnt the skill to have better quality in writing and research work?					
Learning Objects					
32. Has the use of learning objects in the course affected your retention ability?					
33. Do you feel that the use of learning objects in the course has resulted in providing an effective tutorial support to you?					

34. Are you able to access the instructional material repositories that can be used by you for online learning? Learn what you want to learn					
35. Are you able to perform self learning on any topic / course that you like to study?					
Quality & standards in e-learning					
36. Are you able to identify the better quality course among the various online courses?					
English Skills					
37. How comfortable are you at the reading, listening, writing, speaking and skills?					

If you have actually responded to the above table-questionnaire, you would have had a realization of some of the skills required in the future. In addition to these, there would be need for information processing skills, which are gained in a good educational experience. They will be included in the next upgraded list. You would now need to find suitable opportunities to enhance your abilities in areas in which there may be a deficiency.

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Learning 221: A Manifesto for Education in the 2nd decade of the 21st Century

There is a general belief and acceptance that the present state of affairs in education and in fact the whole education system and practices, is not able to even live up to our own benchmarks of the past and is totally out of sync with the needs of the future, especially the challenge of preparing our youth to participate meaningfully in the emerging Knowledge Economy.

As we begin the year 2007 and hear of the year 2010 as the one by which we will have new airports, new metro lines and the Commonwealth Games and we see the first glimpses of the fight within the Knowledge Commission, the approach to the 11th plan and the completely myopic vision therein, it is time for all of us to realize that a response from an 'enlightened self-interest of all' view is required, rather than a small bunch chosen by the Government. We have finally arrived at a point where the principle and the expectation that 'The King can do no wrong' is evolving to the current predicament that "The Government can do nothing right".

During the emerging decade we will have the challenge of swiftly educating to universal secondary education level about 10 crore children and re-educating a similar number, whose education would be either obsolete or irrelevant to the society they would find themselves in. These twin challenges can only be met by leveraging the new technologies in a massive way and at great speed. It also requires a complete business process re-engineering of the current education model, beginning with freeing it from the current stranglehold of the politicians and the bureaucracy and making it a citizen's movement led by civil society.

A system which could not bring bare literacy to all in 60 years cannot be expected to even be able to tinker with the challenge of universal secondary education. The basic principle to be followed up by a universally accessible system of life-long learning is really very simple. "Everyone who wants to learn should have access to an opportunity to learn and everyone who can teach something should be allowed to teach". And when we say everyone, we mean everyone, man woman, child,

disabled or otherwise, independent of age region, caste or present level of education. And to the surprise of many, this is actually do-able by leveraging the current and emerging technologies, especially the mobile phone.

Most responses to the above challenge are in terms of incremental expansion and knee-jerk reactions. My view however is that there is a need for a fundamental transformation involving about several major shifts. I have listed them as 10 dimensions of change, just because it sounds nice and rounded. We could do re-visit them and maybe create a more complete list. They are as follows:

1. Letting go of the Government's dominance and control over the entire educational system. There was a time when education of the young was primarily driven by the community, with little or no state intervention. The British rule changed that, Gandhiji in his Chatham House speech decried that, but after Independence our rulers continued with the same policy and with such a vengeance that 85% of our graduates, 75% of Engineers and almost 70% of our MBA's are unemployable, as indicated in various reports. Continuing to expand this system, without addressing the core issues is completely irresponsible. The expansion policy in the recent decades of the 'growth for growth's sake' has been a reflection of the philosophy of the cancer cell.
2. Establish a clear cut goal of inclusive education and surrender all the trappings of an exclusive elimination system of access. Abolish the very need for reservation by making available educational access to all and if necessary, go back to the drawing board and design the basic model of education so that this goal is met. Any model that does not do so, should be declared against the Constitution. This means that everyone who wants to learn should have the opportunity to be able to learn what he wants to learn and all barriers in the way should be removed.
3. Encourage de-institutionalization of intermediary Institutions such as traditional schools and colleges as the sole entities that put learners in touch with their teachers. Every post office and every cell-phone could become an access device to learning. The axiom that all learning must take place inside a class-room, is fundamentally flawed. The context of learning is the

environment in which a learner lives and he must be encouraged to construct learning from it, rather than a set of boring and controversial books created by the State machinery. Suitable Business Process Re-engineering has enabled many organizations to expand many times and serve a larger base.

4. Re-establish the supremacy of the teacher in the educational process, strengthened and supported by the latest technologies, allowing the possibility of independent educators and the emergence as a profession of education. In this country, a person with suitable qualifications, acceptable to the appropriate professional bodies may practice as a lawyer, doctor, chartered accountant and architect etc. independent of working for the Government or large corporate house as an independent professional. In fact the recent changes in rules allow them to practice their professions from their own homes or even from rented residential premises. A qualified teacher however cannot practice education except within the precincts of an Institution created by or licensed by the Government. And of course even an authorized teacher cannot teach in a residential building. This in a country that had a Gurukul tradition, where in fact the students stayed with the Guru.
5. Give sanction and legitimacy to e-learning and e-education. In a sense the Indian Information Technology Act 2002, permits this, but the regulating agencies are still negative about their approach. Even though the Government has at a considerable cost launched a satellite exclusively for education, there is no legitimacy and recognition to a satellite based educational system and the entire money has been a colossal and criminal waste of public funds. The Courts also need to be made aware that learning happens in the brain and that new media is very effective in creating mental models. The continued view that large tracts of land are an essential requirement for learning to take place may not be quite true. A set of goggles and an earphone with wireless connectivity may connect a student to almost all sources of knowledge and learning in a far better and effective way than the State run schools, colleges and universities.
6. Not merely permit, but encourage the private investment in education, by doing away with the constraints on the returns to

investors on investments in the field of education. The current model only encourages creativity and innovation in how funds can be siphoned from the trusts and societies to their promoters, as opposed to innovation in access and delivery models. We just have to see how the liberal policies of tele-communication have provided access to mobile phones for a large population. A model of education that builds on them and I am not talking of smart phones with 3G, but plain vanilla phones with voice and sms to connect learners and teachers.

7. Create a new system of facilitation and enabling the growth with quality assurance of education, rather than a constraining and inhibiting framework, which does not allow adequate infrastructure to be created. SEZ's, IT Parks and others could also be easily deployed for continuing education for life-long learning.
8. Appreciate that preparing for the future involves moving away from one-time learning to life-long learning. The goal at the school leaving level should be to enable joining the work-force at the entry level and then continue life-long education in a different mode. By the time a learner finishes school, he should have acquired, in addition to the specific knowledge in the domain areas, such as English language, Mathematics, Science, Social Science, Hindi/Sanskrit/Regional Language, some generic skills such as learning to learn, problem solving, information gathering and validation, creativity and innovation and an inter-cultural value system. Instead of prescribing very rigid curricula at each class from 1 to 10 and severe age restrictions for them, we must accept that learners will vary in their stages of learning, styles of learning as well as their learning rates. So, for each of the 10 knowledge areas listed above, we could have about 10 stages broadly spanning the 10 years of secondary schooling. I propose to call them A1, A2, A3, B4, B5, C6, C7, C8, D9, D10. The numbers refer to the usual class and A, B, C, D refer to the stages of Primary, Elementary, Middle and Secondary. In fact the National Institute of Open Schooling already has an Open Basic Education model that has created descriptors and standards for 'A', 'B' and 'C' levels corresponding to class 3, 5 and 8 respectively. The major departure that is being proposed here is that a learner may be in say class

6 and while he may be at level C6 for some subjects he may be at level D9 and for others at B4. His learning pathway would take this into account so that by the time he reaches Class 10, he would achieve level 10 in all the 10 Knowledge areas.

9. Having set the Standards at the end of a year of learning effort, in order to measure progress and provide for the desired learning experience, we further define sub-levels to be reached in about a month. Thus we would have levels A1.0 to A1.9 as 10 sub-levels during Class 1, approximately as monthly goals. Measuring and ensuring progress and achievement of learning outcomes is now better and everyone can hope to reach the endgame.
10. Finally the notion of a one hour lecture by the teacher as the core of the educational requirement, needs to be replaced by participation in experiencing a series of 'learning events', which have a granular structure using small chunks of resources and lead to moments of enlightenment in which the cognitive conflicts existing in or created in the minds of the learner are removed and he exclaims "wow, this is wonderful...I never knew this...isn't it fascinating.....etc" in a spirit similar to the Eureka moment of Archimedes.

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Computer/Video Games: The Educational Value

There is a good chance that if you ask a typical school teacher, a university academic or a parent their views on computer/video games, you will in all probability get a negative answer. And yet, when they look for a good nursery school, they will look for whether the 'playway' method is being adopted and even in a secondary school they will look for playfields. Even the regulatory agencies such as the AICTE/UGC mandate the need for several acres of open land for physical activities.

An important cause of this negative view of computer/video games is that, other than the children themselves, very few adults play these games. Since many computer/video games are created in a metaphor of aggression and violence, they are often accused of promoting violence in the children who play these games.

I posed the question to many such skeptics as to whether they would regard chess was a game of violence or a game of strategy. It is cloaked in terms of killing or eliminating several pieces of the game which in Hindi refer to animals such as camels, horses, elephants and of course foot soldiers and in English of Bishops and Knights and Kings and Queens. But we all ignore that fact and recognize that skill and strategy are needed to consistently win in the game of chess. And of course, chess has been one of the popular computer games.

Winning in a computer or video game involves similar elements of skills and strategies especially in the psycho-motor domain, which are often ignored in school syllabi. Thus like chess, rummy or poker, computer games also need skills, strategies and competencies.

Let us begin by looking at what comprises a video/computer game?

The phrases video game and computer game are often used interchangeably. Typically there is a screen (television, monitor, LCD display) through which the game is viewed. Input devices vary depending on the game and hardware, but usually involve a controller, joystick, keyboard or keypad.

Such games can be played on Televisions, PC's, on dedicated games consoles or on portable media devices including mobile phones. The most popular and well-known mobile game device is the PSP.

The study of why people play video games has received relatively little attention. Considering the vast number of players and monies spent on games, this is a peculiar oversight of the research sector. Computer games provide a medium that engages people for long periods of time and gamers usually return to the same game many times over. There are obvious lessons here for the developers of digitally-based educational, learning and training materials.

For example, one of the most popular video games is that of Pokemon, in which players collect a menagerie of monsters. Pokemon is played by millions of people, mainly children, on handheld and television-based consoles. Players enthusiastically learn a large amount of information during play, such as the fighting and defensive attributes of each monster and the likely outcome of the interaction (through battles) of these attributes. It is here that developers of educational materials may benefit from exploring why people play Pokemon to such an extent, how people so easily soak up such large amounts of information during play and how the answers to these questions can be used to improve education and learning for all. If we truly want to create an inclusive system of education, a sarva shiksha abhiyan of sorts, then more than calculating the right Constitutionally valid ratio for reservations, we need to understand these pedagogies. Research on why people play video games identifies three main reasons: fantasy, challenge and curiosity.

One may venture to say that all learning is either through reading or listening to stories and by playing of games. The former is formalized as boring theoretical classes conducted in dull class-rooms and the latter into unimaginative laboratory exercises killing all elements of discovery and surprises as the results are prescribed and often the laboratory work doesn't happen at all.

The laboratories should be supplemented with a suite of PC's and game machines and the full range of games. This is somewhat expensive, but the only truly scalable way to equip the new generation with skills for the second decade of the 21st Century that is fast approaching.

The reasons for playing games appear to be different for boys and girls. Boys focus on winning the game, whereas girls are more concerned with completion.

Either way, struggle is a key factor in motivating learners. Many games now incorporate creative tools, giving the learner control. This can extend to allowing them to enhance the game or create new games. When the game allows such opportunities for players to personalise the

medium, it creates a completely new learning experience. One has to just experience the kind of experience that games like 'second life' can create.

Game Consoles: the last few years and now

By the start of 2002, there were three main manufacturers of television-based and handheld gaming consoles although there were many more earlier. Most independent reviews and comparisons of the three consoles do not decide on a clear "winner", instead concluding that each is suitable for a particular gaming demographic.

Microsoft

Microsoft is new to the games console industry, though software such as its *flight simulator* series has given it experience in the PC games sector. Microsoft invested substantially in Xbox hardware, game development relationships and PR; consequently, the console launched with a relatively wide range of games, some critically acclaimed.

The Xbox 360, launched a year ago has been quite a success, already sold more than 6 million and by the end of 2006, about 10 million consoles are expected to be sold.

Nintendo

In 2001, Nintendo launched the GameCube in Japan and the US, as a successor to its N64 console. This is the smallest and cheapest of the three contemporary television-based consoles.

Nintendo is also the manufacturer of the Game Boy series of handheld consoles. The third in this series, the Advance, was launched in 2001.

It was appearing that Nintendo would be out of reckoning in this field and the future competition would be only between Sony and Microsoft, but in late 2006 Nintendo announced its new product the Wii, the cheapest of the 3 and in a completely different league resembling a remote more than a joystick. It is operated by waving it around and thus gives a completely new experience.

Sony

The Playstation2 (or PS2) has now sold in excess of 100,000,000 units worldwide giving Sony 70% of the market. The PS2 is the successor to the original Playstation console, which sold about 80,000,000 units. The PS2 can "run" Playstation games and, like the Xbox, can play DVDs and CDs.

The PS3 has just been launched and is the most expensive of the 3 consoles. The PS3 is available in two configurations, costing US\$ 500 and US\$ 600, compared with Microsoft Xbox that starts at US\$300 and the Nintendo Wii at US\$250.

The PC

Many people use the PC as a games machine, even if purchased for other tasks. Most people have had at least a brief encounter with simplistic games or simulations, such as Minesweeper and Solitaire; however, many recent PC-based titles are of a quality and complexity to match that of leading console-based titles. Online games (especially combat-oriented simulations), civilization-building games, business tycoon simulations and flight simulators are genres that are particularly strong on the PC.

Courses on Gaming

The number of gaming-related courses has increased in recent years. In the UK, a number of institutions offer game-related undergraduate or postgraduate courses. Approaches to teaching gaming-related topics differ; some courses are tailored towards game design and programming, while others offer a more generic computer science qualification containing several games-related modules

There are also a number of pre-university colleges offering multimedia courses containing elements of game design, programming and music. Outside the UK, there is a growing collection of academic and educational establishments offering gaming-related courses and qualifications.

Tanya Krzywinska is probably the first person to be appointed a Professor of video games at Brunel University in UK. The University offers an M.A. program in digital games: theory and design.

Games and Education

Games are increasingly used to support teaching and learning e.g., using text adventures to assist in teaching English as a second language. Conclusions as to the effectiveness of games for educational purposes differ; one particular review of relevant research indicated that mathematics was a subject where the use of games was usually superior to traditional classroom instruction.

One recent study involved a football manager simulation game with Year 7 and 8 pupils to achieve the learning objectives of interrogating

databases and data manipulation. The teacher created a scenario in which a team manager (the teacher) needed the scouts (the pupils) to find suitable players according to a range of criteria. Using the database of players in the game, the pupils found the players by using a variety of filtering options.

This database-oriented scenario can easily be extended into a more digital library and teaching-oriented scenario. For example, the scenario could be modified into that of an online database-oriented game. The pupils would then work online in conjunction with pupils from other schools, acquiring database searching, information acquisition, network communication and information analysis skills in order to complete the game. These are the kind of skills needed in the workplace of the future.

Experiments with the structured use of most of these games displayed a variety of positive benefits:

“Teachers in the study found that use of the games could provide motivation, develop skills and encourage collaboration. The motivating power of games and their ability to encourage cooperation were felt to support the work of schools in developing independent but social individuals.”

Future trends in video gaming are very hard to predict. Some of these new games consoles have as much computing power as supercomputers. It has even been suggested that when one is not playing games on the new PSP3, it can be connected to a global research network providing computing power to solve high-end complex research problems. Even established industry experts fail to agree on particular gaming trends in anything more than the immediate future. The one certainty is that video games and gaming consoles are here; the key console manufacturers exhibit relative fiscal health; games are diverse, complex, engaging and attractive; and they are being played in rapidly increasing numbers.

That particular revolution is complete: *game over*. The challenge now is that of combining the best and relevant aspects of games, game consoles and learning, to create engaging and beneficial digital learning pedagogies: *game on*.



The Right to Information Act and its implications for Education

The recently promulgated Right to Information Act 2005 is a major step forward in democratization, ushering accountability and transparency and preparing India for the emerging information economy.

Virtually all agencies of the executive branch of the Government are covered under its ambit and exceptions are few. It is therefore important for all to be aware of its provisions and implications. It is the first law in the country which demands affirmative action by the executive in computerization, putting information suo moto on the Internet and to educate the public, so that they eventually have little need to use the provisions of the Act. This column touches upon the salient features of the Act and is annotated with comments about their bearing in a variety of contexts pertaining to education.

Let us begin with trying to appreciate the scope of the Right to Information Act. As society evolves it moves from a monarchy based on the divine right of kings and the dictum that the king can do no wrong, to a democracy based on social contract demarcating the rights of the citizens of the state. From the signing of the Magna Carta in 1215, to the Fundamental orders of Connecticut in 1638, the American Constitution in 1789, the Helsinki Final Act in 1975 and the Universal Declaration of Human Rights were all a series of steps circumscribing the role of the State. The Indian Constitution through Article 19 gives a fundamental right of expression. The recently passed RTI Act is a practical regime for this purpose.

While the full Act came into force on 12th October, 2005, some of the features were to be put in place earlier. The provisions of subsection (1) of section 4, [dealing with obligations of public authorities], sub-sections (1) and (2) of section 5 [requiring the designation of public information officers], sections 12, 13, [pertaining to the Central Information Commissioners], 15, 16 [relating to State Information Commissioners], 24 [exemptions], 27 and 28 [power to make rules by the appropriate government and the competent authority] have come into force on 21 June 2005 the day of passing of the Act and the rest of the provisions have come into force on the 120th day of its enactment, that is the 12th October, 2005.

The most empowering provision of this Act is that the right to information is conferred on every citizen, even those who do not pay taxes or are eligible to vote. By implication foreign citizens, including persons of Indian origin who have taken up citizenship elsewhere are not covered. Even the OCI category of overseas citizens of India would not be covered. This is because the Indian Constitution does not permit dual citizenship. Article 9 says "No person shall be a citizen of India... or deemed to be a citizen of India...if he has voluntarily acquired the citizenship of any foreign state".

The Right to Information Act confers the right to information on all citizens. This is done through section 3 of the Act, which is a very simple but very powerful provision stating that subject to the provisions of this Act, all citizens shall have the right to information. At the same time it creates an obligation on all public authorities to make information available suo moto as well as upon request by any citizen. So what does the term information mean? While it may mean different things in different contexts, for the purposes of the Act it is defined in section 2(f) as follows "information" means any material in any form, including records, documents, memos, emails, opinions, advices, press releases, circulars, orders, logbooks, contracts, reports, papers, samples, models, data material held in any electronic form and information relating to any private body which can be accessed by a public authority under any other law for the time being in force; Every right must be manifested in terms of what a citizen can do towards the exercise of his right. What is the meaning of the term 'right to information' is given in section 2(j) of the Act and is extracted below. "Right to Information" means the right to information accessible under this Act which is held by or under the control of any public authority and includes the right to –

- (i) inspection of work, documents, records;
- (ii) taking notes, extracts or certified copies of documents or records;
- (iii) taking certified samples of material;
- (iv) obtaining information in the form of diskettes, floppies, tapes, video cassettes or in any other electronic mode or through printouts where such information is stored in a computer or in any other device.

Let us now examine the implications for education. It is quite clear that all higher education Institutions are covered under the Act because

according to section 2(h), public authority is any authority or body or Institution of self-Government established by or under the Constitution, by law made by Parliament or State legislatures, bodies substantially owned, controlled or financed. In India a University cannot be created unless enacted by this Parliament (Central Universities) or by State Legislatures (State Universities) and even Education Boards are controlled by the respective Governments and even the schools although privately owned and managed come within the ambit of the Act.

The first step that has to be taken, in fact had to be taken under the Act was to publicly notify under about 16 heads the information laid down in section 4(1)(b) of the Act. Many departments of the Government who are pro-active have created such a 'handbook' containing the required information, but in my anecdotal experience, not many educational Institutions who are all covered under the Act have done so. They must do this on a priority basis. The other mandatory duty for all educational Institutions is under section 4(1)(a) is the computerization of all records and making them available through a network and section 4(2) desires that most of the information should be made available suo moto without the need to take recourse to this Act.

What kind of information would be sought by the citizens is to emerge, but clearly the following will be some of the immediate areas for which educational Institutions and organizations must be prepared to open the gates. Admission policy and specific information on each one admitted. Examination grading and making available the answer books to the students and their parents. A parent may also ask to see the answer books of other students in these highly competitive times. Educational Organizations may have to share the qualifications and achievements of their faculty. In higher education Institutions sharing the research outputs may be very embarrassing, or even the qualifications of the faculty.

When I have lectured on this topic, I have often been asked, but in the past we never did so. Precisely for this reason there is a section 22 which gives an overriding effect to this Act, even overriding the Official Secrets Act. Of course there are certain categories of information that are exempt and these are given in sections 8 and 9, but anything that does not come within this specific exemption is now accessible to the public. Under section 6(2) no reasons are to be given for seeking information under this Act.

So here we have a new beginning and while as school administrators we may find the Act a bother, as parents and responsible citizens we would all welcome the Act and may it usher in a new era in education.

The 16 items required to have been done by 12th October 2005.

(4)(1)(b) Every public authority shall: Publish within one hundred and twenty days from the enactment of this Act:

- (i) the particulars of its organisation, functions and duties;
- (ii) the powers and duties of its officers and employees;
- (iii) the procedure followed in the decision making process, including channels of supervision and accountability;
- (iv) the norms set by it for the discharge of its functions;
- (v) the rules, regulations, instructions, manuals and records, held by it or under its control or used by its employees for discharging its functions;
- (vi) a statement of the categories of documents that are held by it or under its control;
- (vii) the particulars of any arrangement that exists for consultation with, or representation by, the members of the public in relation to the formulation of its policy or implementation thereof;
- (viii) a statement of the boards, councils, committees and other bodies consisting of two or more persons constituted as its part or for the purpose of its advice and as to whether meetings of those boards, councils, committees and other bodies are open to the public, or the minutes of such meetings are accessible for public;
- (ix) a directory of its officers and employees;
- (x) the monthly remuneration received by each of its officers and employees, including the system of compensation as provided in its regulations;
- (xi) the budget allocated to each of its agency, indicating the particulars of all plans, proposed expenditures and reports on disbursements made;
- (xii) the manner of execution of subsidy programmes, including the amounts allocated and the details of beneficiaries of such programmes;
- (xiii) particulars of recipients of concessions, permits or authorisations granted by it;

- (xiv) details in respect of the information, available to or held by it, reduced in an electronic form;
- (xv) the particulars of facilities available to citizens for obtaining information, including the working hours of a library or reading room, if maintained for public use;
- (xvi) the names, designations and other particulars of the Public Information Officers.

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The Road Ahead

The story of distance learning has been a long one, tracing itself back to the Eklavya episode in the Mahabharat, which was more about self-learning, because Dronacharya, the teacher did not participate at all in the designing of the learning experience to modern times when distance learning is synonymous with the use of technology for educational purpose. It is reminiscent in many ways of the story of the ugly duckling that eventually turned into a beautiful swan.

As distance learning evolved through its various stages, from correspondence courses, telephone supported courses, incorporation of radio, then TV and the recent use of the 'EDUSAT' a dedicated satellite for educational purposes, it continued to be regarded as a second option, mainly for those who could not have access to the main formal system. Considered the dumping ground for second rate faculty and third rate students, it has been trying to fight for parity of esteem and has achieved it in only a very small measure.

Recent developments in distance learning have been propelled by the many convergences, in computing, in communication and in media that we are witnessing. The result is that we see in the future the emergence of 'blended learning' that will involve the blending of teaching-learning modes, the blending of resources ranging from printed text-books to electronic resources including the recent blogs, podcasts, wikis and squidoos. A learner will choose the mix most appropriate to the learner's circumstances, including his learning style and cognitive strategy. The educational system will possibly transform to an educational diagnostics and navigational system, much the same way as today's medical practitioners work with high-end diagnostics carried out with equipment manufactured by specialist companies and patented medicines manufactured by pharmaceutical firms. Implementing the principles of Mastery Learning, the practice of the Keller Plan or the Kumon method and using extensively the copious amounts of data generated by the learner during the course of his engagement with the learning resources, it would be possible to have all learners realize their desired goals to a 6 sigma level of achievement.

This will assure the augmentation of the human capital and the development of talent on a scale never seen before. Our current formal

system, is an exclusive filtering model, which identifies a small number of 'the talented' and provides them all the facilities and by implication denies these opportunities to all others. On the other hand technology empowered distance learning holds out the promise to provide 'talent development' opportunities to all those who are committed and dedicated.

The emerging world will not put much value to the mere memorization of information and the ability to recall large amounts of content from a given domain. Rather it will value the information gathering and processing skills that will efficiently produce meaning in the desired context from vast amounts of raw information. The formal system which is so reluctant to change would become marginalized except in the limited instances where it is an example of excellence in the generation of new knowledge. Mere regurgitations of existing knowledge under the authority of the state and regulating agencies will usually invite scorn though it may elicit some compliance and deference.

In addition to the vast array of distance learning opportunities described in this book, the use of the Internet opens up completely new universes of knowledge. The most well known and exemplary of these is the Open Courseware project of the Massachusetts Institute of Technology where a large number of courses have been made available from the website for anyone to use to further his knowledge. The wikipedia is one large free encyclopedia for anyone to use. There are many resources in the forms of dictionaries and thesaurus. Many books that are now out of copyright restrictions are available through the website of the Gutenberg Project. And of course, searching through Google is the very first step towards gaining information and knowledge in any area. If any of the terms used here was unfamiliar to you, all you have to do is to go to www.google.com type in the word or phrase and you will get a large number of leads to go further in your research.

As we get ready to meet the challenges of a rapidly emerging knowledge economy, the inadequacies of the formal educational system will get more glaring. It is now well documented that a majority of the graduates of our better Institutions are not considered employable by major multi-national players in the Global economy and of our generalist graduates produced by the 300 odd Universities and 15,000 or so Colleges, close to 90% are unemployable. This is current data. If we extrapolate to another 10 years hence, there is no doubt that almost none will be employable on the strength of the formal education alone. Almost

everyone will need supplemental knowledge and skills and distance learning would be the most practical way of pursuing these courses concurrently with formal degree programs and later on as life-long learning programs.

The barriers to access of online learning were not significantly less than the barrier to access of traditional educational Institutions, with the PC and Internet access costs being what they are in India. But a new unprecedented and unexpected development throws open the possibility of an inclusive education model relying upon the post-office and the cell-phone. The cell-phone has now become ubiquitous and Mohammad Yunus has been given the Nobel Peace Prize, for practically demonstrating its reach and effectiveness to overcome poverty, through micro-credits and micro-finance. A similar revolution is waiting to happen using a model to impart education in small chunks of mobile learning objects and audio support with high-order feedback, through a simple device the all pervading cellphone. The micr-credits of learning that the learner accumulates, may later be aggregated for the award of a certified qualification. This hand-held learning will actually be a real opportunity to 'hand-hold' a remote learner via his cellphone, Pocket PC, a PDA or even a game console such as the PSP.

So, how can a student make use of the distance learning opportunities? The UNESCO Delor Commission report had long ago identified the four pillars of " Learning to know", "Learning to do", "Learning to be" and "Learning to live together". Of these the formal system in good professional educational Institutions at the best attempts to deal with "Learning to Do". The other 3 pillars will either remain absent, or in some measure be fulfilled with the extra-curricular and co-curricular activities in good Institutions, but for most measure are ignored.

A good place to start would be the "Learning to Know" program, which may be seen as an almost essential requirement to prosper, flourish and thrive in the emerging Knowledge Economy. A good multi-cultural experience is also provided by becoming members of communities and part of the social Internet. Memberships of groups like Orkut are a step in that direction. Similarly joining the community in a game of 'second life' can be an experience which is very appropriate for the future. Playing computer games can be very interesting fun and full of learning as well.

So, just go ahead and start traveling on his new road to the future and use the facilities available and you will see that in a short time, your

life is transformed beyond recognition. Maybe the following lines will give you an operational plan to keep moving:

- An e-mail a day
- An SMS or two
- Some conversations on cell-phone
- And your learning improves;
- Visit the learning node
- Meet your mentor
- In face to face mode
- And your learning gets better;
- Make good use of the web and Internet resources
- Discussion forums and instant messaging features
- Heed the feedback and hear the discourses
- To find your learning becoming richer;
- They say slow and steady wins the race
- Choose your blend as well as the pace
- Soon you'll find your learning is whole
- No matter what, you reach your goal !!

Bon Voyage!!!!!!



Further Conversations with Prof. M.M. Pant

These essays may have provoked you, amused you, got you thinking and may be motivated you to pursue some of the ideas and opportunities further. While all readers of this book are welcome to pursue a continued interaction with the author through the contact information provided in this book, some may want detailed discussion/interaction on topics of their interest.

For this purpose, a repertoire of 101 talks, each of roughly an hour duration has been developed, a hundred of these are formatted as 30-day workshops/seminars of 3 hours each and two full-day similar events of 5 hours each. Finally there is a one-hour talk on the main theme “An investment in education is the best option”.

One mode of conducting these half-day workshops is the standard face to face mode in groups of 10 to 20 at designated locations. The total duration of the event would be approximately 4 hours. The first half-hour will be for registration and networking, while the sessions themselves would be organized as either 3 sessions of 1 hour each with 2 breaks of 15 minutes between the sessions or as 2 sessions of 1.5 hours each with a 30 minute break between the sessions.

The other mode of participation for those who cannot participate in the above mode because of the constraints will be the e-mode in the form of e-mail workshops. Here the participants would be sent reading materials as e-mail attachment and further interactivity would be by return e-mail and telephonic and/or SMS communication. The time equivalent for a half-day workshop would be a weekend or the working week (evening hours) depending upon the time suitable to the learner. Those who would prefer a video talking head presentation or an audio-track could request for it in the required format and could watch it in the device of their choice. Such participants would also have an occasional opportunity to meet Prof. M.M. Pant individually or in small groups depending upon mutual convenience over tea/coffee, lunch or dinner.

The learning resources for the program will be a combination of:

- Basic course material in word file
- Power point presentations
- Audio files
- Video files with the photograph of the faculty
- E-book format
- Pdf format
- Course material on the net

Learners will be able to access all the resources listed besides being provided links to various sites of relevance. Thus they will have easy access to a vast set of information which otherwise may not have been possible to collect.

1. Prospering through Knowledge

- The emergence of the Knowledge Economy
- Skill sets needed in the Knowledge Economy
- Flourishing and thriving in the Knowledge Economy

2. Thinking for a Living

- Managing one's own thoughts
- Influencing other people's thoughts
- Implementing new thinking

3. Learning to Learn:

- Learning to learn: It's criticalitys
- Learning to Know: Strategy
- Learning with technology

4. Career options and pathways

- A taxonomy of career opportunities
- Conventional career paths: IIT, IIM and such
- Self-fulfilling unusual successful careers

5. International Education Systems

- Global Landscape of Transnational Education
- The well-known destinations: Australia, UK, USA
- Other emerging destinations: Asia, Europe

6. Financial Literacy

- The basics of money and Economics
- Backgrounder to personal Finance
- Achieving personal financial security

7. The MBA Treasure Hunt

- The when and why of MBA?
- The what and where of MBA?
- Leveraging your MBA

8. Nurturing Creativity and Innovation

- Fostering Creativity
- Encouraging Innovation
- Prospering through Innovation

9. Improving Academic achievement

- Implementing Mastery Learning
- Identifying Learning styles
- Assessments beyond Examinations

10. Enhancing employability

- What employers want?
- Skill sets for employability
- Life-long learning for continued employability

11. Emerging Global Environments

- Emergence of the Global Economy
- The WTO and its systems
- TRIPS and the Intellectual Property Framework

12. Corporate Governance

- The corporate frameworks
- Drivers and expectations of corporate Governance
- The Sarbanes Oxley Act and allied matters

13. Business Forensics

- Need for Business Forensics
- Tools for Financial Forensics
- IT Systems and Forensics

14. Future of Businesses

- New Business Organisations
- New Business processes
- New Business Mantras

15. Pre-natal and neo-natal learning – The Abhimanyus

- The womb is also a class-room
- The mother's role in pre-natal learning
- Parenting the neo-natal child

16. Parenting during early childhood

- Mental development during years 2 to 5
- Ensuring balanced development
- Parenting during pre-school phase

17. Parenting during adolescence

- Mental development during years 6 to 12
- Ensuring balanced development
- Parenting during school stage

18. Parenting during the teen-age years

- Mental development during years 13 to 19
- Ensuring balanced development
- Parenting during post school phase

19. The Business of Living

- The glory and possible purposes of human life
- Scripting your life's story
- The pursuit of happiness

20. Life as a senior citizen

- Growing old gracefully: The challenges of the elderly
- Financial independence
- Support systems for the elderly

21. eLQ: Thee-learning Quotient

- Measures of Intelligence and learning abilities
- The 100 point eLQ scale
- eLQ for improving learn ability

22. Safe Computing

- Hazards of the Internet
- Top frauds on the Internet
- Guidance and tips for safe computing

23. The Joy of Learning

- Experiencing the Joy of learning
- Enjoying the learning experience
- Serendipitous Learning

24. Inducing Behavioral Change

- Education for behavioral change
- Motivation for behavioral change
- Overcoming bad habits

25. Sustainable Development

- Only one earth: the Limits to Growth
- Ancient Indian values and sustainability
- Changing lifestyles for sustainable existence

26. Decision Making

- The overwhelming questions and their answers
- Blending predictive Sciences for pleasure & action
- Living sensibly in the 22nd century

27. Quantum Computing

- The concepts of Quantum Computing
- The potential of Quantum Computing
- The present state of implementation

28. Intellectual Property (IP) Awareness

- Types of Intellectual Property assets
- Intellectual Property Audit
- Information Technology & Intellectual Property

29. IP Management and Strategy

- IP Management
- IP Strategy
- IP Valuation

30. Becoming a Digital Jagat Guru

- Attributes of a global tech-empowered Professor
- Skill sets for teaching through the Internet
- Tools and systems for teaching through technology

31. The essentials of Management

- Management skills and their value : Past, present and future
- Sources of Managerial Knowledge: The Billy
- Madison way to learn Management
- Tools for Managerial Effectiveness
- Leadership: Getting extra-ordinary performance from ordinary people
- Leveraging Technology for better Management

32. Complexity Management

- The concept of complexity
- The approaches to complexity
- Applications in Financial Management
- Applications in General Management
- Other area of application

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