Entrepreneurship
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Lecture 36
Education and Entrepreneurship – Part 1

Hi Friends. Welcome to the NPTEL Course on Entrepreneurship. In this session, we will consider the interaction and interplay between education and entrepreneurship. In one of our earlier sessions, we did consider that some of the best known companies in the tech space were founded by experts who are college dropouts. That does not of course imply that not being in the college or not having formal education helps somebody to establish a successful enterprise.

On the other hand, as admitted by they themselves, there is a clear nexus between education or knowledge or the skill level or the creativity and all on one hand and entrepreneurship on the other hand. So, what we are considering here is the importance of education as a broad based formal system of imparting knowledge, inculcating learning behavior and progressing once own knowledge domain, how this actual system, this established formal system would help entrepreneurship.

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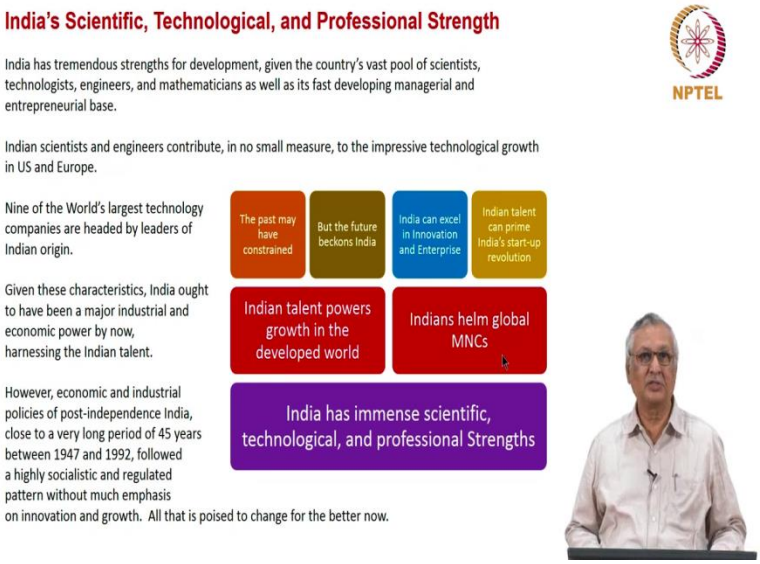

India has got immense scientific, technological and professional strength. We all know that we have a vast pool of scientists, technologists, engineers and mathematicians. We also have a very fast growing managerial and entrepreneurial base. We have also understood through various

examples we have cited earlier and also through common knowledge that Indian scientists and technologists have contributed to the development of advanced nations in no small measure, particularly U.S. and Europe. 9 of the world's largest technological companies are headed by leaders of Indian origin.

In addition, Indian professionals, Indian technologists and Indian managers occupy very important positions in various companies abroad. The latest example is the election of a person of Indian origin as the Chief Operating Officer of Nissan worldwide. So, given these kinds of characteristics, India ought to have been a major industrial and economic power by now if Indian talent has powered the growth of various developed economies in different levels of measure, why not India itself.

However, there is an explanation for that. Between 1947 and 1992, that is in the immediate post-independence era and subsequent planning eras, we did establish a number of educational institutions and then created capacity in the educational system. However, it was very pyramidical in structure and the capacity that was available in higher educational institutions was far less than what the demand was.

So, in a way, there was significant bottleneck impact in terms of how education helped us create more jobs or more environmental opportunities. So, if you take a macro view in a retrospective manner, certainly the past may have constrained in terms of our educational space, but the future is most certainly beckons us for an excellent growth path.

And in particular, India can excel in the innovation and enterprise space and India can also spur the next start-up revolution. So, I have already said that Indian talent powers growth in the developed world. Indians help global MNCs and why not in India. So, given that we have got immense scientific, technological and professional strengths, how do we really ensure that we help ourselves in a more significant manner.

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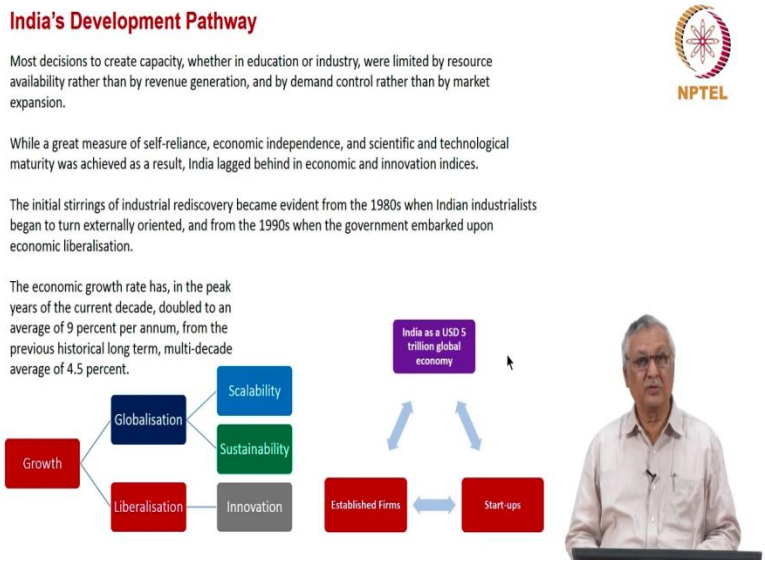

So, if you see India's development pathway, growth of Indian economy can occur on two fronts. The first front is liberalization of our policies, procedures and systems, improving the ease of doing business in India, improving the way we introduce our products and services in India. And the second measure is through globalization.

And to be able to be a global power, we need two essential factors. One is scalability, because global markets mean high volumes, therefore, we should have businesses which are scalable. Globalization also mean that we need to be competitive in our own system before we become competitive in the global world, which means that is we need to have sustainability.

Scalability and sustainability are related in the sense that, if you are not scalable, probably there is no issue of sustainability, because you can be a small niche player, growing and catering to very small markets and be sustainable. But then when you scale up, that is when the challenge of growth comes in, the challenge of competition comes in, and if you want to capture market space, we considered in the earlier sessions that discounts, pricing is not the only option, we need to be competitive. So, to be sustainable in a scalable environment, it requires a different level of competence. And when we want to do that, on a global scale, the competence that is required is even more.

Similarly, liberalization means that we not only import and absorb the technologies, but also innovate by ourselves so that we are competitive in the global marketplace. When we have the

aspiration that India would be one of the largest economic powers in the world, which is a goal of being USD 5 trillion-dollar economy over the next few years, we need both established firms as well as start-ups to contribute to this development.

So, the initial stirrings of our industrial development were evident in the 1980s when we started importing technologies, adopting them and then indigenizing them. And thereafter, the economic growth after liberalization peaked somewhere to the levels of 9 percent per annum, and we were hopeful that we would be in a position to grow to even a double-digit economic growth from the historic base of 4.5 percent we saw earlier. Now to be a U.S. 5 trillion-dollar global economy, we need to do a few things right.

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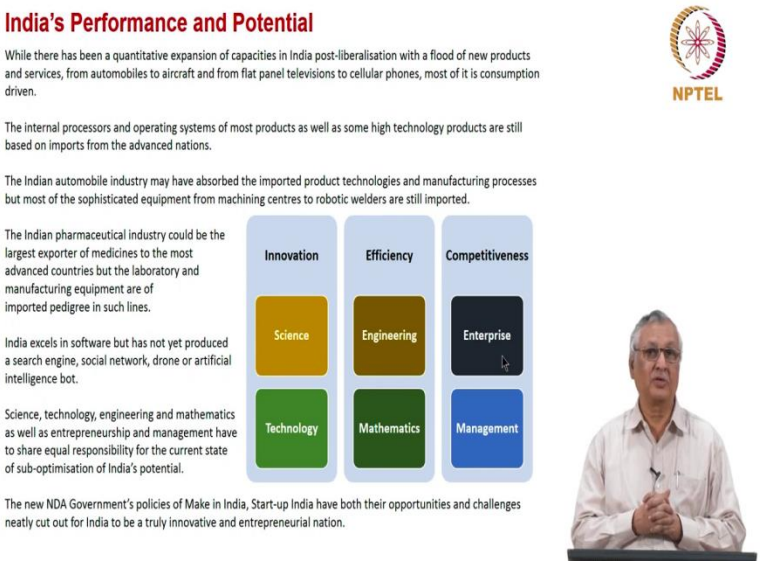

There are three pillars of this; one, innovation; second, efficiency; and third, competitiveness. How does innovation come about? Innovation comes about through science and technology. Efficiency comes about through engineering and mathematics. And competitiveness comes about through enterprise and management. So, these are the six sub-parts of the whole innovation, efficiency, competitiveness paradigm which is required for India to reach its potential through continued performance. We have got a dilemma here.

On one hand we are able to produce automobile products which are of world standard. We are able to produce pharmaceutical products which are of world standards. In fact, pharmaceutical

industry is one of the industries where the entire finished product is exported 100 percent of the capacity in several cases.

But that said, we cannot say that all the equipment which are used in these facilities are made in India. We cannot say that the sophisticated analytical and measurement instruments which are produced are, which are used in the production are produced in India. So, we may say that we have excelled in software, but we cannot say that we have created a software product, which is akin to, let us say, Facebook or a Google search engine.

Therefore, while science technology, engineering and mathematics as well as management enterprise are of very high order, somewhere they are not working together to ensure that we produce our own global products and global services which are competitive across the world. Therefore, the challenges which are coming up, as we look at globalization and liberalization as our twin pillars of growth, we also consider that for us to be very effective in the slogans we have in the signature campaigns we have of the Modi Government that is Make in India and Startup India, we need to do something different and something holistically. So, that is where India's higher education system comes into relevance.

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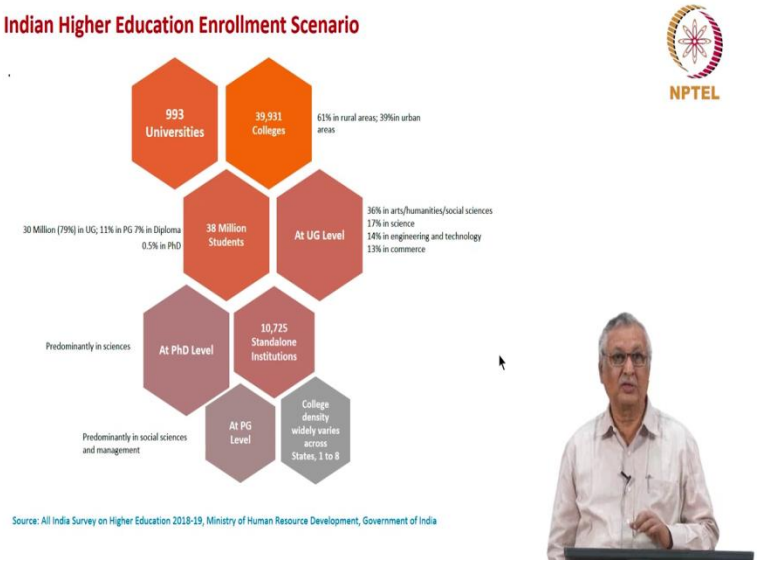

Now, this is a snapshot of our Indian higher education system. We have got vast network of universities, colleges and institutions. We have got roughly 990 plus universities, nearly 40,000 colleges and 10,700 plus standalone institutions. Of the 40,000 colleges, we have got 61 percent

in rural areas, which is a big number and 39 percent in urban areas. By and large, we know that 66 percent of our population lives in rural India and 34 percent lives in urban area. So, it is not therefore, completely out of alignment that we have got 61 percent of our colleges in rural areas and 39 percent in urban areas.

We have an enrollment as per the latest reports of Ministry of Human Resource Development, we have got 38 million students on roll in our entire higher educational system, out of which 30 million, roughly 79 percent are in undergraduate level, 11 percent are in post-graduate level, 7 percent are in diploma level, and 0.5 percent in PhD. The proportion of PhD enrollment is significantly small compared to other enrollments.

Again, at a PhD level, we have a predominant focus on sciences which is good. But at PG level, the focus is predominantly on social sciences and management. Similarly, there are some variations. At undergraduate level, we have 36 percent in arts, humanities and social sciences, whereas 17 percent only is in science and 14 percent in engineering and technology.

And we are also concerned at the same time that not all the engineering graduates are able to be finding their jobs, good jobs in the industrial system, we also are concerned that not all of the engineering and technology graduates as well as science graduates have got skills which are employable immediately, skills which can be deployed immediately. We have got 13 percent in commerce. So, these are some of the interesting facts about the Indian higher educational system and also some points of concern as well as the points of opportunity.

Another important factor is that, it is not that the entire college density is uniform across the country, there are states where the college density in terms of measurement per lakh of population is pretty low and there are states where the college density is very high. In fact, some states over the years got good reputation for being highly college-oriented educational systems.

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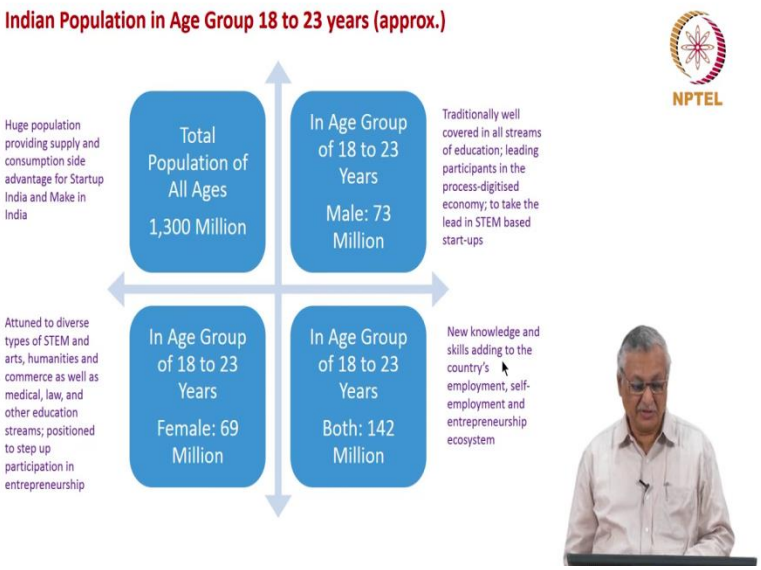

Now, if you look at the Indian population in age group 18 to 23 years on an approximate basis against a total population of all ages of 1,300 million, we have got 142 million who are in the college going and higher education studying range, which is a good number to have. It also implies that the potential for adding new knowledge and skills to country's employment, self-employment as well as entrepreneurial ecosystem is very high.

We are saying that 142 million who are graduating in the next few years and that is the level which will be there and progressively increasing they have the capability to add new skills, new technologies and new ways of doing business to our industrial and business ecosystem, which is substantially growth oriented factor we have. And also, we have got a good level of gender diversity in this age group. We have got 73 million in this age group who are males and 69 million who are in the female population.

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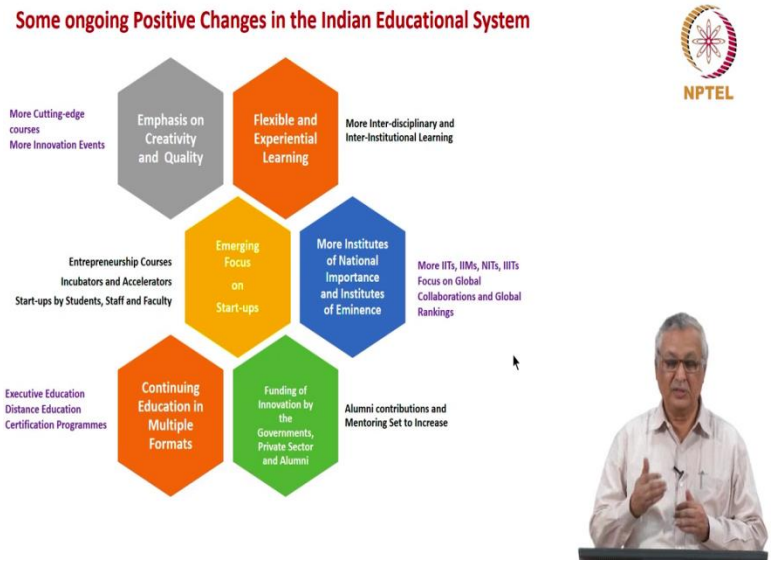

We are also seeing some very good positive changes that are ongoing in the educational system. Fundamentally, I think people are recognizing that the educational system which focused on lot of coursework, lot of home work, and then examinations they wrote has to yield place to more creativity and quality in the educational system. While the quantitative parameters are necessary to ensure that there is universal, not only elementary and secondary education, we also need to have universal higher education that should be the goal of the country.

But apart from the quantitative dimensions, we also have creative and quality dimensions which are extremely important. Therefore, many institutions are today introducing more cutting-edge courses. They are also organizing more innovation events. The emphasis is also shifting from classroom education to more flexible and experiential learning. This is occurring through more inter-disciplinary and inter-institutional learning programs.

We are also having a focus on start-ups in an increasing measure. This is occurring again through courses which are tailored to entrepreneurship because of the focus of certain institutes at least to have incubators and accelerators within their ecosystems, and also the new policies by the government which enable establishment of start-ups by students, staff and faculty.

The governments have also created new institutions both at state level and more prominently, of course at the national level, to support higher order, higher education. We have got more institutions of national importance and institutes of eminence than ever. So, we have more IITs,

23 IITs, more IIMs, NITs, IIITs with focus on global collaborations and global ranking. So, this is one big enabler for the higher education to be at a different level.

We are also having executive education, distance education, certification programs, which enable continuing education in multiple formats. Funding of innovation through higher educational institutions is also on the rise and more importantly, Alumni, who are well settled, both in India and abroad are being tapped to ensure that the institutions become not only self-sufficient, but also have the necessary ability to take on newer technological and scientific challenges.

So if you look at these three factors together, we can say that in, the Indian educational system is undergoing definitely a certain positive changes and as these changes take us to a new level of educational efficacy and efficiency, we can see certain spin-off impact not only on normal industrial development, but also some extraordinary entrepreneurial development.

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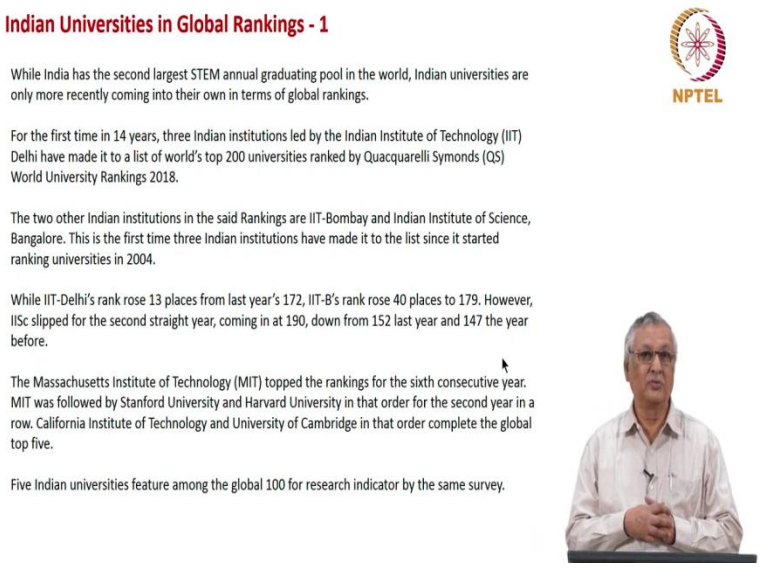

So, one of the ways to assess where Indian higher education is could be through global ranking. We generally rank our industries; we rank our firms in terms of global competitiveness. We say that we are as competitive as somebody else in terms of power production or automobile production, how do our labor productivity rates or capital efficiency rates compare with other global benchmarks. But we have not had until recently a focus on how Indian universities fare in terms of global ranking because education was largely seen to be an introverted activity.

So, although we have the second largest STEM annual graduating poll, when we talk about STEM, it is Science Technology Engineering and Mathematics. We have one of the largest graduating pools in the world, but only recently Indian Universities are coming into the fore in terms of their global rankings. For the first time in 14 years, 3 Indian institutions led by Indian Institute of Technology, Delhi, have made to the list of world's top 200 universities ranked by QS World University Rankings in 2018.

The 2 other Indian institutions in this said rankings are IIT-Bombay and Indian Institute of Science, Bangalore. We know that these institutions as also other IITs are very good in terms of the higher educational space. But what is the significance for us is that this is the first time these three Indian institutions have made it to the list since the institutions started ranking universities in 2004. While IIT-Delhi's rank rose 13 places from last year is 172, IIT-Bombay is rank rose 40 places to 179.

However, IISc slipped for the second straight year, coming in at 190, down from 152 last year, 147 the year before. Again, these points to the fact that this kinds of ups and down in the higher educational space are probably to be expected given that just as India is aiming at a growth in the educational competitiveness era, others are also going to do the same. Therefore, the burden of growth is eternal vigilance and eternal upgradation in our educational system.

But what is again important to note is that a famed institutions such as Massachusetts Institute of Technology, MIT, topped the rankings for the sixth consecutive year. So, we have got institutions which move up and down, and certain institutions which are hopefully having a secular rise in the ranking levels. But institutions such as MIT, have been able to retain top ranking for years in succession.

And the MIT was followed by Stanford University and Harvard University, in that order for the second year in a row. California Institute of Technology and University of Cambridge in that order complete the global top five. Now there is a kind of lesson in this. The lesson in this is that, if you are able to establish a world class virtual university ecosystem or institutional ecosystem, the educational foundations that are led are not to be easily shaken.

Once you have the parameters well set, when you have institutional support, structures and processes well established and you have got good faculty and student intake, the educational

competitiveness of that institution would remain globally competitive for a long time to come. Therefore, we should really look at this kind of virtuous educational system to come in at the higher educational space. And 5 Indian universities feature among the top global 100 for research indicator by the same survey.

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Generally, if you look at the overall ranking, particularly in BRICKS 2018 ranking, which is about the developing nations or emerging economies, we will find that Indian Institute of Technology feature very prominently in ranking. Among the top 20 in BRICKS countries, we have got IIT Bombay, IIT Delhi, IIT Madras and IISc Bangalore featuring very prominently. As many as 14 institutions make it to the top 100 in this listing.

At the same time, we should also note that top 4 rankings are from China. India has certainly certain strengths in terms of the high proportion of qualified faculty and high productivity and quality of research. Now, these are the aspects which we need to build on as we look at higher growth and higher ranking.

And if we add an emphasis on innovation and entrepreneurship, enhancements in faculty and infrastructure levels, and we, as we elevate our cooperation with national and international industries as well as academic institutions, we can think that Indian universities and colleges will continue to forge ahead, not only among emerging economies, but also globally.

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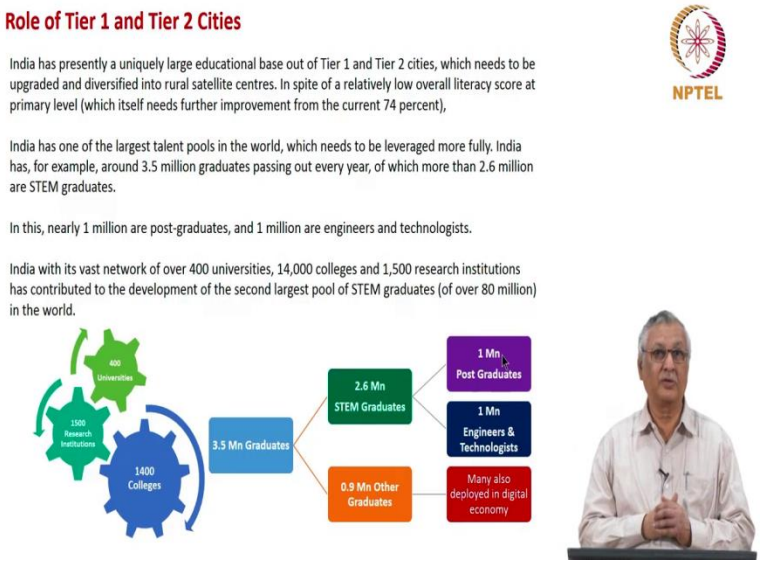

Now in this emerging educational system, what is the role of Tier 1 and Tier 2 cities? India, at present, has a uniquely large educational base out of Tier 1 and Tier 2 cities. As I said earlier, the proportion of colleges is more or less aligned to the proportion of living agglomerations in India, rural, urban. And within urban, it will also go in terms of Tier 1 as well as Tier 2 cities which itself is an engaging phenomenon for India.

So, in spite of the relatively low overall literacy score at the primary level, which of course needs the further improvement from the current level of 74 percent, we have seen that there is a diffusion of higher education capability. But how do we take it to the next level? That is our question. We have got many universities, many research institutions and many colleges, but how do we really take it to the high level.

We have got 3.5 million graduates coming out of institutions every year, out of it roughly 2.6 million are STEM graduates and 0.9 million are other graduates. Out of the 2.6 million STEM graduates, we have 1 million post-graduates and 1 million engineers and technologists. And even within the other graduating streams, many are deployed in the digital economy, because it is not necessary that to be a software programmer or a coding specialist, you need to be an engineer. You can be a graduate of other disciplines, but still have the ability to participate in the digital economy.

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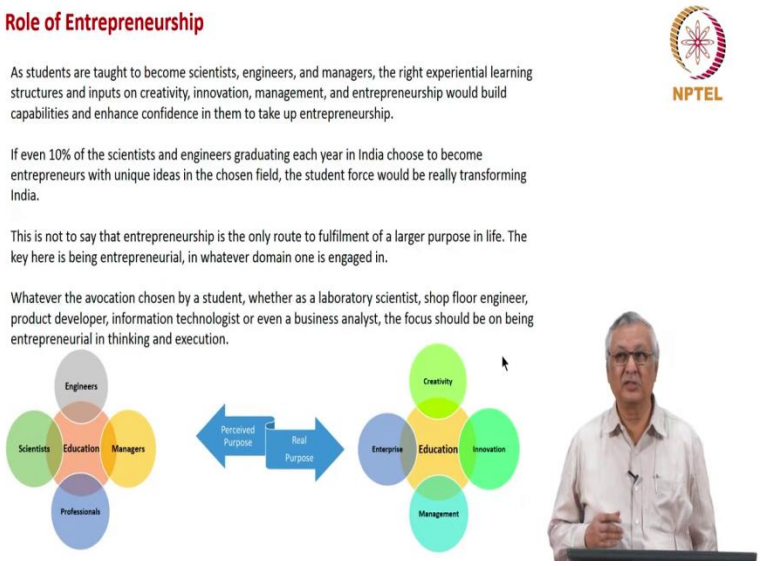

Now, why are we talking about education in such detail? The reason is that education and entrepreneurship have got significant nexus. If you see the graphic below, there is a perceived purpose of education in our minds. The perceived purpose of education is that we should make people become engineers, scientists, managers, or other professionals, the chartered accountants, the company secretaries or anything other like that.

So that is the common perception, not only within the family system, but also in the students themselves that we should become A, B, C or D in terms of the role we will play in the society. If that is the perceived purpose, the real purpose is actually different. Real purpose of education is to enhance creativity, enhance innovation, improve management, and enhance enterprise in individuals. The real purpose of education, I would repeat, is to enhance the levels of creativity, innovation, management, and enterprise in an individual.

So once we say that the real purpose of education is to take a person to higher levels of capability and accomplishment, we will be able to understand the nexus between entrepreneurship and education, because entrepreneurship as we have discussed earlier, is very much dependent on the relationship between our creativity, passion between innovation and commitment on one hand and the ability to create a product or service and deliver effectively in the marketplace.

Therefore, the attributes which I have discussed in the right hand side of this slide are probably more important than the role related requirements or role related imaginations we have of education. This is not to say that an entrepreneurship is the only way for progress of an economy or for progress of an individual in the larger system of life. The key here is to be entrepreneur in whatever domain one person is. Even if a person is employed in an industry, even if a person is employed in a large formal organization, it is possible to be entrepreneurial and then grow the business.

Suppose you are part of a big industry; the industry cannot sit on its laurels. It has to continuously grow. To be able to grow, you may have to expand into other markets, you may have to set up new lines of business for which you need to create new products, establish new facilities and find out new ways of marketing your products, which means that there is an entrepreneurial requirement of doing something in an uncertain environment, which is the essence of entrepreneurship.

Therefore, I would say that being an entrepreneur in an entrepreneurial sitting is something which we can understand. But being entrepreneur in a formal sitting in an established industry is less understood, but is equally relevant. Therefore, whatever will be the avocations chosen by a student be it a laboratory scientist, shop floor engineer, product developer, information technologists, or even a business analyst, the focus should be on being entrepreneurial in thinking and execution. How do I enlarge the envelope of my contribution to the market I am serving, to the individuals I am serving or even to the society at large.

Now mechanistically speaking, if we have millions of engineers and graduates joining our talent pool over the years, even if 10 percent of the engineers and scientists decide that they would have an entrepreneurial career, definitely the impact on entrepreneurial movement is going to be very substantial and that is where the whole opportunity lies for the Indian educational system.

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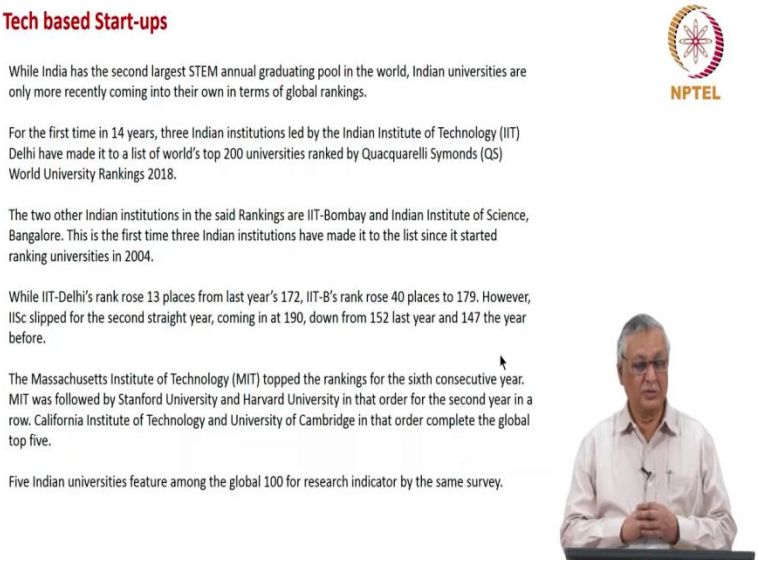

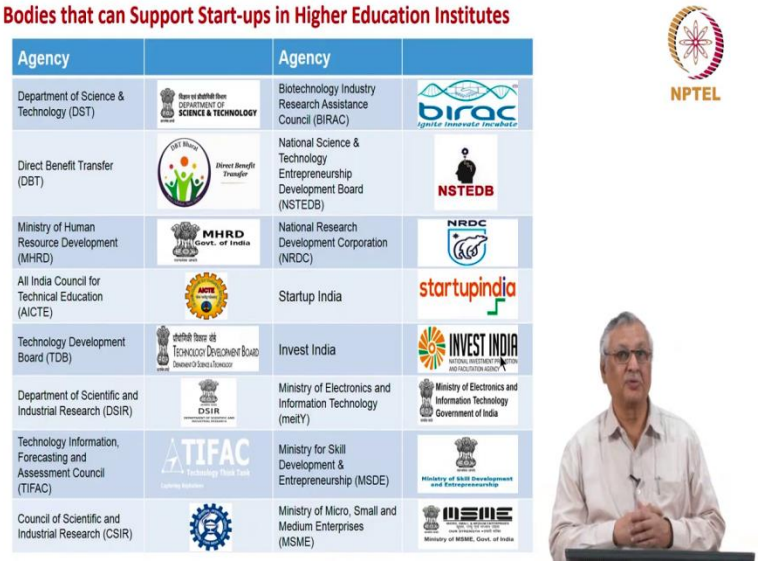

Now, let us talk about tech based start-ups. Now, there are several bodies that can support the start-ups in higher education institutions. We have here Department of Science and Technology, we have got Ministry of Human Resource Development, All India Council for Technical Education, we have Startup India program, Invest India program, Ministry of Micro, Small and Medium Enterprises, all these bodies are in some way or the other engaged in supporting higher education. And these are only a representative sample of the bodies of the government which are engaged in supporting higher education.

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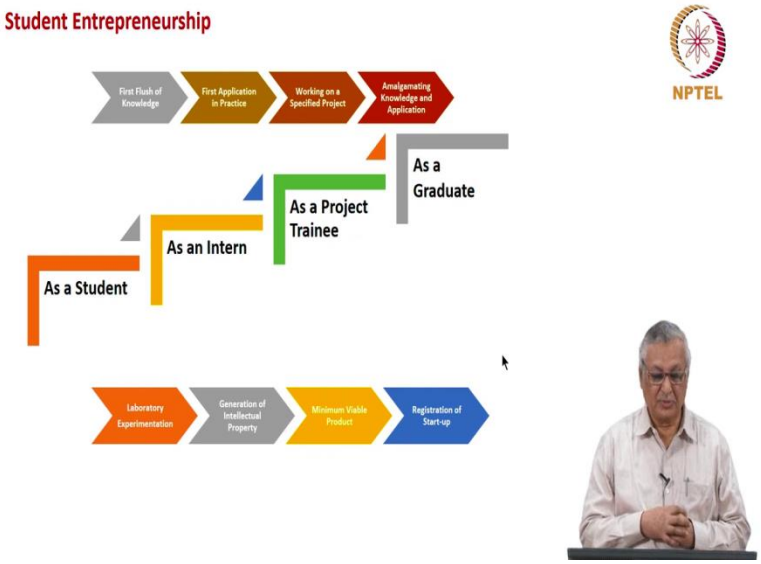

Now, let us specifically talk about student entrepreneurship. How does a student entrepreneurship function? It functions at four levels. First as a student, understanding the domain which one is specializing in and then absorbing all the knowledge, understanding how products are made, how services are made, how businesses are run, that is the knowledge foundation; there is the knowledge part of it. It is you may say that this is the first flush of knowledge one person has. And it also gets accompanied by laboratory experimentation. These days there is no course that is taught without some kind of experimentation in laboratory.

Traditionally, we knew the chemistry laboratories, the physics laboratories, the mechanical engineering laboratory and all that. But today even for social sciences, we have got laboratory based experiential learning. Digital economy is learned through laboratory modeling and simulation. Therefore, as a student you have the opportunity to absorb knowledge at a fundamental level, which will serve as the foundation for the future, but also intertwine that with the laboratory experimentation.

The first application in practice occurs during the student life as an intern, when a person moves into an organization to function in a particular domain. Today an encouraging facet of our education system is that many start-ups are engaging with college students or IIT students to work as interns on very specific modules of creativity and innovation, which the start-ups require, and this is also helping generation of intellectual property.

For example, if you look at, let us say, a smart device, a module could be to encrypt all the data which is generated by the smart device and which is being collected by the smart watch developer or the smart device developer. So, this module of encryption could be a challenge or a project provide to an intern and this in turn helps generation of intellectual property. So when you work for the first time in industrial setting as an intern, you have an opportunity as a student to develop a project which is standalone in its own right, although it is part of an overall project system, but also generate certain intellectual property related to that.

Then towards the end of the course, the student gets often an opportunity to work on a full-fledged project which could be for 4 months or 6 months. That is when we can really work on a minimum viable product, a concept which we discussed in the earlier sessions. That means that the student has got the ability to convert all of his knowledge, all of his experimental knowledge into a product or a service which is developed and offered to an industry. This is again a very good option to check out his own or her own entrepreneurial skills.

And finally, when the student is entrepreneurially inclined, by the time he or she graduates, the entire spread of knowledge and application that we have seen in the previous three steps can be amalgamated and a start-up can be made. This model of student entrepreneurship at times occurs almost simultaneously. There are students who even register their start-ups as they go through the educational stream and that has been made possible by the government policies as well as other policies.