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

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Abstract. Perspective analysis with a broad development vision leads to realizing the pressing problems, education development gaps, recent trends, ground realities and prospects for the betterment of the Indian higher education scenario. Technological advancement, economic growth, innovative education, domain knowledge, change in lifestyle choices, responsible approaches towards development, reduced consumption of energy and resources, specialized research activities, education policy formulations, social reform efforts, and maintaining our identity help us to contribute to the wider task of nation-building through sustainable all-round development and innovative development solutions. Participatory planning for education development, robust reform enforcement mechanism, establishing effective educational institutions and identification of educational hubs have direct implications to bring about a remarkable positive change. Various higher education reform initiatives are required to develop many short and long-term sustainable solutions in the entire range of essential aspects of education.

Keywords: education research, eco-awareness, educational goals, interactive activities, context-based learning, research network

Introduction and background

India is the third largest among the higher education systems in the world, and it spends 1.2 percent of its GDP on higher education.[1)] Indian policy makers and planners should pay particular attention to quality, and we need to spend at least 4-6 % of the GDP to build some world class institutions and universities that will contribute to nation building. The dynamics of Indian higher education have to change dramatically to encourage young, energetic and potential leaders to take up teaching and research responsibilities. Both public and private sectors have to work together to modify the rules of the game, which requires increasing specificity. Every aspect of education reform, including overall infrastructure, faculty, students, curriculum, and campus placements must be considered to be a means of excelling in various facets of higher education. Moreover, the preparedness of all institutions

and universities in conforming to the international standards of professional conduct is crucial. It is immensely important to establish a new learning and research environment via classrooms and laboratories, several research centers in frontier areas and campus connect to corporate and competitive practices. Recruitment of faculty with outstanding academic qualifications, valuable experience, high caliber and competency will boost India's prospects in the long run. India has to put in place a pure merit- based, transparent recruitment mechanism for faculty members in higher educational institutions and promise a secure life to the scientists and other staff members associated with the science. The educational program should comprise fundamental aspects of science, engineering, and technology, including simulated exercises, case studies, tuned to the present day needs. Bridging the gap between experiential knowledge and sophisticated knowledge by moving from the known to the unknown, the concrete to the abstract, the classical to the quantum domain, the transition from the analog to the digital mode, the full moon to a new moon, and the specific to the general aspects will lead to further growth of systematic knowledge and help the learner to take a decision on a reasonable ground through a comparative perspective. Higher education should enhance the cognitive abilities, capacity to lead and the preparedness to take on real life challenges. Creating an educational ecosystem via active collaborations with knowledge and service-based industries where students will have multiple opportunities to pursue further studies, join different spectra of companies, academic organizations, and research centers is important. We have to examine in detail the application, utility, and requirements of higher education system in an Indian context to create a better tomorrow with a profound sense of responsibility towards the nation and to obtain strategic insights for framing progressive policies. In this regard, it is essential to explore the perspectives of authors, teachers, and researchers through a structured questionnaire on different vital aspects of the educational process and research practice. The students in these systems should develop self-reliance, natural confidence and a sense of duty with the career that they would like to pursue. In today's international context, it is essential to follow the best global practices to become global citizens and expand higher education across all borders of the world. The higher education reform movement has an enormous potential for nation building as it could have serious educational consequences and gives us a chance to be a part of a larger ecosystem. The youth can play a leading role in nation building by creating awareness amongst the young people of different disciplines of science, by fostering national integration and by helping with the personal growth of youngsters with a sense of duty. They can play a prominent role in popularizing several scientific disciplines by organizing workshops and conferences at periodic intervals. An important national higher education policy based on individual specific objectives will help the collective consciousness in selecting the best course of action to have a transformative impact.

The purpose of the present article is to provide a panoramic view to draw attention to the reforms and to trigger a constructive change in the perspectives of higher education system. The scope is broad, including crucial reforms and executive decisions as well as extend technology changes in establishing a healthy education system. A fresh look at the current global educational scenario would provide a useful perspective and help in finding the right balance between results based accountability and operational autonomy. It is important to sensitize people to the fact that there is value in higher education reforms and in trying to promote the overall quality and create awareness about positive thinking on meaningful transformations in the higher education sector by a paradigm shift. It is also essential to make classroom discussions of the vast variety of specific topics lively and relevant through the presentation of concepts from different theoretical and applied perspectives. International exposure, global educational content, real academic work experiences, technology-mediated learning, innovative learning environment, creative education delivery methods, academic excellence, industry interface, challenging curriculum, sustaining competitive advantage and substantial educational dynamism help bring about profound changes and develop professional competence. The challenge is to diffuse access to higher education, specialized skills, highly skilled jobs, political positions and healthcare services in a more inclusive manner to reduce inequality. An emerging trend of engagement of highly educated, active young people joining pure politics and responsible entrepreneurship is crucial to address the problems of the masses, and global cooperation is required for resolving international problems. We have to explore new avenues of multilateral and plurilateral cooperation at the business level in areas of mutual concern. There is a sense of urgency so crucial in handling higher education system and a constant need to develop an understanding of technology use, social causes, environmental care, core human values, and individual and social identity. The most significant bit of academic identity development involves different aspects of intellectual, institutional and networking strands of identity that allow them to benchmark their thinking, writings, practice, and actions. High level of commitment to pursuing excellence in education management, research and practice are necessary to provide a channel in the Indian soil for global placement opportunities and to build national real success stories. We should increasingly focus on becoming global in nature with distinct multiple approaches to improve the quality of higher education system and timely execution of a strategy for effective strategic management. There is a need for global coordination and regulation of future industrial, educational and monetary policies to promote shared prosperity in the changed global scenario. Small and medium scale industrial systems and processes will drive the economy as they are the backbones and create large scale employment opportunities for a growing workforce. We can have sustainable peace, secure future, and better prospects of progress via successful implementation of quality higher education services with a blend of abstract

theory and real-world practice while building strong foundations of future leaders and creating catalysts in the nation's overall growth process. Further, inculcating right work culture, sustainable innovation, and academic discipline will actively encourage us to engage in relevant professional activities to eventually write an India growth story. We have to learn lessons from different schools of thought and incorporate them into our education system to develop eco-friendly education with a focus on proper planning and observation, sustainable management of limited resources, course diversity, and secure placement linkage principles to make a significant contribution in the field. Interestingly, the core audience would be interested in the necessary changes the higher education needs, with an emphasis on efficiency, to accurately reflect the science world today and to emerge as a significant economic power in the world.

The essence of higher education

One of the main aims of higher education is to empower people to work in specific fields useful to the nation and the world as a whole by a competency building process. The overall objective of higher education reforms is to enable the learner to select and apply appropriate methods and techniques to solve societal problems on a successful completion of an academic program and help them maintain a higher level of concentration and more interdisciplinary mode of thinking. Mind stimulation and enhanced brain activity are essential to boost the different aspects of high-spirited performance and real life problem-solving from a broader multidisciplinary perspective in diverse fields of human endeavor. There is a bigger need to promote the positive, constructive thought patterns in the learner's subconscious mind and control the functions, conditions, and sensations of the body to experience beneficial effects today than ever before. We can certainly inspire the larger student community by creative methods of teaching for making learning science an enjoyable experience and contribute to the new emerging world order. It has been exciting to engage the reader over the many new perspectives on the higher education system in India in our previous papers (Thimmappa, 2013a; 2013b; 2014a; 2014b; 2015a; 2015b; 2016). It is about the scale, quality, and cost while encouraging environmental care in building higher educational institutions. We need to deregulate higher education and promote long-lasting and productive inter-university partnerships in several areas and allow universities to operate centers anywhere in the country, as the University is a subset of a larger society. The specific purpose of this paper is to outline useful techniques to inspire and engage discerning and diverse educational audiences with a range of higher education reforms. This article highlights important facts and essential features including futuristic practical possibilities in the field of higher education that are likely to result in the process of significant societal transformation. The over-exploitation of the resources of this planet has led to devastating climate impacts and a growing list of persistent

environmental concerns. There is a need to conserve, protect and nurture many botanical and zoological species across the world. The principle of common but differentiated responsibilities of different nations to promote positive changes by upgrading and transferring green technologies for renewable energy at an affordable cost with the policy of promoting secularism and socialism, liberty and equality as essential features was highlighted in the recently concluded United Nations Paris Climate Change Summit.[2)] There is a tangible link in India between environmental degradation and human health in India and intellectual and political debates with an open-minded approach is required to build a modern thinking society.[3)] It is important and essential to execute signature projects involving untapped ideas, creative designs, advanced techniques, economy management and administration, and more eco-friendly approaches. The subject of environmental pollution should become an integral part of the higher education system to develop a sense of responsibility in everybody to protect and conserve multiple natural resources, and promote a better environment. For instance, bringing out a unique environmental calendar containing an attractive picture and valuable information on different topical themes for display in educational institutions and social organizations working in the various sectors will make people aware of the benefits and make an indelible mark on the global stage.

It is primarily important to ensure that the concerned student of an economically weaker section gets access to quality higher education which would be helpful to industry and society. Useful career solutions, lifestyle advice, community-oriented service, personal safety sessions, self-management, leadership, heritage and eco-tourism, educational excursions, nature camps, and nutritional education by experts in the field and emotional, physical, intellectual and spiritual development opportunities should be offered within the programs, it would help in real-life problem-solving and awareness process about the intricacies of nature. All the stakeholders have to be sensitized across India with a group of dedicated domain experts about proper exposure to mainstream higher education and relevant scientific theory and contemporary scholarly practices to achieve national development with ecological stability. It is immensely useful to explain the subject on more dynamic levels via technology-enhanced learning and teaching techniques using video, visual and textual forms for an exciting learning experience and to reinforce, enhance and strengthen teacher-learner bonds. Presenting information in multiple sensory modes results in better educational outcomes and efficient educational dynamism. Through case studies, interactive teaching, intense scientific discussions, conceptual models, laboratory instructions, fascinating examples of nature, specific pedagogical strategies and other effective educational practices, teachers can make science come alive. Science teachers must adopt creative teaching methods to stimulate fundamental interest among youngsters and popularize them to promote rational thinking as a means to understand the laws of the universe and several

phenomena found in nature. It is important to bridge the classroom learning process with the real world with the focus on uplifting the body, mind, and spirit in the learner's life trajectory to make it more meaningful and celebrating the true spirit of India. Creating a rich repository of quality content in higher educational landscape, the option of selecting suitable science subjects from a wider range of programs and courses, and an in-depth coverage of specific topics to give young learners a competitive edge are essential for overall development and to take the knowledge quotient to new levels to embrace the challenges and the changes as they come their way. A regular lecture series, nationwide awareness campaign, brief awareness sessions and stakeholders' meets will be able to influence young learners' minds and enable them to differentiate between fact and fiction, real and reel life, history and hearsay, reason and emotion, instinct and intention, hearing and listening, looking and seeing, objective and subjective, visible and invisible, and aspiration and reality, especially in the Indian context. Constant efforts are required to transform a piece of barren land into a biodiversity zone or an industrial cluster using right ideas, profound thoughts, and advanced techniques through a rational, analytical and conscious mind. Modern medical science and technology can provide the most advanced treatments for different diseases throughout the world. The student should have the option to specialize in some particular branch of science and strive to excel in academics and career. Eventually, one can become a professional through high-level interest, enthusiasm, focus, hard work, passion, and use the profession for the purpose of serving the world by changing situations, events, and problems.

This educational aspect will foster prosperity, job growth, sustainable infrastructure, development of new industrial cities, economic expansion and diversification, economical energy consumption, and growth in industrial production. The real higher education should put human life into a larger scale perspective and raise the bar of learners' intellect to enable them to unlock the windows of their creativity. Another hugely significant factor in strengthening higher education systems and processes is solving the problem of human resource development by developing innovative programs, which will have huge implications. It should provide multiple exciting opportunities to students for their all-round development with a sense of duty, commitment, discipline, dedication, professional ethics and social values to enable them to become useful citizens of this country. The disciplined approach to work is essential for personal growth and societal prosperity, and it is the primary requirement of civilized society for national success. It is important to focus on developing strategic research capabilities and strategic culture among the members of the scientific community with solid plans for the future and raise the standard of efficiency to do the job to the best of their effectiveness. This aspect will help us to earn substantive self-reliance in strategic sectors such as defense, space science, and earth sciences. A multilayered national higher education structure will provide an invaluable source of scientifically relevant information in different directions,

both at the fundamental and applied levels. Another important aspect is to demonstrate how highly educated youth can lead community-based innovative actions to change the social landscape of the nation through a proactive, participatory approach. We have to change India's skills landscape and skill based employment avenues through regular programs on the ground and vigorous training at national skill development centers and industrial training centers. Higher education promotes better thinking, meticulous planning, enhances knowledge, leads to rational decisions and unbiased actions and a successful effort requires multiple elements on the sophistication of their intellectual stand. The global higher education is moving towards programs that can meet with various educational requirements and can make courses in a particular area attractive, where learners feel intellectually empowered to pursue academic interests and have a meaningful debate on different vital issues that needs urgent attention. People will get direct employment as a result of the higher education sector, and more people from a broad cross-section of society will have indirect benefit as well. The unemployment rate in India is about 4.4 %, which translates into a huge number considering the current population levels. It is evident that we have to prepare the blueprint for a large-scale skill development by 2020 and multiple approaches to improve the internal situation will bridge the gap between actual skilled work and higher order professional work. At a broader level, the requirement of three Es – *education, empowerment, and entrepreneurship* to rise in society, by enhancing the level of intelligence, professionalism, and leadership, will help turn the population productive and add a lot more value to the country. We have to make our proactive educational initiatives related to science stronger and optimize our educational processes aimed at promoting excellence in higher education.

The quest for quality approach

A high quality higher education is necessary to develop a competitive spirit with the rest of the world to be eligible for research work related to the particular field of interest to know recent advancements in research in science and technology. We have to develop a scientific temperament and become more scientific in our thought processes to improve productivity and efficiency, and to live a better quality of life. Higher education has great relevance to the achievements in science, engineering, and technology, and prosperity. It has a direct relation to our professional work and is connected with the country's progress. India can become powerful provided it's scientific, technological and industrial development in all the sectors from spare parts to satellites, from modern structural tools to functional equipment, takes place at a rapid pace. The application of advanced technology, modernization of industrial infrastructure and streamlining work habits and enhanced artistry in our industrial system to achieve qualitative and quantitative production will automatically help us to become an active competitor in the global market. Communication

technology and modern mode of transportation have played a tremendous role in making our foreign trade successful and considerably improved national economic condition through a handsome foreign exchange. The overall interconnected information technology system services to the public in a very competitive, attractive and speedy manner have increased the overall efficiency of the country in a broad range of activities in different fields. Efficient use of information technology at the various levels in both public and private sectors will enhance productivity and help the country emerge as a strong nation in the world and can play a significant strategic role during the 21st century. It is necessary to have scientific and technological advancements for meeting the modern needs in this era of globalization in the next twenty years. There should be close coordination and cooperation among various academic and research institutes, training centers, national research laboratories and central universities, and industries to make rapid scientific and technological developments through the exchange of ideas, expertise, trained workforce and technical support. India as an emerging nation has to give top priority to science and technology education, emerging research domains and development activities which have profound implications for the management of the future economic growth. The country needs to perform well in specific areas such as power generation and storage, transportation, health care, manufacturing, new technologies, research, workforce development and smartphone penetration take its rightful place in the world economic growth at operational levels.

The process of interactive learning is continuous, and we need to improve the quality of our progress-oriented thoughts, speech and action and higher education influence the mind, behavior, and productivity. It is essential to provide long-term perspectives to find the big picture and right understanding of the educational issues with razor-sharp clarity. The education and development efforts positively shape learners to contribute to a better global society. The encouragement of productive activities would have several good effects of both individual and population levels. The environmental studies suggest a complete banning of certain destructive activities as well as the promotion of an afforestation program to prevent further damage to the ecosystem. The challenge and promise of India's future lie in establishing a large manufacturing base, Indian scientific sensibilities, primary commercial energy needs, entirely practical universal principles and values, change in attitudes and perspectives, and a corruption-free society by adopting a transparent way of life. Improving the manufacturing process via the introduction of better designs, efficiency enhancement, and reliable operations and large scale production can bring about a visible change in the modern industrial landscape. It is the promotion of industrialization that will make India the global manufacturing powerhouse, a major investment destination, and a world-class modern tourist hub. There is a future prospect in setting up world class manufacturing clusters for rapid production activities in verticals such as pharmaceuticals, energy, electronics, biotechnology, and

agriculture. The high rate of growth in manufacturing and agriculture will enhance the prospect of exponential growth in placement opportunities. Even the higher education sector is a sunrise sector from an investment point of view, and we need to prepare the blueprint for a large-scale investment in the higher education sector from the government and the scientific research and development community by 2020.[4)] The investment in human resource development is more productive than that in physical assets, and it leads to a faster rate of growth, while creating the images of the future. A healthy investment climate must be carefully maintained to help the process of building physical infrastructure to continue educational activities and to transform the society continually.[5)] The technology solutions, service innovations, and sustained excellence, while providing a service or a product, boost investor confidence which would bring enormous benefits. A rapid integration of multiple technologies into daily life will certainly promote the precious aspects needed for a competition at the global level. Resource persons at seminars, workshops, and conferences help in sharing a series of major innovations and significant advancements in production, processing, quality control, quality improvement, research and development, marketing, trade promotion, safe use of chemicals, policy matters, as an integral part of development. Adopting best practices from education to entrepreneurship, from healthcare to hospitality, will go a long way in inspiring primarily young aspirants in improving the quality up to global standards. There is a need to establish modern infrastructure, offer a complete range of energy solutions and adopt effective, economical and eco-friendly methods of agriculture as an integral part of a continuing aspirational journey in the years to follow. It becomes imperative for us to conserve our natural resources for future generations and optimum utilization for our current needs. We have to revisit certain policies and continuously evolve, change and adapt the revised versions for quick decision making in the expansion and diversification of educational and research activities. There is an increasing need for developing eco-friendly active energy sources which are then further processed into different useful forms. Solar energy, wind power, hydro and biomass energy, and sustainable energy pathway are the major concerns in the energy sector in India, and the impact of emerging technologies will be adding scientific value to the development.

It is important to use print, digital and social media platforms for the efficient operation of universities and higher educational institutions as transparency and accountability are hallmarks of a good educational administration. Explaining and learning the finer elements of science requires efficient time management, failure management, enormous patience and professional practice and presenting the subject matter in an impactful way to transform into a model education system. Teachers play a particular role in their learners' lives and could make a huge difference in the careers of people by promoting their talent, abilities, and wisdom, from where world-class scientists, scholars, and researchers will emerge. They have to be role

models for guiding students in the right manner because of their extensive experience and the necessary expertise whom the younger generation should emulate. A teacher has to be a mix of a mentor, magistrate, an orchestra conductor, learner, solution provider, ethical guide, effective executor, executive editor, education counselor, learned author, an academic activist, a managing director, contributing scholar, leading expert, an able administrator, public intellectual, an innovative thinker, planner, and a person with a big heart who by sticking to his core principles will succeed in achieving multiple academic goals. A good educationist will motivate people to ensure that learners are adequately trained and equipped to meet multiple professional challenges. There is a remarkable rise in the number of Indian students going abroad for higher studies due to the quality of higher education, the reputation of the university, high-end research facilities, institution-industry interaction, and better career prospects. Further, students have the freedom to choose courses within the program. An academic exchange program with different foreign universities would give the learners an exposure to a different educational system with new opportunities and ultimately a better future. We have to refocus our energy on specific goals such as creating a new value-added product, a new process or a novel system or solve a social problem or deal with important issues or meet a consumer need, achieve goals, and help in different ways to make our lives better. There is a need to conduct a nationwide education survey to explore the reasons behind the current perception and to understand the hurdles the stakeholders face. This study helps in a process in which we strive very hard to bring forth certain qualities and to reinforce positive perceptions about the effectiveness and integrity of higher education and research. The bigger learning picture includes four critical participatory aspects of the lecture, library, laboratory and life in cohesion so that learning becomes a holistic and inspiring experience. This image compliments the four primary learning styles - visual, auditory, reading and writing, and kinesthetic learning. Lectures and intensely dynamic discussions have a multilayered message and could serve as a trigger for the task. An excellent resource center comprising a library and audio-visual facilities can offer the learners an exposure to the outer world to support developing expertise and help transform the higher educational landscape. Laboratory infrastructure, including latest equipment, machines, and other facilities is essential to perform experiments and to demonstrate several academic concepts, basic principles, and educational applications. Some laboratory experiments should be broad-based, covering different scientific disciplines to demonstrate to learners how diverse subjects are brought to bear in modern scientific practice, while some others can be based on their connection with everyday life situations. Laboratory sessions should increase the students' subject knowledge and provide them with useful skills that can be applied in other contexts via thought experiments. The learner should have the right exposure to the practice of collecting and interpreting reliable analytical data using a variety of modern instruments

which use spectroscopic, electrochemical, chromatographic and miscellaneous techniques. This experience will promote reasoning and problem-solving and help them to interact and cooperate in small focus groups. Some laboratory activities have the potential to become more challenging learner research experiences outside laboratory courses. Higher education should have deep connections with life and nature is the best teacher to provide real conceptual and practical breakthroughs or concrete examples with profound results. The human body is the most complex molecular machine ever designed with an amazingly intricate and broad ecosystem and biomimetic system that involves the imitation of the models, systems, and elements of nature for the purpose of solving complex human problems and understanding the intricacies of the production process. It is controlled by the mind, but strongly influenced by the body through a complex mechanism of intricate working. The scientific view of nature that it is an unfinished experiment and discovery of natural phenomena in the universe is a process. Hence results and discussions, reflections and expectations, observations and recommendations, involving extensive research on nature in its myriad forms and expressions would certainly help in the progressive development of a theory, conceptual understanding, and achieving problem-solving goals.

Technology and leadership development cells within the campus functioning on technical consultancy, development projects, communication skills, creative solutions, technological innovations, prototype construction, pilot plant designs, business incubation, capacity utilization, and innovation in delivery will take the industry to the next higher level of global competence. More importantly, we have to create exciting campus life as well as simulated exercises and develop cutting-edge innovations, creative projects via collaborating with colleges and market the innovative technologies across the globe. The range of human experience in the intellectual world such as ideas, concepts, imagination, innovation, creation and discovery that function as the seed of solutions can expand in scope and meaning through joint actions. Colleges across the country can evolve learning partnerships and productive research collaborations via an interactive satellite-based audio-visual medium. Such inter-institutional collaborations would enhance their creativity through peer interaction within specialized academic disciplines. The association of scientists in different laboratories and companies to conduct research through an interdisciplinary approach to address scientific problems will witness exciting times. Matched expectations, preferences, practical aspects, values, and ideas about research help while arriving at a decision. Along with bold structural reforms and highly innovative ideas, a strong team with an inherently joint network enabled support systems and exciting research environment form an intrinsic part of intellectual forces and will be crucial to the successful outcome of research activities. Further, conveying the research findings to the public and industries without losing the sight of the big picture is equally important. The scientific community has to master the sci-

ence of scientific communication to bridge the gap between the scientists and the general public. It has immense significance in eliminating public domain notions in community-specific contexts. One of the most significant challenges is how to make people understand scientific ideas at macroscopic, microscopic, symbolic and practical levels despite the major differences in their way of thinking. The collaboration of higher educational institutes with civil society organizations and eminent persons in the community has the power to fundamentally transform the future of higher education and establish a healthy and vibrant society. A forward-looking approach and a broad outlook on national issues, actively encouraging teamwork and using modern technology to build quality higher education system would have more power to move on the growth path. The challenge will be to keep our dream alive by raising the level of practical governance and rational societal values, optimal use of resources and technology, taking the right decisions in the national interest, the expeditious implementation of critical decisions, and creating solutions to problems to have higher order needs of the progressive society and nation.

There is a need to obtain feedback from the present set of faculty members about the different aspects of higher education that meet their needs and personal perspectives about the changes that make a maximum positive impact in India. Studying various crucial aspects of higher education management system in the Indian context can reveal their importance in education dynamics-the processes that shape and change an education ecosystem over the years. The results will provide valuable fresh insights into the refinements of Indian higher education culture. There should be a consistent framework to audit the scientific research work at various private, public higher education institutions and discipline-specific research centers across the country to improve the quality and quantity of work. The vision is to provide a high level of service to advanced learners, and the mission is to establish benchmarks of quality in the higher education system and to be an inspirational leader in the global education scenario. The essential requirements to lead us to a higher education destination include large investments in education infrastructure, devices and content, a large spectrum of study options in different streams, a common set of practices and standards, ethical practices, quality services, functions or deliverables, collaborative processes, technology development, technology transfer, use of new technology, career counselling, rapid expansion plans and developmental efforts, and natural ecosystem conservation programs and other eco-initiatives. It is important to note that life-giving patterns of constructive thoughts and their creative manifestation are expressed as conditions, experiences, and events in different phases of life. A multipronged approach to industrial development, optimum use of resources and environmental protection are key ingredients to create an overall impact of viable solutions in building the future. An intense interest in clear and distinct radical ideas, a decisive mental action for a particular purpose, changing the individual thought patterns, experimenting and studying

the international scientific, technological and patent literature on the subject and adopting useful, efficient and practical techniques would enable us to move on the sure path to real success. Thus, higher education reforms are required to create a professional, well trained and equipped, and highly motivated faculty while improving the service conditions of its members and maintaining accountability and transparency in the system while moving towards the mindset of a facilitator. These elements would have far-reaching implications that can change the work philosophy of the teachers with a slightly wider view of the digitally connected world and act as catalysts in facilitating learner engagement, intrinsic motivation, and clear communication.

The importance of research orientation

Our education system should make us better human beings and encourage the search for new frontiers in knowledge and the spirit of scientific inquiry to discover, innovate and research. Scientific research is an objective process to prove a hypothesis or observation, and it offers a broad spectrum of opportunities to explore the issues leading to life-altering effect. Scientific investigation and development outcomes help strengthen our understanding of the nature of science and promote higher order critical thinking skills that open up more avenues for further studies. Conducting an intensive research has its importance, as it helps to lead learners forward on their journey to understand and devise scientifically sound strategies to march forward or develop specific science models. It is quite stimulating and valuable for developing the body of specialized knowledge that drives innovation or technological advancements.[6)] Research involves logical thinking and a questioning attitude to arrive at a rational solution to the problems of the modern world, answer questions about science or to develop new modes of science expression. The research should demonstrate the importance of a critical analysis of results and show that a drug can be effectively targeted to treat diseases or to find a specific solution to several problems facing humanity. It is important to develop innovative infrastructures, disciplined imagination, a multidisciplinary approach, intellectual problem-solving skills, professionalism, and performance delivery techniques. Further, preparing people with the right skills and developing key competencies to meet the current demand would enhance India's industrial productivity and operational efficiency. Science and technology would play a significant role in driving development in this century of knowledge and researching to expand its reach, impact, and understanding of nature. Constant efforts are required to upgrade technology, to maintain an edge in research capability and the decisive role it plays in the eventual outcome of higher education. Special training and capacity building in specialized fields have far-reaching research implications and in conducting the most efficient educational activities in particular academic settings. An explosion of research activities in the pharmaceutical sector is changing the way certain dead-

ly diseases are treated, considerably boosting survival rates and tailor-made personalized treatment process, remote diagnosis using a medical grade body scan through mobile phones, light and smell alarms or toxins, early symptoms alerts, and life-saving advanced intensive care technology. Emerging technological advances in modern sensor technology may transform the healthcare sector through the development of cheap, reliable and handy medical diagnostic kits. Recent reports indicate the emergence of multi-drug resistant bacteria at a rapid rate across the globe. This fact is a serious public health problem, especially with patients having compromised immunity, children, and senior citizens. Recent advancements in functional materials, designer alloys, sophisticated instrumentation, wireless charging devices, real-time translations from text-to-voice and vice-versa, and biomedical and biotechnology application developments illuminate and inspire a range of research activities and achievements. Transformative change in health care delivery practices, including health promotion, protection, prevention, and diagnostic and curative services would be highly beneficial. Establishing multispecialty research stations at different locations help develop a treatment, expertise, rational use of certain mainstream modern medicines or solve issues at a local or global level.

The digital transformation involving nearly half the population is evolving exponentially, and it has a life-changing impact. Digitization of various programs and course network to establish a system where students can check online the possibility of enrolling themselves in required programs/courses across the country. Providing unlimited internet access via the new space-based technologies such as balloons, drones, and microsatellites, is of particular importance in India. The significant milestone is the discovery of new metamaterials, which enhance the diagnostic capability of acoustic imaging. The entire research program design should involve a serious scientific perspective to real-world challenges and opportunities. Developing strong research links with reputed organizations and funding academic research projects and data collection on different topics of science would serve a particular purpose in education ecosystem. There are strong indications that the Indian scientific research is progressing well despite the influences of the composite and diverse cultural backgrounds and there is a remarkable rise in the interest levels in scientific research across India (Agarwal 2009). Fundamental research in science, engineering, and technology are required to develop original insights into fundamentals of natural phenomena, to meet new challenges, and to achieve new heights of professional excellence. There is a necessity to substantially increase general awareness about biodiversity conservation and structural control of land, water, and air pollution to a larger extent. The educational research activities provide outcomes that do not depend on an assertion of personal opinions, group reasoning or biased discussions. There are exciting areas of research and development from biotechnology in sustainable agriculture to nanotechnology in targeted drug delivery and development of alternative energy sources which have the potential to

transform the future to have food, energy and health security in India. The design and provision of health services with improved efficiency require proper health policies, innovative programs, and specific joint-venture projects involving corporate sector companies. These should adopt the definite roadmap of declared problems, informed perspectives, and realistic priorities with an objective of improving access, affordability, and quality. Private companies operating in diverse sectors such as steel, textiles, telecommunications, pharmaceuticals, petrochemicals, mechanical engineering, and high-technology products deserve proper recognitions of their contribution. Most importantly, they should extend and expand their operations in agriculture, infrastructure development, energy, defense equipment, biotechnology, service, and resource-based products through broader strategic partnership approaches to improve the situation.

Increasing employment opportunities and productive entrepreneurship are essential to excel in the production of manufactured goods, and we need to celebrate the spirit of new-age entrepreneurs, especially in an age of rapid technological change. Research is of central importance in all fields of science to gain fundamental understanding, general to specific understanding, constructing new knowledge, applying knowledge and critical thinking. The future of science will depend on attracting some of the finest minds of the country to scientific research with further emphasis on nurturing their talent. People should come together as a community and follow innovative ways to create appropriate awareness about higher education reforms, science administration, innovation and enterprise through television, radio, and print. We can be activists in our thought processes, expression of ideas and in the way we work to bring about substantial positive change and be a part of the holistic development model which is environmentally sustainable. We should engage and empower the average citizens and actively involve them in the establishment of new academic institutions and new local, national and international networks, collaborations, and ventures, more as a mission to transform the lives of people and as an essential part of public welfare. Scientific research and development outcomes help strengthen our macroscopic, microscopic, symbolic and practical level of understanding of the nature of science and promote a higher order thinking. Research in all the universities must be encouraged through large financial support and specific policy measures to ensure high-quality research output in different disciplines. Currently, there are many opportunities to get into new business ventures and business enhancement with a business-friendly atmosphere. The customer expectations in any market segment have become far more complex, and business administrators have to think twice before introducing a new product or service with a clear emphasis on profitability rather than sustained value creation. Business policy in line with international standards along with simple 'ease of doing business' parameter needs to be adopted along with stringent labeling and advertising regulations and streamlining service delivery as per contractual obligations is essential. There should be

open access to intellectual property rights of key technologies to enable developing countries to build their capacity. It has to set up the task forces on world class infrastructure for active learning and development and research and development work for its nation-building and economic development. Participatory research and development activities with a focus on documentation of knowledge could help in better understanding of natural and human-made systems and subsystems. It is essential to instill a sense of social belonging in young learners by involving them in a project with an objective to solve social problems and enhance their problem-solving ability. Another interesting aspect is that the student exposure to a broad spectrum of topics in the various branches of science, engineering, and technology that demonstrates key developments in these rapidly expanding areas will help them stay current with the recent techniques and scientific approaches in these multiple areas. There is a need to generate more evidence about acceptability and effectiveness of science, engineering, and technology education research activities as well as studies to identify the barriers to implementation of technology in real life settings (Borrego & Bernhard, 2011; Borrego et al., 2009; Jafe, 1989). This aspect will require a structured approach to the standardization of processes and procedures, better data collection mechanisms, accurate interpretation, and healthy research practices that provide reliable and efficient higher education systems. It will prove an inspiration to other countries, and there is the scope for revision as more experience is gained, from emerging, intermediate to established levels. The depth of the quality of research using qualitative and quantitative methods drives research design, development and eventual outcome of the activities of the research community. Finally, research productivity results depend on the individual (emerging, intermediate, established levels) and institutional (local, national, international levels) traits. Further, detailed study of the factors affecting research performance of university faculty would throw light on reshaping the academic work culture and research-based strategies based on international perspectives (Wood, 1990). Forward thinking approach and innovative research practices can have a particularly significant human impact on the development of emerging researchers and enhance their ability to keep moving in the right direction via adequate research, large sample size, and objective and unbiased analysis. Encouraging the researchers to keep their mind sharp and enhancing the spirit of curiosity for further exploration are the essential starting steps to take them to the next level. In fact, we are indeed promoting one of the goals of higher education and research - 'quest for knowledge through research orientation and groundbreaking research,' which will be good for the country in the long term.

Opportunities and challenges capsule

Modern-day challenges are many, and the scale is enormous from healthcare to the energy industry, and the government plays a crucial role in effective educational

planning and management on a large scale to tackle the emerging situation, including challenging internal situation. India needs a broader, transformative, and a radical reboot of the higher education system to address the research related problems and to provide new lines of sophisticated investigations. Major new opportunities are opening up for the Indian higher education sector, and it is immensely important to have a competitive edge over other countries to gain a global perspective. We can learn key lessons from the recent past and work towards a better tomorrow through accelerated changes to make rapid progress on all fronts, taking the country on the path of growth. We have to make our universities the hub of higher educational activity, as a natural progression of developing societies and one of the world's leading centers for innovation. It is clear that there are opportunities for active build-up steps in the higher education sector and several distinct dynamic features are particularly attractive concerning actual development. The higher education as an instrument of change with a clear emphasis on the reforms following a very predictable developmental trajectory would certainly direct the younger generation to show great maturity in handling specific and relevant questions on several new challenges and roadblocks. It can be applied to any field of biomedical diagnosis to space research, providing opportunities for learners in the pursuit of their passion for deep learning or research and talent and help change the Indian scientific landscape. The actual mission of higher education institution is to foster the unique talents of each student and develop the principles of individual and collective responsibility. Discovery, engagement, experience, excitement, socialization and search for knowledge are all part of the higher education package. There is a need to provide a fresh perspective on the efficiency, quality, and benefits of higher education in science and technology. This aspect will provide opportunities to enlighten, enrich and empower individuals to get rejuvenated, revitalized and recharged scientifically. Students should be excited about the possibilities to contribute and make an impact on all dimensions in sectors such as agriculture, automobile, battery, cement, coal, food, fertilizer, gems, glass, leather, metals, mining, paper, power, steel, sugar, television, and textile industries. A particular kind of skill is needed to deal with different institutions and universities in the country, each one with its unique demands and challenges. Conferences, workshops or symposia provide a platform for discussion of today's opportunities and tomorrow's challenges in the sectors of higher education and research to find out economic, efficient and environment-friendly solutions to the problems of the real world. They provide an opportunity for science enthusiasts to meet, interact and share their common interests and channelize their energy upwards to evolve and become better in expressing personal and public opinions, dreams, aspirations, vision, creativity, imagination, motivations, values, and convictions. It is imperative to bring academicians, scientists, industrialists and policymakers to a common platform to exchange scientific ideas and explore collaborative opportunities with specialized topics of interest.

Bringing together like-minded progressive people from different walks of life on a platform such as an Indian Intellectual Forum (IIF), Vibrant Creative Community (VCC), Educational Research and Training Council (ERTC), Effective Education Task Force (EETF), Higher Education Reforms Commission (HERC) or Think Tank Trust in Leadership (TTTL) to have constructive debates will make a world of difference in the future. The application of science and technology can transform the way we produce, distribute, conserve and consume energy by establishing a future of clean energy, efficient energy conversion technologies and cheaper, reliable, renewable energy. One of the most significant challenges in our country is an early diagnosis of various diseases to treat patients in time for immediate recovery. It is more important to be effective at communicating progressive ideas and it requires an organized effort by a team of experts, including subject specialists, educationists, scientists, engineers and trained technology staff to popularize science within India and project India in a positive light in different forums across the world to enhance the visibility and branding.

Over-exploitation of resources of the planet, fast-track development initiatives, and unplanned development have resulted in environmental degradation and climate changes. Polluted air containing harmful superfine particulate matter in several major Indian cities will affect the health of our future generations, leading to a range of illnesses. It is essential to promote positive changes to avoid devastating climate impacts through detailed development plans (DDP), responsible development, dynamic control of pollution, regular environmental monitoring, energy efficient solutions, and great maturity in handling environmental degradation. It is essential to retain significant biodiversity value via sustainable conservation of the integrated ecosystem. We should look at long-term alternative development solutions that are friendly to both ecology and economy. Recent central government development initiatives such as 'Make in India**,** Skill India, Digital India**,** Clean India, Stand-Up India, and Start-Up India' are of central importance in many fields. Such special initiatives on various fronts provide a national platform for young people to transform India via target-oriented development to emerge stronger and more confident on a specific goal involving individual rights and responsibilities. The latest start-up India action plan, aimed at encouraging the start-up ecosystem, includes establishing sector-specific incubators, public-private partnership models for new incubators, innovation centers at national institutes and new research parks by channeling investments and facilitating job creation. Many startups by young Indian entrepreneurs are performing well, and sound education, knowledge, novel ideas, professionalism, and availability of funds support such business ventures. They should now focus on quality, publicity, branding, and cost to compete in the global market. A change in mindset by encouraging imagination, creativity, innovation to have opinions, changes the way people perform, provide job opportunities, and be a part of the solution to make real progress at a faster rate.

The biggest challenges for India will be to pave the path for a better tomorrow economically and ecologically through fertile imagination, action-oriented plans, and powerful performance abilities while developing a favorable ecosystem. More importantly, establishing an enabling ecosystem involving reform, restructure and modernization of higher education system in almost every sphere of science activity play a prominent role in guiding the younger generation of learners. Higher education should offer young aspirant students an excellent opportunity to experience diverse modern subjects that capture the essence and extracurricular activities that activate the mind of moving upward on the ladder of life. We have to invest time, energy, effort and resources in doing long-term strategic planning for the future and quick executive action regarding fundamental reforms in the higher education sector to build workforce capabilities in a systematic manner with timely decision making and proper follow-up measures. We should consider human resource as 'high-value national assets' to move up with the growth, innovation, leadership and global competitive index to make rapid progress on all fronts and realize the immense significance of skilled human resources in the development sector.[10] The future development of a country depends on the collective subconscious initiative of the citizens of that nation and continued efforts towards a common purpose, strategic plan, and quality execution. There is a need for dramatic changes in the higher education system with far better checks and balances in place to make a significant impact on public opinion and to meet global challenges. India's industrial progress, agricultural production, natural resource management, quality testing services, supply chain management, and hands-on academic experience must proceed in a cohesive manner and offer a more long-term potential to apply disciplinary knowledge to the Indian context. A set of general guiding principles and practices that are useful in solving higher education challenges and concrete steps needed for moving towards competency-based education would certainly help to establish a learned society in the country (Marr, 2005; Teece, 2002). There should be different sets of activities in the program designed especially for those who would like to pursue an academic career or technical career. The success of various programs depends on a combination of factors that include high-level action plans, use of innovative technology, right guiding principles, and high impact education delivery mechanism.

An emerging trend in the last few years with technological advancement is that some universities are offering tailor-made programs suited to the specific needs of various communities and providing an exciting learning experience in most branches of knowledge. Other interesting trends in the global higher education scenario include massive open online courses, flipped classrooms, context-based learning and project based learning (Abeysekera & Phillip, 2015; King, 2012; Bennet & Lubben, 2006). A successful action requires multiple elements of inspiration, excitement, adventure, imagination, understanding, energy, economy, empathy, equity, and environment. While the higher education outcome is more a matter of

perspective, it has aspects of non-linear perspective and influence learner's clarity of thoughts in building the essential character of mature citizens and the type of knowledge-based society they create. The members of the science education community should discuss the opportunities and challenges of development of current scientific knowledge in the context of new international students to actively engage them with the higher education system and the potential for future international connections to explore their development as researchers. We have the opportunity to build the best minds capable of engaging with the tough societal challenges and changing the course of higher education for the world. A coordinated effort by all the stakeholders will offer hope about the future of the area. It involves accepting the challenge and opportunity of integrating international standards with enhanced functional autonomy to leverage several tangible benefits to achieve inclusive growth and dramatic transformation.[8)] Objective and rational thinking, right perspective and practical implementation aspects can make a substantial impact on the research output and excel in a particular field on the global stage on a consistent basis. Further, the benefits of the advancements in science and technology should reach rural people to transform their lives to a large extent. Major focus areas in a multipoint formula to become the fastest growing large economy with active support from the government include the following; (i) Promoting the use of renewable resources such as solar, wind, and biomass with a specific purpose to harvest energy as well as to promote distributed power generation and battery back-up storage system; (ii) Building an e-portal for sharing a set of tried-and-tested best practices in the field of higher education and to have an orientation just beyond the present day borders. Developing a borderless interaction through teaching and research activities on our planet Earth help solve global problems and contribute to progress via global developmental activities; (iii) Investing in research and development efforts in higher education, and green technology to lessen its carbon footprint (iv) Creating an expert committee for maintaining, monitoring and verification protocols of quality standards at multiple levels to ensure the desired outcome; (v) Developing safe, affordable, equitable and sustainable solutions to several problems as a means of human welfare and transferring advanced technology to address climate changes; (vi) Expanding enrollment by increasing awareness about the clear advantages of higher education quality to sharpen their scientific temperaments. Developing some large, medium-sized and small science museums across the country to promote the dissemination of science knowledge, sharing the global scientific heritage and raising the level of curiosity, has a fundamental significance; (vii) Nurturing the effective workplace and conducting an in-depth research on the main learning aspects in Indian context to have transformational impact on the teaching-learning process; (viii) Formulating a long-term common higher education policy and a regulatory framework for effective implementation to make the process more streamlined and efficient; (ix) Finding innovative solutions to

transform the future of the Indian higher education scenario and to make a significant contribution towards scientific research in a new dynamic situation with adequate opportunities for professional advancement; (x) Building premier institutions of national importance through public-private partnership initiatives to promote a brilliant academic/industrial career; (xi) Teaching a set of proper skills, practical techniques and efficient methods to illuminate and inspire the learners for the active engagement with the material and to have a high level of preparedness with potentially grave consequences while pursuing a common goal; (xii) Sensitizing and educating learners about environmental aspects and impacts as well as solutions to climate change issues; (xiii) Changing the mindsets, attitudes, and culture through proactive discussions, wider perspectives and advocating good practices to make us better equipped to manage ethical and responsible education and qualitative and quantitative research activities; (xiv) Creating the right educational environment, special ambiance and business network to enable the learner to have an exciting learning experience and to become a more creative individual with a progressive mindset; (xv) Developing human resource security and multinational cooperation to move the work forward to deliver their best to the world and to expand its presence in the world; (xvi) Establishing strong connections with employers and career centers offering counseling, additional training and job-matching functions and working partnership between the Centre and the states; (xvii) Changing the skilling scenario in India through various skill development schemes and courses through constant corporate connections and active support from the business world in the development of components, products and applications; (xviii) High-level political support and commitment to invest in the higher education sector in advancing science, technology, engineering and mathematics education, research, and development; (xix) Establishing some research-intensive universities, intermediate level research-practice based universities and emerging development based universities, depending on the needs of the planet, industry, and society; (xx) Establishing a properly integrated system for the promotion of multiple education projects, training and capacity building for better quality services and also nurturing true team spirit to carry out quality research.

Forward thinking outlook

We have presented in this paper a series of educationally relevant perspectives in the higher education sector that showcase the power of reforms in the entire educational and economic system. The Indian mindset needs to be changed about the efficiency, quality, and benefits of higher education in science and technology while keeping working diligently towards a better tomorrow until we reach the top levels.[7)] A gradual and systematic reconditioning of the minds to establish a new habit pattern may be required to overcome individual blocks and to become successful in enhancing the scholarly value of work. An individual and collective approach

within the framework of higher education system involving concrete structure, procedures, powers and duties of academic institutions will pave the way in meeting higher level national goals.[9] In essence, a series of surgical reforms rather than cosmetic ones will have the desired impact on the lives of people across the country and channelize the educational tide in the right direction in the future. A revolutionary approach to high impact higher education is required to produce many global citizens, to occupy global leadership positions and to lift the existing academic organizations up the ladder. Top priority should be given to the higher education sector as it can act as a pillar driving India's growth and development, and help us meet new challenges via rapid societal changes. A new national higher education policy that highlights institutionalized mechanisms and methods to realize our goals in a time-bound manner is required to create an educational ecosystem that prevents further brain drain and enhances the quality of teaching and research, leading to the delivery of high performance in a globalized environment. The process of making our educated workforce more relevant to face future challenges to create a better tomorrow involves leveraging the collective wisdom of all stakeholders, and the education, training and research programs should be implemented gradually in building the future brick by brick.

Education is to be practiced more in spirit than in the letter, and a complete education should uphold human values while providing inspiration to move forward. A clear set of core values helps in changing the mindset of the members of the civil society to maintain a more positive attitude towards life. Special attention should be paid to unlock the considerable growth potential of people, and the prospects are bright in multiple missions and targets. The critically important attributes will be a) the learning objectives and learning outcomes of various educational programs b) the type and volume potential of placement opportunities c) the identification and mapping of potential employers, and d) the generation of entrepreneurs in local, regional and international business. It remains to be seen if continuous efforts in great planning and proper implementation using experience, talent, wisdom, intelligence, and power can bring about remarkable transformation in the way in which higher education is perceived, presented and appreciated, especially in the modern Indian context. It assumes even greater importance in the global context, especially in this digital age of fast internet connectivity, reliable e-learning infrastructure, the power of clear scientific expression, state-of-the-art learning management systems, and collaborative research programs. A modern outlook and a desire to lead a decent standard of living by creating job opportunities, empowerment and modernization is the essence of India to promote the real progress of the country as a whole. The development of a positive outlook towards higher education perspectives for an exciting educational experience in an Indian context can result in educational effectiveness and help us achieve phenomenal success in reaching higher-order goals and making India one among the five top nations of the higher education and research map.

NOTES:

1. http://www.siteresources.worldbank.org/resources/India_countrysummary.pdf
2. www.scientificamerican.com/article/why-science-is-important
3. http://www.unfccc.int/meetings/paris_nov_2015/meeting/8926.php
4. http://www.cseindia.org/cse's-inaugural-state-india's-health-report
5. www.ijird.com/index.php/ijird/article/download/45858/37232
6. http://www.indianresearchjournals.com/pdf/ijmfsmr2012/August/4.pdf
7. http://www.topuniversities.com./rankings/brics rankings/2013
8. http://www.theindiaeconomyreview.org/article.aspx/aidmid
9. http://www.ugc.ac.in/oldpdf/pub/report/12
10. https://www.globalinnovationindex.org/userfiles/file/.../GII-2015-v5.pdf

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