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HIGHER EDUCATION PERSPECTIVES FOR AN EXCITING EDUCATIONAL EXPERIENCE – PART IV – AN INDIAN CONTEXT

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Abstract. India needs a large number of people with a wide range of professional skills. It is essential to equip young Indians with specialist knowledge, practical skills and the right attitudes to take the challenges of real life and enable them to make strong contribution to a forward thinking nation. Educational advancement of people, innovative education practices, sustainable educational development, achieving significant improvement, and passing on knowledge to younger generations is essential in the larger interest of the nation. These require more comprehensive educational reforms to bring about perceptible change in the thought process of people and a positive transformation in the society. This will ensure sustained attention to development of the higher education system in this techno-scientific age. There is an urgent priority to take up large scale reforms in the higher education sector to meet the existing and emerging socio-economic challenges and to reach our goal of inexpensive world-class higher education in an efficient way.

Keywords: inspired education, higher education movement, analytical thinking, learning challenges, Indian context, knowledge base

This paper is organized under selected headings - Wheels of change, Inspire the next, Excellence in quality, Empowering minds, Education challenges and Causes for concern. It is an attempt to appeal to the intellect, creativity and imagination of general readers, and to sow the seeds of progressive thoughts and excellence, to take India to the next level. The principal purpose of this narration is to illustrate how in a short period of time our nation could train enough promising youngsters for scientific success through a transformative process. Using a proactive approach, individuals can make significant contributions to solutions at the micro-level, while the academic community supports them to lead the nation to success. Progressive thoughts can create turbulence, and winds of change and experiences. Ideas and concepts can result in educational, environmental and social initiatives and theme-based interactive activities to achieve intellectual sophistication. The scope of the paper is limited to raising important questions about contemporary Indian science practice and discussion on how the higher education reforms would be useful in the process of transformation. The paper highlights the need

for access to proper higher education, a framework of progressive educational policies, and for researching the effects of quality parameters on exceptional performance. This educational vision and focused approach, coupled with appropriate policy matters, can result in a significant positive change on the path of prosperity. This will send out a resounding message to the younger generations, encouraging them to think about the reforms to move forward with technology, skills and opportunities for success. There is a need to change their mindset to go beyond mediocrity and achieve excellence, particularly when the nation is emerging as the new academic destination globally. The vision is to promote environmentally and socially sustainable growth through best practices in education, to empower and enhance the ability of youngsters to fish for life in calm and turbulent waters; symbolizing serene, and chaotic situations. The higher educational process transforms the individual, fostering confidence, and instilling the discipline to chase their dreams. It encourages a life-long commitment to learning, growing, changing, quality and timeliness. This paper is an attempt to encapsulate the perspectives on a journey to uncover the many layers of higher education reforms and to trigger higher education movement, leading to major reforms.

Wheels of change - making a mark

Education is ranked eighth in the top ten problems humanity faces in the next fifty years, and in India large majority of people are of working age.[1)] We have to aim to promote scientific and technological innovations, from the internet to the Mars mission, for youngsters from all parts of the country via distinct educational ideology. They should be equipped with knowledge in a wide spectrum of disciplines to take on the issues and challenges of the real world and become enlightened citizens with strong value bases, to play an important role in building a progressive nation. Driving young minds toward success by working harder and providing opportunities for recognition will be essential. They should be diligent and smart in the performance of their duties with the ability to deliver. This can be achieved by adopting a cooperative, competitive approach with implementation realities, evaluating every single aspect of the situation. The challenge of change for good lies in overcoming the limitations of current higher educational system, to make it more vibrant and to follow international educational best practices. Sincere, disciplined individuals with robust work ethics can drive a "development without greed" campaign and take steps to find practical solutions to major and pressing problems. In the light of the complexities of contemporary Indian life and a constantly changing modern lifestyle, these nation-changing decisions become important. We have to train the young minds to collectively emerge from their comfortable confines, help them to discover the immense possibility of being radically different and effectively encourage them for thinking out of the box.

Although there has been a marked increase in the number of higher education institutions and the student enrolment, the delivery and outcomes of higher education needs substantial improvement. Uses of innovative information technologies, regulatory reforms, refocus on intensive research, financial support, and professional education and training, are essential to enhance the overall skill levels of the people (Fig. 1). Sound knowledge of the subject, professional and practical skills, healthy attitudes and right values, and performance at maximum level of capacity, can lead to personal success. The higher education movement marks a new direction in Indian science as it creates a lasting positive impact on the society and it can act as the source of inspiration for emerging science research activities on Indian soil. Integral to the making of a fine university is the coming together of infrastructure, academic resources, administrative machinery, teaching faculties and learning communities. Indian higher education reform faces the ultimate challenges of five E's - *excellence, empowerment*, *expansion*, *evolution* and *equity*, and three T's - *talent*, *technology* and *trade*. Several studies have explored and examined the emerging trends in higher education in India, and reflected on a wide range of critical issues, specific concerns, perspective pointers, new directions and recommendations.[2)] Gardner describes five minds for the future, related to intellect and character; – disciplined, synthesizing and creative, respectful and ethical minds (Gardner, 2007). The mind needs intellectual stimulation to develop and this provides positive and beneficial neurological changes. Higher education is one of the most important ingredients for the intellect to cultivate insight. The lack of proper higher education has major societal consequences. It stifles productivity and advancement. Effective combination of different approaches and time management is required to optimize efforts to ensure higher levels of productivity. Critical thinking ability and action planning can influence future generations significantly. The courage and conviction of the intellectuals, who realize the necessity to make Indian higher education world-class, would result in the enhancement of knowledge and an expanded world view, and inspiring others to contribute to the larger interest of the nation (Fig. 2).

Inspire the next - mobilize the masses

India has the explosive potential to chart a new future and to provide global quality products, processes and services via business ideas, high quality talent, and labor. Transforming the education, industrial and agricultural sectors with integrated solutions and optimal resource use, helps achieve long-term goals. Rapid and large scale steps can make extraordinary differences. Chemicals are produced in our brains, inspiring us to go that extra mile and have deeply satisfying and significant experiences. The long-term impact of poor quality higher education will inevitably lead to considerably higher unemployment or underemployment rates.[3)] The challenges include motivating

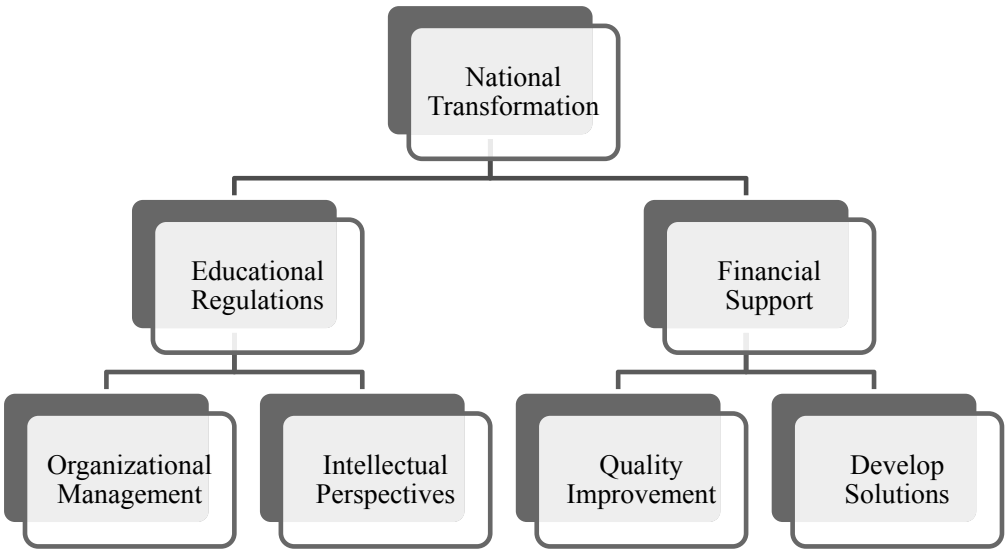

Fig. 1. The practice model of development for radical change involving higher education, assistance, regulations and management for long term sustainability

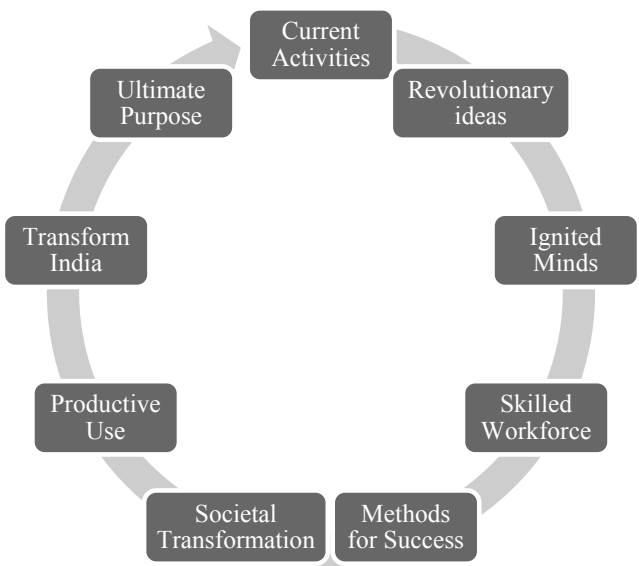

Fig. 2. The revolutionary ideas to change current activities and successful techniques to transform the society to boost India's productivity manifold with the better perspective

people to achieve quality, and creating achievement oriented youngsters, equipped with an international perspective. Fast economic growth that raises living standards is not sustainable without strong human capital development. Productive work is the source of national wealth. Education is about inspiring people to do their best, and it is very inspiring to ponder the incredible capacity of the human brain. We have to create the right environment for learning, research and innovation. We have to set short - (< 6 months), medium- (6 months-1year) and long-term (>1year), realistic higher educational goals and leverage the strategies of standard educational operating procedures to build stepwise or integrated solutions. The concept of courses offering life lessons, with the unique blend of tight traditional values and contemporary liberal lifestyle, indicates a future direction. A course on money management, for instance, can equip the students with basic financial literacy. It is important to empower and mobilize a critical mass of people for change to create a wave of transformation making a significant contribution to the betterment of the country. The revolution in higher education research requires new ways of thinking in a stimulating environment. The long-term consequences of a research based learning approach are significant.[4] Research provides critical insights on the useful links between higher education and knowledge, skill set and attitude. The higher education process can develop a taste for intense research work. The success of a changing research culture plays a significant role in producing excellent results.[5]

The recent attitude trends of today's youth are silent acceptance of things as they are, lack of courage to complain, and the lack of will to change the world or make a difference. A progressive mindset requires idealism, hope, determination, creativity and lateral thinking skills. It is necessary to make the education exercise more interesting, exciting and challenging, using positive reinforcement to acquire the required level of maturity and self-confidence. Future thinkers must break the silence and come forward to share their educational experience, highlighting the real educational issues to be addressed. It will require more studies to resolve how both teachers and learners benefit from teaching-learning interactions in the contemporary Indian context, gathering evidence from the learning impact angle. Thus the way forward in the higher education revolution is to gain mainstream attention and wide acceptance for this better future, by making use of the available communication technologies. An educationist-inspired mass movement can cause a paradigm shift and create a new tangible, active and dynamic vision for societal transformation. It should inspire strong reactions, mobilize and move to action, set in motion educational reforms and aim for the highest possible educational outcome. We have to create collective actions that appeal to youngsters emotionally and intellectually for broader social and ideological implications. It is like different strands of yarn are woven together to create a beautiful fabric. Every individual must imagine for himself and perform meaningful work for transformation in the society. There is no

single clear-cut solution to taking care of different aspects of work and the key lies in practicing the technique of prioritizing sensibly. The visionary leadership which has the spirit and determination to take the higher education challenges could act as a facilitator for fostering events at local, national and international levels. There has to be serious deliberation on the question of why many talented young Indian people are not coming back to India after acquiring their international higher education.

It is important to sensitize the public to the problem of higher education quality standards for the real change to take place. Young people should be involved in a wide range of academic activities that bring about positive change. In this context, "Improve the Indian Higher Education" campaign to reach the wider audience effectively, creates awareness and enables people to take timely and effective steps for maximum impact. It is essential to create a stronger body of public opinion and launch a nationwide information campaign, about mixed mode of delivery in colleges. This includes structured active online and conventional modes. The challenge now is to convert the opinion into wave for the benefit of the individual and the country. Reform conclaves, panel discussions, fiery speeches, road shows, street plays, celebrity campaigns, smart campaigns, and digital movements may be required to inform and provoke people towards transformation journey and also help capture the attention of both the media and learners. The activist groups and academic bodies should target higher education transformation in India and initiate particular activities reflecting upon the problem of the system, and make people participate in the movement for higher education reforms, to create a conducive climate for research and development action projects. The educational organizations can contribute via advocacy, awareness and counselling. Online education activists can initiate an anti-corruption movement and carry on vigorous campaigning. The Citizen's Ombudsman Bill (Jan Lokpal Bill) is a significant step in the war against corruption and to ensure transparency and fairness. We have to integrate anticorruption curricula into education to drive societal change using preventive reforms. If the anticorruption agencies become an aggressive symbol, more transparency and better accountability will actively impact our society.

We have to activate multiple new pathways to reach a wider audience for an improved progress. Platforms are needed for all stakeholders in scientific development such as intellectuals, industry leaders, policy makers, regulatory authorities, technical consultants, academic evaluators, academic advisors, progressive thinkers, technology providers, effective communicators, opinion makers, concerned citizens, planners, investigators and scholars, to encourage critical discussion on many higher education-related activities, quick exchange of ideas, practices and concepts related to education and to impart the knowledge, skills and wisdom. The power of sharing interesting stories of experiences in science principle and practice, an aspect of their work or a practical

perspective by scientists on a regular basis, can give an orientation and enhance a nation's prosperity of intellectual horsepower. Sharing wisdom, opinions, principles and thoughts, help open windows and allow the winds of transformation whistle through our lives. A good thought with some universal and forceful appeal, is like a spark that causes a fire to produce light, heat and sound in different proportions. It is possible to increase higher education awareness considerably, through an open participative extension service network and activities of online and social activists.[6] Social awareness can be increased by publishing the reform message in the most convincing manner both in print (newspapers, magazines) and visual (television, internet) media and create taste for better higher education among the audience. Making the right noises on the intellectual movement, along the length and breadth of the country, and taking informed decisions with proper consideration of all relevant factors is necessary to have paradigm shift in Indian higher education system. Developing a healthy dialogue with the public, organizing massive protests or demonstrations against current conditions, and voicing preference for high impact higher education, aids in the effort to create better academic opportunities, and lifestyle improvements. All various platforms are essential to share the quality improvement ideas in higher education and training human resource, to have a better understanding of international best practices in higher education, and to explore the possibilities of academic collaboration between educational institutions and industrial organizations. We have to catch the imagination of young people around the nation and make a countrywide call for them to rise. This is a further step to bring about revolutionary changes in the higher education sector and so much remains to be done in a short period of time.

Collaborative research speeds up the useful process to move on with a new perspective for collective growth, leading to increase in research output. Current scientific knowledge suggests a combination approach involving behavioral approach, framing policy matters and implementation aspects is most effective in producing interesting results in integrative science research. Around the world, there are several high profile companies with big corporate social responsibility (CSR) budgets. They like to associate with worthy educational causes and institutions, where they can actively contribute their expertise and skill sets. Main stream corporates can sponsor internship programs and live projects for learners, and provide placement opportunities at a later stage for students passing out the portals of these institutions. Further, they conduct talent assessment examinations or science Olympiads, and other science education initiatives, thus helping in skill development. They can play a crucial role in creating a platform for science community and corporate, to conduct powerful idea exchange sessions, thematic panel discussions, awareness interaction sessions, and drastic course correction campaigns. These philanthropists, high net worth individuals and chief executives of business houses feel that

patronizing basic science research is a reflection of their refined taste. A recent case is Rs. eight crore donations by the Cipla chairman to promote chemistry.[7)] There is a need to integrate higher education into science as a vocation, and to adopt multiple methods through which this can be achieved. Scientific speeches inspire budding talents to go ahead and take the interesting and exciting challenges, exploiting a number of possibilities inherent in scientific expression to maximize the desired effect. Understanding and practicing principles and values, courage and respect, reasonable restraint and righteous action, allow us to evolve convincing solutions to the education challenges facing the country. A committed visionary government would provide land, water, electricity, transportation, health clinics, roads, schools, drainage, tax concessions and safety nets to educational megaprojects. A revolutionary higher educational movement has the potential to bring about significant and benchmark performance rather than just small incremental increases in quality. Corporates collaboration with academic institutions, focusing on the use of microteaching approaches, and innovative methods to develop entrepreneurship skills, and popularization of the marketing of the locally, nationally and globally available products and processes are some progressive steps to be taken. Some companies are already conducting short-term courses to address the gaps in the educational framework as a part of their broad based welfare program.[8)] It is important to adopt interdisciplinary perspectives in research and to strengthen the university-industry interface to boost research and long term development activities. Investment proposals and business schemes in science and technical education, research and development, healthcare and energy sectors should be encouraged to stimulate specific growth areas. The research in various topics adds to overall knowledge of diverse subjects, possibly helping to find advanced solutions to complex problems and potentially having direct or indirect links for the benefit of society. The sense of exploration and excitement results in advances in technology, the emergence of new evidences, techniques and facts, and enhanced the profits. Educative enterprises can also make a huge difference and the social entrepreneur has a role to play in stimulating creative thinking and dynamism to accelerate social change. The emerging community of social entrepreneurs could assist in encouraging youngsters to find solutions to India's education, management, and leadership challenges.

It is clear that a small group of passionate educators, thoughtful citizens and committed individuals can influence others' thoughts, with several stimulating practical ideas, innovative visions and action plans, to bring about the much required large scale change. One step is to send an open letter to concerned ministers and relevant members of parliament by a group of scientists, educators and other concerned citizens highlighting the important changes in the higher education policies to pursue and change management aspects. The private players in the education sector can play critical role in

building a progressive nation and it is essential to frame progressive higher educational policies that inspire international universities to open branches in India. It can become an attractive destination for global universities to deliver high quality higher education while offering interesting insights. Framing a standard operating procedure across the country to prevent the problem of implementation paralysis is important to achieve fast growth. In particular, it is worthwhile to start Science Research Group Consortium (SRGC) with active collaboration of academic institutions, research laboratories and corporates to trigger critical thinking responses for new ideas, on a variety of education issues. These would include coherent and effective policy matters for a new India and promote change in education and breakthroughs in research activities. A memorandum of understanding (MoUs) signed between investors and the government would translate into real projects and implemented with incentive policies. Global science research is increasingly becoming a private enterprise, with philanthropists acting as patrons of social progress through science research in a mission to make public, science, space exploration, environmental studies, molecular biology, effective treatments and other central topics. A proactive approach has to be applied for research activities leading to better research results. To have a maximum impact, it is essential to steer the higher education movement, with the right momentum and with a sense of direction.

Excellence in quality - substance over form

Sustained purposeful work, built on strength, knowledge and capabilities has a social and economic impact. Changing the current perceptions about scientific research, and generating creative ideas to overcome obstacles, solve problems through a systematic approach will have a significant impact on the situation. There has been a decline in the quality of higher education in the last decade[9)] and we need to bring back the energy and enthusiasm in our teachers and students, to change the notion of the nation about excellence in science and engineering education. A healthy pursuit of excellence to reach noteworthy levels of full potential is required. High-quality higher education and innovative science education programs for college students in India have a huge impact on all facets of society. To succeed in the world of scientific discoveries and inventions, higher education specially designed to transform and enhance the performance of students is essential. Creating quality awareness at all levels should be an integral part of inspirational science and engineering programs. Professionals need to increase their knowledge and competencies in providing rigorous training, as well as boosting will power, optimism and vision to make a real difference to the science education. It is the use of knowledge that makes it valuable. Building a new level of academic excellence with the right strategies can improve learning outcomes at an individual and scientific community level, leading to accomplishments in life (Altbach & Salmi; 2011). There is

a need to undertake fundamental long-term changes to stimulate creative thinking and dynamism and to touch and transform the lives of billion people. In addition to achieving the highest quality in processes, products or services, it is important to have a quality mindset and work culture imparted by higher education as a tool to stimulate the mind. This can bring about a profound transformation to promote the progress of a country. It is essential to expand the manufacturing base of engineering goods, pharmaceuticals and software, to promote growth oriented economies and enhance the quality of workmanship by following best international practices. The establishment of industrial zones, for example, factories from foams to fridges, with distributed manufacturing and policies in place are necessary for long-term sustainable success. The exploitation of science and technology to enhance the economic and social growth could act as catalyst to propel India to secure rightful place in the world. The growth of production in multiple areas such as aluminum and steel, construction and cement, automobiles and machine tools, electronic components and electrical power, computers and software, agriculture and food processing, chemicals and pharmaceuticals, advanced materials and sensors, could contribute substantially to national development. Air and water pollution caused by factories and other industrial units, have to be tackled to restore the sanctity of nature. A new government will be in the perfect position to take certain concrete steps to frame stronger policies with inbuilt checks and balances, to boost the manufacturing base and therefore increase economic growth, in India. It is also necessary to promote a dynamic entrepreneurial and innovative culture for long-term development and industrialization. This requires strength from right thinking people from a cross section of society leading to dramatic improvements for India's higher education sector.

Everyone in the institute should think that she can make an impact in her area and contribute to make life better for everyone. As part of human resource management strategies, attracting the best talent, and increasing diversity of academic disciplines, will help keep the focus on innovation and creativity. There is much scope for world-class innovation, to take it to an altogether different level through new scientific equations, personal development and integrated teamwork. It is essential to promote best practices in education with intellectual rigor to have wonderful experience and create an indelible impact. Better academic engagement and improved performance of learners should be reflected in measurable learning outcomes. The assessment process involving qualitative and quantitative assessment of learning objectives should be designed to enable teachers to distinguish wheat from chaff using an evaluation system which tests the overall competence of learners in conjunction with continuous academic performance. The 'good' teachers perceive and fulfil their different roles; information provider, facilitator, assessor, mentor, curriculum planner and the creator of resource materials, efficiently and earn the respect of learners. The establishment of technology transfer cells and ed-

ucation technology implementation centers at higher educational institutions will help in dissemination of information related to teachers and students. This could facilitate teacher training in analytical assessment and feedback design or student assessment requirements and announcement of results in each subject.

There is strong desire for change and we have the enormous potential to perform better. Higher education boosts our brain powers through activities that are coordinated by complex interactions of nerve cells in the brain. The life-long learning leads to the formation and growth of new cells, neurons, in the human brain and improve cognitive skills, enabling to think more efficiently and effectively. This will certainly keep the mind sharp, develop mental focus, obtain wider perspective, and reach new levels of understanding. The power of the mind when controlled, can allow us reach incredible heights with our constructive thoughts and deeds. All round development of individuals and holistic growth of the nation is a difficult task. Immense efforts have to be made to establish and maintain a healthy growth-environment balance. Let us direct the energy of youth to the proper channels, to make use of its power in productive ways and create an enabling environment, achieving full potential by focusing on unlimited opportunities. We can open the doors of development through perceiving exciting information, assimilating knowledge, the thought process, and application to practical problems. We can develop each type of intelligence (word-, number-, picture-, music-, body-, people-, self-smart) through rigorous education and experience, to enhance natural ability and refinement of skill. The great minds of Einstein, Edward De Bono, Stephen Hawking, Thomas Edison, Helen Keller, Leonardo Da Vinci and Walt Disney, inspire us to maximize our potential, become better thinkers, and achieve greater heights in our chosen fields. It is important to inspire the next generation, especially aspiring students. It is essential to establish 'centers of excellence' for several core areas of science, to be integral parts of talent development process and create a culture of excellence. We have to follow the path that leads to success with the right kind of high intensity training and proper stimulating environment, continually improving thoughts, ideas and solutions with review, alterations and refinements. Higher education works in two basic ways; changing the biology by creating more connections between brain cells associated with learning, and altering the behavior by promoting appropriate attitudes, values and lifestyles. There is a growing recognition that it is possible to alter the brain's chemistry using environmental stimulation.[10] This makes the brain work harder by providing stimulating learning experiences. It has profound significance for collective achievement through new inventions, evolutionary technology, technological progress and creative breakthroughs. In this context, 'science exchange and outreach programs' would have a beneficial effect on the economy.

Teacher training certification is essential to have up to date knowledge and skills in the world of science and technology. The educational requirement of finding, training

and retaining excellent workers in specialized areas is a challenge. Productivity improvement results from highly engaged employees and learners ultimately leading the nation to success. The academic leaders must speak out to change attitudes, promote basic education about reforms, and optimize the skills, experience and productivity of all the higher education administrators and faculty members, to influence higher education related long-term transformations. It would influence and inspire individuals and remind them that they are capable of doing much more. Extraordinary individuals make for extraordinary nations by bringing out the best, at the individual and collective levels. It is possible to achieve success through local action and special initiatives and national effort, and exciting science research and revolutionary concerted efforts over the medium to long term will show positive results and drastic improvement in standards. It will be interesting to see whether the emphasis on higher education on radio and television can introduce a change to create a positive state of mind. We would be able to deal with higher education issues, by rational thinking process, and acquiring enough background knowledge, helps to influence concerned political authority. As a first approach to pave the way for change, we have to encourage six C's- confidence, cooperation, coordination, courage, clarity, connection, and discourage three C's- cinemas, cricket and chatting. This is necessary to increase putting time to productive use and reduce time on non-productive activities. In India, work interruptions, wastage of time on telephone and internet, attending to insignificant works or unimportant jobs and procrastination reduce efficiency considerably. We have to understand and realize the importance of self-discipline, control, and effective time management skills. These are essential parts of core management principles and work plan implementation. The new government can promote a revolution in higher education and take measures to increase enrollment in institutions to channelize local aspirations. It should have a plan to promote domestic production and export of manufactured items such as textiles, chemicals, electronics and machinery. The vision of the future coupled with a clear message about relevant and important aspects of change provide proper direction. People should attempt to change the higher education system by thinking differently, and by acting boldly, in their pursuit of creativity and innovation. The key is to develop excellent intellectual capital development systems, bring drastic change in the thinking process, and decode the secrets of nature through research activities.

Empowering minds - stay ahead

The power of ideas, competence and insight helps to shape India's growth direction and a modern higher education should include all aspects such as scientific knowledge, managerial and technological skills leading to a healthy social reformation. To make a remarkable impact, it is essential to provide a broad perspective that will open up new

horizons of knowledge for the virgin minds of youth. It is important to develop an achievement motive and a desire for individual commitment to achieving concrete goals in life, for any scientific achievements, engineering skills and technological advancements. The process of empowering young minds also involves the generation of new educational ideas, drawing on both ancient wisdom and current practice. It is essential to enhance avenues for government-private participation in the higher education sector to create a knowledge society with forward thinking processes. The resultant iteration of the core courses will include multimedia centers as libraries, auditoriums and other physical and intelligent infrastructure, mega science and technology parks of India (STPI), university based advanced research parks and centers for study in industrial growth, world-class universities, higher level intellectual transactions, and multidisciplinary curriculum. From an Indian perspective, government needs to lead in setting up of special scientific zones to nurture and nourish scientific community and to reflect the contemporary science environment. "Science Centers" in the capital of each state could encompass working models from different branches of science to ignite the young minds that will populate the high-performance organizations of the future. A scientific community based project, on establishing specialized biological/chemistry/physics mega-parks, in an effort to showcase science working models could contribute to shaping the nation's future. An academic trip to these science centers by learners will bring about the most positive perceptions about science and surely inspire new scholarship in teaching or research by change in orientation. Proper educational environment can shape learner in its own mold, taking learning to the next action-packed level.

It is essential to look at the issues of minimizing monopoly, reducing bureaucracy and political interference and improving accountability. These are intrinsic to eliminating corruption, favoritism, nepotism, and workplace harassment. Public spending on higher education reforms needs to be properly channeled to ensure the requisite number of employable professionals for India and to create platforms to raise the larger issues: reform mechanisms and science education investigations. It is prudent to join hands with contemporary global providers of higher education solutions to carry out educational megaprojects. This will ensure sustained attention to the development of a domestic embedded education system. It is not uncommon to find mindless destruction of forests, changing ecological conditions and causing environmental degradation. This has to be prevented for the sake of sustainable development. It is evident that today's natural disasters are increasing in severity and frequency because of human activities. We have to understand the main perspectives of environment and biodiversity. Scientific management of natural resources and biodiversity conservation, rather than market-inspired modernity, development of real forests instead of concrete jungles, for example, plays an important role in altering attitudes, thinking and behavior. The construction

of civil structures such as dams, bridges, buildings and establishment of functional machinery such as generators, pumps, turbines must be done in natural surroundings to bring out an interesting blend of engineering and nature. Use of environment friendly materials, adoption of eco-friendly features, and adherence to all statutory environmental guidelines can make a real difference. It is essential to control toxic release from different industries, consumerism and ever increasing population, to reduce the effect on imbalance of natural order. A sustainable and impactful model such as the 'train the trainer' approach on a large scale, with financial support from philanthropists, industrialists, educationists, professional bodies and corporates will allow thousands of teachers across India, to enhance their knowledge and life skills, and experience a new dimension in learning, to bring about a perceptible rise in the quality of higher education. Here the selection of brilliant scientists of outstanding competence, not influenced by any extraneous considerations, is important to initiate an active discussion and more educated debate regarding future educational activities, and to ensure an expeditious positive conclusion to the higher education reform related issues. The issue of higher education reforms is prominent enough to be dealt with on priority basis and this may result in brilliant original schemes and thrilling discoveries. There is a need to bridge the gap between academic production and corporate expectation to enhance the capability of the youth and to effect major transformations. It will require larger, dynamic leadership roles in the country to propel future organic and inorganic growth, and to actively encourage national talent pursuing an aggressive growth trajectory. It is important to honor people with outstanding accomplishments in teaching and research, extraordinary leadership skills and exceptional commitment to science popularization. Similarly, young investigator fellowships to obtain professional promotion can act as a stimulant, which can trigger energy and improve the quality of research. The fruits of higher education, that nurture many of tomorrow's leaders, visionaries, should connect millions of young Indians with a common goal.

Education challenges - different perspectives

The identification of specific higher education challenges and a clear vision of how the reforms will affect future prospects is half the battle won (Singh; 2012; Joshi & Ahir; 2013; Thimmappa, 2014). The discipline of science is historically populated by learners who score highly in sensing, thinking, judging and extraversion traits (Butt; 2005; Myers; 1998). Their learning approach tends to find success as incidental when combined with passion, discipline, meticulous micro-managing, perseverance, and professionalism. It would prove useful to conduct curriculum conclaves of the multiple stakeholders, and collect their thoughts on higher education reforms and promoting multidisciplinary approaches in high-impact teaching and research. It is proposed that an extensive survey of

young people via a structured questionnaire be conducted to incorporate their viewpoints in the recommendations of reforms. The analysis of the results will likely reveal certain important implementable aspects of our vision, as educators, for a new higher education system. Studying the factors affecting the quality of higher education through surveys on overall program content, assessment patterns, employability aspects, social interactions and public image, is certain to reveal possible improvements. Further, study on current trends, coupled with the expectations of new-age learners is vital. It is important to view various educational activities through different lenses commonly considered to affect educational outcomes in India. Understanding these perspectives can show us ways to modulate the education system and improve the standards of higher education. It is evident that visionary perspective is needed to build a long-term sustainable higher education system. There is concern over declining academic research standards, rigid academic structure and lack of autonomy in institutions, lack of incentives for high level performance, dysfunctional regulatory and accreditation systems, and differential employment opportunities across a wide spectrum of disciplines. The journey of searching, discovering and life-long learning, to attain knowledge and perfection should be based on the solid foundation of the science. This will actually translate into conceiving, conducting and publishing research outcomes and put the entire process of progress into fifth gear. It is certainly important to preserve, protect, nurture and promote biodiversity while significantly contributing to industrial development activities. We do this by establishing new industrial clusters and parks in barren lands as the falling contribution of agriculture to the gross domestic product is a concern in recent years. There should be considerable increase in agricultural production in the coming years, using organic farming or other improved methods of cultivation, as population explosion still remains an unsolved problem.

It makes perfect sense to rejuvenate the quality improvement program for faculty members and encourage the institutions to establish advanced innovation and incubation centers for entrepreneurial evolution, with a sharp focus and concentration on new product development process. We should not allow the higher educational institutions to be weakened by the complacency and incompetence that weakens the very foundations of our education system. In the larger interest of the nation, we need to restructure the syllabus taught in colleges to create a change to bridge the gap between industry and academia and everyone needs to take a first step to make a difference. The holiday science festival featuring participatory discussions, delightful conversations on diverse subjects ranging from chemistry, physics and computer science to synthetic biology, modern architecture and society, may involve deeper engagement and interaction. The establishment of a higher education consultative committee (HECC) and national science and technology advisory council (NSTAC) consisting of representatives from

several educational networks would promote national core curriculum on different science subjects. A panel of experts with representations from the education ministry, institutions and industries could regularly monitor the quality of academic performance. Regular discussions can expedite the institution building process and bring about the desired changes through the process of collaborative efforts. It is evident that educated people's mindset is indeed changing. The key is to reduce bureaucracy and information gap, and implement e-procurement processes. The dynamics of change could include maintaining professional freedom at individual levels and more operational autonomy to the institutions, to have long-term goal related implications. Talented people focus their interests across various disciplines and energies, and passion provides extra energy and time to work hard to achieve greater heights in life. Interestingly, attitude creates a drive for excellence, to produce model citizens with ideology, character and credibility to leave a mark.

The aspirational young Indian will have the right to work for the country. To reduce the overseas brain drain we have to create better opportunities for the post graduate and real world work experienced people to initiate advanced research projects (ARP) and improved educational activities (IEA) in diverse interdisciplinary fields. It is a daily struggle for those who join smaller academic, and research and development institutions and many people provide testimony to this reality. It is time for introspection. It is clear that positive action and intense awareness drive coupled with developing appropriate skills in the changing world is the need of the hour. We must instill a sense of national purpose, patriotism and an undiluted commitment to stability, honesty and the development of India in the minds of people. This lifts the nation and puts it back on to the road of prosperity to ensure the emergence of India, as one of the fastest growing economies in the world. Higher education is the seed of a nation's destiny and we must initiate the intellectual education revolution to become a launching pad for the tough, bold, ethical executive leadership positions in various sectors: the global thought leaders. It is essential to achieve a huge increase in the production of papers for publication in reputed journals with high quality peer review processes. The number of patents filed, published, and awarded in a short-span of time, also needs to rise if we are to have a voice and occupy prominent scientific space. A disturbing trend is the increasing pressure on the scientific community to publish results faster. This results in spurious publications. The scientific community should maintain its intolerance to the unethical practices of plagiarism, falsification and fabrication, image manipulation and gross misrepresentation of facts. Scientific frauds must be exposed expeditiously by scrutinizing the minute details of academic papers, avoiding the replication the results wherever possible, and using stronger punishments as deterrents. The accreditation and ranking of the higher educational institutes and universities must be done based on objective and accurate assessment in line with inter-

national accreditation standards and the statement of findings highlighting the strengths, shortcomings, weaknesses, concerns and observations should be documented. At present, Indian institutions and universities do not figure among the best in the world and there is a huge scope to improve and attain the benchmarks of quality and innovation. As part of professional planning and execution, adopting universal and standardized educational ideas, principles and practices has acquired greater importance in the current context (Fig. 3). The creation of a dynamic knowledge society with an innovative mindset, by the modern institutions of excellence and world-class higher educational infrastructure, will lead us to a more productive economy. This is possible by those youngsters keen to climb the professional ladder and raise India in the brainpower ranking.

Fig. 3. Scheme to make considerable changes in life using past, present and future activities to uncover creative potential by setting high standards and management approach

A premier initiative is a national workshop on "Science higher education challenges and nation-building in the 21st century" to actively debate on the current issues and action plans required. Further, we have to fill the vacancies of teaching and research

faculty in a phased manner over a period of 3-4 years in all existing higher education or research institutions to add immense value in teaching. It is also necessary to distinguish activity-oriented vs people-oriented positions and take necessary steps to weed out existing unnecessary faculty positions in certain premier institutions/universities. Faculty evaluation in teaching, research and service (institutional and professional) activities should be carried out based on certain established criteria in an objective manner (Seldin, 1980; Martin, 1997; Braskamp et al., 1984; Centra, 1993).

In several cases, rules have been bent to serve individual rather than national interests, and selection bias was adapted to suit individual needs rather than opting for collective opinion. Proactive steps must be taken, and specific guidelines must be laid down for transparency and greater representation of people with merit, from all over the country in premier higher education institutions, research laboratories and central universities. Preventive measures should be taken by employers regarding the interference by scientific 'godfather' and bring an end the high command culture. It is important to avoid discrimination between the branches of science, and favoritism in research funds, teaching load and promotional opportunities. This involves a mark of moving in and out of both the inner and outer academic circles, with intellectual marginalization, despite the academic merit and the psychology of trauma and exclusion. Another tendency is to take credit for very good results leading to success, in certain universities and national laboratories. We have to recognize and encourage people with active involvement and contributions to the project rather than supporting those in the administrative hierarchy. Thus the creation of better research environment will generate the confidence in people and we can expect better research output and social impact. Courses in agricultural engineering, sanitary engineering, and environmental engineering fulfill societal and community needs, and create a multitude of higher productivity job opportunities. It is important to enhance performance level and strive to reach greater heights through hard work. Although our contribution may be a nanodrop in the ocean, it is worth it. The administrative staff in educational and research organizations must display the maturity to implement policies and handle operational issues efficiently. India should push research organizations to refocus energies on developing new products, and processes. It is also important to maintain the typical faculty: student ratio of 1:15 and class strength of 20-40 to be able to deliver effective teaching. It has been anecdotally observed that the learner of today has a short-attention span; therefore it is asserted that it is better to involve young people in the process of creating a work of science. Holistic development of learning skills, combined with healthy food choices and exercises for whole of life is an important step, to start the students on a steep learning curve. Today, there is a huge volume of data, and an overflow of information available at the touch of a button on the internet, but proper accumulation, assimilation and dissemination of knowledge has to take place. The emphasis should be

on the creative thinking coverage and not on instantaneous information overload. An alternative framework involving a strong focus on science research, funding for large, medium and small projects, and new academic priorities may lead to contributions for a better understanding of science research. We need to enhance the momentum of educational research activities, and inputs from comprehensive academic research should be used to establish meaningful links with learners. A systematic approach involving set priorities or central concerns (most urgent tasks), secondary activities (less urgent tasks) and marginal matters (least important tasks) would help us in generating quality results with staged success and in addition, enable us to grow in a continuous upward spiral of transformation. It is time we started developing our appetite for higher learning, with a tendency to aim high before it is too late; start performing high-value tasks that are useful, now. It is important to bring a sense of urgency to several projects in the educational process and maintain transparent regulatory environment to propel India to achieve its full creative potential by providing the right kind of stimulus. It is essential to expand higher educational activities by establishing several major higher educational hubs in different places, with many technical schools and university departments. In the long term, expansion of higher educational activities, promoting best practices in education, planning drastic changes, continuous quality improvement activities, preserving natural landscapes, providing a clean and transparent administration and making efforts to impart values and knowledge beyond classrooms is the correct approach. The model of educational development should encapsulate effective solution involving intensity, concentration, speed, urgency and efficiency, leading to high level of performance to establish their competence in the workplace at every stage from concept to completion.

Causes for concern - serious implications

The existing framework needs further improvements to ensure environmental sustainability and to develop a global partnership for development that are in line with the millennium development goals (MDGs).[11] The latest trend is the establishment of active and successful academic and research partnerships between universities and corporates, which act to propel both to reach greater heights and produce thought leaders in specific domains. In-depth societal perspective and clarity of perception are the main factors for effective functioning and to arrive at reasonably good conclusions. It is important to accelerate public-private partnership programs on technology missions, on a large scale throughout the country, to make breakthroughs. If individuals and institutions join hands with clear vision and mission, the excitement and opportunities of the future will open up. An essential component of development is to provide a separate policy framework to support efficiency of small scale industries for enhancing their management and technological capabilities. The multinational companies (MNCs) should initiate

immediate actions for creating better enabling environment of certain Indian industries by partnership or projects in line with the concept of global village development. The central and state level public sector units (PSUs), small and medium scale industries (SMSIs), MNCs and a large number of informal sector units should initiate different kinds of activities depending on their capabilities and aspirations, to occupy prominent place for India on the industrial map of the world. While India needs to pay attention to technological inventions in specified high-tech areas, developing generic technologies for common civilian and military applications on a large scale, should be considered for the overall rapid growth of the economy. The main challenge is to provide adequate and appropriate, good quality employment opportunities in an organized sector for the educated mass. The setting up of several micro, small, medium and large scale industries to process natural resources, for example, minerals and hydrocarbons, in a sustainable manner creates employment opportunities and strengthens the economy. Promotion and development of these enterprises, with varying degree of capacity and competence, have to be aligned to international best practices and proper accreditation mechanisms. The product market is fast becoming socially conscious, and buying back the used product is bound to become a pressing issue in the coming years. This change is essential as part of sustainable practices using "cradle-to-grave or life-cycle assessment".

Essential conditions emphasized in science higher education around the world are: ability to apply science knowledge, analyze and interpret experimental/theoretical data, identify and solve problems, professional and ethical responsibility, global, environmental and societal impact, knowledge of technological issues, ability to design, develop, fabricate and test a component, system or process, strengthening institutions, breakthrough accomplishments, and supporting quality education. The higher learning process teaches us to be focused, precise and careful with details, reinforces a sense of strength to move forward, regain perspective by clear and rational thoughts and reenergizes people by engaging in activities that help them feel better. The lack of a Noble prize to any Indian-born scientists for their work, carried out on an Indian soil, six decades after independence is a matter of great concern. To improve the standards of higher education in India, it is better to support a wide range of academic initiatives, including developing new approaches to teaching and learning, and advancing research across disciplines with a contemporary touch, and transnational partnerships (Fig. 4). In many cases, managers are too preoccupied with the implementation process of the education reforms. When change affects an educational institution, the critical role of the leaders and managers in leading employees through the change process, become more significant, as they are the engines of change to instill a firm, optimistic picture of the future. Other constraints include a lack of necessary skills and shortage of human resources. While the government has taken some steps to reform higher education practices, these are simply

not enough. It is important to address the existing shortcomings in the Indian higher education system and to move towards a bold and aspirational vision. We have to look at the community and public education perspectives of mental development, corruption control, social support and a learner centric approach. The roles and responsibilities of public and private higher education institutions by successful partnerships to take up this change challenge should be reflected in the national characteristics and mindsets. India has several inherent strengths that can be leveraged to build an effective education and to create high energy next generation education leadership. The global education experts can share some sound and focused advice on global perspectives of various aspects of higher education to realize this immense potential and throw light on how the country could achieve its full potential. Now is the time to make higher education reforms a priority with proper awareness, financial support and appropriate policies for better use of taxpayers' money.

Teaching is truly noble profession. It shapes the future citizens of this great nation and people can achieve progress in many fields of activities. Surely a better salary package could be given to make the teaching profession more equitable and attractive to bright talent, resulting in an expansion and diversity in size and scope. Many people consider teaching profession an important and interesting one. A good teacher can leave indelible impressions in the minds of students and mold their destiny. He is like a lighted candle and thousands of candles can be lighted from a single source. More significantly, it is the pragmatic approach of transforming lives inspired through science touching, that sets the tone of the journey and there is a greater need for innovation. It is important to stir the hornet's nest on a pertinent educational issue to activate an emergency educational response and to trigger the collective consciousness to create an opportunity to live up to potential and make a difference to educational landscape.

The challenge is to change the current system by acting boldly through a firm and focused approach, to be involved in the serious pursuit of innovation to drive change, and to create the new impactful higher education system. The higher education reform movement has to link people holding a common perspective, and incite publicity to create a new wave of transformation, not just in the Indian context, but with universal support. We have to provide solid evidence of significant growth acceleration in India in the forthcoming years, driven by leadership, expertise, dedication and commitment, and realize important breakthroughs in the different fields of science. The major concern at this time is to start the higher education reforms ball rolling, before it is too late, and reinforce reform attitude stimulating more research and concerted efforts in this direction. It is essential to engage, educate, enrich and encourage the young minds aimed at providing intelligent innovations, to gain the required level of confidence to face life. The urgent need is to make dedicated and sustained efforts in developing core compe-

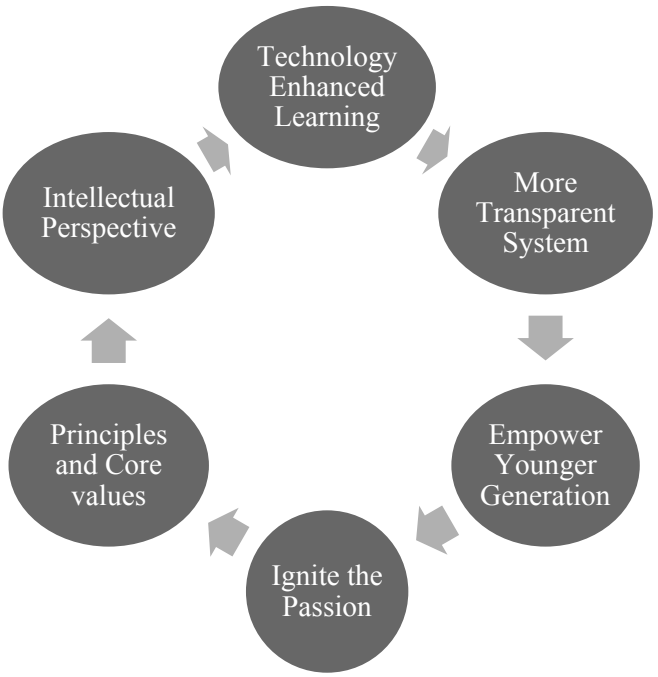

Fig. 4. Ways to transform India into a new vibrant country to reach long-term goals

tence, in certain critical technological areas, that can transform our nation and achieve overall development of our nation in the near future. The clarity of national vision could drive the next generation of leaders towards its aspirations in a short period of time. There is cause for concern in certain attributes of graduates such as subject knowledge and multidisciplinary perspective, critical thinking, problem analysis, problem solving, research skill, modern tool usage, effective communication, individual and team work, project management and finance, ethical practices (professional, social and personal), social responsibilities, sustainable development, and life-long learning. A disciplined and systematic educating approach that guides, reinforces, and supports learners is the key to enable and accelerate success. Innovating on educational design, policy matters and product features ensuring quality teaching-learning interactions, changing attitude, behavior and environment, is the path to improve performance.

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NOTES

1. http://data.worldbank.org/indicatorshttp://data.worldbank.org/indicators
2. www.forbes.com/top-issues-facing-higher-education-in-2014
3. www.ilo.org/wcms_211552.pdf
4. www.heacademy.ac.uk/...based.../research-ba
5. www.hbcse.tifr.res.in/epist
6. www.mobilization.sdsu.edu/.../153VanLaer.ht.
7. www.rsc.org/.../rsc-chemistry-education-india
8. www.trainingmag.com/solving-todays-skill-gaps
9. www.ugc.ac.in/oldpdf/pub/report/12.pdf
10. www.web-us.com/brain/learningtousethebrain.html
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